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Neuromuscular components of fitness of handball players

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Abstract
Aim: The purpose of this study was to compare the Neuromuscular components of fitness of handball players.
Variables: For the purpose of this investigation, Neuromuscular Components of Fitness variables were measured (*viz*. Agility, Balance, Speed, Explosive Strength and Flexibility).
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: Agility: The t-value is 0.546. The result is not significant at $p < .05$. Balance: The t-value is 0.386. The result is not significant at $p < .05$. Speed: The t-value is 0.492. The result is not significant at $p < .05$.
Explosive Strength: The t-value is 0.114. The result is not significant at $p < .05$ and Flexibility: The t-value is 0.728. The result is not significant at $p < .05$.

Keywords: Neuromuscular, agility, balance, speed, explosive strength, flexibility, handball

1. Introduction
Everyone performs physical activity in order to sustain life; however, the amount is largely subject to personal choice and may vary considerably from person to person as well as for a given person over time. The most common units of time used to refer to kcals spent in physical activity are the week [1] and the day [2]. Physical activity during monthly, seasonal, or yearly periods may also be examined to establish the stability of physical activity for longer time periods.
Physical activity can be categorized in a variety of ways. A commonly used approach is to segment physical activity on the basis of the identifiable portions of daily life during which the activity occurs. The simplest categorization identifies the physical activity that occurs while sleeping, at work, and at leisure [3]. Leisure-time physical activity can be further subdivided into categories such as sports, conditioning exercises, household tasks (for example, yard work, cleaning, and home repair [4], and other activities. To the extent that each of the categories has different determinants [5] and different health effects, these categorical distinctions have both epidemiologic utility and public health implications in terms of promotion and intervention strategies [6].
In contrast with physical activity, which is related to the movements that people perform, physical fitness is a set of attributes that people have or achieve. Being physically fit has been defined as "the ability to carry out daily tasks with vigor and alertness, without undue fatigue and with ample energy to enjoy leisure-time pursuits and to meet unforeseen emergencies" [7]. The most frequently cited components fall into two groups: one related to health and the other related to skills that pertain more to athletic ability [8].
There is consensus that regular physical activity (PA) can improve physical fitness (PF) and health and assist in the prevention of disease [9, 10]. Several studies have shown that physically 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].

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2.1. Subjects

To obtain data, the investigators had selected Forty eight (N=48) male Inter-College and Inter-University level Handball Players to act as subjects. They were divided into two groups; Thirty Two (N_1=32) Inter-College level and Sixteen (N_2=16) Inter-University level.

All the subjects, after having been informed about the objective and protocol of the study, gave their consent and volunteered to participate in this study.
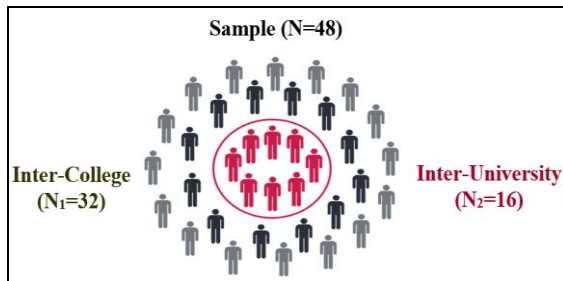

Fig 1: Classification of subjects.

2.2. Variables:
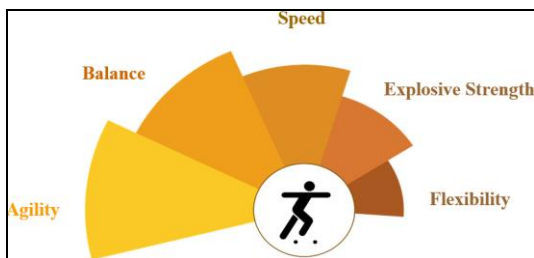For the purpose of this investigation following Neuromuscular Components of Fitness Variables were measured.

Fig 2: Neuromuscular Components of Fitness Variables.

Table 1: Neuromuscular Components of Fitness Variables, Tests and Criterion Measure.

Variable (s)	Test (s)	Criterion Measure
Agility	20 Yard Agility Run Test	Recorded to the nearest 1/100th Second
Balance	Stork Balance Stand Test	Recorded to the nearest 1/100th Second
Speed	30 Yard Dash Test	Recorded to the nearest 1/100th Second
Explosive Strength	Vertical Jump Test	Recorded to the nearest Centimeters
Flexibility	Sit and Reach Test	Recorded to the nearest Centimeters

2.3. Sampling

Convenience sampling (also known as availability sampling) is a specific type of non-probability sampling method that relies on data collection from population members who are conveniently available to participate in study were utilized for the purpose of this study.

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 2: Group Statistics with regards to variable, "Agility".

Variable	Group	N	Mean	Std. Deviation	Std. Error Mean
Agility	Inter-College 32	32	7.1031	.28600	
	Inter-University 16	16	7.1525	.31321	

Table 3: Independent Samples Test with regards to variable, "Agility".

	Levene's Test for Equality of Variances		t-test for Equality of Means					95% C. I.	
	F	Sig.	t	df	Sig. (2-tailed)	Mean Diff.	SE Diff.	Lower	Upper
Eq. variances assumed	.308	.582	.546	46	.587	.049	.090	.231	.132
Eq. variances not assumed			.530	27.778	.601	.049	.093	.240	.141

The t-value is 0.546. The result is not significant at *p* < .05.

Table 4: Group Statistics with regards to variable, "Balance".

Variable	Group	N	Mean	Std. Deviation	Std. Error Mean
Balance	Inter-College	32	21.080	2.351	.415
	Inter-University	16	21.344	1.974	.493

Table 5: Independent Samples Test with regards to variable, "Balance".

	Levene's Test for Equality of Variances		t-test for Equality of Means					95% C. I.	
	F	Sig.	t	df	Sig. (2-tailed)	Mean Diff.	SE Diff.	Lower	Upper
Eq. variances assumed	.694	.409	.386	46	.701	.264	.684	1.641	1.113
Eq. variances not assumed			.409	35.243	.685	.264	.645	1.573	1.045

The t-value is 0.386. The result is not significant at *p* < .05.

Table 6: Group Statistics with regards to variable, "Speed".

Variable	Group	N	Mean	Std. Deviation	Std. Error Mean
Speed	Inter-College	32	9.6778	.35135	.06211
	Inter-University	16	9.6269	.38246	.09562

Table 7: Independent Samples Test with regards to variable, "Speed".

| | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | |
	F	Sig.	t	df	Sig. (2-tailed)	Mean Diff.	SE Diff.	95% C. I. Lower	Upper
Eq. variances assumed	.480	.492	.460	46	.648	.05094	.110	.172	.273
Eq. variances not assumed			.447	27.924	.658	.05094	.114	.182	.284

The t-value is 0.492. The result is not significant at $p < .05$.

Table 8: Group Statistics with regards to variable, "Explosive Strength".

Variable	Group	N	Mean	Std. Deviation	Std. Error Mean
Explosive Strength	Inter-College	32	27.2188	6.15779	1.08855
	Inter-University	16	27.0000	6.41872	1.60468

Table 9: Independent Samples Test with regards to variable, "Explosive Strength".

| | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | |
	F	Sig.	t	df	Sig. (2-tailed)	Mean Diff.	SE Diff.	95% C. I. Lower	Upper
Eq. variances assumed	.013	.909	.114	46	.909	.218	1.911	3.629	4.067
Eq. variances not assumed			.113	29.009	.911	.218	1.939	3.747	4.184

The t-value is 0.114. The result is not significant at $p < .05$.

Table 10: Group Statistics with regards to variable, "Flexibility".

Variable	Group	N	Mean	Std. Deviation	Std. Error Mean
Flexibility	Inter-College	32	2.1875	1.06066	.18750
	Inter-University	16	1.9375	1.23659	.30915

Table 11: Independent Samples Test with regards to variable, "Flexibility".

| | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | |
	F	Sig.	t	df	Sig. (2-tailed)	Mean Diff.	SE Diff.	95% C. I. Lower	Upper
Eq. variances assumed	.371	.546	.728	46	.470	.250	.343	.440	.940
Eq. variances not assumed			.691	26.340	.495	.250	.361	.492	.992

The t-value is 0.728. The result is not significant at $p < .05$.

5. Conclusions
- Agility: The t-value is 0.546. The result is not significant at $p < .05$.
- Balance: The t-value is 0.386. The result is not significant at $p < .05$.
- Speed: The t-value is 0.492. The result is not significant at $p < .05$.
- Explosive Strength: The t-value is 0.114. The result is not significant at $p < .05$.
- Flexibility: The t-value is 0.728. The result is not significant at $p < .05$.

6. Acknowledgement

7. Conflict of interests
The authors declare that there is no conflict of interests.

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