



Effect of Induced Fatigue of Different Duration on Selected Psycho-Motor Components

KEYWORDS

Volleyball, Speed of movement, Reaction time, Orientation ability, Hand steadiness, Balance ability

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ABSTRACT *The purpose of the study was to investigate the effect of induced physical fatigue of different duration on selected psychomotor components of volleyball players. For the purpose of the study, 12 male volleyball students who represented the Banaras Hindu University volleyball team. The subjects were selected from Banaras Hindu University, Varanasi respectively. The age level of the subjects ranged from 18 to 25 years. Keeping the feasibility criterion in mind, the following psychomotor components were selected from the study- speed of the movement, hand steadiness, reaction time, balance ability, orientation ability was selected for the present study. Descriptive Statistics i.e. mean, standard deviation, analysis of variance (ANOVA) were used. The level of significance was set as 0.05 level. Significant difference was found in case of speed of movement, reaction time and orientation ability. Insignificant difference was found in case of hand steadiness and balance ability.*

Introduction

In term psychomotor is concerned with voluntary human movement, which is observable. Psychomotor components are the components directly associated with muscular action or motor skill. Some manipulation of materials and objects and some act requiring non-muscular coordination.

Since Physical education and sports activities are mainly based upon motor skills, the psychomotor components are great concern to physical educators and coaches, most of the sports task require a high degree of development of psychomotor components especially speed of movement, hand steadiness, reaction time, balance ability and orientation ability.

Fatigue is a term used to cover all those discernable changes in the expression of an activity which can be traced to the continuing exercise of that activity under its normal conditions, which can be shown to lead deterioration in the expression of that activity or more simply, to results within the activity that event wanted.

Speed of movement has been defined as the rate of which a person propels parts of his body through space. It refers to the time taken from the presentation of stimulus to the completion of a small movement and it's equal to the sum of reaction time and movement time.

Hand steadiness is a measure of motor control in the present study it is expressed in the form of value of hand shakiness as measured by steadiness testers.

Reaction time refers to the ability of an individual to respond to an external stimulus i.e. the time from the occurrence of a stimulus to the completion of a simple muscular contraction is called reaction time.

Balance is the ability to maintain body position which is necessary for the successful performance of sport skill.

Orientation ability is the ability to analyze and change position and movement of the body in space and time relat-

ed to a defense action.

Objective of the study

The objective of the study was to investigate the effect of induce physical fatigue of different duration on selected psychomotor components of volleyball players.

Hypothesis:

It was hypothesized there will be no significance difference in the psychomotor components to varying levels of induce physical fatigue.

Procedure and Methodology

Subjects: For the purpose of the study, 12 male volleyball students who represented from Banaras Hindu University, Varanasi, as the subjects of the study. Age of the subjects was ranging from 18 to 25.

Variable: The psychomotor variable selected for the purpose of this study was: (a) Speed of movement (b) Hand steadiness (c) Reaction time (d) Balance ability (e) Orientation ability.

Criterion Measure: For testing the hypothesis the following criterion measures were selected.

(a) **Speed of movement-** To measures the speed of movement, Nelson speed of movement test was used, and the average of three trials as taken as the distance score. This distance score was then converted to time score.

(b) **Hand steadiness-** To measures the hand steadiness of the subjects the test of hand steadiness was used. Three trials were given each subject and the average of the three error score and time score were recorded and then these scores were converted into standard scores.

(c) **Reaction time-** To measures the reaction time of the subjects the Anand's reaction time chronoscope was used. Three trials were provided to each subjects and average of these readings were constituted as the reaction time score.

(e) **Balance ability-** To measures the balance ability of the subjects the long nose test was used. Each subject was given only one chance and the time taken in seconds to complete the course was taken as the scores.

(f) **Orientation ability** - To determine the orientation ability of the subjects numbered medicine ball run test was used. Time taken to complete the course was noted in seconds. Two trials were given to the subjects and better one was recorded as score.

Statistical Technique: The data was analyzed by applying Descriptive Statistic i.e. Mean, Standard Deviation &Independent Sample t-test. The level of significance was set at 0.05.

Findings

Finding of research study related to selected psychomotor components and the discussion of the findings have been presented below.

**TABLE-1
ONE-WAY ANALYSES OF VARIANCE OF SCORES
SPEED OF MOVEMENT**

Sources of Variance	Degree of Freedom	Sum of Square	Mean Sum of Square	F-value
Between groups	2	.001	.0005	5.500*
Within groups	33	.003	.00009	

Significant at .05 level F.05 (2, 33)= 3.28

From the above table it is clear that the computed F-value is greater than tabulated F-value so it can be concluded that the evidence is sufficient to indicate a difference in mean speed of movement of three different duration of induced Physical fatigue. To further analyse which induced fatigue is more effective to reduce the speed of movement, pair wise mean comparison analysis was employed by using least significant different (LCD) test it is presented in table 2.

**TABLE 2
SIGNIFICANT DIFFERENCE BETWEEN 15 MINUTE, 20 MINUTE, 25-MINUTE DURATION OF INDUCED PHYSICAL FATIGUE OF VOLLEYBALL PLAYER IN THE PAIRED MEAN OF SPEED OF MOVEMENT**

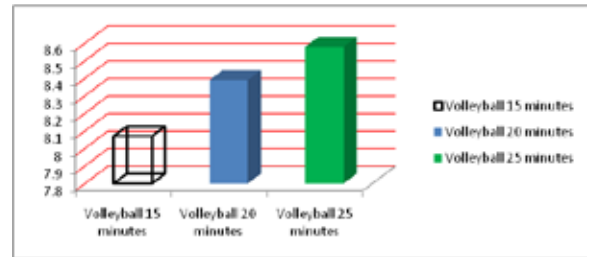
15 Min	20 Min	25 Min	Mean Difference	Critical Difference
1.877	1.938		0.061	
	1.938	2.063	0.125*	.026
1.877		2.063	0.186*	

* Significant difference between mean.

The LCD test result indicates that there was no significant difference between 15 minute duration and 20 minute duration of induced physical fatigue whereas mean of the 25 minute duration of induced physical fatigue is significantly higher than 15 minute and 20minute durations of physical fatigue. Thus it may be concluded that 25-minute duration of induced physical fatigue was more effective to reduce the speed of movement of volleyball players.

Graphical representation of means of 15 minute and 20 minute and 25 minute of duration of induced physical fatigue of volleyball players in the speed of movement has

been presented in figure no.1.



**TABLE 3
ONE-WAY ANALYSIS OF VARIANCE OF SCORES HAND
STEADINESS (seconds)**

Sources of Variance	Degree of Freedom	Sum of Square	Mean Sum of Square	F-value
Between groups	2	19.34	9.671	.091
Within groups	33	3495.28	105.918	

**Significant at .05 level
Tab F.05 (2, 33) = 3.28**

From the above table it is clear that the calculated value (.091) is less than tabulated value (3.28) at .05 level of confidence, so that it can be said that there is no significant difference from each other on the component of hand steadiness under varying levels of physical fatigue i.e15 minute, 20 minute, 25 minute duration of induced physical fatigue.

**TABLE 4
ONE WAY ANALYSIS OF VARIANCE OF SCORES REACTION TIME (seconds)**

Sources of Variance	Degree of Freedom	Sum of Square	Mean Sum of Square	F-value
Between groups	2	.024	.012	24.00*
Within groups	33	.018	.0005	

**Significant at .05 level
Tab F.05 (2,33) = 3.28**

From the above table it is clear that the Computed F-value is greater than tabulated F-value so it can be concluded that the evidence is sufficient to indicate a difference in mean reaction time of three different duration of induced physical fatigue. To further analyse which induced fatigue is more effective to reduce the speed of movement, pair wise mean comparison analysis was employed to using least significant different (LSD) test it is presented in table.5.

**TABLE 5
SIGNIFICANT DIFFERENCE BETWEEN 15 MINUTE, 20 MINUTE, 25MINUTE DURATION OF INDUCED PHYSICAL FATIGUE OF VOLLEYBALL PLAYERS IN THE PAIRED MEAN OF REACTION TIME.**

15 Min	20 Min	25 Min	Mean	Critical Difference
.1700	.2017		0.0317*	
	.2017	.2333	0.0316*	.018
.1700		.2333	0.0633*	

* Significant difference between mean

The LSD test result indicates that there was significant difference between 15minute, 20 minute, 25 minute duration of induced physical fatigue in reaction time because the difference between means of three different duration of induced physical fatigue are higher than critical difference (.018).

Graphical representation of means of 15 minute and 20 minute and 25 minute of duration of induced physical fatigue of volleyball players in the reaction time has been presented in figure no.2.

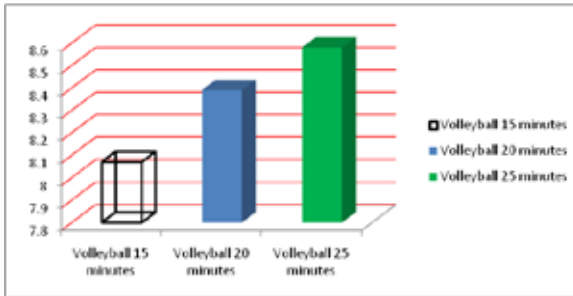


TABLE 6
ONE WAY ANALYSIS OF VARIANCE OF SCORES BALANCE ABILITY (seconds)

Sources of Variance	Degree of Freedom	Sum of Square	Mean Sum of Square	F-value
Between groups	2	.527	.263	.678
Within groups	33	12.805	.388	

Significant at .05 level
Tab F.05 (2,33) = 3.28

From the above table it is clear that the calculated value (.678) is less than tabulated value (3.28) at .05 level of confidence. So that it can be said that there is no significant difference from each other on the component of balance ability under varying level of physical fatigue i.e. 15 minute, 20 minute, 25 minute duration of induced physical fatigue.

TABLE 7
ONE WAY ANALYSIS OF VARIANCE OF SCORE ORIENTATION ABILITY

Sources of Variance	Degree of Freedom	Sum of Square	Mean Sum of Square	F-value
Between groups	2	1.56	0.78	4.33*
Within groups	33	6.05	0.18	

Significant at .05 level
Tab F.05 (2, 33) = 3.28

From the above table it is clear that the computed F-value is greater than tabulated F-value so it can be concluded that the evidence is sufficient to indicate a difference in mean orientation ability of three different durations of induced fatigue. To further analysis which induced fatigue is more effective to reduce the orientation ability.

Pair wise means comparison analysis was employed by using least significant different (LSD) test. It is presented in table 8.

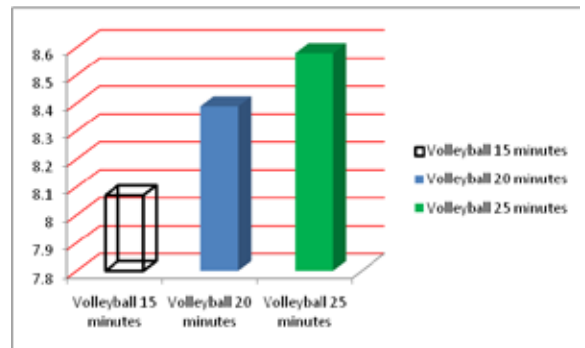
TABLE 8
SIGNIFICANT DIFFERENCE BETWEEN 15 MINUTE, 20 MINUTE, 25MINUTE, DURATION OF INDUCED PHYSICAL FATIGUE OF VOLLEYBALL PLAYERS IN THE PAIRD MEAN OF ORIENTATION ABILITY

15 Min	20 Min	25 Min	Mean Difference	Critical Difference
8.07			0.32	
	8.39	8.58	0.19	0.351
8.07		8.58	0.51*	

* Significant difference between mean

The LSD test results indicate that there was no significant difference between 15 minute duration and 20 minute duration of induced physical fatigue and also 20 minute duration and 25 minute duration of induced physical fatigue. Whereas mean of 25-minute duration of induced physical fatigue is significantly higher than 15-minute duration of induced physical fatigue in orientation ability. Thus it may be concluded that 25 min duration of induced physical fatigue was more effective to reduce orientation ability of volleyball players.

Graphical representation of means of 15 minute and 20 minute and 25 minute of duration of induced physical fatigue of volleyball players in the orientation ability has been presented in figure no.3.



Discussion

From the findings it was observed that there was significant difference between 15 minute, 20 minute and 25 minute duration of induced physical fatigue. In case of speed of movement, reaction time and orientation ability probably the reason was speed of movement as the rate of which a person propels parts of his body through space. It depends upon technique, coordination, metabolic power (lactic acid, flexibility, attention and coordination).

Reaction time is the ability of an individual to respond to an external stimulus such as the time from the occurrence of a stimulus to the completion of a simple muscular contraction, it depends upon functional capacity of sense organs eg. Eye, ear, etc, coordinative processes of CNS selection and decision making, attention and concentration and anticipation.

Whereas orientation ability is the ability to analyze and change position and movement of the body in space and time related to defense action, it depends upon perception, position, movement and the motor action to change the body position and movement of head and eyes is important. On other hand, kinesthetic sense organs assume

more important function for orientation.

All these three psychomotor abilities depends upon functional capacity of the CNS of an individual due to induced physical fatigue would induced local muscular fatigue plus other factor such as low blood glucose levels (hypoglycemia), liver glycogen depletion, loss of body water (dehydration), loss of body electrolytes (salt and potassium), high body temperature (hypothermia)¹ which affect the psychomotor ability of the volleyball players.

On the other hand it was observed that there was no significant difference between 15 minute, 20 minute, 25-minute duration of induced physical fatigue in case of hand steadiness, balance ability. Probably the reason hand steadiness is a measure of motor control. It depends upon coordination, flexibility and attention of an individual. Balance ability is the ability to maintain body position, which is necessary, or the successful performance of sports skills. It depends upon coordinative abilities, and complex combination of cognition and psychic factors.

Conclusions

Based on the finding and within the limitation of the present study following conclusion were drawn.

From the evidence it is sufficient to indicate a difference

in mean speed of movement of three different duration of induced physical fatigue.

The mean hand steadiness of three different duration of physical fatigue was not significantly differing because the calculated value (.091) is less than tabulated value (3.28) at .05 level of significant.

From the evidence it is sufficient to indicate a difference in mean reaction time of three different duration of induced physical fatigue because the calculated value (24.00) is higher than calculated value (3.28) at .05 level of significant.

The mean balance ability of three different duration of induced physical fatigue is not significantly differing because the calculated value (0.678) is less than the tabulated value (3.28) at .05 level of significant.

From the evidence it is sufficient to indicate a difference in mean orientation ability of three different duration of induced physical fatigue because the calculated value (4.33) is higher than tabulated value (3.28) at .05 level of significant.

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