Forehand, Backhand, and Serve Accuracy Among Physical Education Students

by Ians Aprilo

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Forehand, Backhand, and Serve Accuracy Among Physical Education Students

*Ians Aprilo[1], Poppy Elisano Arfanda[1], M. Adam Mappaompo[1], Hasbi Asyhari[1], Yusnadi[1]
[1]Universitas Negeri Makassar, Makassar, Indonesia
Corresponding Author: Ians Aprilo, ians.aprilo@unm.ac.id

Abstract

Objectives: To describe and compare forehand, backhand, and serve accuracy among physical education students enrolled in a university tennis course.

Materials and Methods: In this cross-sectional study, 82 male students completed 20 target-based attempts for each stroke. Each target hit scored one point. Scores were summarized descriptively and compared using the Friedman test.

Results: The forehand had the highest mean score (13.95 ± 2.62 out of 20), followed by the backhand (12.50 ± 1.69) and serve (10.98 ± 2.04). Serve scores were most frequently classified as fair (47 of 82 students, 57.32%). Scores differed overall across the three tasks, $\chi^2(2, N = 82) = 39.802$, $p < .001$, Kendall's $W = .243$.

Conclusions: Students recorded the fewest target hits on the serve. The accuracy profile identifies serve placement as a priority for follow-up assessment and practice in this cohort.

Keywords: tennis, shot accuracy, groundstrokes, serve, physical education

Introduction

Students in a university tennis course are often expected to demonstrate a stroke and explain how to teach it. A target test gives lecturers a straightforward way to assess one part of that task: whether students can place the ball where they intend. University-level tennis tests have long assessed the forehand, backhand, and serve separately (Hewitt, 1966). Placement tests have also been developed for novice players, with evidence that the correspondence between target-test performance and match play varies by stroke (Digennaro, 1969).

Groundstrokes and serves pose different problems for learners. In a fed-ball groundstroke, the player adjusts to an incoming ball and directs it toward the target. In the serve, the player initiates the stroke, places the toss, and coordinates the swing with the point of contact. Research on professional serves has shown that aspects of the setup, toss, and impact position vary with the intended landing location (Reid et al., 2011). In physical education students, video analysis has identified errors across several fundamental strokes, with the serve accounting for the largest share of observed errors (Ruslan et al., 2026).

For a lecturer planning practice, it is useful to know which strokes students place consistently under the course's assessment conditions. Comparing scores from the same students gives a cohort-level profile and can identify where additional assessment or practice may be warranted. The purpose of this study was to describe and compare forehand, backhand, and serve accuracy among physical education students using three target tests with 20 scored attempts per stroke.

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Materials and Methods

Study Design

This cross-sectional skills assessment used a within-student design. Each student completed forehand, backhand, and serve tests during the same assessment period. The outcome was the number of successful target hits for each stroke.

Study Participants

The study included all 82 eligible physical education students enrolled in a tennis course in the first semester of the 2025–2026 academic year. Eligibility required active participation in the course, previous instruction in fundamental tennis strokes, willingness to participate, and the ability to complete the tests safely. Students with injuries or physical limitations that prevented testing were excluded.

Study Organization

Students received instructions, warmed up, and completed familiarization attempts before scoring began. Tests were administered in a fixed sequence: forehand, backhand, and serve. Rest was provided between tests. The feeder, target setup, and number of attempts were kept consistent across students, and scores were recorded on structured observation sheets.

For the forehand and backhand tests, students returned fed balls toward a designated target. For the serve, students stood behind the baseline and served into the diagonally opposite service box. Each student completed 20 scored attempts per stroke. A valid attempt that reached the target scored 1 point, and other scored attempts received 0 points. Scores could range from 0 to 20 for each stroke. The same operational categories were applied to the three scores: very poor (0–4), poor (5–8), fair (9–12), good (13–16), and very good (17–20). These cutoffs were used to summarize this cohort.

Statistical Analysis

Analyses were reported using IBM SPSS Statistics version 27. Scores were summarized with the mean, standard deviation, median, and observed range. Mean percentages of successful attempts were calculated as the mean score divided by 20 and multiplied by 100. Counts and percentages were used to summarize the operational categories.

Score distributions were assessed using Shapiro–Wilk tests. A Friedman test compared the three related sets of scores at $\alpha = .05$. Kendall's W was calculated from the reported Friedman statistic as $\chi^2/[N(k - 1)]$, where k is the number of strokes. Differences between the displayed stroke means were calculated for descriptive interpretation. The omnibus analysis was the basis of the inferential comparison.

Ethical Considerations

[Confirm the ethics committee decision or exemption, reference number, and consent procedure.]

Results

All 82 students in the analytic cohort were male. Thirty-two (39.02%) reported prior tennis experience, and 50 (60.98%) reported none.

Accuracy by Stroke

The mean score was highest for the forehand, followed by the backhand and serve (Table 1). On average, students hit the target on approximately 70% of forehands, 63% of backhands, and 55% of serves. The gap between the displayed forehand and serve

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means was 2.97 successful attempts per 20 shots. The corresponding gaps were 1.45 for forehand versus backhand and 1.52 for backhand versus serve. Forehand scores had the largest standard deviation, and backhand scores had the smallest.

Table 1

Target Accuracy Scores by Stroke (N = 82)

Measure	Forehand	Backhand	Serve
Mean ± SD	13.95 ± 2.62	12.50 ± 1.69	10.98 ± 2.04
Median	14.00	12.50	11.00
Observed range	10–18	10–15	8–15
Mean target hits (%)	69.75	62.50	54.90

Score Categories

A total of 54 students (65.85%) scored in the good or very good categories for the forehand (Table 2). Backhand scores were split evenly between fair and good. Forty-seven students (57.32%) scored in the fair category for the serve, and another 12 (14.63%) scored in the poor category. The forehand was the only stroke with scores in the very good category.

Table 2

Distribution of Target Accuracy Scores by Category (N = 82)

Category	Score range	Forehand n (%)	Backhand n (%)	Serve n (%)
Very Good	17–20	18 (21.95)	0 (0)	0 (0)
Good	13–16	36 (43.90)	41 (50.00)	23 (28.05)
Fair	9–12	28 (34.15)	41 (50.00)	47 (57.32)
Poor	5–8	0 (0)	0 (0)	12 (14.63)
Very Poor	0–4	0 (0)	0 (0)	0 (0)

Comparison of Related Scores

Shapiro–Wilk tests indicated departures from normality for the forehand ($W = .929$), backhand ($W = .910$), and serve ($W = .928$), all $p < .001$. The Friedman test indicated an overall difference in scores across the three tasks, $\chi^2(2, N = 82) = 39.802$, $p < .001$, Kendall's $W = .243$.

Discussion

The students placed more forehands than serves on target, with backhand accuracy falling between the two. The gap between the forehand and serve averaged about three successful attempts on a 20-shot test. The distribution added a practical detail: forehand scores were relatively dispersed, whereas the serve was the only stroke for which some students scored in the poor category. The Friedman test supports a difference across the three test conditions as a set. The observed ordering of individual strokes is based on their descriptive scores.

The low serve scores are consistent with two studies that assessed different aspects of beginning tennis performance. Ruslan et al. (2026) found that serves accounted for the largest share of technical errors in a video-based study of physical education students. Aprilo et al. (2025) reported low serve-placement scores in a separate group of novice junior athletes assessed using the Hewitt test. The present study used a different scoring

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procedure and a university cohort, so the percentages and category labels from the two studies cannot be compared directly. Taken together, the studies give instructors a reason to evaluate serve placement alongside the movement phases that may underlie a missed target.

An inaccurate serve may begin with a variable toss or result from adjustments made later in the swing. Reid et al. (2011) found differences in toss and impact characteristics when professionals directed first serves to different locations. Research in elite juniors also showed that isolating the toss or swing can change features of the movement seen in a complete serve (Reid et al., 2010). For university classes, these findings suggest a practical sequence: use focused feedback when a student repeatedly struggles with one phase, then reassess placement during the complete serve. The present scores provide no phase-level observations, so they cannot identify which technical errors occurred in this cohort.

The groundstroke results also have implications for how the course assesses skill. The relatively wide spread of forehand scores suggests that a single class mean can hide meaningful differences between students. Backhand scores were more tightly grouped, with half of the class in each of two adjacent categories. Earlier test-development work reported that correspondence between target scores and performance during play differed by stroke (Digennaro, 1969). A target test can therefore guide individualized practice, while a short rally assessment or a technique rubric can show whether a student also maintains control when ball placement and timing vary.

Several features of the design limit interpretation. Equal numbers of attempts provide a common score range, while comparable task difficulty would require separate calibration. The groundstroke and serve tasks differed in ball delivery and landing requirements. The serve was assessed last, so a fixed-order effect is possible even with rest between tests. The cross-sectional assessment cannot distinguish previous experience from learning during the course, and the sample was drawn from one male course cohort. Target geometry, feed characteristics, and reliability evidence for the specific protocol should be documented in future applications. Repeated testing and direct observation of technique would help determine whether changes in accuracy persist and carry over to play.

Conclusions

In this cohort of 82 physical education students, forehand accuracy was highest, followed by backhand and serve accuracy. Scores differed overall across the three target tests, and the forehand–serve gap averaged about three successful attempts per 20 shots. Serve placement was the clearest priority for follow-up assessment and practice in this course. Adding a brief assessment of serve technique would help lecturers identify what to address when students repeatedly miss the target.

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