**Musamus Journal of Physical Education and Sport (MJPES)**
http://ejournal.unmus.ac.id/index.php/physical
Volume 8, No. 3, July 2026, Pg. 1156- 1161
DOI: 10.35724/mjpes.v8i3.7888

# Effects of Multiball Training on Forehand Serve Performance Among Male Junior High School Table Tennis Participants

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## Abstract

**Objectives:** This study examined whether a multiball training program improved forehand serve performance among male students participating in a junior high school table tennis extracurricular program.

**Materials and Methods:** A one-group pretest–posttest design was used with all 15 male table tennis extracurricular participants at SMP Negeri 7 Kota Bima, Indonesia. Participants completed 16 multiball training sessions, conducted three times per week for 60 minutes per session. Forehand serve performance was assessed over 10 attempts using target-zone accuracy scoring (0–5 points per attempt), with raw scores converted to a 0–100 scale. Data were summarized descriptively and analyzed using the Shapiro–Wilk test, a paired-samples t-test, and normalized gain (N-gain).

**Results:** Mean forehand serve performance increased from 44.93 ± 1.04 at pretest to 78.40 ± 0.82 at posttest, representing a mean improvement of 33.47 points. The improvement was statistically significant, $t(14) = 51.802$, $p < .001$. The N-gain was 0.61, indicating a moderate improvement relative to the maximum possible gain.

**Conclusions:** The 16-session multiball program was associated with a substantial improvement in forehand serve accuracy in this group. Multiball practice may therefore be a useful technique-focused option for school table tennis programs; however, the absence of a control group prevents a definitive causal conclusion.

**Keywords:** forehand serve; multiball practice; motor skill; school sport; table tennis

## Introduction

Table tennis requires rapid perception–action coupling, precise racket control, and the ability to reproduce technically stable movements under severe temporal constraints. For developing players, fundamental technical competence is particularly important because early movement patterns provide the basis for later tactical variation and performance. A systematic assessment framework for talented youth players likewise identifies stroke execution and ball placement as central components of table tennis proficiency (Faber et al., 2021).

The serve is the only stroke initiated entirely under the server's control. Its placement, speed, spin, and disguise can shape the next phase of the rally, making consistent service performance an important technical objective. At school level, however, learners often struggle to coordinate ball toss, racket angle, contact timing, and target placement. These difficulties were observed among male participants in the table tennis extracurricular program at SMP Negeri 7 Kota Bima, where forehand serves were frequently inaccurate and technically inconsistent.

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One potential response is multiball training, in which a coach or feeder supplies balls repeatedly so that a player can complete a high number of task-specific repetitions within a controlled period. Compared with ordinary partner rallies, the feed can be stabilized or progressively varied, allowing the coach to emphasize particular movement cues and target zones. Prior studies have reported improvements after multiball practice in forehand accuracy among extracurricular students (Alexon et al., 2021), forehand performance among club athletes (Mahdiah & Candra, 2023), and forehand-drive precision among secondary-school students (Mongsidi et al., 2023). Multiball training has also been linked to improvements in postural control and stroke outcomes in table tennis players (Gu et al., 2019; Cao et al., 2020).

Despite this evidence, research has focused more often on rally strokes such as the forehand drive than on the forehand serve, particularly in junior high school extracurricular settings. Evidence is also limited in Bima, Indonesia, where school programs may have restricted practice time and equipment. Accordingly, this study aimed to determine the change in forehand serve performance following a 16-session multiball training program among male table tennis extracurricular participants at SMP Negeri 7 Kota Bima. It was hypothesized that posttest performance would be significantly higher than pretest performance.

## Materials and Methods

### Study Design and Setting

This quantitative study used a pre-experimental one-group pretest–posttest design. Participants completed a baseline assessment ($O_1$), received the multiball intervention (X), and completed the same assessment after the intervention ($O_2$). The study was conducted at SMP Negeri 7 Kota Bima, Indonesia, in 2025.

$$O_1 \rightarrow X \rightarrow O_2$$

## Participants

The population comprised all 15 male students enrolled in the school's table tennis extracurricular program. Because the population was small and accessible, total sampling was used and all 15 students were included. The source manuscript did not report participants' ages, training experience, attendance rate, or exclusions.

### Multiball Training Program

The intervention consisted of 16 multiball sessions delivered three times per week, with each session lasting 60 minutes. During multiball practice, balls were fed repeatedly to enable frequent forehand serve repetitions. The program emphasized ready position, racket position, ball presentation, the forehand serving action, repeated target-directed practice, and evaluation of serve outcomes. Training was organized to improve movement coordination, racket–ball control, serve placement, and consistency.

**Table 1. Summary of the multiball intervention**

| Component | Description |
|---|---|
| Frequency | 3 sessions per week |
| Total dose | 16 sessions |
| Session duration | 60 minutes |

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| | |
|---|---|
| Primary task | Repeated forehand serves using multiball feeding |
| Technical emphasis | Ready position, racket position, contact, placement, control, and consistency |

## Forehand Serve Performance Test

Forehand serve performance was assessed before and after the intervention using a target-zone accuracy test. Each participant completed 10 serve attempts. A successful serve received 1–5 points according to the target zone reached; an unsuccessful or out-of-bounds serve received 0 points. The maximum raw score was 50. Raw totals were converted to a 0–100 score by multiplying the total by two. Scores were interpreted as very good (86–100), good (71–85), fair (56–70), or poor (≤55). The source manuscript did not report evidence of the test's reliability or validity.

**Table 2. Target-zone scoring and performance categories**

| Target outcome | Points | Converted-score category |
|---|---|---|
| Zone 5 | 5 | 86–100: Very good |
| Zone 4 | 4 | 71–85: Good |
| Zone 3 | 3 | 56–70: Fair |
| Zone 2 | 2 | ≤55: Poor |
| Zone 1 | 1 | — |
| Miss/out | 0 | — |

## Statistical Analysis

Pretest and posttest scores were summarized using the mean, standard deviation, minimum, and maximum. Normality was examined using the Shapiro–Wilk test. Because both distributions met the normality criterion ($p > .05$), pretest and posttest scores were compared using a two-tailed paired-samples t-test at $\alpha = .05$. Normalized gain was calculated as (posttest mean − pretest mean)/(maximum possible score − pretest mean) and interpreted as high (≥0.70), moderate (0.30–0.69), or low (<0.30). Exact p values smaller than .001 are reported as $p < .001$ rather than $p = .000$.

## Results

All 15 participants contributed pretest and posttest scores. On the 0–100 scale, the pretest mean was 44.93 (SD = 1.04; range = 40–44), placing the group in the poor category. The posttest mean was 78.40 (SD = 0.82; range = 78–80), placing the group in the good category. Thus, the mean increase was 33.47 points.

**Table 3. Descriptive statistics for forehand serve performance**

| Assessment | n | Minimum | Maximum | Mean | SD | Category |
|---|---|---|---|---|---|---|
| Pretest | 15 | 40 | 44 | 44.93 | 1.04 | Poor |
| Posttest | 15 | 78 | 80 | 78.40 | 0.82 | Good |

The Shapiro–Wilk results indicated no statistically significant departure from normality for the pretest ($W = .968$, $p = .781$) or posttest ($W = .974$, $p = .846$). The paired-samples analysis showed a statistically significant increase

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from pretest to posttest, mean change = 33.47 (SD = 2.50), t(14) = 51.802, p < .001. The normalized gain was 0.61, which was classified as moderate.

**Table 4. Inferential analysis of the pretest–posttest change**

| Comparison | Mean change | SD of change | t | df | p | N-gain | Interpretation |
|---|---|---|---|---|---|---|---|
| Posttest − pretest | 33.47 | 2.50 | 51.802 | 14 | <.001 | 0.61 | Moderate gain |

## Discussion

The principal finding was a marked increase in forehand serve performance after 16 multiball sessions: the group mean rose from the poor to the good category, and the normalized gain was moderate. These results support the study hypothesis and indicate that repeated, target-directed ball practice was associated with better serve placement and consistency in this school extracurricular group.

The finding is consistent with earlier multiball studies, although most previous work examined rally strokes rather than serves. Alexon et al. (2021) reported improved forehand precision among high-school extracurricular participants, while Mongsidi et al. (2023) found a significant improvement in forehand-drive precision after multiball practice among secondary-school students. Mahdiah and Candra (2023) similarly observed gains in forehand ability after 12 multiball sessions among club athletes. In a broader educational comparison, Solissa (2022) found that multiball training influenced table tennis learning outcomes, and Suisdareni and Tomoliyus (2021) demonstrated that structured drill practice can improve drive accuracy among beginners. Together, these studies support the value of high-repetition, goal-directed technical practice.

Several mechanisms may explain the observed improvement. First, repeated feeds increase the number of task-relevant attempts available within each session. This practice density gives learners more opportunities to stabilize racket angle, contact timing, and directional control. Second, controlling the feed reduces unnecessary variability during early learning, allowing attention to remain on the critical movement and target. Third, immediate observation of where the ball lands provides intrinsic knowledge of results that can guide the next attempt. Multiball practice may also support postural adjustments: Gu et al. (2019) reported improvements in dynamic posture control after table tennis multiball training, while Cao et al. (2020) found that modified multiball conditions improved stroke-related outcomes among adolescent players.

The present result also extends the existing evidence in a specific way. Whereas much of the multiball literature has concentrated on forehand drives, backhand drives, or general stroke performance, this study applied the approach to forehand serving in a junior high school extracurricular context. Its practical contribution is the demonstration that a modest school-based dose—16 sessions of 60 minutes—can be organized around repeated serve placement and evaluated with a simple target-zone test. This makes the approach feasible for programs that do not have sophisticated ball machines or motion-analysis systems.

Nevertheless, the magnitude of improvement should be interpreted cautiously. The study used a single group with no comparison condition, so maturation, familiarization with the test, regular extracurricular practice, coach attention, or other concurrent experiences cannot be separated from the intervention effect. The sample was small, drawn from one school, and included only boys; consequently, the findings cannot be generalized confidently to girls, other age groups, or competitive athletes. The source manuscript also did not report test

reliability, adherence, assessor blinding, detailed progression across sessions, or ethical approval and consent procedures. Finally, the very narrow posttest score range may indicate a ceiling effect in the assessment.

Future research should use randomized or matched control groups, larger and more diverse samples, blinded assessment, and a validated service-performance test. Researchers should also report attendance and intervention fidelity, retain-test performance after several weeks, and compare constant with variable multiball feeds. Such designs would clarify whether improvements transfer to match play and persist after structured practice ends.

## Conclusions

A 16-session multiball training program was associated with a statistically significant and practically substantial improvement in forehand serve performance among 15 male junior high school table tennis extracurricular participants. Mean performance increased from 44.93 to 78.40, with a moderate normalized gain of 0.61. The findings suggest that repeated target-directed multiball practice can be incorporated into school table tennis training to develop serve placement and consistency. Because the study lacked a control group and used a small single-school sample, the result should be interpreted as preliminary evidence rather than definitive proof of causality.

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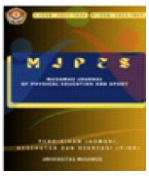

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