

CONSTRUCTION OF SKILL TEST BATTERY AND NORMS FOR FIELD HOCKEY PLAYERS

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Abstract: The purpose of the study was to construct a skill test battery for Female Field Hockey players. To achieve this purpose three hundred and thirty (n = 330) school level female hockey players of 14 to 16 years were randomly selected from various schools of Tamilnadu state, India. Sixteen game related skills as test items were selected as independent variables and the respective performance were assessed by coaches rating as dependent variables in this study. Factor analysis was applied to extract the significant factors responsible for variance and dominant skill related variables through Principle Component Analysis (PCA - Varimax rotation). Totally, PCA yielded three factors constitute of 12 test items out of 16 test items. The playing ability performance (overall performance) score of the players were interpreted by using a grading scale on the basis of 6-Sigma Scale as Excellent, Good, Average, Below Average and Poor respectively according to their overall performance score based on the percentiles norm, which was developed for all the selected test items.

Intex Terms: Field Hockey, Dodge, Direction and Pace Dribbling, Angle Shooting, Long and Short Passing

I. INTRODUCTION

Skill is the outcome of message sent by the sensory organs to the brain which in turn makes the concerned muscles act in a certain way to perform a complicated action in the desired manner. In general, a skill is learnt by repeatedly making attempts at movement in such a way that particular muscles are forced to act in certain directions until the requisite skill is acquired. Hockey players therefore must understand that to get good results they should first grasp the intricacies involved in a skill. They must make up in their mind to create a clear picture of what they are going to attempt. If their mind grasps the whole movement involved in a skill their tasks in acquiring that skill will become easier. In Hockey, the term skill is applied to a pattern of movements which a player is able to make with his stick and ball in a manner that corresponds to rules and is effective in its objective. Hockey is played at a fast pace and a player must use his skills in a manner which corresponds to the tempo of the game. A player who is in the act of stopping or receiving the ball should decide whether his next move is to be a forward pass or a dribble past to an opponent. The purpose of the study was to construct skill test battery and to develop standard norms for female field hockey players.

II. METHODOLOGY

To achieve the purpose of the study, three hundred and thirty (n = 330) school level female field hockey players of 14 to 16 years were randomly selected from various schools of Tamilnadu state, India. The subjects played hockey at least for two years. Only those who represented their respective school teams were taken as subjects irrespective of their playing position. Considered the feasibility, time factor & equipments availability, sixteen hockey skill related test items were constructed and were selected as independent variables in this study as Power Dribble, Speed Dribble, Pace Dribble, Zig- Zag Dribble, Direction Dribble, Long Pass, Short Pass, Speed Pass, Over Head Pass, Angle, hooting, Straight Shooting, Speed Shooting, Speed Right Dodge, Speed Left, Dodge, Accuracy Jabbing and Speed Jabbing. Reliability of the test was established by test-retest method using process from thirty subjects. Coefficient of Correlation of the scores of the selected skill tests items were ranged between 0.86 and 0.92 by the test retest method. Face validity was adopted for different test administrators among the subjects were ranged between 0.89 and 0.96. Reliability of the instruments was established by accomplished the well equipped calibration.

Factor analysis was applied as Feltz & Mugno (2003) suggested that, significant factors responsible for variance and dominant were extracted through Principle Component Analysis (un-rotated factor loadings and varimax rotation). The final solution so obtained was used to identify the different factors. These factors were given an appropriate name depending upon the characteristics of variables contained in it. A skill test battery was constructed by picking up the factors having higher loading. Finally norms were developed using Percentiles and 6-sigma scale. All the statistical computations were done through Statistical Package for Social Sciences (SPSS, 16th Version).

III. ANALYSIS AND DISCUSSION

All the selected sixteen test items' data were collected for two days during the final phase of the preparation period before the competitions and their respective descriptive statistics were presented in the table 3.1. Adequate rest was given in between the test items.

Table 3.1: Descriptive statistics on Selected Skill Variables of Female Field Hockey players (N = 330)

S.No	Variables	Range	Minimum	Maximum	Mean	Std. Deviation (\pm)
1	Power Dribble	5.97	10.12	16.09	12.56	1.15
2	Speed Dribble	7.02	31.08	38.10	34.38	1.55
3	Pace Dribble	4.01	11.00	15.01	12.71	0.69
4	Zig Zag Dribble	3.54	10.45	13.99	12.38	0.74
5	Direction Dribble	5.54	17.05	22.59	20.20	1.07
6	Long Pass	11.00	7.00	18.00	10.79	1.94
7	Short Pass	9.00	8.00	17.00	12.82	1.78
8	Speed Pass	8.00	.00	8.00	4.10	1.56
9	Over Head Pass	4.00	.00	4.00	1.38	0.96
10	Angle Shooting	11.00	1.00	12.00	7.10	1.74
11	Straight Shooting	17.00	3.00	20.00	11.70	3.34
12	Speed Shooting	4.00	1.00	5.00	2.41	0.86
13	Speed Right Dodge	4.15	14.75	18.90	17.13	0.99
14	Speed Left Dodge	4.05	15.14	19.19	17.16	0.99
15	Accuracy Jabbing	6.00	6.00	12.00	8.59	1.55
16	Speed Jabbing	4.90	20.18	25.08	22.83	0.98

Two tests, the Kaiser-Meyer-Olkin (KMO) test of sampling adequacy and Barlett's test of Sphericity, are usually conducted to determine if the sample has met the appropriate requirements for factor analyses. The KMO test is done to examine if the data set is adequate for factoring and is one of the pre-requisites for conducting a factor analysis (Andersen & Herbertsson, 2003).

Table 3.2: Total variance obtained for selected Hockey Skill Tests

Component	Initial Eigen values		
	Total	% of Variance	Cumulative %
1	5.875	36.717	36.717
2	2.027	12.671	49.388
3	1.788	11.177	60.565
4	1.143	7.145	67.710
5	.863	5.391	73.101
6	.653	4.084	77.185
7	.599	3.742	80.927
8	.563	3.520	84.447
9	.500	3.128	87.575
10	.436	2.727	90.302
11	.383	2.392	92.695
12	.290	1.812	94.507
13	.282	1.765	96.271
14	.254	1.587	97.858
15	.225	1.407	99.265
16	.118	.735	100.000

Extraction Method: Principal Component Analysis.

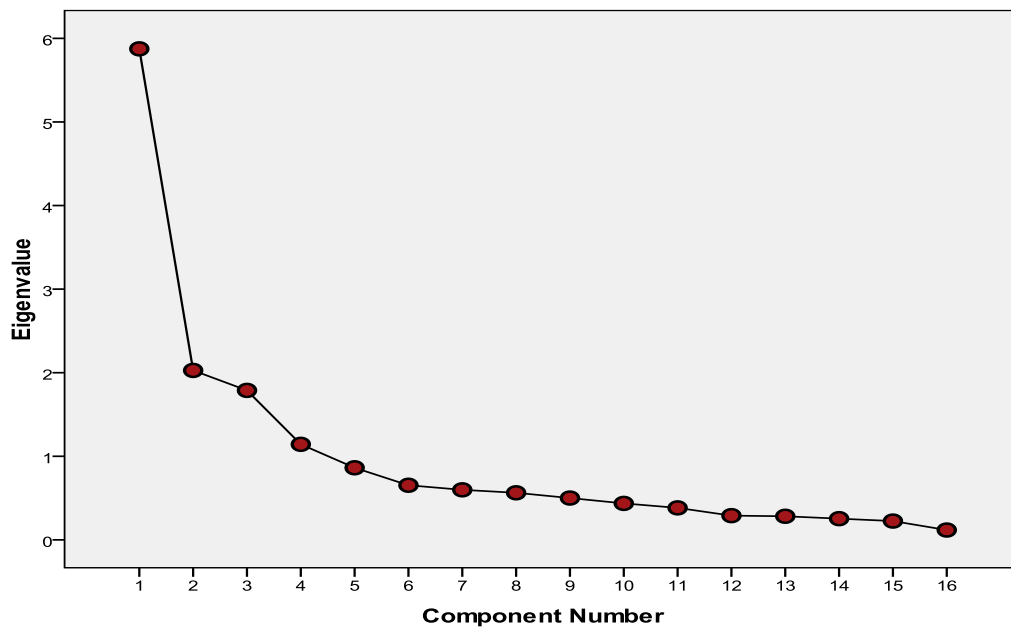


Fig 3.1: Graph for hockey skill characteristics

Factor analysis was conducted for all of the variables under study. The 16 variables for hockey skill characteristics were factor analyzed. The percentage of variance explained is provided in Table 3.2. The factor loadings are provided in Table 3.3. Only variables with factor loadings of 1.00 and above were considered. It was noticed that the fourth component (factor) loaded above 1.00 (Eigen = 1.143); but the total variables accounted was less than the 10 (7.145). Accounting more than 10 % of variance loaded as first three components, were only considered for the final test battery. The scree plot for hockey skill characteristics, showing the sorted Eigen values, is depicted in Figure 3.1.

Table 3.3: Rotated component matrix for selected Hockey skill test items

Variables	Component		
	1	2	3
Power Dribble	.212	-.070	.848
Speed Dribble	.310	.162	.276
Pace Dribble	.075	-.196	.874
Zigzag Dribble	.338	-.515	.208
Direction Dribble	.134	-.771	.213
Long Pass	-.356	.627	.270
Short Pass	-.280	.661	-.088
Speed Pass	-.269	-.012	.123
Over Head Pass	.032	.430	-.176
Angle Shooting	-.136	.801	-.129
Straight Shooting	-.715	.322	.168
Speed Shooting	-.629	.074	-.287
Speed Right Dodge	.820	-.324	.155
Speed Left Dodge	.794	-.334	.080
Accuracy Jabbing	-.213	.474	-.487
Speed Jabbing	.712	-.013	.293

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

The rotated component matrix presents the three factors after Varimax rotation. To identify what these factors represent, it would be necessary to consider what items loaded on each of the three factors. The clustering of the items in each factor and their loadings offer the best clue as to the meaning of the factor. In the table 3.3, five variables loaded on Factor 1. An inspection of these variables clearly shows that all these variables reflect the speed based shooting, dodging and jabbing dimension and hence

labeled as speed shooting, dodging and jabbing hockey skill test; factor 2 contains five variables that clearly reflect the zig-zag dribble, direction dribble, angle shooting, long and short passing characteristics, labeled as long and short pass direction dribbling and angle shooting hockey skill test; and factor 3 contains two variables as the representation for pace and power dribbling dimension, labeled as pace and power dribbling hockey skill test. But rest of the variables loaded less than 0.5. Since only variables with factor loadings of 0.50 and above were considered, this three-factor model represents the combination of the 16 original variables, and appears to reflect adequately the underlying factor structure of the 12 variable reflects the hockey offensive skill characteristics.

3.1 Development of Final Test Battery

The items to be included in the Hockey skill test battery were selected on the basis of Product Moment Correlation among all the 16 test items and by applying factor analysis to extract the factors. Only the extracted test items which has higher loading from both the factors, were selected to constitute the final test battery. The test items that constituted the final battery were shown in the table 3.4.

Table 3.4: Hockey Skill Tests Battery

S.No	Name of the Test Item	Name of the Factor
1	Straight Shooting, Speed Shooting, Speed Right Dodge, Speed Left Dodge & Speed Jabbing	JDS Hockey Playing Ability Test
2	Zigzag Dribble, Direction Dribble, long and short pass & angle shooting	DPS accuracy based Playing Ability Test
3	Power Dribble and Pace Dribble	Ball Control Playing Ability Test

3.2 Development of Norms

A norm is a scale that permits conversion from a raw score to a score capable of comparisons and interpretations. A percentile score norm indicates a player's relative position in a group and informs the player of the percentage of players who score below his score. In this study, an effort was undertaken to construct norms for skill test battery for Hockey players and were presented in the table 3.5.

3.3 Development of Grading Scale for Interpreting Playing Ability

All the individual performance of the skill test was converted as composite score. Based on the norms found in table 3.3, a six – sigma scale as 3 standard deviations above the mean and 3 standard deviation below the mean was developed to calculate the playing ability which was given in the table 3.5.

Table 3.5: Percentile Norms for all the Skill Test Items

Variables	Percentiles									
	10	20	30	40	50	60	70	80	90	100
Power Dribble	16.09	14	13.71	13.14	12.79	12.49	12.2	11.87	11.61	11.16
Pace Dribble	15.01	13.54	13.44	13.25	12.86	12.64	12.56	12.39	12.1	11.8
Zig Zag Dribble	13.99	13.39	13	12.76	12.49	12.33	12.16	12.07	11.86	11.43
Direction Dribble	22.59	21.36	21.16	20.97	20.58	20.41	19.8	19.63	19.39	18.5
Long Pass	9.00	9.00	10.00	10.00	11.00	11.00	12.00	12.00	13.90	18.00
Short Pass	11.00	11.00	12.00	12.00	13.00	13.00	14.00	14.00	15.00	17.00
Angle Shooting	5.00	6.00	6.00	6.40	7.00	7.60	8.00	8.00	9.00	12.00
Straight Shooting	8.00	9.00	10.00	11.00	12.00	12.00	14.00	14.80	16.00	20.00
Speed Shooting	1.00	2.00	2.00	2.00	2.00	3.00	3.00	3.00	3.00	5.00
Speed Right Dodge	18.9	18.49	17.88	17.68	17.6	17.47	16.8	16.63	16.29	15.68
Speed Left Dodge	19.19	18.19	17.98	17.68	17.45	17.39	17.09	16.8	16.39	15.4
Speed Jabbing	25.08	24.1	23.81	23.59	23.08	22.79	22.59	22.39	21.8	21.44

Table 3.6: Six – Sigma Scale for Playing Ability Scores

6-Sigma Scale	Playing Ability Performance Scores
3 σ	236.25
2 σ	224.04
1 σ	211.83
σ	199.62
-1 σ	187.41
-2 σ	175.20
-3 σ	162.99

Finally from the norms a Grading Scale was developed to interpret the playing ability of the players which is presented in table 3.7.

Table 3.7: Six – Sigma Scale for Playing Ability Scores

Scores	Alphabetical Grade	Interpretive Grade
Above 236.25	A	Excellent
211.84 to 236.24	B	Good
187.42 to 211.83	C	Average
163 to 187.41	D	Satisfactory
Below 162.99	E	Poor

VI. CONCLUSIONS

Based on the results, the following conclusions were drawn,

1. The performance of the Hockey players was acknowledged significant relationship with all selected test items.
2. Three test items were designed with Hockey skill related characteristics as (i) JDS Hockey Playing Ability Test; (ii) DPS accuracy based Playing Ability Test and (iii) Ball Control Playing Ability Test.
3. The playing ability performance (overall performance) score of the players were interpreted by using a grading scale on the basis of 6-Sigma Scale as A, B, C, D & E (or) Excellent, Good, Average, Below Average and Poor respectively according to their overall performance score based on the percentiles norm, which was developed for all the selected test items.

Reference

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