

# Establishing A Reliable Fencing-Specific Lunge Distance Test

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## ABSTRACT

This study developed a standardized procedure to measure fencing-specific lunge distance in national fencing players and examined its test-retest reliability across three non-consecutive sessions (Day 1, Day 3, and Day 5). Twenty national players performed three maximal lunges per session from a controlled en-garde starting position; the best was recorded each day. Reliability of the test was assessed using ICC, SEM, and CV; the lunge distance showed excellent consistency (ICC = 0.990), low measurement error (SEM = 2.34 cm), and minimal relative variability (CV = 1.78%), with no systematic differences between days. These findings suggest that the standardized fencing-specific lunge distance test (FSLDT) is a practical and reliable tool for measuring lunge distance and assessing lower-limb performance in fencing.

**KEYWORDS:** *Fencing, Lunge Distance, En-garde, Standardization, Reliability, Intraclass Correlation Coefficient, ANOVA*

## 1. Introduction

Fencing is a combat sport in which two players engage in a duel on a piste with the same weapon (Haobam & Singh, 2025). Fencing players require the sudden execution of a lunge, changing direction, and recovering to en-garde to combat during the bout (Turna, 2020). Lunge in fencing is one of the key techniques used during a bout, and players must master it in various situations to achieve optimal performance. The lunge in fencing is a fundamental technique used in offensive and counter-offensive movements, requiring lower-limb power and precision execution. The lunge, an explosive extension of the fencer's body driven by the non-dominant leg as the dominant leg is kicked forward, is one of the primary methods (Moore et al., 2015). Consequently, lunge performance assessment is necessary for monitoring player performance, training adaptations and competition readiness. However, several lower-limb

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performance tests lack relevance to fencing. Therefore, a reliable and standardized method for measuring fencing lunge distance is necessary for coaches, players, and researchers.

## **2. Methods**

### **2.1 Participants**

Twenty national fencing players were selected from Khongman Fencing Academy for the study. All the players had participated in the national fencing championship and were free from lower-limb injury at the time of the test.

### **2.2 Test Standardization equipment and procedure**

The fencing-specific lunge distance test was standardized as follows:

- Equipment: Piste, measuring tape and whistle
- Standard en-garde position, with the front foot toe aligned to the starting line.
- Proper warm-up for about 10-15 minutes before the test.
- The tester blew the whistle, and the player performed the lunge, attempting to reach their longest distance while maintaining balance and proper form.
- The measurement was taken from the starting line to the heel of the front foot at the lunge's final position in cm.
- If the balance was lost, it was counted as invalid.
- The procedure was repeated 3 times.
- Out of the three trials, the best was recorded for analysis.
- The same tester, piste, equipment, and approximate time of the day were maintained across all sessions.

### **2.3 Test-Retest Design**

The test was conducted in the evening on three separate days: **Day 1, Day 3, and Day 5**. These intervals were maintained to minimize fatigue while reducing learning adaptation.

### **2.4 Statistical Analysis**

Descriptive statistics, including mean and standard deviation, were calculated for lunge distance scores for each testing session. Standard deviation was reported for descriptive purposes only. Test-retest reliability

was assessed using the Intraclass Correlation Coefficient. A one-way repeated-measures ANOVA was used to obtain the mean square between subjects (MSR) and mean square error (MSE) required for ICC calculation. Absolute reliability was evaluated using Standard Error of Measurement (SEM), calculated as the square root of the error mean square. Relative reliability was assessed using Coefficient of Variance (CV%), and statistical significance was set at  $p < .05$ .

### 3. Results

#### 3.1 Descriptive statistics

Table 1

***Mean And Standard Deviation for the Fencing-Specific Lunge Distance Test Across the Three Testing Sessions***

Session	Mean (cm)	SD (cm)
Day 1	131.05	23.64
Day 2	131.45	24.05
Day 3	132.35	23.16

Table 1 represents the Mean and Standard Deviation values of lunge distance across the three testing sessions. The mean and standard deviation across three different days: *Day 1*, *Day 3*, and *Day 5* are  $131.05 \pm 23.64$ ,  $131.45 \pm 24.05$  and  $132.35 \pm 23.16$ , respectively.

#### 3.2 Test-Retest reliability

TABLE 2

***One-Way Repeated-Measures Anova For The Fencing-Specific Lunge Distance Test***

**Source of Variation      SS      df      MS      F      P-value      F crit**

Rows	31588.85	19	1662.57	304.32	1.14E-35	1.86
Columns	17.73	2	8.86	1.62	0.21	3.24
Error	207.60	38	5.46			
Total	31814.18	59				



Table 2 shows the one-way repeated-measures ANOVA for the Fencing Specific Lunge Distance Test. The analysis demonstrated that no significant differences were observed between the testing sessions, as indicated by  $F(2, 38) = 1.62$  and  $p = 0.21$ , suggesting the absence of fatigue effects and systematic learning across the three testing sessions.

TABLE 3

***Test-Retest Reliability Statistics of The Fencing-Specific***

***Lunge Distance Test***

Measure	Value
ICC (3,1)	0.99
SEM (cm)	2.34
CV (%)	1.78

**Note:** ICC = Intraclass Correlation Coefficient; SEM = Standard Error of Measurement;

CV = Coefficient of Variation

Table 3 shows that the ICC (3, 1) value was 0.99, suggesting high consistency in the Fencing Specific Lunge Distance Test. The SEM was 2.34, indicating low-level measurement error and high precision of the test. The CV (%) was 1.78%, which is below the threshold of 5%, demonstrating high consistency across the testing sessions.

**4. Discussion**

The purpose of this study was to standardize a fencing-specific lunge distance test and evaluate its test-retest reliability in national fencing players. The results demonstrated excellent reliability, as supported by a high ICC, low SEM, and CV values. The ICC (3, 1) value was 0.99, suggesting high consistency in the Fencing Specific Lunge Distance Test. The SEM was 2.34, indicating low-level measurement error and high precision of the test. The CV (%) was 1.78%, which is below the threshold of 5%, demonstrating high consistency across the testing sessions. Furthermore, there were no significant differences between the testing sessions, as indicated by  $F(2, 38) = 1.62$  and  $p = 0.21$ , suggesting the absence of fatigue effects and systematic learning across the three testing sessions. These findings suggest the importance of controlled testing conditions at the time of measurement.



## **5. Recommendations**

From the standardization of establishing a reliable fencing-specific lunge distance test, the following recommendations can be drawn:

- It is recommended to use the standardized fencing-specific lunge distance test to assess explosive lower-limb performance in fencers.
- It can be incorporated to track performance changes over time and assess the effectiveness of strength and power training interventions.
- Due to its cost-effective and practical nature, the test is suitable for use in both elite and grassroots fencing players.
- Future studies may be conducted on cross-sport adaptation for other combat or lunge-dominant sports.

## **6. Conclusion**

The standardized fencing-specific lunge distance test showed excellent reliability, which is supported by a high ICC, low SEM and CV values across the three different testing sessions. The test is highly reliable for use by coaches and researchers to assess explosive lower-limb performance by measuring lunge distance. This standardized test provides a practical and cost-effective assessment tool for monitoring players' performance and scientific research.

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