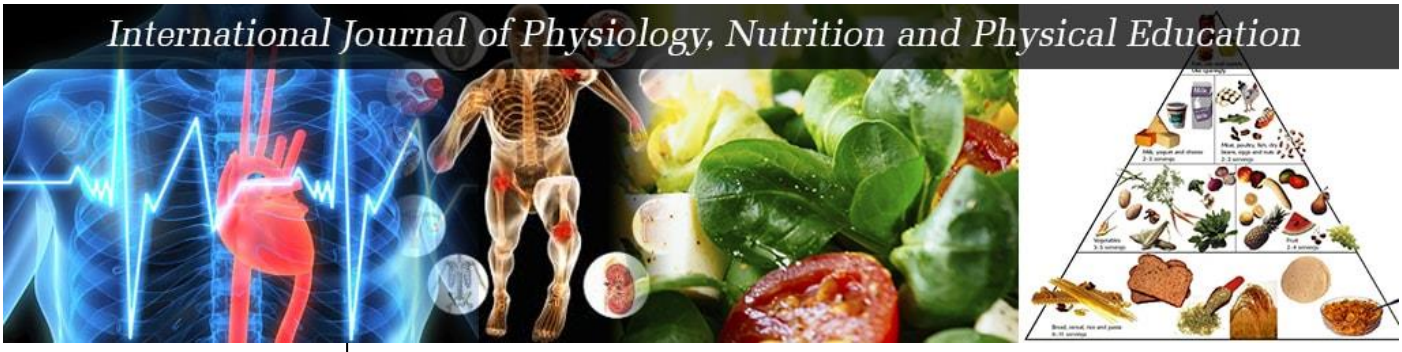

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A comparative study of psychomotor abilities of handball players

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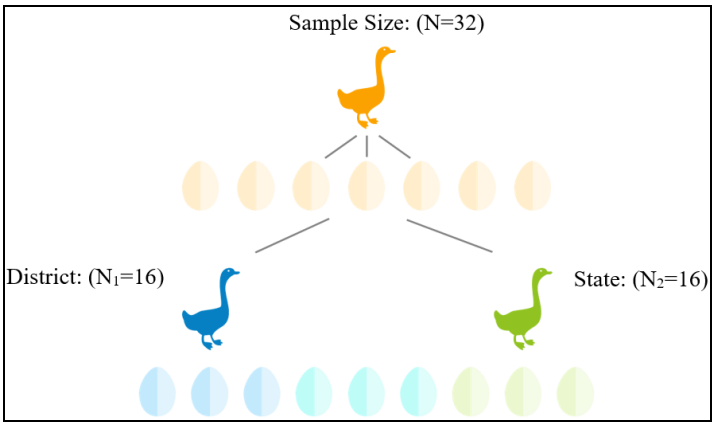
Abstract
Aim: The purpose of this study was to compare psychomotor abilities of handball players.
Subjects: For the purpose of present study, Thirty Two (N=32) male handball players between the age group of 11-19 years from Amritsar district of Punjab State volunteered to participate in the study at different level of achievement (*viz.* Sixteen (N_1=16) from District level and Sixteen (N_2=16) from State level.
Procedure: Kinesthetic Perception was measured by Horizontal Space Test, Speed of Movement was measured by Nelson Speed of Movement Test whereas Response Time was measured by Four-Way alternate Test.
Statistical Analysis: The Statistical Package for the Social Sciences (SPSS) version 14.0 was used for all analyses. The differences in the mean of each group for selected variable were tested for the significance of difference by an independent samples t-test. For testing the hypotheses, the level of significance was set at 0.05.
Results: Kinesthetic Perception:- The t-value is 0.76382. The p-value is .225472. The result is not significant at $p< .05$. Speed of Movement:- The t-value is 0.51407. The p-value is .305484. The result is not significant at $p< .05$. Response Time:- The t-value is 0.47017. The p-value is .320817. The result is not significant at $p< .05$.

Keywords: Psychomotor abilities, kinesthetic perception, speed of movement, response time, handball players

1. Introduction
Team-handball is an Olympic sport ball game that is characterized by fast pace defensive and offensive action during the game with the objective of the game to score goals. The modern game's origins were in Scandinavia in the early 19th century. It is today played by around 19 million people [1], and has been an Olympic sport since 1972 for men and since 1976 for women. In handball, there are various actions such as throws, passes, jumps, hits, blocks, pushes, runs, and dribbling [2] that make it a contact sport of intermittent high intensity [3]. Given the sport's complexity, performance in handball depends on multiple factors: anthropometric features, coordination, strength, endurance, nutrition, cognition, tactics, social factors, and external influences [4].
Besides evaluation of competitor's basic somatic parameters [5, 6, 7], motor skills [8, 9], sports seniority [10, 11] it seems essential to deal with evaluation of their psychomotor abilities. Ability top redict the movement of the opponent and the ball, selective attention, choosing the response, speed of perception and a high level of sensory and motor fitness are the elements of a sports competition that help a competitor win the game [12, 13].

2. Material and Methods
2.1. Selection of Subjects
For the purpose of present study, Thirty Two (N=32) male handball players between the age group of 11-19 years from Amritsar district of Punjab State volunteered to participate in the study at different level of achievement (*viz.* Sixteen (N_1=16) from District level and Sixteen (N_2=16) from State level. active adults are healthier and have a higher PF than inactive adults throughout different nations and populations groups [11, 12]. Physical activity is therefore promoted as part of a healthy lifestyle [13].



2.2. Selection of Variables

Table 1: Kinesthetic Perception (Horizontal Space Test)

Purpose	**To measure the kinesthetic ability to determine specific positions along the horizontal line.**
Procedure	The yard stick placed on the wall so that it will approximately at eye level while the subjects were in the sitting position. The subject was asked to sit on the chair facing the yard stick and attempted to establish in the mid a sense of its position. Then while blindfolded and without a practice trail, pointed the Index finger of the right hand to the point indicated by the tester.
Scoring	The score was the deviation from the desired mark measured to the nearest centimeters. The final score was the total of the deviation on the three trails.

Table 2: Speed of Movement (Nelson Speed of Movement Test)

Purpose	**To measure combined reaction and speed of movement of the hands and the arms.**
Procedure	The performer set on a table with his hands resting on the edge of the table; palms facing each other with the inside of the little fingers 30 cm apart and first in line with the lines marked on the table. The tester held the time i.e., wooden meter scale near its top and it hung right midway between the subject's palms with the base line of the time positioned evenly with the upper edges of the subjects index fingers. After the preparatory command 'ready' was given, the meter scale was dropped and the subject attempted with a horizontal movement and stopped it as quickly as possible by clapping the hands together.
Scoring	The score for the combined response movement was read from the times at the point just above the upper edge of the hand after the catch was made. The five slowest and five fastest trails were discarded and an average of the middle ten trails were recorded as the subjects score.

Table 3: Response Time (Four-Way alternate Test)

Purpose	**To measure the response time of the subject.**
Procedure	The subject stood at a point 'X' on the floor. After a preparatory command 'ready' was given, the tester made an obvious movement with his hand in one of the four directions. One receiving the signal, the subject moved in the designated direction as rapidly as possible and crossed over the line 5 yards away from the point. If the test moved his hand up, the subject ran forward across the line if he moved his hand down, the subject moved backward. If he moved his hand to either side, i.e., right or left, the subject was given 3 trails in all, five in each direction. The trails in each direction were given in the order decided by tester.
Scoring	The tester held a stopwatch which he started at the beginning of each hand movement. The subject stopped the watch as soon as the subject crossed the correct line and recorded the time to the nearest $1/10^{th}$ seconds. The score was the total of the times on all 3 trails.

3. Statistical Analysis

The Statistical Package for the Social Sciences (SPSS) version 14.0 was used for all analyses. The differences in the mean of each group for selected variable were tested for the significance of difference by an independent samples t-test. For testing the hypotheses, the level of significance was set at 0.05.

4. Results

Table 4: Descriptive Analysis results between District and State level Handball Players with regards to "Kinesthetic Perception".

t-test for Equality of Means								
Level of Participation	n	ΣX	ΣX^2	SS	mean	df	t-value	p-value
District level	16	312	6120	36	19.5	30	0.76382	.225472
State level	16	301	5821	158.437	18.812			

The t-value is 0.76382. The p-value is .225472. The result is not significant at $p < .05$.

Table 5: Descriptive Analysis results between District and State level Handball Players with regards to "Speed of Movement".

t-test for Equality of Means								
Level of Participation	n	ΣX	ΣX^2	SS	mean	df	t-value	p-value
District level	16	95	611	46.9375	5.9375	30	0.51407	.305484
State level	16	90	548	41.75	5.625			

The t-value is 0.51407. The p-value is .305484. The result is not significant at $p < .05$.

Table 6: Descriptive Analysis results between District and State level Handball Players with regards to "Response Time".

t-test for Equality of Means								
Level of Participation	n	Σ_X	Σ_{X^2}	SS	mean	df	t-value	p-value
District level	16	147.799	1401.840	36.537	9.237	30	0.47017	.320817
State level	16	151.799	1471.52	31.317	9.487			

The t-value is 0.47017. The p-value is .320817. The result is not significant at $p < .05$.

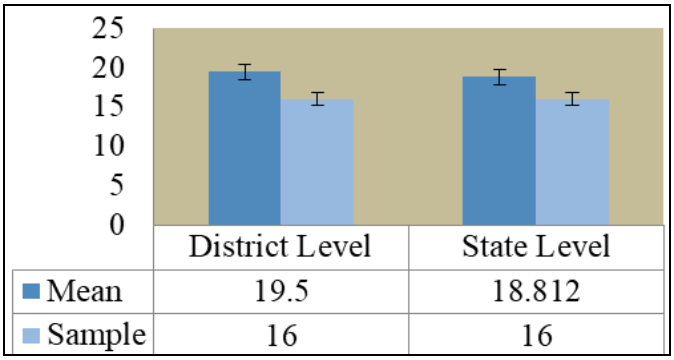


Fig 1: Graphical illustration of Descriptive Analysis (Mean) results between District and State level Handball Players with regards to "Kinesthetic Perception".

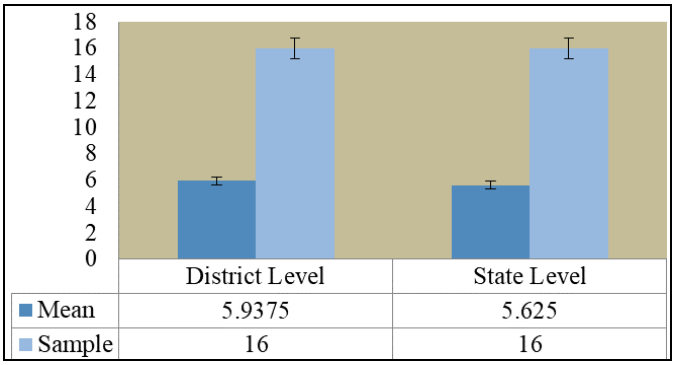


Fig 2: Graphical illustration of Descriptive Analysis (Mean) results between District and State level Handball Players with regards to "Response Time".

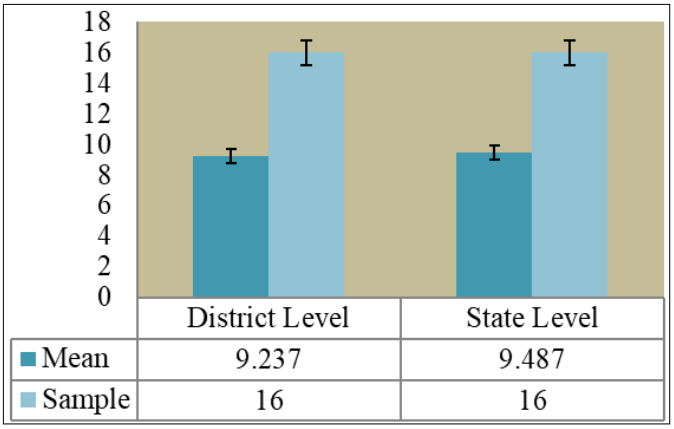


Fig 3: Graphical illustration of Descriptive Analysis (Mean) results between District and State level Handball Players with regards to "Speed of Movement".

5. Conclusions

- **Kinesthetic Perception:** The t-value is 0.76382. The p-value is .225472. The result is not significant at $p < .05$.
- **Speed of Movement:** The t-value is 0.51407. The p-value is .305484. The result is not significant at $p < .05$.
- **Response Time:** The t-value is 0.47017. The p-value is .320817. The result is not significant at $p < .05$.

6. Acknowledgement

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7. Conflict of interests

The authors declare that there is no conflict of interests.

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