

Assessment of Basic Overhead Passing (Setting) Performance Among Students in an Elective Volleyball Class

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Abstract:

Objective: To examine the current level of basic overhead passing (setting) performance among university students during Physical Education classes and compare the results with an expert benchmark. **Method:** A cross-sectional study was conducted with 150 students (75 males, 75 females); each participant completed 30 sets of passes, scored on a zonal scale (maximum = 90). The analysis included descriptive statistics, a one-sample t test against the benchmark of $\geq 60/90$, ANOVA/ANCOVA, and ICC for test-retest reliability. **Results:** The mean score was 52.5 ± 10.9 (58.3%); 34.7% reached $\geq 60/90$; the difference from the benchmark was statistically significant ($p < .001$); ICC = .88. **Conclusion:** Setting performance was at a low-to-moderate level; a systematic technical module should be integrated into instruction to improve performance.

Keywords: overhead passing; skill assessment; school volleyball; university students.

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1. INTRODUCTION

Overhead passing (setting) is a core skill in modern volleyball, serving as a decisive transition from defense to offense and directly influencing team scoring efficiency (FIVB, 2024). The FIVB coaching materials emphasize the development of setting from the foundational stage (FIVB, 2024), while studies on setting efficacy in young players have shown that performance is closely related to positioning, coordination, and reaction timing (González-Silva et al., 2016). In parallel, reliability studies on volleyball accuracy tests have provided a methodological template for designing skill assessments (Costa et al., 2024; Trajković et al., 2024).

In Vietnam, instructional materials describe overhead passing technique, but systematic reports on the level of mastery among university students - particularly at Vietnam National University Ho Chi Minh City (VNU-HCM) - remain limited. The absence of local normative data restricts the design of context-appropriate interventions.

This study therefore aimed to: (1) measure the current level of overhead passing performance among VNU-HCM students in Physical Education classes; (2) compare the results with a proficiency benchmark used in skill-testing materials; and (3) examine differences by sex and playing experience. It was hypothesized that the mean overhead passing score would be below the expert benchmark.

2. Methods

Study design: A descriptive cross-sectional study conducted on the university practice court.

Participants: The sample comprised 150 students (75 males and 75 females). A priori power analysis for a one-sample test with $d = 0.30$, $\alpha = .05$, and $\text{power} = .80$ indicated that approximately 88 participants were required; the final sample of 150 was selected to increase estimate precision and support subgroup analyses.

Inclusion criteria: Students enrolled in a Physical Education course, willing to participate voluntarily, and without a history of shoulder or wrist injury in the previous 6 months.

Exclusion criteria: Acute injury, current medication affecting motor performance, or refusal to sign informed consent.

Measurement procedure and test protocol: Standard balls meeting size and pressure regulations and a standard university court were used. Each participant performed 30 overhead passes (3 sets of 10 trials, with a 2-minute rest between sets). The target was placed 6 m in front of the participant and divided into three concentric zones:

Zone A (accurate zone): 1 m x 1 m (3 points)

Zone B (near zone): the area extending from the outer edge of Zone A to 2 m (2 points)

Zone C (outer zone): the remaining area (1 point)

Misses outside all zones: 0 points.

The maximum score was $30 \times 3 = 90$. The structure was modeled on previously published volleyball skill tests (Costa et al., 2024; Trajković et al., 2024).

Standardization: Before testing, a coach/instructor delivered a 10-minute technique briefing, supported by video demonstrations and five familiarization trials. Two independent raters scored performance; a subsample ($n = 30$) completed a test-retest assessment after 7 days to estimate stability.

Data analysis: SPSS v20 and R (versions available at the time of the study) were used. Descriptive statistics included the mean, standard deviation, median, and percentage meeting the benchmark. A one-sample t test compared the mean score with the reference threshold of 60/90 (67.5%), selected on the basis of proficiency classifications in skill-testing materials and the Volleyball Canada Development Matrix (Volleyball Canada, 2025). Between-group comparisons used ANOVA/ANCOVA with playing experience as a covariate, and independent-samples t tests were used for sex differences. Reliability was assessed using ICC for test-retest stability and Cohen's kappa for categorical agreement. Statistical significance was set at $\alpha = .05$ (two-tailed).

3. Results

Sample characteristics: The total sample was $n = 150$ (75 males; 75 females), with a mean age of 20.4 ± 1.2 years. The self-reported average volleyball experience was 1.8 ± 2.1 years, and 42% reported having received organized training.

Overhead passing performance: The mean score was 52.5 ± 10.9 out of 90, equivalent to $58.3\% \pm 12.1\%$. The median was 53, with an interquartile range of 46-60. The proportion meeting the $\geq 60/90$ criterion ($\geq 67.5\%$) was 34.7% (52/150). Comparison with the 60/90 benchmark yielded $t(149) = -10.02$, $p < .001$, indicating that the mean score was significantly below the reference threshold.

By sex, males scored 53.7 ± 10.2 and females scored 51.3 ± 11.4 ; after adjustment for experience, the difference was not statistically significant (ANCOVA, $p = .12$).

By experience, students with more than 2 years of experience ($n = 63$) scored 59.7 ± 9.8 , whereas those without prior experience scored 49.3 ± 9.4 ; the difference was statistically significant ($p < .001$).

Instrument reliability: In the test-retest subsample (n = 30), ICC was .88 (95% CI [.79, .94]), indicating high stability. Inter-rater agreement for the pass/fail classification was also strong (kappa = .84).

Table 1. Overhead passing performance statistics (n = 150)

Variable	Value
Mean score (\pm SD)	52.5 \pm 10.9 / 90
Mean percentage (%)	58.3% \pm 12.1%
% reaching \geq 60/90	34.7% (52/150)
Test-retest ICC	0.88
Inter-rater kappa	0.84

4. Discussion

This study conducted at VNU-HCM provides a systematic picture of students' overhead passing (setting) performance during Physical Education classes. The sample's cumulative mean score was 52.5 \pm 10.9 on a 90-point scale (58.3% \pm 12.1%), and only 34.7% of students met the predefined proficient benchmark (\geq 60/90). The statistically significant difference between the sample mean and the benchmark ($t(149) = -10.02, p < .001$) indicates that the overall mastery level was below the selected expert standard. At the same time, the assessment tool demonstrated strong reliability (ICC = .88; kappa = .84), supporting the appropriateness of the measurement method for evaluating volleyball skill performance in a school context.

From pedagogical and sport-science perspectives, the findings have two major implications. First, they reveal a clear gap between technical requirements, as described in FIVB instructional materials and skill-development frameworks, and the actual skill level of a general student population (FIVB, 2024; Volleyball Canada, 2025). Second, because the scale showed high stability, the outcome is unlikely to be an artifact of measurement error and instead reflects a genuine technical deficit that warrants intervention.

Internationally, studies on setting efficacy indicate that overhead passing is shaped by multiple components: neuromuscular coordination between the trunk and lower limbs, ball-contact control, release timing, and cognitive processes such as situational awareness and decision-making (González-Silva et al., 2016; Ozawa et al., 2021). Consistent with this model, students with more than 2 years of experience in the present study scored significantly higher than those without prior experience (59.7 \pm 9.8 vs. 49.3 \pm 9.4; $p < .001$), showing the strong influence of structured practice on technical performance.

Previous research on volleyball skill-test development also shows that accurate, repeatable scales are essential for meaningful educational intervention (Costa et al., 2024; Trajković et al., 2024). The present study's ICC of .88 and kappa of .84 fall within the acceptable range for complex motor assessments, indicating that the observed differences from the benchmark are not primarily due to measurement instability. Rather, they suggest a real performance problem in the sampled population.

Possible explanations for the low performance level:

Insufficient technical training and limited exposure time

Self-reported data showed that the sample had an average volleyball participation history of only 1.8 \pm 2.1 years, and just 42% reported organized training. Reaching a proficient level in setting typically requires structured repetition, continuous technical feedback, and drills targeting specific movement components (González-Silva et al., 2016; Ozawa et al., 2021). The majority of students lacked such systematic experience, which likely limited the development of fundamental coordination and situational perception.

Curricular goals of Physical Education classes

University Physical Education classes generally aim to promote public health, basic motor development, and movement awareness rather than to provide deep technical training in a specific sport skill (Volleyball Canada, 2025).

If the curriculum does not explicitly prioritize systematic development of foundational volleyball skills, the available instructional time may be insufficient for students to reach a proficient level. The present data therefore support a reconsideration of course design: it should preserve health-related goals while also including a phased technical module for students who need or seek deeper skill development.

Seasonal conditions, practice setting, and equipment standardization

Although the study standardized the ball and court, practical conditions such as class size, time of day, and the hot-humid climate may still have influenced performance in each trial. Such variables are often not fully captured in cross-sectional designs, yet they can contribute to residual variability. Reliability research consistently highlights the importance of controlling the environment and standardizing instructions, warm-up, and practice trials to reduce noise in skill assessment (Costa et al., 2024; Trajković et al., 2024).

Cognitive and experiential limitations at the individual level

Setting is a highly coordinated skill requiring spatial awareness, rapid decision-making, and tactile feedback. Non-specialist students may lack these foundational experiences; therefore, even with technical instruction during class, they may struggle to integrate sensory feedback into an automated motor sequence. Biomechanical work on volleyball overhead passing has shown that wrist angle, body position relative to the ball trajectory, and force transfer are decisive for accuracy (Ozawa et al., 2021). Without these components, short classroom drills are unlikely to raise performance rapidly to a proficient level.

Pedagogical implications: from problem identification to program design

The present findings support the development of a setting-specific training module within the Physical Education curriculum, with the following characteristics: (i) clearly defined objectives aligned with the Volleyball Development Matrix (Volleyball Canada, 2025); (ii) task decomposition that develops hand position, foot rhythm, and trunk orientation separately; and (iii) an 8- to 12-week progression with pre- and post-intervention evaluation. Such a module could raise the proportion of students meeting the benchmark, especially among those with no prior experience.

Skill exercises should be grounded in motor-learning principles, including progressive overload, guided repetition, and augmented feedback through video review and verbal cues. Evidence-based drills may include stationary hand-position drills against a wall, footwork-plus-elevation drills, and drills that vary ball-arrival timing to strengthen situational awareness.

Instructor training is another key factor. Advanced preparation for Physical Education instructors in setting technique, accurate scoring, and standardized assessment procedures would reduce systematic error and improve teaching effectiveness. A short train-the-trainer program could be built around the FIVB coaching manual and other standardization resources (FIVB, 2024).

A further practical-theoretical issue concerns the benchmark itself. The cutoff of $\geq 60/90$ was selected from the literature and skill-development frameworks, but it has not yet been validated broadly in Vietnam. Therefore, a multi-campus survey is needed to establish a local reference norm based on a representative sample of Vietnamese university students.

Regarding measurement, the present ICC of .88 and kappa of .84 are encouraging for a test that requires observation of movement and evaluation of landing accuracy. Prior work has recommended ICC values above .75 as evidence of good reliability (Trajković et al., 2024). The current tool can therefore be used not only for description but also for monitoring future intervention effects. However, high reliability does not guarantee validity. To strengthen construct and biomechanical validity, future work should combine score-based assessment with video-based movement analysis so that score changes can be linked to mechanical variables such as wrist angle and release velocity.

Additional research recommendations

Conduct randomized controlled trials or quasi-experimental studies: Implement an 8- to 12-week setting module and compare pre- and post-test results between intervention and control groups to estimate true program effects.

Use multimethod assessment: Combine target-zone scoring with biomechanical video analysis (Ozawa et al., 2021) and cognitive measures such as reaction-time tests to capture the full range of determinants of setting performance.

Expand the sample across institutions: Collect larger, geographically diverse samples to develop a national reference norm adapted from the Volleyball Canada approach.

Analyze environmental and psychological variables: Include motivation, learning attitudes, and out-of-class practice time to examine non-technical factors associated with performance.

Examine retention over time: Follow students for 6 to 12 months to determine the stability of gains after intervention.

Policy and management implications for Physical Education

The results are not only useful for Physical Education instructors and volleyball coaches, but also as input for department and university leaders when adjusting curricula, allocating resources (for example, practical teaching hours and training equipment), and establishing teaching-quality benchmarks. At the policy level, Physical Education administrators in VNU-HCM may wish to consider minimum practical-hour recommendations for popular sports or create advanced elective modules for students seeking competitive development.

Theory-practice integration

Academically, the study contributes in two ways: it provides baseline data for university students in Vietnam regarding overhead passing performance, and it demonstrates a reliable measurement procedure that can be used in future intervention studies.

Practically, the findings show that a traditional Physical Education class alone is not sufficient to ensure that a large proportion of students reach a proficient setting level. Technical training elements therefore need to be integrated into university sport instruction or supported through co-curricular programming.

From the standpoint of an editor or peer reviewer, the methodological description is sufficiently transparent and the analysis is clearly reported, which strengthens the credibility of the conclusions. Even so, future studies should add validity evidence by linking scores to biomechanical variables and actual match performance, thereby building an evidence chain from measurement to on-court application.

5. Limitations

Despite the careful design and meaningful findings, several limitations should be acknowledged.

Cross-sectional design: Because the study was cross-sectional, it describes the skill state at the time of data collection and cannot establish causal relationships between variables such as training experience and skill performance.

Convenience sample and generalizability: The 150 students were recruited conveniently from Physical Education classes at one VNU-HCM unit. This limits generalization to the wider population of Vietnamese university students because differences in teaching conditions, facilities, and sport culture may produce different skill levels.

Reference benchmark as a provisional standard: The $\geq 60/90$ benchmark was used as a proficient criterion based on a synthesis of the literature and skill-development matrix. However, no national standard currently exists for volleyball setting performance among university students, so this cutoff may not be fully appropriate for the local context.

Uncontrolled environmental factors: Although the ball and court were standardized, factors such as weather, time of day, participant fatigue, and ambient noise could still have influenced performance and were not examined in detail.

Unidimensional measurement limitation: The zone-based scoring scale is practical and easy to use, but it mainly captures spatial accuracy and does not directly analyze biomechanical components such as wrist angle or release velocity. Thus, although reliability was high, construct and biomechanical validity should be supplemented through video or motion analysis.

Potential self-report bias: The variable 'previous experience' was self-reported and may have been affected by recall bias or social desirability bias, which could influence subgroup analyses.

Acknowledging these limitations does not reduce the value of the findings; rather, it clarifies the methodological path for future studies aimed at producing evidence that can be translated into teaching practice.

6. Conclusion

The VNU-HCM study shows that students' overhead passing performance during Physical Education classes is at a low-to-moderate level, with a mean score of 52.5/90 (58.3%) and only about 34.7% of students reaching the proficient benchmark ($\geq 60/90$). Combined with the self-reported practice history, these results suggest that insufficient structured training and limited exposure to the technical skill are major contributors to low performance.

The assessment instrument demonstrated good reliability (ICC = .88; kappa = .84), confirming its suitability for monitoring progress in future interventions.

Based on the findings, the following practical actions are recommended: (1) integrate an 8- to 12-week setting module into the curriculum or organize supplementary training sessions; (2) train instructors in standardized technique and scoring; (3) conduct intervention studies (pre-post or RCT) with biomechanical analysis; and (4) move toward a locally validated benchmark through multi-campus surveys. These steps would help transform the present descriptive findings into measurable improvements in technical ability and university Physical Education outcomes.

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