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## Construction of test for accuracy in softball throw

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### Abstract

This study was conducted to construct a test to determine the throwing accuracy of the players in the game of Softball. The test was constructed with 220 male junior softball players from various districts of Kerala with ages ranging from 15 to 19 years. Aim of the test was to check the ability of the subjects to throw to a target from a particular distance with consistency. This test was then tested for its reliability and objectivity. The test was named as 321 Target test. Data was collected with the assistance of expert testers. A total of 120 male junior softball players of Kerala state who participated in the state championship conducted by the Kerala State Softball Association were selected as the subjects for analyzing reliability and a total of 220 subjects were used for analyzing objectivity. The main objective of the study was to predict the performance of the players by the level of skills possessed. Intra Class Correlation Coefficient with Two- way random effect ANOVA model was used to estimate the reliability and objectivity of this test. Repeated trials was conducted by a tester to analyze the reliability of this newly constructed test and repeated trials by two different testers in similar conditions on same subjects was conducted for determining the objectivity. Reliability coefficient of .90 and Objectivity coefficient of .86 were obtained.

**Keywords:** Reliability, objectivity, throwing accuracy

### 1. Introduction

The game Softball was invented in the United States of America and is also known as American Cricket. Hitting, throwing, running and fielding are the fundamental skills needed to play this game. Here we have focused only on throwing skills. Multi playing situations occur frequently in this game. So, while considering throw in softball, accuracy and speed are very important. A test was constructed to determine the accuracy of softball throwing. Data was collected and analyzed to obtain reliability and objectivity coefficients to determine whether the test was valid or not.

Scientific methods of training and performance analysis are necessary for achieving high performance in sports. Identifying talents at an early age and grass root scientific trainings are the major stepping stones towards success. Different types of training methods and programs were developed according to the nature and demands of various activities. Training methods are very specific in nature and are unique with respect to individual differences, capacity and level of proficiency. Continuity, periodization, progression of load, diet and rest in a scientific manner helps attain high performance. Performance and skill analysis at each stage is very important to identify the talent, performance level and the effectiveness of training. Skill level can be measured with standard skill tests and performance level can be checked with the help of competitions. Highly scientific method to predict the potential abilities and screen talents from a group is essential to achieve optimum performance. Standardized skill test batteries can help a coach or selector to obtain these objectives.

In this modern world, coaches, trainers and researchers globally compete against each other to develop the most effective methods to train athletes; physically, mentally, socially and emotionally to achieve optimum performance and consistency. Skill test can help us in team selection to find the most efficient squad. Homogenous groups can be separated from a large number of subjects with the help of scores obtained from a valid test.

### 2. Materials and Methods

The Aim of this study was to construct a specific softball throwing accuracy test for junior boys. 321 target test was constructed for the same.

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This test contains a marked target hung on a wall and a restraining line on the floor. A total of 120 male junior softball players of Kerala state were selected as the subjects for the study to analyze the reliability and a total of 220 subjects were selected to analyze objectivity. Their ages ranged from 15 to 19 years. Intra Class Correlation Coefficient with Two- way random effect ANOVA model was used to estimate the reliability and objectivity of this test. Repeated trials were conducted by one tester to analyze the reliability of this newly constructed test and repeated trials by two different testers in similar conditions on the same subject were conducted for determining the objectivity.

**3, 2, 1 Target test (3.2.1)**

**2.1 Purpose:** The purpose of this test is to measure the player’s throwing accuracy.

**2.2 Materials:** Wall, Target, Marking Powder, Measuring Tape, Chalk, Soft balls. Scorers, Recorders, Tester, Ball collector.

**2.3 Marking**

The target is a series of squares of sizes 1.5 sq. ft., 3 sq. ft. and 4.5 sq. ft., arranged one inside the other. The target is marked by one inch wide lines painted on a sheet of canvas or marked with chalk on a smooth wall or a mat hung on a wall. The target is either marked or hung 1.5 m above the ground on the wall. The center square is 1.5 square feet in area (Outside measurement), the next is 3 square feet and the outer

one is 4.5 square feet in area. The bottom of the outside square target is 1.5 feet above the ground. The target is 40 feet from a restraining line of 6 feet length parallel to the target.

**2.4 Procedure**

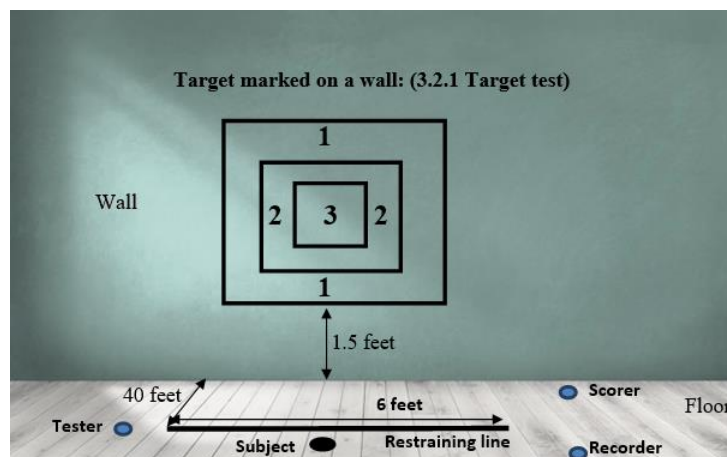
The subject is asked to stand behind the restraining line and throw towards the target for maximum possible score. A scorer and a recorder are required. Scorer stands near the target at a safe distance with good view. Recorder stands near the tester for recording the test score. When a throw strikes the target, the scorer announces the score loudly by raising one hand with raised fingers showing the number of points scored.

**2.5 Rules**

Throws should be done from behind the restraining line of 6 feet. Over arm and sidearm throws are allowed. Direct throws will only be counted. Under arm throw is not allowed. If the subject touches the restraining line re-throw will be awarded. No points will be awarded if a throw misses the target face.

**2.6 Scoring**

Each successful throw to the center square count three points, next or middle square count two points and outer square counts one point. Ball hitting on a line will count higher points. Score is the total of four throws. Two trials of four throws (4x2) will be awarded in a trial. Best of the two sets will be taken as final score of each trial.



**Fig 1:** Target marked on a wall: (3.2.1 Target test)

**3. Analysis of data**

The data obtained was statistically analyzed to compute the reliability and objectivity of the tests. Two sets of data taken by a tester were used to analyze reliability and two sets of data taken by two different testers were taken to analyze the objectivity. The reliability estimates were computed using Intra Class Correlation Coefficient with Two-way random effect ANOVA model (Safrit & Wood model 1989). Two important sources of variation in the observed data are due to the differences among subjects and between repeated trials. The variations in the data were divided in to three; between subjects, between repeated measurements and also interaction between subjects and repeated measurements.

For n subjects with k repeated measures for each subject, the degrees of freedom associated with subjects is n-1, repeated measures k-1, and with interaction is (n-1)(k-1) and a total of nk-1. An estimate of the reliability (R) is calculated using the formula,

$$R = (MSS - MSI) / MSS \tag{1}$$

Where, MSS is the mean square for subjects, obtained by dividing sum of squares between subjects with the corresponding DF. In a similar manner, MSI the interaction mean square can be computed. Note that mean square due to repeated measures does not appear in the computation of R. Hence that term is not incorporated in the tables.

**3.1 Reliability estimates**

**Table 1:** The reliability estimates of 321 Target test (321)

S. No.	Name of test	Source	SS	DF	MS	ICC
1	3,2,1 Target test (3.2.1)	BS IN	712.650 71.400	119 119	5.989 0.600	0.900*

Source of Variance:

BS: - Between Subjects  
 IN: - Interaction  
 SS: - Sum of Squares  
 MS: - Mean Sum of Squares  
 DF: - Degrees of Freedom  
 ICC: - Intra Class Correlation  
 - Highly Reliable Test Items

Table 1 shows the reliability estimates of 321 Target test (321). According to Barrow and McGee (1986), a reliability coefficient in the range 0.80 to 0.89 is acceptable; 0.90 to 0.94 is very good; and excellent if it ranges between 0.95 and 0.99. Morrow *et al.* (1995) stated that, reliability coefficient represents the repeatability or consistency.

### 3.2 Objectivity coefficients

Intra Class Correlation Coefficient with Two- way random effect ANOVA model was used to estimate the objectivity coefficients of the highly reliable skill test item. The two important sources of variation are due to differences among subjects and differences between the two testers.

Those skill test items with objectivity coefficients greater than or equal to 0.80 were accepted. The objectivity estimates for the 3, 2, 1 Target test (321) test is shown in Table 2.

### 3.3 Objectivity estimates

**Table 2:** The objectivity estimates for the 3, 2, 1 Target test (321)

S. No.	Name of test	Source	SS	DF	MS	ICC
1	3, 2, 1 Target test (3.2.1)	BS	1359.055	219	6.206	0.896*
		IN	141.955	219	0.648	

The objectivity coefficient of the 321 Target test (321) is shown in Table 2. In this test package the objectivity coefficient ranges from 0.80 to 0.99. As a general rule, the objectivity coefficients of a highly reliable and objective test should ranges from 0.80 or above. Hence it can be concluded that the test item is highly objective in nature.

### 4. Result & Discussion

The reliability coefficient is .900 and Objectivity coefficient is .896. We can say that this test is having high reliability and objectivity. This shows that this test is highly valid for measuring the accuracy in softball throw.

### 5. Conclusions

321 Target test (321) can measure the accuracy in softball throw with high amount of reliability and objectivity. So we can conclude that this test is useful for the analysis of softball throw for accuracy.

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