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Comparison of selected psychomotor responses to varying levels of fatigue induced by squat thrust among judoka's and weightlifters

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Abstract

The main purpose of the study was to compare the selected psychomotor response to varying levels of physical fatigue induced by squat thrust among judokas and weightlifters. Ten Judokas and ten weightlifter belonging of the age group 18-24 years from L.N.I.P.E., Gwalior were selected randomly as subjects. The necessary data on the selected psychomotor components were collected by administering the test of these variables. The test hand co-ordination was conducted in the Human performance laboratory, whereas, the testing on agility, Balance, Rhythm, Orientation ability were conducted on the field. In order to induce the varying levels of physical fatigue the subject were made to perform squat thrust where the work load was set by Research Scholar. Three different levels of physical fatigue were induced on the subjects. Three sets of scores were obtained on each of the selected psychomotor component i.e. after low level fatigue, after moderate level fatigue and after high level fatigue. The intensity of workload was set by research scholar i.e. 100%, 80% & 60%. After inducement of one particular level of physical fatigue at a time only one test was administered so that the influence of fatigue could be correctly assessed. Further adequate rest period was provided administering the next desired level of physical fatigue. The comparative analysis of effects of varying levels of Physical fatigue of selected psychomotor components of Judokas and Weightlifters was done by two way analysis of variance. Two way analysis of variance revealed that Judokas and weightlifters significantly differed from each other only on one component i.e. balance ability (8.07). Under varying levels of physical fatigue. When considered together, judokas and weightlifters exhibited statistically significant decrease in their performance on the components of balance ability (5.11), Orientation ability (29.44), Rhythm ability (168.75), Agility (4.07) and Two hand coordination (160.42) under varying levels of physical fatigue.

Keywords: Psychomotor, squat thrust, fatigue, agility, rhythm, orientation ability

Introduction

Judo is a form of wrestling in which clothes are worn by contestants. The clothes and belt allow for greater range of technique. A method of self-defence, is based on essential combination of strength and balance and the contest is won by the Judoka displaying superior holding and throwing techniques. The primary objective in strength training is not to learn to lift as much weight is possible but to increase strength for application to the relevant sports. As the muscles work, they utilize oxygen from regular blood supply and produce lactic acid and other metabolites, when the rate of waste product accumulation is comparatively higher than the oxygen and fuel supply in the body, the homeostasis gets upset and fatigue sets in. In a fatigue condition the reaction time slows down accompanied by stiffening or inability of the muscles to reach a condition of relaxation. This coupled with a reduced ability to respond to stimulation is one of the factors contributing not only to deterioration of the performance but also to athlete injury. The total outcome of the player depends upon the arrival of fatigue. It is vital to develop more knowledge regarding fatigue in relation to the performance capacity of the players.

Statement of the Problem

The purpose of this study was to compare the selected psychomotor responses to varying levels of fatigue by squat thrust among Judokas and weightlifters.

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Hypothesis

On the basis of related literature and scholars own understanding of the problem it was hypothesised that there will be no significant difference in the psychomotor responses to varying levels of fatigue induced by squat thrust among Judokas and weightlifters.

Significance of the Study

1. The study will bring into light the effects of induced fatigue on psychomotor variables of agility, two-hand co-ordination, balance ability, rhythm ability and orientation ability.
2. The findings of the study will be of value to make more sound and scientific training programme of the Judokas and weightlifter. If it is known that which variable is influenced to which extend by the fatigue, the training programme can be frame accordingly.
3. The study serves as a motivational force to Judokas and weightlifter to improve their status.

Section of Subjects

For the purpose of this study ten Judokas and ten weightlifters belonging to the age group 18-24 years from L.N. I.P.E., Gwalior were selected randomly as subjects. The subjects were thoroughly acquainted with the testing procedure as well as the purpose of the study. All the subject were readily agree to undergo the testing programme and to co-operate during the course of the study.

Selection of variables

The individual scores were obtained by administering five different test item for agility, two-hand co-ordination, balance ability, rhythm ability, orientation ability and these variables were used as criterion measures for the study because they are considered as very important psychomotor components for

good Judokas and weightlifter.

Collection of Data

The necessary data on the selected psychomotor components were collected by administering the test of these variables. The test on two hand co-ordination was conducted in the human performance laboratory, whereas, the testing on agility, balance, rhythm, orientation ability were conducted on the field. In order to induce the varying where the workload was set by research scholar. Three different levels of physical fatigue was induced on the subjects. Three sets of the scores were obtained on each of the selected psychomotor component i.e. after low level fatigue, after moderate level fatigue and after high level fatigue. The intensity of workload was set by research scholar i.e. 100%,80%,60%. After inducement of one particular level of physical fatigue at a time only one test was administer so that the influence of fatigue could be correctly assessed. Further adequate rest period was provided before administering the next desired level of physical fatigue.

Administration of Test

The necessary data was collected by administering various psychomotor ability tests. All the tests were demonstrated and explained by the Research Scholar. The data were collected with the help of fellow scholars who had experience in conducting tests and taking measurements under the direct supervision of the scholar.

Statistical Procedure

The comparison of various selected psychomotor abilities will be done by using two-way analysis of variances at.05 level of significance.

Results and Discussions

Table 1: Two Way Analysis Of Variance of Scores on Two Hand Coordination (Seconds)

Source of Variance	df	SS	MSS	Obtained F-ratio	Required F-ratio at.05 level
Judokas and Weightlifters	1	-18.39	-18.39	-292.58	4.02
Varying levels of Physical fatigue	2	323.7	161.85	160.42*	3.17
Interaction	2	203.94	101.97	100.54*	3.17
Error	54	-77.22	-1.43		
Total	59	3333.7			

*Significant at.05 level of significance.

It is evident from table 1 that Judokas and weightlifters were not significantly differed from each other on the component of two hand co-ordination under varying levels of physical fatigue, i.e. low level physical fatigue moderate level and high level physical fatigue as obtained F-ratio of -292.58 was less than required F-ratio of 4.02 (with 1 and 54 df) to be significant at.05 level of confidence. When judokas and weightlifters were considered together, there was found to be significant difference on two hand coordination component under varying levels of physical fatigue as obtained F-ratio 160.42 was much higher than required F.05 (with 2 and 54 df) =3.17. The table further reveals that statistically significant interaction was found between the groups (Judokas and weightlifter) and varying levels of physical fatigue as F-ratio of 100.54 was greatly higher than required F-ratio of 2.61 (with 2 and 54 df) to be significant at.05 level of confidence.

The statistical analysis of data on two hand coordination reveals that the Judokas and weightlifters were not significantly differed on this component under varying levels of physical fatigue. Judokas and weightlifters when considered together, performed significantly different on two hand coordination under the influence of varying physical fatigue levels. The statistical analysis further indicated a significant interaction between groups and varying levels of physical fatigue. Since the F-ratio obtained for varying physical fatigue levels were found to be statistically significant, LSD test of post hoc was employed to determine the significance between the paired ordered means of two hand coordination under varying physical fatigue levels. These paired ordered means and differences between the means under varying levels of physical fatigue are presented in Table 2, 3, and 4.

Table 2: Weighted means of two hand co-ordination for varying levels of physical fatigue (both sports combined)

High Level	Moderate Level	Low Level	CD at 5% level
2.993	2.592	1.990	0.336

From above table it is clear that the mean for varying levels of physical fatigue is significantly different because the difference between mean of varying levels of physical fatigue is higher than 0.336 (CD at 5% level).

Table 3: Weighted mean for different sports in each level of physical fatigue (two hand coordination)

	Judo	Weightlifting	CD at 5% level
Low Level	1.99	1.991	0.476
Moderate Level	2.413	2.771	0.476
High Level	2.518	3.168	0.476

It is evident from Table 3 that there is no difference between the mean of Judokas and weightlifters at different levels of physical fatigue in two hand coordination ability.

Table 5: Two way analysis of variance of scores on Agility (Seconds)

Source of Variance	df	SS	MSS	Obtained F-ratio	Required F-ratio at.05 level
Judokas and Weightlifters	1	0.35	0.35	0.46	4.02
Varying levels of Physical fatigue	2	6.21	3.10	4.07*	3.17
Interaction	2	-28.86	-14.43	-18.9	3.17
Error	54	41.56	0.76		
Total	59	19.26			

*Significant at.05 level of confidence.

Two way analysis of variance on scores of agility presented in Table 5 helps to interpret that Judokas and weightlifter were not significantly differ from each other on the component of agility under varying levels of physical fatigue as obtained F-ratio of 0.46 was lesser than required F ratio of 4.02 (with 1 and 54 df). When considered together, both the groups performed significantly different on the component of agility under varying levels of physical fatigue as obtained F-ratio of 4.07 was higher than F-ratio 3.17 required to be significant (with 2 and 54 df) at.05 level of confidence. Moreover the interaction between Judokas and weightlifters and varying levels of physical fatigue was not significantly differ concerning agility performance because F-ratio of -18.9 was lesser than the value of 3.17 required to be significant at.05 level of confidence (with 2 and 54 df).

LSD Test of post-hoc was employed, therefore, to test the significance of difference between paired ordered means of

Table 7: Two Way Analysis of Variance of Scores on Balance Ability (Seconds)

Source of Variance	df	SS	MSS	Obtained F-ratio	Required F-ratio at.05 level
Judokas and Weightlifters	1	2.1	2.1	8.7*	4.02
Varying levels of Physical fatigue	2	2.67	1.33	5.11*	3.17
Interaction	2	0.59	0.29	1.11	3.17
Error	54	14.43	0.26		
Total	59				

*Significant at.05 level of confidence.

Two way analysis of variance on scores of balance ability presented in Table 7 helps to interpret that Judokas and weightlifter were significantly differ from each other on the component of balance ability under varying levels of physical fatigue as obtained F-ratio of 8.07 was higher than F.05 (with 1 and 54 df) =4.02. When considered together, both the groups performed significantly different on the component of balance under varying levels of physical fatigue as obtained F-ratio of 5.11 was higher than F-ratio 3.17 required to be significant (with 2 and 54 df) at.05 level of confidence. Moreover the interaction between Judokas and weightlifter and varying levels of physical fatigue was not significantly differ, concerning balance ability performance because F-ratio

Table 4: Weighted mean of different level of Physical fatigue in each sports.

Judo	2.818 (high)	2.143 (Moderate)	1.9 (low)	0.476
Weightlifting	3.168 (high)	2.771 (Moderate)	1.991 (low)	0.076

It can be seen from Table 4 that in Judo section mean value of two hand co-ordination is same in high level, moderate and low level of physical fatigue. In weightlifting section, mean values of high, moderate and low level of physical fatigue are same because the mean difference between different levels of fatigue is lesser than 0.476 (CD at 5% level).

Agility

The results pertaining to agility are presented in Table 5.

agility in the case of columns (physical fatigue levels) separately. These means arranged in order of their magnitude and have been indicated in Table 6.

Table 6: Weighted means of Agility for varying levels of physical fatigue (Both sports combined)

High Level	Moderate Level	Low Level	CD at 5% level
11.5785	11.216	10.791	0.54

From above table it is clear that the mean of agility at varying levels of physical fatigue is same because the difference between mean of varying levels of physical fatigue is lesser than 0.54 (CD at 5% level).

Balance Ability

The results pertaining to balance ability are presented in Table 7.

of 1.11 was lesser than the value of 3.17 required to be significant at.05 level of confidence (with 2 and 54 df). LSD test of post hoc was employed, therefore, to test the significance of difference between paired ordered means of balance ability in the case of rows and columns separately. These means arranged in order of their magnitude and have been indicated in Table 8 and Table 9.

Table 8: Weighted means of balance ability for both sports (All levels of physical fatigue combined)

Judokas	Weightlifters	CD at 5% level
4.13	3.75	0.263

In table 8 difference between the mean of balance ability of Judokas and weightlifters is greater than the critical difference at .05 level of significance. Thus, it may be concluded that mean of balance ability is higher in Judokas in comparison to that of when all levels of physical fatigue are combined.

Table 9: Weighted Means of balance ability of varying levels of physical fatigue (Both sports combined)

High Level	Moderate Level	Low Level	CD at 5% level
4.213	3.923	3.697	6.44

Table 10: Two Way Analysis of Variance of Scores on Rhythm Ability (Seconds)

Source of Variance	df	SS	MSS	Obtained F-ratio	Required F-ratio at.05 level
Judokas and Weightlifters	1	0.126	0.126	0.78	4.02
Varying levels of Physical fatigue	2	54	27	168.75*	3.17
Interaction	2	0.264	0.132	0.82	3.17
Error	54	8.79	0.16		
Total	59	63.180			

*Significant at .05 level of confidence.

Two way analysis of variance on scores of rhythm ability presented in Table 10 helps to interpret that Judokas and weightlifters were not significantly differ from each other on the component of rhythm ability under varying levels of physical fatigue as obtained F-ratio of 0.78 was lesser than F-ratio .05 (with 1 and 54 df) =4.02. When considered together, both the groups performed significantly different on the component of rhythm ability under varying levels of physical fatigue as obtained F-ratio 168.75 was higher than F-ratio 3.17 required to be significant (with 2 and 54df) at .05 level of confidence. Moreover the interaction between Judokas and Weightlifters differ, concerning rhythm ability performance because F-ratio of 0.82 was lesser than the value of 3.17 required to be significant at 0.05 level of confidence (with 2 and 54df). LSD test of post hoc was employed, therefore, to test the significance of difference between paired ordered means of rhythm ability in the case of columns (physical

fatigue levels) separately. These means arranged in order of their magnitude and have been indicated in Table 11.

Rhythm Ability

The results pertaining to Rhythm ability are presented in table 10.

fatigue levels) separately. These means arranged in order of their magnitude and have been indicated in Table 11.

Table 11: Weighted Means of balance ability for varying levels of physical fatigue (Both sports combined)

High Level	Moderate Level	Low Level	CD at 5% level
3.487	2.625	1.187	0.252

From above table it is clear that the mean of balance ability at varying levels of physical fatigue is not same because the difference between means of varying levels of physical fatigue is higher than 0.252 (CD at 5% level).

Orientation Ability

The results pertaining to orientation ability are presented in Table 12.

Table 12: Two Way Analysis of variance of Scores on Orientation Ability (Seconds)

Source of Variance	df	SS	MSS	Obtained F-ratio	Required F-ratio at.05 level
Judokas and Weightlifters	1	.33	.33	2.59	4.02
Varying levels of Physical fatigue	2	7.48	3.74	29.44*	3.17
Interaction	2	8.91	4.45	35.03	3.17
Error	54	6.87	0.127		
Total	59	23.59			

*Significant at .05 level of confidence.

Two way analysis of variance on scores of orientation ability presented in Table 12 helps to interpret that Judokas and Weightlifters were not significantly differ from each other on the component of orientation ability under varying levels of physical fatigue as obtained F-ratio of 2.59 was lesser than F.05 (with 1 and 54df) =4.02. When considered together, both the groups performed significantly different on the component of orientation ability under varying levels of physical fatigue as obtained F-ratio of 29.44 was higher than F-ratio 3.17 required to be significant (with 2 and 54df) at .05 level of

confidence. Moreover the interaction between Judokas and Weightlifters and varying levels of physical fatigue was significantly differ concerning orientation ability performance because F-ratio of 35.03 was higher than value of 3.17 required to be significant at .05 level of confidence (with 2 and 54 df). LSD Test of post hoc was employed, therefore, to test the significance of difference between paired ordered mean separately. These means arranged in order of their magnitude and have been indicated in Table 13 and Table 14(A) and 14 (B).

Table 13: Weighted Means of Orientation ability of varying levels of Physical fatigue (Both sports combined)

High Level	Moderate Level	Low Level	CD at 5% level
8.659	8.356	7.806	0.184

From the table it is clear that the means of orientation ability at varying levels of physical fatigue is not same because the

difference between means of varying levels of physical fatigue is higher than 0.184 (CD at 5% level)

Table 14(A): Weighted Mean of Orientation ability for different sports in each level of physical fatigue

	Judo	Weightlifting	CD at 5% level
Low Level	8.055	7.557	0.318
Moderate Level	8.411	8.302	0.318
High Level	8.578	8.741	0.318

It is evident from table 14(A) that there is no significant difference between the mean of Judokas and Weightlifters of moderate and high level of physical fatigue. But it is found that there is a significant difference between mean of Judokas and Weightlifters of low level of physical fatigue because the difference between the mean of Judokas and Weightlifters is higher than that of 0.318 (CD at 5% level).

Table 14(B): Weighted Mean of Orientation ability for different levels physical fatigue in each sports

CD at 5% level				
Judokas	8.578 (High)	8.411 (Moderate)	8.055 (Low)	0.318
Weightlifters	8.741 (High)	8.302 (Moderate)	7.55 (Low)	0.318

It can be seen from table 14(B) that in Judo section mean value of Orientation ability is same in high level and Moderate level of physical fatigue but significantly differ from the low level of physical fatigue because the difference between the mean is higher than 0.318 (CD at 5% level). In weightlifters section, mean values of high, Moderate and low level of physical fatigue are not same because the mean difference between different levels of fatigue is higher than 0.318 (CD at 5% level).

Discussion and Finding

Prominently the psychomotor component orientation ability, Rhythmic ability, Agility, Two hand co-ordination of weightlifters and judokas were affected to almost equal level under varying level of physical fatigue. This finding may be attributed to the fact that the performance factor for both the game weightlifting and Judo is similar to great extent. Development of explosive strength, speed, strength endurance etc. were highly emphasize in planning training schedule and training. Though the duration of game and technicalities involved in the two games is highly depends on motor qualities like reaction time, strength, speed, endurance. Both the game emphasis on resistance training is different form. Hence the varying level of fatigue affected selected psychomotor variable among weightlifters and Judokas in similar way. Further the finding of the study revealed in balancing ability weightlifters and Judokas were affected significantly different way. Judo contest is primarily based on applying throws. Where a player's main intention is to apply a successful throw without being thrown himself in this process and every attempt as application of throwing requires a high level of dynamic balance so that in the process of throwing Judoka himself maintains good balance otherwise also maintaining balance in Judo is very part of defence. In weightlifting also a lifter needs to maintain balance with very heavy weights, which does requires a good level of balancing ability. But this requirement is limited to two technique in weightlifting where in Judo the nature of following ability required is more critical and diverse. Hence the findings that weight lifter balancing ability is more affected by varying level of physical fatigue then Judo player can be attributed to this fact. The three level of exercise induced fatigue affected

significantly all the psychomotor component. The selected exercise to induce physical fatigue caused considerable amount of lactic accumulation in all three level. Hence it considerably affected the selected psychomotor component. The hypothesis that there will be no significant difference in the psychomotor responses to varying levels of fatigue induced by squat thrust among Judokas and weightlifters is rejected.

Conclusion

Within the limitation of the present study the following conclusion may be drawn:

1. Judokas and weightlifters significantly differed from each other only on one components i.e. Balance ability.
2. Judokas and weightlifters, when considered together, performed significantly different on the components of balance ability, orientation, Rhythm ability, Agility and two hand co-ordination under varying levels of physical fatigue.
3. Significant interaction existed between the groups (Judokas and weightlifters) and varying levels of physical fatigue on the components of orientation ability and two hand coordination.
4. Significant interaction did not exist between the groups (judokas and weightlifters) and varying levels of physical fatigue on the components of balance ability, Rhythm ability and agility.

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