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Development of a Valid and Reliable Multidirectional Dribbling Assessment Instrument for Futsal Players

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ABSTRACT

Purpose of the Study: This study aimed to develop, validate, and determine the reliability of an enhanced futsal dribbling skills assessment instrument for male university students using a practical and standardized testing design suitable for indoor futsal environments.

Methodology: This study used the Borg and Gall Research and Development model. Data were collected through observation sheets, Likert-scale questionnaires, digital stopwatches, expert validation forms, and dribbling performance tests. Participants included 50 and 100 male university students in small- and large-group trials. Pearson product moment correlation analysis was used to test validity and reliability.

Main Findings: The instrument achieved an expert validation score of 81.43%. Large-group testing produced validity coefficients of 0.774 and 0.714, while reliability coefficients reached 0.809 and 0.813. Participant acceptance reached 90.08%. The final instrument utilized a 10 × 6 meter course integrating circular, winding, zig-zag, and straight dribbling patterns for multidirectional skill assessment.

Novelty/Originality of this Study: This study developed a futsal-specific dribbling assessment instrument combining four movement patterns within a compact testing area. The instrument also provides normative performance categories for university athletes. This development advances existing futsal assessment tools by improving practicality, multidirectional technical evaluation, and objective interpretation of dribbling performance outcomes.

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1. INTRODUCTION

Futsal has developed rapidly into one of the most popular indoor team sports worldwide. The sport is characterized by high-intensity activity, limited playing space, rapid transitions, and continuous technical interaction under physical pressure [1]-[3]. Compared to outdoor football, futsal requires players to perform technical actions in a much shorter time and within narrower movement areas. The use of a hard court surface and a low-bounce ball also increases the complexity of technical execution, particularly in maintaining ball control while moving at high speed [4]-[6]. These conditions make futsal a sport that demands excellent coordination, agility, decision-making ability, and technical precision simultaneously [7]-[9]. Along with the increasing

competitiveness of futsal at school, university, national, and international levels, the need for scientific performance evaluation and objective athlete assessment instruments has become increasingly important.

Among the various technical components in futsal, dribbling is considered one of the most essential skills that directly influences match performance [10]-[12]. Dribbling is not only a basic movement for advancing the ball but also a tactical tool that allows players to create space, penetrate defensive formations, maintain possession under pressure, and build attacking opportunities [13]-[15]. Effective dribbling ability enables athletes to adapt quickly to dynamic game situations and maintain control during rapid directional changes. In modern futsal, successful dribbling performance requires the coordinated use of both the inside and outside surfaces of the foot, balance control, speed, and multidirectional movement efficiency [16]-[18]. Players with superior dribbling skills generally demonstrate higher levels of confidence and offensive effectiveness during competition.

Despite the importance of dribbling ability in futsal performance, the availability of scientifically developed assessment instruments specifically designed for futsal remains limited [19]-[21]. Most existing dribbling tests were originally adapted from outdoor football assessments that do not fully represent the spatial and biomechanical characteristics of futsal [22]-[24]. Many currently used instruments focus only on single movement patterns such as zig-zag or slalom dribbling, which are unable to comprehensively measure the multidirectional movement demands experienced during real futsal matches. In addition, several previously developed tests require large testing areas, making them impractical for schools, universities, and indoor sports facilities with limited space availability [25]-[27]. As a result, coaches and sports educators often rely on subjective observation rather than standardized performance measurements.

Another major limitation in the current literature is the absence of normative reference standards for futsal dribbling performance, particularly among university athletes. Without normative benchmarks, coaches cannot objectively categorize athlete ability levels, monitor progress systematically, or determine appropriate training targets based on measurable standards. This condition creates difficulties in athlete evaluation and limits the effectiveness of evidence-based coaching practices [28]-[30]. Preliminary observations conducted among male university futsal players also revealed several recurring problems, including low dribbling speed, frequent loss of ball control during directional changes, and heavy dependence on the dominant foot during movement execution. These findings indicate that currently available instruments are still unable to capture the complexity of futsal dribbling performance comprehensively.

The urgency of this study is strongly related to the growing need for valid, reliable, and practical futsal-specific assessment tools that can support systematic athlete evaluation and training development. In sports science, performance assessment instruments must possess strong psychometric properties to ensure that the measurement results accurately represent athlete ability and remain consistent across repeated testing sessions. Instruments lacking validity and reliability may produce misleading information and negatively influence coaching decisions, athlete monitoring, and training program design. Therefore, the development of a futsal dribbling instrument that reflects actual game demands while remaining practical for implementation in limited indoor facilities is highly necessary for coaches, lecturers, researchers, and sports practitioners.

This study also addresses several important research gaps found in previous investigations. Existing dribbling assessment tools generally emphasize only one movement pattern, provide limited evaluation of multidirectional foot usage, require large testing spaces, and rarely include normative scoring categories. In addition, studies focusing specifically on futsal dribbling instrument development for university athletes are still relatively scarce. These limitations demonstrate the need for a more comprehensive and context-specific assessment model capable of representing real futsal technical demands more accurately.

The novelty of this study lies in the development of an enhanced futsal dribbling assessment instrument that integrates four distinct movement patterns, namely circular, winding, zig-zag, and straight dribbling movements, within a compact 10 × 6 meter testing area. Unlike previous instruments that relied primarily on single-pattern movement configurations, this instrument was specifically designed to maximize the use of both inside and outside foot surfaces while maintaining practicality for indoor implementation. Furthermore, the study provides normative performance categories that allow coaches and practitioners to interpret dribbling scores objectively and systematically. The integration of multidirectional movement assessment, compact spatial design, and normative scoring framework represents an advancement in futsal-specific performance evaluation research.

To ensure scientific quality and practical applicability, this study employed the Borg and Gall Research and Development (R&D) model, which allows systematic product development through stages of needs analysis, expert validation, product revision, and empirical testing. This approach enables continuous refinement of the instrument based on expert recommendations and participant responses, ensuring that the final product is theoretically sound, practically feasible, and psychometrically reliable. Through iterative development procedures, the resulting instrument is expected to provide more accurate measurement outcomes and greater usability for futsal training environments.

Therefore, the primary objective of this study was to develop a futsal dribbling assessment instrument that is valid, reliable, practical, and suitable for use in university-level futsal training and evaluation. The study also aimed to establish normative performance categories for male university athletes and provide a standardized

testing procedure that can support objective dribbling performance assessment. Ultimately, this research is expected to contribute to the advancement of sport-specific performance evaluation literature and provide coaches, researchers, and educators with a more comprehensive tool for futsal skill assessment.

2. RESEARCH METHOD

2.1 Research Design and Development Stages

This study employed a Research and Development (R&D) method using the Borg and Gall procedural model. The R&D approach was selected because the study aimed not only to investigate a phenomenon but also to develop a practical and scientifically validated futsal dribbling assessment instrument [31]-[33]. The development process was conducted systematically through seven sequential stages to ensure that the final product possessed both theoretical validity and practical applicability. Ethical clearance was obtained from the Research Ethics Committee of Universitas Negeri Padang (No. 045/UN35.15/LT/2025) prior to data collection. The complete R&D stage framework, including activities, procedures, outputs, and corresponding results sections, is presented in Table 1.

Table 1. Borg and Gall R&D Development Stages, Procedures, and Outputs

Stage	Activity	Procedure	Output	Reference
1	Needs Analysis	Field observations during futsal training sessions at UNS; consultation with futsal coaches; review of existing dribbling test instruments	Identification of key dribbling deficiencies and gaps in current assessment tools	Section 3.1
2	Initial Product Design	Development of prototype instrument integrating circular, winding, and zig-zag dribbling patterns within a 9-meter course layout	Prototype Instrument (Version 1)	Section 3.2
3	Expert Validation	Structured evaluation by three domain experts using 14-item Likert-scale questionnaire (scale 1–5)	Validation score 81.43%; recommendation to add straight-line segment	Section 3.2
4	Small-Group Trial	Instrument administered to 50 male university students; two test sessions; participant questionnaire distributed	Validity r = 0.770/0.721; Reliability r = 0.817/0.807; ease-of-execution 56%	Section 3.3
5	Product Revision I	Addition of straight-line dribbling segment at course end; course reconfigured to 10 × 6 meter layout	Revised Instrument (Version 2)	Section 3.3
6	Large-Group Trial	Revised instrument administered to 100 male university students; two test sessions; participant questionnaire	Validity r = 0.774/0.714; Reliability r = 0.809/0.813; acceptance 90.08%	Section 3.4
7	Final Product	Compilation of normative performance categories; finalisation of test protocol and scoring manual	Final Validated Instrument with 5-category normative framework	Section 3.6

R&D = Research and Development; UNS = Sebelas Maret University, Surakarta; r = Pearson correlation coefficient

As shown in Table 1, the seven-stage development process followed an iterative improvement logic in which each stage produced empirical evidence that informed the design decisions of the subsequent stage. This sequential architecture is consistent with the procedural principle that instrument development must incorporate both expert knowledge and user feedback to achieve a balance between psychometric rigor and practical usability [31]. The transition from Stage 4 (Small-Group Trial) to Stage 5 (Product Revision I) was particularly critical, as the participant feedback on execution difficulty directly prompted the course extension from a 9-meter to a 10 × 6 meter configuration, a revision that subsequently produced the substantial improvements in measurement capacity and ease-of-execution scores documented in Stage 6.

2.2 Population and Sample

The population of this study consisted of male undergraduate students participating in futsal activities at Sebelas Maret University (UNS), Surakarta, Indonesia. The participants were selected because they represented the target population for the developed assessment instrument and possessed prior experience in futsal training and competition. The sampling technique used was purposive sampling, in which participants were selected based on specific eligibility criteria relevant to the study objectives. The study involved two stages of empirical testing: a small-group trial (n = 50) and a large-group trial (n = 100). In addition, expert validation was conducted by three domain specialists: a sports research methodology expert, a licensed futsal practitioner, and a sports measurement and evaluation expert. All participants voluntarily provided written informed consent prior to data collection. The inclusion and exclusion criteria applied in participant selection are summarised in Table 2.

Table 2. Participant Inclusion and Exclusion Criteria

Inclusion Criteria	Exclusion Criteria
Male undergraduate students actively participating in futsal activities at UNS	Female students (instrument calibrated specifically for male performance norms)
Age between 18–22 years	Students with musculoskeletal injuries preventing safe participation
Possession of basic futsal dribbling experience	Students who failed to attend both test sessions
Physically healthy without musculoskeletal injuries at time of testing	Students participating in other structured dribbling assessment studies concurrently
Voluntarily providing written informed consent prior to participation	Incomplete data records (missing Test I or Test II scores)
Able to complete both test sessions (Test I and Test II)	Students unable to provide informed consent

The criteria presented in Table 2 ensured that the participant sample was homogeneous with respect to sex, age, experience level, and physical readiness, thereby minimising sources of systematic variance unrelated to dribbling ability. Restriction to male participants was necessary given that the normative performance categories generated in this study are calibrated to male university athlete performance distributions; inclusion of female participants without sex-specific norming would have produced misleading categorical boundaries. The 80% session attendance threshold was established to ensure that each participant completed both test sessions required for the test-retest reliability analysis [40].

2.3 Data Collection Techniques and Research Instruments

Data collection was conducted through multiple complementary methods corresponding to the different stages of the R&D process. During the needs analysis stage, direct field observations were carried out during futsal training sessions to identify problems related to dribbling performance and limitations of existing assessment instruments [34]-[36]. The observations focused on movement quality, ball control, directional changes, and dribbling speed. At the expert validation stage, three domain experts evaluated the prototype instrument using structured 14-item Likert-scale questionnaires (scale 1–5) covering theoretical relevance, instruction clarity, safety, practicality, and measurement capability. At the empirical testing stages, each participant completed two dribbling test sessions with three attempts per session; the best completion time from each session was recorded. Dribbling performance was timed using digital stopwatches with 0.01-second accuracy. Participant response questionnaires (12-item Likert scale) were distributed after each trial phase to evaluate ease of execution, clarity of instructions, practicality, and overall instrument acceptance. The complete framework of research instruments is presented in Table 3.

Table 3. Research Instruments by Variable, Indicator, Technique, and Scale

Variable	Indicator	Data Collection Technique	Instrument	Scale/Unit
Expert Content Validity (Independent Variable)	Theoretical relevance, instruction clarity, safety, practicality, measurement capability, population suitability (14 dimensions)	Expert validation questionnaire (14-item, Likert scale 1–5)	Expert Validation Form	Ordinal (1–5); converted to % score
Participant Acceptance (Dependent Variable)	Futsal relevance, ease of execution, clarity of instructions, safety, measurement	Participant response questionnaire distributed post-testing	12-item Likert Questionnaire	Ordinal (1–5); converted to % score

Variable	Indicator	Data Collection Technique	Instrument	Scale/Unit
	capacity, feasibility (12 items)			
Dribbling Performance (Dependent Variable)	Completion time (seconds) for 10 × 6 m multi-pattern course; best of three attempts per session	Standardized performance test; two sessions (Test I and Test II)	Digital Stopwatch (0.01s accuracy)	Ratio (seconds)
Instrument Validity (Psychometric Property)	Correlation between individual session scores and composite total score	Pearson product moment correlation (item-total correlation)	Statistical analysis output	r coefficient (> 0.60 = acceptable)
Instrument Reliability (Psychometric Property)	Temporal consistency between Test I and Test II across sessions	Test-retest method; Pearson correlation between session scores	Statistical analysis output	r coefficient (> 0.60 = acceptable)
Qualitative Feedback (Process Data)	Expert revision recommendations; participant execution difficulties; instrument design weaknesses	Field observation notes; open-ended expert feedback forms	Observation Sheet; Field Notes	Descriptive/Narrative

r = Pearson correlation coefficient; % = percentage score from Likert-scale aggregation; 1RM = not applicable to this study

Table 3 demonstrates that the study employed a multi-instrument, multi-method data collection strategy designed to capture both the psychometric properties of the instrument (validity and reliability) and its practical acceptability among target users. The triangulation of expert validation scores, participant questionnaire responses, and empirical performance data across two trial phases provides a comprehensive evidence base for evaluating the instrument's overall quality. This multi-source validation approach is consistent with established standards for sport-specific assessment tool development [40], [41].

2.4 Data Analysis Techniques and Decision Criteria

The data analysis process combined qualitative descriptive analysis and quantitative statistical analysis. Qualitative data from observations, expert recommendations, and participant feedback were analyzed descriptively to identify design strengths, weaknesses, and areas requiring revision during each development stage [37]-[39]. Quantitative data from expert validation and participant questionnaires were converted into percentage scores and interpreted against the validity and decision criteria defined in Table 4.

Table 4. Analysis Types, Decision Thresholds, and Interpretation Criteria

Analysis Type	Threshold	Interpretation	Action if Not Met
Expert Validation Score	≥ 80%	Valid / Feasible for implementation	< 80% = requires revision
Item Validity (Pearson r)	r > 0.60	Acceptable validity	r ≤ 0.60 = item removed/revised
Test-Retest Reliability (r)	r > 0.60	Acceptable reliability	r ≤ 0.60 = instrument revised
Participant Acceptance	≥ 80%	Instrument accepted by users	< 80% = usability revision needed

Threshold criteria adapted from Bolarinwa (2015) for r > 0.60; expert validation threshold ≥ 80% based on Borg and Gall R&D standard criteria

As shown in Table 4, the study applied a multi-threshold decision framework to evaluate different dimensions of instrument quality at each development stage. The expert validation threshold of ≥ 80% served as the gate criterion for proceeding from prototype design to empirical testing. The Pearson r threshold of > 0.60 for both validity and reliability was applied consistently across small-group and large-group trials [40]. Validity analysis was conducted by correlating individual session scores with the total composite score, while reliability analysis used the test-retest method by correlating Test I and Test II results. Normative performance categories were established using mean (M = 13.04 s) ± standard deviation calculations derived from the large-group trial data (n = 100).

3. RESULTS AND DISCUSSION

3.1 Needs Analysis Findings

Field observations conducted across multiple futsal training sessions at UNS consistently revealed that male students struggled with effective ball advancement toward the opponent's defensive zone. Key deficiencies included low dribbling speed when approaching the goal area, frequent ball loss when attempting directional changes, and a near-exclusive reliance on the dominant foot for ball contact during change-of-direction sequences. Practitioner consultation confirmed that currently available dribbling tests do not adequately capture these multidirectional demands, and that coaches lack normative reference points against which to benchmark individual dribbling performance.

These observations align with the broader literature on technical performance in futsal. Purwanto et al. [10] demonstrated that dribbling ability is a significant differentiator of competitive performance level in futsal, with higher-level players showing more consistent and diversified ball manipulation across foot surfaces. Fitrianno and Romadhoni [11] similarly confirmed through a comprehensive literature review that dribbling speed and directional control are among the primary technical competencies distinguishing elite from sub-elite futsal players. The identification of a need for a richer, more demanding dribbling assessment tool was therefore not only context-specific but also theoretically grounded in the existing performance science literature.

3.2 Expert Evaluation Results

The three expert evaluators provided independent assessments of the initial prototype instrument across the fourteen evaluation dimensions. Table 5 presents the aggregated expert evaluation outcomes.

Table 5. Expert Evaluation Results of the Initial Dribbling Test Prototype

No.	Evaluation Dimension	Expert 1 (Method.)	Expert 2 (Practitioner)	Expert 3 (Measurement)	Mean Score
1	Urgency of needs analysis	4	–	–	4.00
2	Theoretical grounding for product	4	–	–	4.00
3	Clarity of execution instructions	5	5	4	4.67
4	Measurement capability for dribbling	4	4	2	3.33
5	Safety in application	4	4	5	4.33
6	Age-developmental appropriateness	4	4	3	3.67
7	Motivational potential	4	4	4	4.00
8	Physical development stimulus	4	4	4	4.00
9	Ease of performance	4	4	3	3.67
10	Visual-textual consistency	5	5	5	5.00
11	Practical applicability	4	4	4	4.00
12	Target-population appropriateness	5	4	4	4.33
13	Alignment with stated objectives	4	4	3	3.67
14	Overall comprehensibility	4	5	4	4.33
	Overall Percentage Score	84.29%	85.00%	75.00%	81.43%

Expert 1 = Research Methodology Specialist; Expert 2 = Licensed Futsal Practitioner; Expert 3 = Sports Measurement and Evaluation Specialist. Scores on 1–5 Likert scale; '–' indicates dimension not applicable to that expert's domain.

The aggregate expert evaluation score of 81.43% falls within the 'valid/usable' category (≥ 80%), confirming that the prototype instrument possessed sufficient theoretical and practical merit to proceed to group-based empirical testing. Notably, Expert 3 (Measurement Specialist) assigned a comparatively lower overall score (75.00%), with the lowest individual rating assigned to Item 4 (Measurement capability for dribbling; mean = 3.33). This expert specifically recommended adding a straight-line dribbling segment at the conclusion of the course to ensure that ball retention at speed, rather than merely agility through obstacles, was also being assessed. The methodology and practitioner experts both affirmed the instrument's multi-pattern design as a substantive improvement over single-pattern predecessors, particularly highlighting its visual-textual consistency (Item 10; mean = 5.00) and target-population appropriateness (Item 12; mean = 4.33).

The divergence in scores between Expert 3 and the other two evaluators reflects a methodologically important distinction between content validity (does the instrument measure what it claims to measure?) and face/practical validity (is the instrument well-structured and feasible?). Expert 3's lower measurement capability

score indicated a content validity concern, specifically that the initial prototype, lacking a terminal straight-line segment, was insufficient to capture the full spectrum of dribbling demands in competitive futsal. This feedback directly informed the first product revision and demonstrates the importance of including a specialist in measurement and evaluation, rather than relying solely on practitioner and methodology experts, in the validation panel [40].

3.3 Small-Group Trial Results

Following incorporation of the straight-pattern segment at the end of the course, the revised instrument (Revision I) was administered to 50 male students in the small-group trial. Table 6 presents the validity and reliability coefficients obtained from this trial phase.

Table 6. Validity and Reliability Coefficients, Small-Group Trial (n = 50)

Test Session	Validity (r)	Reliability (r)	Interpretation
Dribbling Test I	0.770	0.817	Valid & Reliable
Dribbling Test II	0.721	0.807	Valid & Reliable

Threshold for acceptable validity and reliability: r > 0.60 [40]. Both coefficients exceed threshold across both test sessions.

Both validity and reliability coefficients exceeded the 0.60 threshold across both test sessions, confirming that the revised instrument exhibited strong psychometric properties within the small-group context. The validity coefficients (r = 0.770 and 0.721 for Tests I and II respectively) indicate that individual session performance is a meaningful indicator of overall dribbling capability as measured by the composite score. The reliability coefficients (r = 0.817 and 0.807) demonstrate good temporal consistency across the two test sessions.

However, the participant questionnaire revealed that 44% of participants found the instrument difficult to perform, with a composite ease-of-execution score of only 56% (Item 10). Analysis of performance data corroborated these subjective reports, revealing that average dribbling completion times were slower than anticipated, suggesting that the cone spacing was insufficiently generous to allow fluid, high-speed dribbling. This finding is consistent with the principle articulated by Makhlouf et al. [40] that instrument usability must be empirically verified through user testing rather than assumed from design specifications alone. This finding prompted the second product revision in which the total course length was extended from a 9-meter configuration to a 10 × 6 meter layout.

3.4 Large-Group Trial Results

The final revised instrument (Revision II: 10 × 6 meter course with four pattern types) was administered to the large-group cohort (n = 100). Table 7 presents the psychometric results from this phase.

Table 7. Validity and Reliability Coefficients, Large-Group Trial (n = 100)

Test Session	Validity (r)	Reliability (r)	Interpretation
Dribbling Test I	0.774	0.809	Valid & Reliable
Dribbling Test II	0.714	0.813	Valid & Reliable

Questionnaire overall acceptance score of 90.08% applicable to both test sessions. All coefficients exceed r > 0.60 threshold.

The large-group results confirmed and strengthened the psychometric findings from the small-group trial. Validity coefficients of 0.774 and 0.714 for Dribbling Tests I and II respectively reflect strong criterion-related validity, indicating that performance on each individual test session is a meaningful indicator of overall dribbling capability. These values compare favourably with validity coefficients reported in comparable futsal and football skill assessment studies: Makhlouf et al. [40] reported validity coefficients ranging from 0.71 to 0.85 for a modified Illinois change-of-direction test with ball dribbling in young soccer players, while Kustiawan et al. [31] documented validity coefficients of 0.72–0.80 for their basic futsal skills test instrument. The present instrument's validity profile is thus well-situated within the empirical benchmarks established by recent comparable research.

The reliability coefficients (r = 0.809 and 0.813) demonstrate excellent temporal consistency, indicating that the instrument generates reproducible scores across repeated administrations under comparable conditions. These values exceed the minimum threshold of r > 0.60 by a substantial margin and are consistent with the reliability range of 0.78–0.91 reported by Ridwan et al. [24] for their football dribbling skills assessment. The participant acceptance questionnaire aggregate of 90.08% represents a marked improvement over the small-group score of 80.83% and confirms that the course extension from 9 to 10 meters successfully resolved the execution difficulty previously reported while preserving psychometric integrity.

3.5 Questionnaire Comparative Analysis

Table 8 presents the comparative participant questionnaire results across both trial phases, enabling systematic evaluation of the impact of the second product revision on instrument usability.

Table 8. Participant Questionnaire Comparison: Small-Group vs. Large-Group Trial

No.	Assessment Dimension	Small Group (%)	Large Group (%)	Change (Δ)
1	Futsal skill relevance	100	100	0
2	Equipment/facility compatibility	100	100	0
3	Age-developmental appropriateness	88	86	−2
4	Motivational potential	76	72	−4
5	Physical development stimulus	76	72	−4
6	Dribbling skill measurement capacity	60	98	+38
7	Alternative assessment value	60	98	+38
8	Safety in application	100	100	0
9	Comprehensibility	88	86	−2
10	Ease of execution	56	92	+36
11	Feasibility of performance	100	100	0
12	Clarity of execution instructions	66	77	+11
	Overall Mean Percentage	80.83%	90.08%	+9.25

Positive Δ values indicate improvement from small-group to large-group trial; negative values indicate slight decrease. All percentages based on 5-point Likert aggregation.

Table 8 reveals a compelling pattern of improvement across trial phases attributable to the second product revision. The most dramatic gains occurred in dimensions directly related to execution quality and measurement value: 'Dribbling skill measurement capacity' increased from 60% to 98% (+38 percentage points), 'Alternative assessment value' rose from 60% to 98% (+38 pp), and 'Ease of execution' improved from 56% to 92% (+36 pp). These improvements directly reflect the impact of the course length extension incorporated in Revision II, which provided participants with sufficient spatial freedom to execute high-speed dribbling movements fluidly across all four pattern types. Dimensions already achieving ceiling scores in the small-group trial, including futsal skill relevance (100%), equipment compatibility (100%), and safety (100%), were maintained at identical levels in the large-group trial, confirming that the revision introduced no regressions in the instrument's foundational design qualities.

The minor decreases observed in motivational potential and age-appropriateness scores (−4 pp each) likely reflect the greater heterogeneity of the larger participant pool. In a sample of 100 students, individual variability in intrinsic motivation toward dribbling tasks and perceived relevance to one's specific training context is naturally more pronounced than in a smaller, more homogeneous group of 50 students. These marginal decreases do not constitute a psychometric concern; rather, they reflect expected variance in subjective perception across a more diverse sample [37].

3.6 Final Instrument Specification and Normative Data

Table 9 presents the complete normative scoring categories derived from the large-group trial data (n = 100; M = 13.04 s), which serve as the primary reference framework for score interpretation in coaching and research applications.

Table 9. Normative Performance Categories for the Futsal Dribbling Test Instrument

Grade	Performance Category	Time Boundary (seconds)	Interpretation
A	Excellent	< 11.87 s	Top-tier dribbling ability; exceeds peer norms
B	Good	11.87 – 12.23 s	Above-average dribbling performance
C	Adequate	12.23 – 13.59 s	Average; meets minimum competency threshold
D	Below Average	13.59 – 15.94 s	Below peer norms; targeted training required
E	Poor	> 15.94 s	Significant deficiency; intensive remediation needed

Time categories derived from mean (M = 13.04 s) ± standard deviations from large-group trial (n = 100). Grade A: M − 1.5SD; Grade B: M − 1SD to M − 1.5SD; Grade C: M − 0.5SD to M + 0.5SD; Grade D: M + 0.5SD to M + 1.5SD; Grade E: > M + 1.5SD.

The five-category normative framework provides coaches and sports scientists with a readily interpretable reference system for translating raw dribbling times into performance classifications. Athletes completing the course in under 11.87 seconds demonstrate exceptional dribbling speed and control consistent with the demands of high-level futsal competition. The adequate performance boundary (12.23–13.59 seconds) delineates baseline competency for university-level participation. Athletes falling within the 'Below Average' or 'Poor' categories (>

13.59 seconds) are identifiable candidates for targeted dribbling development interventions, enabling coaches to move beyond intuitive judgment toward evidence-based decision-making in training design.

The validated futsal dribbling test instrument developed in this study represents a meaningful methodological advance over its predecessors in several respects. First, the integration of four geometrically distinct movement patterns, circular, winding, zig-zag, and straight, provides a substantially richer stimulus for assessing ball manipulation capability than the single-pattern zig-zag protocols previously documented in the literature [22]–[24]. The requirement to navigate both circular and winding trajectories demands that athletes engage the outside and inside foot surfaces in coordinated alternation, reflecting the multi-surface ball-handling that Selin et al. [12] and Priyambada et al. [16] identified as the dominant technical modality in competitive futsal performance.

Second, the instrument's spatial economy represents a practical advantage with real-world implications. By achieving validity and reliability coefficients comparable to existing instruments within a 10 × 6 meter footprint, the present tool dramatically reduces the spatial requirements for systematic dribbling assessment compared to earlier protocols requiring substantially larger testing areas [25]–[27]. This compact design makes the instrument deployable in standard indoor sports halls, school gymnasiums, and multi-use recreation facilities, expanding access to evidence-based performance monitoring for athlete populations that previously lacked standardized assessment tools. Nusri et al. [20] similarly emphasized that spatial practicality is a foundational condition for widespread instrument adoption in applied university and school settings.

Third, the establishment of normative performance categories addresses the interpretive gap that has long characterized futsal skill assessment at the university level. As documented in the needs analysis phase and confirmed by the broader coaching literature [28]–[30], the absence of normative reference standards has historically forced coaches to rely on subjective judgment when categorizing athlete performance. The five-category system developed here, ranging from Excellent (< 11.87 s) to Poor (> 15.94 s), provides precisely the contextual interpretive structure needed for objective performance classification, systematic progress monitoring, and evidence-based training prescription. This normative framework is consistent with the approach recommended by Mendes et al. [22] in their systematic review of talent identification in male futsal, which identified norm-referenced scoring as an indispensable component of sport-specific skill assessment.

From a broader theoretical perspective, the significance of accurate dribbling assessment extends beyond individual athlete development. Wilson et al. [15] demonstrated that dribbling and passing performance are significant predictors of individual success in small-sided soccer and futsal games, suggesting that the present instrument has potential utility not only for developmental monitoring but also for talent identification within futsal pathways. Peña-Ardila [8] further documented that technical skill differentiation across expertise levels in futsal is most pronounced in ball manipulation tasks, reinforcing the value of a validated instrument capable of detecting these inter-individual differences reliably.

3.7 Limitations and Future Research Directions

Despite its strengths, the present study carries several limitations that must be acknowledged to ensure appropriate interpretation of the findings. First, the normative categories were derived exclusively from a male university student population at a single institution (UNS, Surakarta), which constrains the generalizability of the established performance benchmarks to other age groups, sexes, and competitive levels. The use of single-institution data is a recognized limitation in normative standard development, as institutional selection effects including training culture, facility access, and student athletic background may produce population-specific norms that do not transfer well to other contexts [31].

Second, the study did not include a criterion validity assessment against an established gold-standard dribbling measure. While the item-total correlation approach used here provides evidence of internal consistency and test-retest reliability, it does not directly demonstrate that the instrument measures dribbling ability as defined by external criterion measures such as coach ratings, match performance metrics, or biomechanical dribbling analyses. Future studies should incorporate concurrent or predictive criterion validity analyses to strengthen the construct validity evidence base [40].

Third, the test-retest interval between Test I and Test II was not standardized across all sessions, introducing a potential confound from differential training effects or fatigue accumulation between administrations. Standardization of the inter-session interval, ideally 48–72 hours to allow physiological recovery while minimizing training adaptation is recommended for future reliability studies. Fourth, the instrument's sensitivity to training-induced change over longitudinal monitoring periods has not yet been established. Future research should address these limitations through multi-site cross-validation studies across different Indonesian universities and competitive levels, inclusion of female athletes with sex-specific normative standards, extension to youth and elite populations, and longitudinal monitoring designs to examine the instrument's responsiveness to structured dribbling training interventions.

4. CONCLUSION

This study successfully developed, validated, and established normative benchmarks for an enhanced futsal dribbling test instrument grounded in the Borg and Gall R&D model. The final instrument a 10 × 6 meter multi-pattern course integrating circular, winding, zig-zag, and straight dribbling sequences demonstrated strong psychometric properties in large-group empirical testing, with validity coefficients of 0.774 and 0.714 and reliability coefficients of 0.809 and 0.813 for Dribbling Tests I and II respectively. Participant questionnaire responses confirmed the instrument's practicality, safety, and relevance, with an overall acceptance score of 90.08%. The normative five-category performance framework provides coaches, sport scientists, and educators with a context-specific interpretive tool for translating raw dribbling performance scores into actionable developmental classifications.

The instrument fills a meaningful gap in the futsal assessment literature by offering a spatially efficient, multi-surface, technically comprehensive dribbling evaluation tool calibrated to the demands of the sport. The iterative seven-stage development process demonstrated that systematic incorporation of expert feedback and empirical user testing is essential for producing instruments that balance psychometric rigor with practical usability. The first revision, adding a terminal straight-line segment, addressed a genuine content validity gap identified by the measurement specialist. The second revision, extending the course to 10 × 6 meters, resolved usability concerns and produced the substantial improvements in measurement capacity and ease-of-execution scores documented in the large-group trial. Future implementation is recommended across different age groups, competitive levels, and playing environments to further examine the instrument's applicability and generalizability in futsal talent identification and performance evaluation.

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AUTHOR CONTRIBUTIONS

Conceptualization, S.R. and D.A.; Methodology, S.R., D.A., and D.C.; Software, S.R.; Validation, D.A. and D.C.; Formal Analysis, S.R. and D.C.; Investigation, S.R. and D.A.; Resources, D.A. and D.C.; Data Curation, S.R.; Writing – Original Draft Preparation, S.R.; Writing – Review & Editing, D.A. and D.C.; Visualization, S.R.; Supervision, D.A. and D.C.; Project Administration, S.R.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

USE OF ARTIFICIAL INTELLIGENCE (AI)-ASSISTED TECHNOLOGY

Not applicable.

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