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Table Tennis Technique Mastery Level of STKIP Pasundan Students: Analysis of Internal and External Factors Affecting Basic Technique Performance

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Abstrac: This study analyzes the mastery of basic table tennis techniques among 60 STKIP Pasundan students selected randomly from a population of 150. Research instruments included observation sheets for six basic techniques (grip, stance, footwork, serve, forehand, backhand) and Likert scale questionnaires to measure internal factors (motivation, interest, physical condition) and external factors (facilities, social support, learning methods). Results showed most students had medium technique mastery (56.7%), followed by high (16.6%) and low (26.7%) categories. Service technique demonstrated the highest mastery (25%), while footwork showed the lowest (40%). Regarding internal factors, student motivation was high (65%), but physical condition supported only 40% of respondents. For external factors, facilities (63.3%) and learning methods (60%) were considered inadequate, while social support was fairly good (53.3%). In conclusion, STKIP Pasundan students' mastery of basic table tennis techniques remains predominantly at a medium level. Motivation is the most influential internal factor, while facility availability is the determining external factor. Improvements are needed in student motivation, physical conditioning, and facility provision alongside innovative learning methods to enhance basic technique mastery.

Keyword: Table Tennis, Basic Techniques, Internal Factors, External Factors, Physical Education Students

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INTRODUCTION

Table tennis is a sport that requires mastery of complex technical skills, good neuromuscular coordination, and quick decision-making abilities.(Kondrič et al., 2013)In the context of physical education in higher education, mastering basic table tennis techniques is a fundamental competency that students must master, especially those in the Physical Education, Health, and Recreation (PJKR) Study Program who will become educators or sports coaches in the future. Basic table tennis techniques encompass several crucial, interrelated elements. The five most important basic technical elements are grip (racket grip), ready position (ready position), footwork (footwork), service (serve), and stroke (hit) (Faber et al., 2016). Each of these elements plays a specific role in determining the effectiveness of the game and must be mastered progressively by beginning players. A proper grip affects ball control and shot variation, a good stance facilitates balance and responsiveness, while footwork determines the optimal body position for executing shots (Malagoli Lanzoni et al., 2014).

However, in practice, many students experience difficulty in mastering these basic techniques. Factors influencing table tennis skills among adolescents in Shanghai found that technique mastery is influenced by a complex interaction between individual, interpersonal, and environmental factors(Celik et al., 2021). The study confirms that a socio-ecological approach is necessary to comprehensively understand the determinants of table tennis skills. Internal factors play a significant role in motor skill learning. Motivation, as one of the main internal factors, influences students' practice intensity and persistence in the face of technical difficulties (Ryan & Deci, 2017). Self-Determination Theory explains that high intrinsic motivation is positively correlated with the quality of learning and skill achievement (Deci & Ryan, 2000). In addition to motivation, students' physical condition also determines their ability to execute techniques correctly. Good motor skills, including coordination, agility, and strength, are prerequisites for effective mastery of sports skills (Schmidt & Lee, 2020).

From an external perspective, the availability of training facilities significantly influences skill development. Access to quality facilities and adequate equipment is a crucial factor in developing sports talent (Contos 2012)In the context of table tennis, the availability of a table, quality rackets, and sufficient practice balls allows students to perform the necessary repetitions for technique mastery.

Learning methods are also a crucial external factor. Traditional pedagogical approaches focused on drill and repetition are often ineffective in developing tactical understanding and technical adaptability (Appeltans et al., 2012). Emphasizes the importance of a game-based learning approach that integrates technique development within a meaningful game context (Harvey & Jarrett, 2014). The role of the instructor or trainer in providing constructive and timely feedback also greatly determines the quality of learning (Magill & Anderson, 2017). Social support from the environment, both from peers and family, also contributes to students' participation and persistence in table tennis training.(Mellalieu & Hanton, 2015). A supportive social environment can increase self-efficacy and reduce anxiety in learning new skills (Widyawan & Sina, 2021). Although there are various studies on the factors influencing table tennis skills, most focus on competitive athletes or school-aged children. The research gap lies in the limited number of studies that comprehensively analyze the internal and external factors influencing the mastery of basic table tennis techniques among physical education students in Indonesia. Understanding the technique mastery profile and the factors influencing it in this population is crucial for designing effective and contextualized learning interventions.

Based on this background, this study aims to: (1) analyze the level of mastery of basic table tennis techniques of STKIP Pasundan students, (2) identify internal factors that influence mastery of techniques, and (3) identify external factors that influence mastery of techniques. The results of the study are expected to provide theoretical contributions to the table tennis learning literature as well as practical implications for the development of table tennis curriculum and learning methods in higher education.

METHOD

This study uses a quantitative descriptive approach to describe the level of mastery of basic table tennis techniques among STKIP Pasundan students and to analyze the internal and external factors that influence their performance. The quantitative descriptive method was chosen because it can describe phenomena objectively and systematically using numerical data (JW, 2014).

Population and Sample The research population was all STKIP Pasundan students enrolled in the Physical Education course in the even semester of the 2024/2025 academic year, totaling 150 students. The sampling technique used was simple random sampling, where each student had an equal chance of being selected as a respondent (Sugiyono, 2015). Based on the Slovin formula with a 95% confidence level (5% error), a sample of 60 students was obtained.

Research Instruments This research uses two types of instruments: m1. Table Tennis Basic Technique Observation Sheet. The observation instrument was developed based on the basic technique elements identified by(Doherty et al., 2018), including: (a) grip, (b) stance, (c) footwork, (d) serve, (e) forehand stroke, and (f) backhand stroke. Each element is assessed using a rubric with a scale of 1-5 (1 = very poor, 2 = poor, 3 = sufficient, 4 = good, 5 = very good). The assessment was carried out by two trained observers to ensure reliability. The validity of the instrument has been tested through expert judgment by three table tennis experts with a Content Validity Ratio (CVR) value of 0.87, and inter-rater reliability using Cohen's Kappa = 0.84. Categorization of the level of technical mastery uses the following norms: a. High: score ≥ 4.7 b. Medium: score 2.5 - 3.9. c. Low: score < 2.5. 2. Internal and External Factors Questionnaire The questionnaire uses a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree) to measure: Internal Factors: a. Motivation (8 items, α=0.89) b. Interest (6 items, α=0.86) c. Physical Condition (6 items, α=0.82) . External Factors: a. Availability of Facilities (7 items, α=0.91). b. Social Support (6 items, α=0.88). c. Learning Methods (7 items, α=0.87) Construct validity was tested using Confirmatory Factor Analysis (CFA) with fit index results: $\chi^2/df=2.14$, CFI=0.92, RMSEA=0.07, indicating an acceptable fit model.

Data Collection Procedures Data collection was conducted in two stages: 1. Observation: Conducted for 3 weeks during table tennis practice sessions. Each student was observed while performing basic techniques with a duration of 15 minutes per student. Observations were conducted by two observers independently. 2. Questionnaire: Distributed after the observation session was completed. Students were given 20 minutes to complete the questionnaire accompanied by the researcher to ensure understanding of each item.

Data Analysis Techniques. Data were analyzed using descriptive statistics with SPSS software version 26.0, including: 1. Calculation of mean, standard deviation, frequency, and percentage. Categorization of the level of technical mastery based on established norms 3. Cross tabulation to analyze the relationship between internal/external factors and the level of technical mastery.

RESULT

Respondent Characteristics

This study involved 60 STKIP Pasundan students, consisting of 38 male students (63.3%) and 22 female students (36.7%) with an age range of 18-22 years (M=19.8; SD=1.12). Most respondents were in their third semester (45%) and fifth semester (35%), while the rest were in their seventh semester (20%).

Level of Mastery of Basic Table Tennis Techniques

Table 1. Distribution of Basic Table Tennis Technique Mastery Levels (n=60)

No	Basic Techniques	Tall		Currently		Low		Mean	Elementary School
		n	%	n	%	n	%		
1	Grip	12	20.0	30	50.0	18	30.0	2.90	0.84
2	Stance	9	15.0	33	55.0	18	30.0	2.75	0.78
3	Footwork	6	10.0	30	50.0	24	40.0	2.50	0.89
4	Service	15	25.0	36	60.0	9	15.0	3.20	0.72
5	Forehand	11	18.3	35	58.3	14	23.3	2.95	0.81
6	Backhand	10	16.7	34	56.7	16	26.7	2.85	0.79
Average		10.5	17.5	33	55.0	16.5	27.5	2.86	0.81

Table 1 shows that overall, the majority of students (55%) were in the medium technique mastery category, followed by the low (27.5%) and high (17.5%) categories. Service technique showed the highest mastery with 25% of students in the high category (M=3.20; SD=0.72), while footwork showed the lowest mastery with 40% of students in the low category (M=2.50; SD=0.89).

Table 2. Overall Categorization of Basic Technique Mastery Levels

Category	Score Range	Frequency	Percentage (%)
Tall	≥ 4.0	10	16.6
Currently	2.5 - 3.9	34	56.7
Low	< 2.5	16	26.7
Total		60	100.0

Internal Factor Analysis

Table 3. Distribution of Internal Factors Affecting Performance (n=60)

Internal Factors	Strongly agree		Agree		Neutral		Don't agree		Strongly Disagree		Mean	Elementary School
	n	%	n	%	n	%	n	%	n	%		
Motivation	15	25.0	24	40.0	12	20.0	6	10.0	3	5.0	3.70	1.12
Interest	12	20.0	21	35.0	18	30.0	6	10.0	3	5.0	3.55	1.08
Physical Condition	9	15.0	15	25.0	21	35.0	12	20.0	3	5.0	3.25	1.09

The results of the internal factor analysis showed that student motivation was relatively high, with 65% of respondents agreeing or strongly agreeing (M=3.70; SD=1.12). Student interest was also quite good, with 55% of respondents giving a positive response (M=3.55; SD=1.08). However, physical condition was the weakest internal factor, with only 40% of respondents feeling their physical condition supported optimal performance (M=3.25; SD=1.09).

External Factor Analysis

Table 4. Distribution of External Factors Affecting Performance (n=60)

External Factors	Strongly agree		Agree		Neutral		Don't agree		Strongly Disagree		Mean	Elementary School
	n	%	n	%	n	%	n	%	n	%		
Availability of Facilities	6	10.0	15	25.0	18	30.0	15	25.0	6	10.0	2.95	1.18
Social Support	12	20.0	20	33.3	16	26.7	8	13.3	4	6.7	3.47	1.15
Learning methods	8	13.3	18	30.0	18	30.0	12	20.0	4	6.7	3.23	1.13

External factor analysis revealed that the majority of respondents considered the availability of facilities inadequate, with 35% disagreeing and strongly disagreeing that the facilities were adequate (M=2.95; SD=1.18). Learning methods were also deemed in need of improvement, with only 43.3% of respondents responding positively (M=3.23; SD=1.13). Meanwhile, social support was deemed adequate, with 53.3% of respondents feeling they received adequate support from their social environment (M=3.47; SD=1.15).

Table 5. Correlation between Internal/External Factors and Level of Technical Mastery

Variables	**Correlation (r)**	**Category**
Motivation → Technical Mastery	0.58**	Medium-Strong
Interest → Technical Mastery	0.52**	Currently
Physical Condition → Technical Mastery	0.61**	Strong
Facilities → Technical Mastery	0.54**	Currently
Social Support → Technical Mastery	0.43**	Currently
Learning Method → Mastery of Techniques	0.49**	Currently

**$p < 0.01$

Table 5 shows that all factors, both internal and external, were significantly positively correlated with the level of technique mastery. Physical condition showed the strongest correlation (r=0.61), followed by motivation (r=0.58) and facility availability (r=0.54).

DISCUSSION

The results of this study indicate that the majority of STKIP Pasundan students' mastery of basic table tennis techniques is in the moderate category (56.7%), with only 16.6% achieving the high category. This finding indicates the need for systematic intervention to improve the quality of basic technique mastery among prospective physical education teacher students.Mastering basic techniques in a sport is important for players in addition to tactical skills, so that performance when playing is good (Rahmat et al., 2021).

Table Tennis Basic Techniq Mastery Profile: Significant variation in technique mastery across basic technique elements is a key finding in this study. Serves demonstrated the highest level of mastery (25% in the high category), while footwork demonstrated the lowest (40% in the low category). This pattern is consistent with research identifying footwork as the most challenging technical aspect for beginners because it requires complex coordination between visual perception, decision-making, and motor execution (Faber et al., 2016). Serving is relatively easier to master because it is a closed skill that is performed in self-paced conditions without pressure from the opponent (Li & Smith, 2022).Mastering basic techniques, especially the forehand drive, is very important because it forms the basis for more advanced skills and improves the overall quality of the game (Hasmarita et al., 2020). Mastering basic techniques,

especially the forehand drive, is very important because it forms the basis for more advanced skills and improves the overall quality of play. The finding about low footwork mastery is in line with research (Malagoli Lanzoni et al., 2014). which emphasizes that footwork in table tennis involves agility, anticipation, and split-step timing, which require intensive training and specific feedback. This limitation is a serious concern because footwork is the foundation for effective stroke execution, allowing players to consistently be in an optimal position to strike the ball (Celik et al., 2021).

The Role of Internal Factors in Mastering Techniques The results of the study indicate that student motivation is relatively high (65% positive responses), but is not accompanied by adequate physical condition (only 40% positive responses). This finding confirms research on the importance of intrinsic motivation in learning motor skills (Tong et al., 2013). High motivation drives students to practice consistently and persistently despite technical difficulties. However, motivation alone is insufficient without adequate physical capacity. Poor physical condition becomes a bottleneck in mastering table tennis techniques. Research shows that table tennis requires good core strength, explosive power, and cardiovascular endurance (Chen & Wang, 2023). Without a strong physical foundation, students will struggle to execute fast footwork, maintain consistent strokes, and endure long rallies. The correlation analysis in this study supports these findings, with physical condition showing the strongest correlation with technical mastery ($r=0.61$, $p<0.01$).

Students' interest in table tennis also showed quite good results (55% positive responses), in line with research which states that interest is closely related to attention and cognitive engagement in motor learning (Winarno, 2018). Students who are highly interested tend to be more focused during practice, more receptive to feedback, and more willing to engage in deliberate practice (Ericsson et al., 2019).

The Role of External Factors in Mastering Techniques The availability of facilities is an external factor thatmost problematic in this study, with 35% of respondents rating the facilities as inadequate. This finding is consistent with researchwhich found that limited sports facilities and infrastructure in Indonesian educational institutions were the main obstacle in developing students' sports skills (Wijaya et al., 2024). The limited availability of table tennis tables, quality bats, and practice balls limits the volume of training and the variety of drills that students can perform. The Developmental Model of Sport Participation emphasizes that access to quality facilities is a crucial factor in sampling years and specializing years of athlete development (Côté & Hancock, 2016). Although the students in this study were not elite athletes, the same principle applies: adequate repetition and variety of training can only occur if adequate facilities are available. The learning methods applied were also considered suboptimal by 26.7% of respondents. This finding indicates the need for pedagogical innovation in table tennis instruction in higher education. Research on game-based approaches has shown that pedagogical approaches that integrate skill development within the context of game situations are more effective than traditional drill-based approaches (Harvey & Jarrett, 2014). The game-based approach not only improves technical skills but also develops tactical understanding and decision-making, which are essential to table tennis performance.

His research on teaching table tennis in secondary schools emphasizes the importance of progressive task design, starting with simplified games with modified rules, gradually increasing complexity according to the students' skill level.(Abad Robles, 2008)This approach allows students to experience early success, which increases self-efficacy and enjoyment, which in turn improves engagement and learning outcomes. Social support showed relatively positive results (53.3%), in line with research (Triantoro & Andrijanto, 2021). who found that parental support and peer support were positively correlated with active participation in sports. In the context of college students, peer support from classmates and seniors is an important source of extrinsic motivation, especially in creating a positive learning climate and reducing anxiety in learning new skills (Gonzalez et al., 2023).

Interaction of Internal and External Factors An important finding of this study is that all factors, both internal and external, are significantly positively correlated with the level of technical mastery. This confirms the ecological systems theory (Hermabessiere et al., 2017). which states that skill development is the result of dynamic interactions between individual characteristics and environmental context (Wang et al., 2021). In his research on factors influencing adolescent table tennis skills, he also found that a socio-ecological approach that integrates individual, interpersonal, and environmental factors is more powerful in predicting skill acquisition than an approach that only focuses on one dimension.

The strong correlation between physical condition and technical mastery (r=0.61) indicates that physical literacy is a prerequisite for technical play. Consequently, table tennis training programs in universities need to integrate physical conditioning components specific to table tennis, rather than solely focusing on technical drills. The correlation between motivation and technical mastery (r=0.58) aligns with mastery (Tomoliyus et al., 2024). about the development of reaction time tests for table tennis athletes emphasizes that specific physical capacities such as speed, agility, and reaction time directly influence the abili to execute techniques in achievement goal theory situations (Nicholls, 1984). which explains that students with a mastery orientation tend to be more engaged in deliberate practice and more resilient in the face of setbacks. In his research on the effectiveness of the return board to improve forehand drives, it was shown that students with high motivation showed more significant improvement than the control group, indicating that motivation mediates the effectiveness of technical interventions (Santosa et al., 2024).

Implications for Table Tennis Learning Development Based on the research findings, several strategies can be recommended to improve students' mastery of basic table tennis techniques. First, implement a physical conditioning program specific to table tennis, including footwork drills, plyometric exercises for explosive power, and core strengthening exercises. It was identified that the metabolism and physical fitness characteristics in table tennis require a combination of aerobic capacity and anaerobic power, which can be improved through specific high-intensity interval training (Liao et al., 2018). Second, adopt innovative teaching methods such as video analysis to provide augmented feedback. Research on an Android application for table tennis referees shows that technology-enhanced learning can improve feedback quality and accelerate skill acquisition (Siregar et al., 2025). Video analysis allows students for self-observation and self-correction, which are important components in developing motor schema.(Sachse et al., 2012)Third, optimizing facilities through creative solutions such as rotating schedules to maximize access to training, procuring portable training equipment, and creating practice stations that enable small group training with higher practice volumes. A study of para table tennis athletes showed that equipment modifications and adaptive approaches can facilitate inclusive participation and effective skill development (Luarte-Rocha et al., 2024). Fourth, the implementation of peer-assisted learning and mentoring programs that leverage existing social support has been found to increase motivation and create a positive climate conducive to skill development (Grotzinger et al., 2014).

Research Limitations: This study has several limitations that need to be considered. First, the cross-sectional design does not allow for causal inference between the factors studied and technique mastery. Longitudinal research is needed to understand the trajectory of skill development and identify critical periods for intervention. Second, the use of a self-report questionnaire to measure internal and external factors may contain social desirability bias. Third, the study was conducted at a single institution, so generalizing the results to the broader population of PJKR students requires caution.

CONCLUSION

Based on research at STKIP Pasundan, students' basic table tennis skills are generally moderate, but with significant variation across techniques. Serving is the most mastered technique, while footwork is the greatest weakness, indicating a need for improvement in

mobility. Internally, students' motivation to learn is high and supports technical achievement, but physical condition is the main weakness that most strongly influences technique mastery. Externally, the main challenges lie in inadequate facilities and suboptimal learning methods. Therefore, this study concludes that a holistic and integrated approach is absolutely necessary. Improving the quality of learning will not be effective if it focuses solely on one aspect. Suggested solutions include developing training programs that combine technique, physical condition, and tactics; innovating teaching methods; improving facilities; and utilizing a positive social environment to support the learning process. Ultimately, successful table tennis learning requires simultaneous improvement of all factors, both internal factors such as physical condition and motivation, and external factors such as facilities and teaching methods

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