Vol. 11, No. 4, 2026, pp. 46-56
DOI: https://doi.org/10.29210/027261jpgi0005

Contents lists available at Journal IICET

JPGI (Jurnal Penelitian Guru Indonesia)
ISSN: 2541-3163(Print) ISSN: 2541-3317 (Electronic)

Journal homepage: https://jurnal.iicet.org/index.php/jpgi



Changes in futsal dribbling-test performance after a 16-session ball-feeling program in high-school players: a single-group pre–post study

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Article Info

Article history:

Received Oct 23th, 2026
Revised Oct 27th, 2026
Accepted Oct 28th, 2026

Keyword:

Adolescent futsal (15–17 years),
Ball-manipulation training,
Slalom dribbling test,
Measurement reliability,
Single-group pre–post study

ABSTRACT

Ball-manipulation and close-control drills (often called "ball feeling" in Indonesian coaching practice) are used in school futsal, but intervention studies often lack control groups and test-specific reliability evidence. To describe changes in slalom-dribbling time after a 16-session program and audit the consistency of repeated trials. In a single-group pre–post study, all 15 players of one senior-high-school futsal team in Padangsidimpuan, Indonesia (age 16.5 ± 0.6 years) completed 16 supervised sessions. Dribbling was assessed with an eight-pole out-and-back slalom test using a handheld stopwatch; the faster of two trials was the primary score. Analyses included a paired t test, 95% confidence interval (CI), Cohen's dz, exact Wilcoxon signed-rank test, scoring-rule sensitivity analyses and trial-to-trial intraclass correlation (ICC). Mean time decreased from 22.75 ± 2.22 s to 13.60 ± 1.10 s (mean difference 9.16 s, 95% CI [7.66, 10.66]; t (14) = 13.10, p < .001; dz = 3.38, 95% CI [2.04, 4.71]); all 15 players were faster. Pre-test trial agreement was high (ICC = .99), but post-test agreement was poor (ICC = .15; maximum difference 6.02 s). Two pairs of players had identical post-test trial records, and pre- and post-test times were weakly negatively correlated (r = -.24). Recorded dribbling times were lower after the program, but the poor post-test agreement and absence of a control group prevent attributing the magnitude of change to the program. Original records and test conditions must be verified before the findings are interpreted as an intervention effect.

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Introduction

Futsal is played on a small court with five players per team, so players receive the ball frequently and must keep possession under constant pressure from nearby opponents (Barreira et al., 2025). In this setting, the ability to carry the ball with short, controlled touches while changing direction is a decisive individual skill. Match analyses of Indonesian league futsal show that dribbling is used throughout attacking play and that the distances covered with the ball vary by playing position (Doewes et al., 2022). In school futsal, players with better ball reception and control progress more often into attacking space, whereas less skilled players tend to avoid one-versus-one duels (Ueda et al., 2023). Dribbling is not only a motor act: video analyses of young players show that what happens after a dribble, such as an accurate pass, strongly shapes how coaches judge technical quality (Iuliano et al., 2023).

In Indonesian coaching practice, "ball feeling" is a practical label for ball-manipulation and close-control drills rather than a separately measured psychological or proprioceptive construct. In this study, it refers to repeated contacts using the sole, instep, inside and outside of the foot, practiced first in stationary or slow-moving tasks and later in movement-based combinations (e.g., toe taps, sole rolls, pull–push actions and short dribbles through cones). The outcome measured here is not ball feeling itself but elapsed time on a closed slalom-dribbling test. This distinction matters because youth-soccer skill assessments vary considerably and many tests are conducted outside representative match-play settings (McCalman et al., 2022). Longitudinal data from talented youth soccer players indicate that dribbling performance develops across adolescence and differs between performance levels (Huijgen et al., 2010), supporting the relevance of age-appropriate technical practice without establishing the efficacy of any specific drill.

How such practice should be organised is debated. Contemporary skill-acquisition frameworks emphasise representative, variable practice, appropriate attentional focus and learner motivation rather than isolated repetition alone (Williams & Hodges, 2023; Wulf & Lewthwaite, 2016). A systematic review of practice and instruction in soccer concluded that evidence for traditional assumptions about drill-based practice is mixed and largely derived from laboratory tasks (Pacheco et al., 2023). Comparisons of linear (prescriptive, repetitive) and nonlinear pedagogies in team-invasion games show broadly similar effects on technical skills, with some advantage for nonlinear approaches on tactical outcomes (Bromilow et al., 2025; Chow et al., 2023). Game-based methods, including small-sided games and differential learning, can also improve technical actions (Hamaidi et al., 2026; Ulupınar et al., 2026). Ball-feeling programs therefore occupy one end of a continuum from decontextualised repetition to game-based learning, and their specific contribution needs to be quantified rather than assumed.

Empirical support for ball-feeling training in futsal comes mainly from Indonesian intervention studies. Single-group studies report faster dribbling-test times after four weeks or 16 sessions of ball-feeling training in club and school players (Aristian et al., 2025; Vyasa & Hidayah, 2025), and after programs combining ball feeling with ladder drills, agility or speed work (Putri et al., 2025; Qolbi et al., 2025; Sulihin et al., 2026). Related studies report changes after dribbling-variation, drill-based, coordination, agility or small-sided-game programs (Arsil et al., 2023; Herlambang et al., 2022; Karma et al., 2025; Kurniawan & Amiq, 2025; Ramadhan et al., 2025; Reynaldi & Nugraheni, 2023; Ridozuta et al., 2025). However, samples are often small, comparison groups are uncommon, and ball feeling is sometimes combined with other training. More generally, reliability studies show that technical-test performance depends on the task and protocol: reliability has been examined for youth speed-dribbling tests, soccer skill tests, and multi-skill futsal tests, but coefficients from those tests cannot be transferred automatically to the present adapted slalom test (Farhani et al., 2019; McCalman et al., 2022; Padrón-Cabo et al., 2019; Russell et al., 2010). These limitations motivate reporting effect estimates, uncertainty, individual responses and measurement checks rather than relying only on significance tests (Mesquida et al., 2022).

Three gaps follow. First, little is known about the magnitude, precision and individual pattern of change in dribbling-test performance after a ball-feeling program delivered as a stand-alone, fully documented protocol in senior high-school extracurricular futsal. Second, timed slalom tests require familiarisation and can show learning effects across repeated administrations (de Oliveira et al., 2024), yet previous studies rarely report trial-to-trial agreement. Third, the plausibility of very large pre–post changes is seldom examined against measurement error, regression to the mean (Barnett et al., 2005) and co-interventions. The present study addresses these gaps by reporting a 16-session ball-feeling protocol in sufficient detail for replication, together with effect sizes, confidence intervals, individual trajectories and an explicit audit of the measurement data. The aim was to describe changes in slalom dribbling-test time in high-school futsal players after the program. It was hypothesised that test time would be shorter after the program than before it; given the design, the study was not intended to establish causal efficacy.

Method

Design

A single-group pre-test–post-test design was used. Dribbling performance was measured before and after a 16-session ball-manipulation and close-control program (locally termed "ball feeling"); no control or comparison group was included. The study therefore estimates change over time and cannot isolate the program effect from maturation, familiarisation, other activity or changes in test conditions. Reporting includes effect sizes, confidence intervals and measurement checks (Lakens, 2013).

Setting and study period
The study took place at the futsal court of SMA Negeri 1 Padangsidimpuan, North Sumatra, Indonesia, between August and September 2026.

Participants
The population was the school's futsal extracurricular team (N = 15), and all members were included using total sampling. Participant characteristics are shown in Table 1. All players were right-foot dominant. All 15 players completed both tests and attended all 16 sessions (240 of 240 planned attendances).

Table 1. Participant Characteristics (N = 15)

Characteristic	Value
Age, years, *M* ± *SD* (range)	16.53 ± 0.64 (15–17)
Age 15 / 16 / 17 years, *n* (%)	1 (6.7) / 5 (33.3) / 9 (60.0)
School grade X / XI / XII, *n* (%)	2 (13.3) / 6 (40.0) / 7 (46.7)
Height, cm, *M* ± *SD* (range)	167.33 ± 4.94 (160–178)
Body mass, kg, *M* ± *SD* (range)	58.47 ± 4.64 (52–68)
Body mass index, kg·m^{-2}, *M* ± *SD*	20.84 ± 0.49
Right-foot dominant, *n* (%)	15 (100.0)
Session attendance, %	100

Note. Values were recalculated from the individual participant data in the thesis appendix. Body mass index was computed from height and body mass. Grade X–XII corresponds to Years 10–12 of senior high school.

Intervention
The program comprised 16 sessions of about 55 min: a 15-min warm-up, a 10-min preparation segment (prayer, explanation, jogging, agility and technique activation), a 20-min main ball-manipulation and close-control segment, and a 10-min cool-down (small-sided play followed by dynamic and static stretching). In the main segment, each drill was performed for 30 s per repetition with 30 s rest between repetitions, six repetitions per set (seven in Session 5), three sets and 2 min rest between sets, giving about 9 min of active drill time per session. Content progressed from stationary or slow-moving ball contact (Sessions 1–5: toe taps, sole touches, outside touches, inside-foot pushes, pull–push), to movement between cones and combinations with passing and shooting (Sessions 6–11), to zig-zag dribbling, sole rolls, ball control without looking at the ball and rondo with a two-touch limit (Sessions 12–16). Drills were usually performed in pairs over 3 m. The session-by-session protocol is given in Table 2. Formal intensity targets were not prescribed for the main ball-manipulation segment.

Table 2. Session-by-Session Ball-Feeling Protocol

Session	Main drill content	Reps × sets	Main part (min)
1	Toe taps in pairs over 3 m: alternate taps on top of the ball while walking to a cone; pass back and jog to start	6 × 3	20
2	Sole touches in pairs over 3 m: alternate light sole contacts while advancing to the end cone; pass to partner	6 × 3	20
3	Outside-foot touches: push ball sideways/forward with the outside of the foot, keeping it close	6 × 3	20
4	Inside-foot push to a cone with support foot beside the ball	6 × 3	20
5	Pull–push: sole on the ball, pull back and push forward with balance and control	7 × 3	23
6	Inside–outside touches through cones, then dribble back to start	6 × 3	20
7	Figure-eight around the legs using inside, outside and sole	6 × 3	20
8	Toe taps, then push forward and dribble to the end cone; stop and pass	6 × 3	20
9	Sprint–jog between cones and pass–support pattern (A→B→C, A supports into space)	6 × 3	20
10	Dribble to the middle cone and shoot (instep, toe, inside) with rotation every 3 reps	6 × 3	20
11	As Session 10	6 × 3	20
12	Zig-zag dribble through cones; sole dribble after the green cone; dribble back	6 × 3	20
13	Sole roll sideways, push forward and dribble; alternate feet	6 × 3	20
14	Alternate sole/inside/outside control without looking at the ball; dribble to end cone	6 × 3	20

Session	Main drill content	Reps × sets	Main part (min)
15	Combination of zig-zag, sole roll, inside and outside dribbling; rondo (max. two touches)	6 × 3	20
16	Zig-zag dribble with short touches, then sprint-dribble to finish without losing the ball; rondo	6 × 3	20

Note. Each repetition lasted 30 s, with 30 s rest between repetitions and 2 min rest between sets. All sessions also included a 15-min warm-up, 10-min preparation segment, and 10-min cool-down (approximately 55 min total; 58 min in Session 5). The Session 6 drill is described in the thesis results chapter, but its original session plan was not present in the supplied appendix; the author must verify this row against original training records before submission.

Dribbling test

Dribbling was measured with a slalom dribbling test adapted from Irianto (1995). Eight poles (height 1.5 m) were placed in a straight line 1.5 m apart, starting 1.5 m from the start/finish line. On the command "go", the player dribbled the ball through the poles in sequence to the far end and back to the finish line, using either or both feet. If a pole was missed, the player resumed from the point of error. Time was recorded with a hand-held stopwatch from the start command until the player or the ball crossed the finish line. Each player completed two trials with up to 5 min between trials; the faster trial was used as the primary score, and a shorter time indicated better performance. The nominal procedure and equipment were described as the same at pre- and post-test. The supplied thesis reports validity and reliability coefficients of .763 and .637, respectively, for the source test attributed to Irianto (1995), but the full bibliographic record and equivalence between the original and adapted protocols have not been verified. Other soccer/futsal assessments have reported protocol-specific reliability, including speed dribbling after familiarisation, multi-skill futsal testing and repeated-dribbling protocols (Duarte et al., 2016; Farhani et al., 2019; Padrón-Cabo et al., 2019; Russell et al., 2010); their coefficients do not validate the present adaptation. The two within-occasion trials in this study are a measurement-consistency check, not a formal between-day test–retest reliability study.

Statistical analysis

All analyses were recalculated from the individual trial data in the thesis appendix. Descriptive results are reported as means and standard deviations (SDs), medians and ranges. Change was defined as D = pre-test time - post-test time; positive values therefore indicate faster post-test performance. Normality of the change scores was assessed using the Shapiro–Wilk test. Pre–post differences were evaluated with a two-tailed paired-samples t test ($\alpha = .05$), with a 95% confidence interval (CI) for the mean difference. The paired standardised effect was expressed as Cohen's dz (mean change divided by the SD of change scores), with a 95% CI derived from the noncentral t distribution; small-sample corrected Hedges' gz was also calculated (Lakens, 2013). Because post-test scores were non-normal, the exact Wilcoxon signed-rank test, a bias-corrected bootstrap CI (20,000 resamples), and the Hodges–Lehmann estimator were used as sensitivity analyses. Scoring-rule sensitivity was examined using the mean of the two trials and the first trial alone. Trial-to-trial agreement was assessed at each occasion using the two-way mixed, consistency, single-measure intraclass correlation coefficient, ICC (3,1) (Koo & Li, 2016). ICC was interpreted alongside absolute discrepancies because correlation-based reliability indices alone can be misleading; measurement error and agreement should also be considered (Atkinson & Nevill, 1998; Hopkins, 2000; Weir, 2005). Associations between baseline performance and change were examined with Pearson's r and Oldham's method to reduce mathematical coupling (Barnett et al., 2005). Relative change was calculated as mean D divided by the pre-test mean. All 15 players on the team were included (total sampling), so no a priori power-based sample-size calculation was performed. A sensitivity calculation for a two-sided paired t test with $n = 15$, $\alpha = .05$ and 80% power yields a detectable within-person standardized effect of approximately $dz = 0.78$; this is a statistical-sensitivity estimate, not evidence of causal efficacy or a substitute for planning a future controlled trial. Analyses were performed in Python using SciPy 1.18.

Results and Discussions

All 15 participants were included in the analysis, with no missing data. Descriptive and inferential results are presented in Table 3. Mean dribbling-test time was 9.16 s shorter after the program, representing a 40.2% reduction relative to the pre-test mean. Change scores were approximately normally distributed (Shapiro–Wilk $W = .97$, $p = .848$), whereas post-test times were not ($W = .88$, $p = .044$). The paired-samples t test, exact Wilcoxon test, bootstrap CI, and Hodges–Lehmann estimate (9.01 s) produced results consistent with a substantial pre–post difference. The standardised paired effect was very large ($dz = 3.38$), although its confidence interval was wide, as expected with a small sample.

Table 3. Pre–Post Changes in Dribbling Test Time (N = 15)

Statistic	Pre-test	Post-test	Difference (pre - post)
$M \pm SD$, s	22.75 ± 2.22	13.60 ± 1.10	9.16 ± 2.71
Median (range), s	22.56 (19.32–26.85)	13.19 (12.04–15.50)	9.55 (4.50–14.81)
95% CI of mean difference, s			[7.66, 10.66]
Bootstrap 95% CI, s			[7.86, 10.50]
Relative change from pre-test mean, %			40.2
Paired t test			$t(14) = 13.10$, $p < .001$
Cohen's d_z [95% CI]			3.38 [2.04, 4.71]
Hedges' g_z			3.20
Wilcoxon signed-rank test (exact)			$W = 0$, $p < .001$
Participants with faster post-test, n (%)			15 (100)

Note. Scores are the faster of two trials. Lower times indicate better performance; positive differences indicate faster post-test times. Exact p values: paired t test, $p = 3.0 \times 10^{-9}$; Wilcoxon, $p = 6.1 \times 10^{-5}$. CI = confidence interval; dz = mean difference divided by the standard deviation of the differences; gz = dz with small-sample correction.

Individual trajectories are shown in Figure 1. Every participant was faster at post-test, with individual reductions ranging from 4.50 s (P09) to 14.81 s (P12), corresponding to 23.3% to 55.2% of each player's own pre-test time. Pre-test classification against the norms used in the thesis placed five players in the "fair", seven in the "poor" and three in the "very poor" category; at post-test, 13 players were classified as "excellent" and two as "good". Players with slower pre-test times showed larger reductions (r = .92, p < .001); after correction for mathematical coupling, the association was smaller but still present (Oldham r = .61, p = .015). Pre-test and post-test times were weakly and negatively correlated (r = −.24), indicating that the post-test rank order of players was unrelated to their baseline rank order; for example, the slowest player at pre-test (P12) was the fastest at post-test.

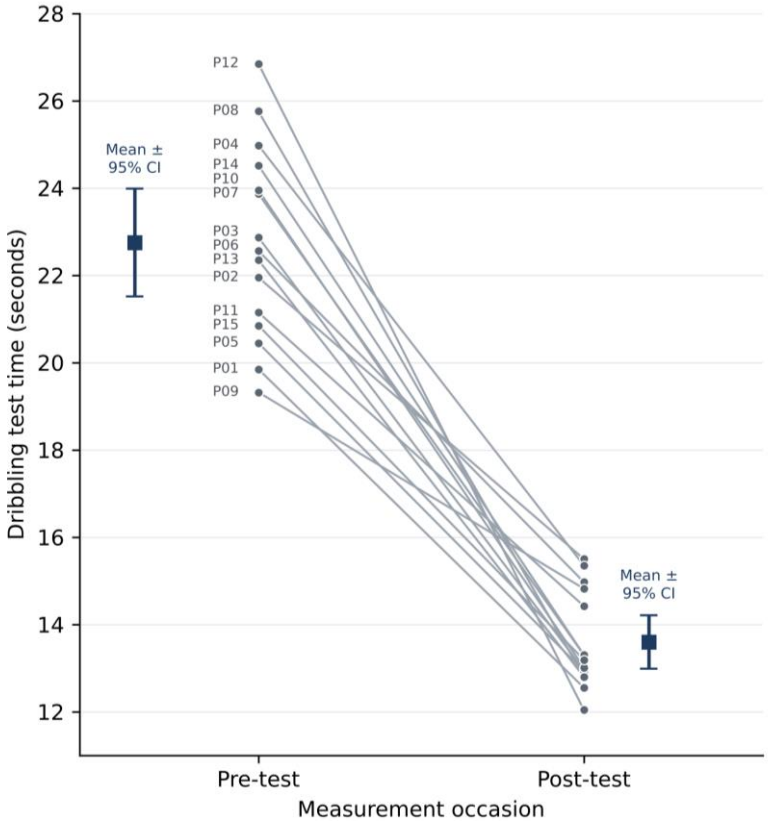


Figure 1. Individual Pre–Post Changes in Dribbling Test Time

Note. Grey lines connect each participant's pre-test and post-test times (best of two trials); labels P01–P15 identify participants at pre-test. Dark squares and error bars show the group mean and 95% confidence interval at each occasion. Lower values indicate faster (better) performance. All 15 participants were faster at post-test.

Measurement-quality and robustness checks are summarised in Table 4. At pre-test, the two trials agreed closely (ICC = .99; mean absolute difference 0.30 s; maximum 0.38 s). At post-test, agreement between trials was poor (ICC = .15; mean absolute difference 1.99 s; maximum 6.02 s), with the first trial slower than the second in 12 of 15 players and by more than 1 s in eight players (Figure 2). Two pairs of players (P07 and P14; P08 and P13) had identical times on both post-test trials (19.32 and 13.30 s; 12.90 and 12.80 s). When the mean of the two trials or only the first trial was used as the score, the improvement remained large but was smaller (8.31 s and 7.37 s, respectively).

Table 4. Measurement Quality and Sensitivity of the Pre–Post Change to the Scoring Rule

Analysis	Pre-test	Post-test	Pre–post change
Trial 1 vs. trial 2, ICC (3,1)	.99	.15	—
Mean |trial 1 - trial 2| (max), s	0.30 (0.38)	1.99 (6.02)	—
Technical error of measurement, s (CV%)	0.22 (0.9)	-	—
Score = best trial: *M* diff [95% CI], s; d_z	22.75	13.60	9.16 [7.66, 10.66]; 3.38
Score = mean of trials: *M* diff [95% CI], s; d_z	22.90	14.59	8.31 [6.88, 9.75]; 3.21
Score = trial 1 only: *M* diff, s (%); d_z	22.85	15.48	7.37 (32.3); 2.42
Pearson *r*, pre-test vs. post-test			-.24
Pearson *r*, pre-test vs. change (Oldham *r*)			.92 (.61)
Players with identical post-test trial records			2 pairs (P07/P14; P08/P13)

Note. ICC (3,1) = two-way mixed, consistency, single-measure intraclass correlation coefficient; CV = coefficient of variation. Pre- and post-test columns show group means (s) where applicable. All paired t tests in the sensitivity analyses had $p < .001$. The technical error at post-test is not reported because the two trials were not interchangeable (see text).

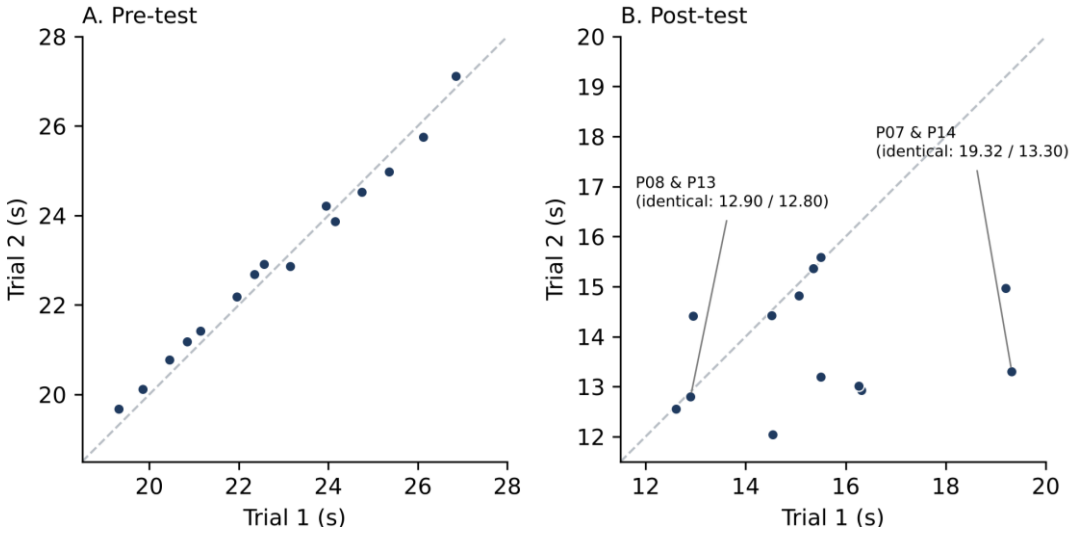


Figure 2. Agreement Between Trial 1 and Trial 2 at Pre-Test and Post-Test

Note. Each point is one participant; the dashed line is the line of identity (trial 1 = trial 2). (A) Pre-test trials agreed closely (ICC = .99). (B) Post-test trials agreed poorly (ICC = .15), and two pairs of participants had identical times on both trials (overlapping points, labelled). Axes differ between panels.

Anonymised participant-level trial records underlying the summary and sensitivity analyses are provided in Table 5.

Table 5. Anonymised Individual Trial Records

ID	Pre-test Trial 1	Pre-test Trial 2	Pre-test Best	Post-test Trial 1	Post-test Trial 2	Post-test Best	Change (s)
P01	19.85	20.12	19.85	12.61	12.55	12.55	7.30
P02	21.95	22.18	21.95	15.50	15.59	15.50	6.45
P03	23.15	22.87	22.87	12.95	14.41	12.95	9.92
P04	25.36	24.98	24.98	15.35	15.36	15.35	9.63
P05	20.45	20.78	20.45	16.31	12.93	12.93	7.52
P06	22.56	22.91	22.56	19.20	14.97	14.97	7.59
P07	24.15	23.87	23.87	19.32	13.30	13.30	10.57
P08	26.12	25.76	25.76	12.90	12.80	12.80	12.96

ID	Pre-test Trial 1	Pre-test Trial 2	Pre-test Best	Post-test Trial 1	Post-test Trial 2	Post-test Best	Change (s)
P09	19.32	19.68	19.32	15.06	14.82	14.82	4.50
P10	23.95	24.21	23.95	16.26	13.01	13.01	10.94
P11	21.15	21.42	21.15	14.52	14.42	14.42	6.73
P12	26.85	27.12	26.85	14.54	12.04	12.04	14.81
P13	22.35	22.68	22.35	12.90	12.80	12.80	9.55
P14	24.75	24.52	24.52	19.32	13.30	13.30	11.22
P15	20.85	21.18	20.85	15.50	13.19	13.19	7.66

Note. All times are in seconds. Pre-test Trial 1/Trial 2 and Post-test Trial 1/Trial 2 denote the first and second attempts at each occasion; "Best" is the faster of the two attempts. Change = pre-test best − post-test best. Records were transcribed from the thesis appendix (Lampiran 4–5), and identities were replaced with participant codes.

This study described changes in slalom dribbling-test time after a 16-session ball-feeling program in a senior high-school futsal team. All 15 players recorded faster post-test times, with a mean reduction of approximately 9 s (about 40%) and a very large standardised paired effect. However, the measurement audit identified substantial differences between pre-test and post-test trial behaviour: post-test trial agreement was poor, two pairs of players had identical trial records, and baseline and post-test rankings were weakly and negatively associated. The results therefore indicate improved test performance over the study period, but the magnitude of change is uncertain and cannot be attributed to ball-feeling training alone.

Interpretation of the change in test time

The direction of change agrees with previous Indonesian studies of ball-feeling training, which reported faster dribbling times after training (Aristian et al., 2025; Putri et al., 2025; Qolbi et al., 2025; Sulihin et al., 2026; Vyasa & Hidayah, 2025). The size of change here is much larger than in the most comparable reports: after 16 ball-feeling sessions, soccer-school players improved from 22.37 to 19.57 s (about 12.5%; Aristian et al., 2025); after four weeks of ball-feeling training, club futsal players improved from 15.24 to 12.75 s (about 16%; Vyasa & Hidayah, 2025); and after 16 sessions of dribbling variations, school futsal players improved figure-eight dribbling time by about 7.5% (Ramadhan et al., 2025). A 40.2% reduction after a program that included only about 2.4 h of active ball-manipulation drill time therefore warrants careful scrutiny rather than an efficacy claim. The findings can be compared with those studies descriptively, but differences in samples, test protocols and co-interventions prevent a direct ranking of program effectiveness.

The measurement literature reinforces this caution. Padrón-Cabo et al. (2019) found satisfactory reliability for selected F-MARC skill tests, including speed dribbling, in U-14 players after familiarisation; Farhani et al. (2019) reported test–retest and inter-rater evidence for a multi-skill futsal performance test; Duarte et al. (2016) reported good reproducibility for several repeated-dribbling outputs; Rodriguez-Giustiniani et al. (2022) reported only moderate reliability for dribbling speed and poor reliability for dribbling accuracy within a modified match-simulation protocol; and Russell et al. (2010) showed that reliability and construct validity should be evaluated for the specific soccer skill test rather than assumed across tasks. McCalman et al. (2022) also documented substantial variation in youth-soccer skill assessments, while broader sport-science measurement guidance recommends combining relative reliability with estimates of absolute error and agreement (Atkinson & Nevill, 1998; Hopkins, 2000; Weir, 2005). Those studies provide methodological context only: none validates the present Irianto-derived slalom protocol, and none resolves the duplicated post-test records in the current dataset.

Several mechanisms could contribute to a genuine improvement. The players started from a low level, with two-thirds classified as "poor" or "very poor", and novices typically make rapid early gains when given structured, high-repetition practice. The program also became progressively more test-specific: Sessions 12, 15 and 16 included zig-zag dribbling through cones with short touches, which closely resembles the criterion test. Task-specific practice of this kind is expected to transfer to the test more than to match performance (Williams & Hodges, 2023). The larger improvements in initially slower players are consistent with this ceiling-and-floor pattern, although part of that association reflects regression to the mean and mathematical coupling between baseline and change scores (Barnett et al., 2005); the corrected association (Oldham $r = .61$) suggests that a real baseline-dependent component may remain.

Alternative explanations are equally important. First, multi-action timed tests require familiarisation, and performance improves across repeated administrations even without training (de Oliveira et al., 2024). Second, players continued normal school life and possibly other football or futsal activity, and the sessions included agility, sprint, passing, shooting and rondo components, so the intervention was broader than ball feeling alone. Third, measurement procedures may have differed between occasions. The pre-test trials were almost perfectly consistent (technical error < 1%), as expected for a stable skill test (Makhlouf et al., 2022), whereas the post-test trials differed by up to 6 s within the same player, and two pairs of players recorded identical times on both trials.

Such patterns can arise from transcription errors, from a change of timer, venue or surface, or from players repeating sections of the course after errors; they need to be checked against the original score sheets. Finally, the negative correlation between pre- and post-test times is unusual for a skill measured twice within a few weeks and indicates that individual post-test values should be interpreted cautiously. These considerations echo broader concerns about small, uncontrolled studies in sport science, where large effects and limited measurement information reduce replicability (Mesquida et al., 2022).

Theoretical considerations

From a motor-learning perspective, ball-feeling drills provide a high density of foot–ball contacts with systematic variation in contact surface and direction, which may help players calibrate force and timing and reduce the need to look at the ball. Skill-acquisition frameworks suggest that such benefits are greatest when practice also includes representative information such as opponents, space and decisions, and when learners are encouraged to adopt an external focus and experience autonomy and success (Williams & Hodges, 2023; Wulf & Lewthwaite, 2016). The later sessions of the present program moved in this direction by adding rondo and combinations with passing and shooting. Evidence from small-sided games and differential learning indicates that game-based variability can improve technical actions in matches, not only in closed tests (Hamaidi et al., 2026; Hidayat et al., 2022; Ulupınar et al., 2026), and comparisons of linear and nonlinear pedagogies suggest similar technical but possibly better tactical outcomes for nonlinear approaches (Bromilow et al., 2025; Chow et al., 2023). Because the present outcome was a closed slalom test without opponents, the results speak to ball-carrying speed around fixed obstacles rather than to dribbling decisions in play, which depend on perception and choice (Iuliano et al., 2023; Ueda et al., 2023).

Practical implications

For school coaches and physical-education teachers, the protocol shows that a structured ball-feeling block requiring only balls, cones and about 20 min per session can be delivered within an extracurricular schedule with full attendance. Players' dribbling-test times were faster after the block, and players with the weakest baseline scores changed most. These observations support including ball-feeling drills as one component of technical preparation for beginner and intermediate school players. They do not establish that this protocol is superior to other forms of practice, and the dose used here (16 sessions, about 9 min of active drill time per session) has not been compared with alternatives. Coaches should combine closed ball-feeling drills with opposed and game-based tasks, monitor progress with a standardised test administered under identical conditions, and record at least two trials per occasion so that measurement consistency can be checked.

Limitations and future research

The study has limitations across construct, internal and external validity. For construct validity, the timed closed-course slalom test reflects speed around fixed obstacles rather than decision-making or dribbling under opponent pressure; the "ball-feeling" label describes a drill category and was not measured as an independent construct. Internal validity is limited by the absence of a control group, possible familiarisation/practice effects, maturation, other training exposures and uncertainty about whether test conditions were identical. The handheld stopwatch may add timing error, test reliability was not established between days in this sample, post-test trial agreement was poor (ICC = .15; maximum within-player trial difference = 6.02 s), and two pairs of records were identical; all of these records require source verification. External validity is limited by the census of 15 players from one school. The original validity/reliability coefficients attributed to Irianto (1995) are from a different sample and cannot establish the psychometric properties of the present adaptation. Ethics approval and consent procedures also remain to be documented in the supplied materials and must be resolved before submission. Future studies should use a randomized controlled or non-equivalent comparison-group design, familiarisation sessions, test–retest reliability assessment, electronic timing or blinded timers, pre-specified criteria for handling missed poles, larger multi-school samples, and match-representative outcomes. For sample-size planning, researchers should specify the smallest worthwhile effect and calculate sample size for the planned between-group design rather than using the very large observed within-group effect as an unbiased estimate.

Conclusions

In 15 senior high-school futsal players, slalom-dribbling times were lower after a 16-session ball-manipulation and close-control program, and every player had a faster recorded post-test score. The observed mean reduction was 9.16 s (40.2%), but post-test trial agreement was poor (ICC = .15; maximum difference 6.02 s), two pairs of participants had identical post-test trial records, and there was no control group. Accordingly, the recorded pre–post change should not be interpreted as an effect caused by the program until the original score sheets, timing procedures and test conditions have been verified. The protocol appears feasible to deliver in this school setting, but claims about its efficacy, match performance or decision-making require a controlled study with validated and reliable measurement.

Acknowledgments

The authors thank the principal, teachers, coach and players of the futsal team of SMA Negeri 1 Padangsidimpuan.

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