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## Comparative effect of post exercise application of different recovery means on strength, cardio respiratory endurance and muscular endurance

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### Abstract

The purpose of the study was to find out the comparative effect of application of different recovery means on strength, Cardio Respiratory endurance and Muscular Endurance. Total forty school going boys of various school of Bolpur sub division, were selected as subjects for the study. The average age of the subjects were 17 years ranging from 15 to 18 years. Forty students were randomly distributed to four groups ten in each. Group- A was termed as Massage group, Group-B was termed as Nutritional group, Group- C termed as Progressive muscles relaxation group and Group- D termed as Control group. Motor fitness capacity of the subjects was tested by applying Eurofit motor fitness test The Motor Fitness variables i.e. Muscular Endurance, strength and Cardio Vascular endurance were calculated. In order to find out actual effect of treatment factors and significant differences among the four groups Analysis of Co-Variance was applied.

**Keywords:** muscular endurance, strength and cardio vascular endurance

### Introduction

Motor fitness is defined as the ability of the neuromuscular system to perform specific tasks. Test items used to assess motor fitness include chin-ups, sit-ups, the 50-yard dash, the standing long jump, and the shuttle run (a timed run in which the participant dashes back and forth between two points). The primary physical characteristics measured by these tests are the strength and endurance of the skeletal muscles and the speed or power of the legs. These traits are important for success in many types of athletics. Muscular strength and endurance are also related to some aspects. In the present study more factors have been given consideration for assessment of motor fitness to make the approach more authentic and comprehensive. There are many different manifestations of fitness. Some examples include strength, stamina, speed, and flexibility. Certain types of fitness, such as an athlete's cardiac fitness level, are more important than others.

An athlete needs to be aware of the various types of fitness to develop an effective training program that focuses on weak or important areas. Motor fitness, or motor physical fitness, refers to how an athlete can perform at his or her sport, and involves a mixture of agility, coordination, balance, power, and reaction time.

Coordination is more difficult to describe than agility because it cannot be observed directly. An athlete with a high level of coordination is able to combine all forms of fitness - not just those that are part of motor fitness - in an effective and controlled way. The more coordinated an athlete is, the more efficient he or she will be during competitive activities. Power refers to the athlete's ability to contract his or her muscles forcefully in an explosive movement. Most people have an intuitive sense of what power is, and why it's important for sports. Powerful athletes are not merely strong; they are able to use that strength quickly and efficiently. Balance and reaction time are two other important parts of motor fitness.

In the competitive sports an athlete can experience numerous types of recovery means which are fulfil his/her lost energy store. But it is depend on the technical knowledge of coach/athlete to select proper recovery means. List of suitable recovery means are given below:

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- Sleep and rest
- **Nutrition**
- Periodization
- Warm-down
- Stretching
- **Massage**
- Hydrotherapy
- Compression garments
- **Relaxation technique**

**Review literature**

Coletta. A, *et al.*, (2013) [4] investigated a study on the influence of commercially available carbohydrate and carbohydrate protein supplements on endurance running performance in recreational athletes during a field trial. For the purpose of the study author selected twelve male recreation runners, those have instructed to run for 19.2 km. The supplements were provided before the start in 4 km increments. Performance was measured by time to complete the 19.2 km run and last 19.2 km sprint. For reaching the hypothesis author used one way analysis of variance (ANOVA). In conclusion the author obtained the result that commercially available carbohydrate and carbohydrate protein not taken in any significant role to enhance performance in male recreational runners.

**Statement of the problem**

The problem entitled as “Comparative Effect of Post Exercise Application of Different Recovery Means on Motor Performance Capacity”.

**Objective of the study**

The objective of the study was to find out the comparative effect of application of different recovery means on strength, Cardio Vascular endurance and Muscular Endurance.

**Hypotheses**

It was hypothesized that application of recovery means selected for these study would show significantly higher on strength, Cardio Vascular endurance and Muscular Endurance.

**Significance of the study**

- The result of the study will highlight the effects of different recovery means used in sports training.
- The result of the study will guide physical education teacher and coaches to select suitable recovery means for their athletes.
- The result of the study will inform the physical education teacher, coaches about various recovery means and their procedure of application.
- The result of the study will also highlight the significance of utilization of additional recovery means and their procedure of application.
- The result of the study will help to select suitable

recovery means relevance to particular type of motor performance.

**Methodology**

**Selection of the subjects**

Total forty school going boys of various school of Bolpur sub division, were selected as subjects for the study. The average age of the subjects were 17 years ranging from 15 to 18 years. Forty students were randomly distributed to four groups ten in each. Group- A was termed as Massage group, Group-B was termed as Nutritional group, Group- C termed as Progressive muscles relaxation group and Group- D termed as Control group.

**Eurofit motor fitness testing battery**

The Eurofit Motor Fitness Test Battery was a set of nine physical fitness tests Covering strength, Muscular Endurance, Cardio Vascular endurance. The standardized test battery was devised by the Council of Europe for children of school age and had been used in many European schools since 1988. The series of tests were designed so that they could perform within 35 to 40 minutes, using very simple equipment. A similar Eurofit for adults was published in 1995 which was adopted and utilized by the research scholar for the purpose of the present study.

**Reliability of the data**

The reliability of the data was established by ensuring instrument’s reliability, reliability of subjects and the tester’s competent.

**Criterion measure of motor performance capacity**

To evaluate the Motor Performance Capacity Eurofit test was applied. Motor Fitness tests were designed with three different dimensions i.e. Strength, Muscular Endurance, and Cardio Vascular endurance. To measure these components following tests were recommended.

1. Bent Arm Hang Test was applied to measure the Muscular Endurance and Functional Strength of arm and maximum duration was recorded in seconds.
2. 20mt Endurance Shuttle Run was applied to measure the Cardio

Respiratory Endurance and recorded the level and number of shuttle covered.

1. Hand Grip Test measure the maximum isometric strength of the hand and forearm muscles.
2. Standing Long Jump measure the explosive strength of the legs.

**Statistical procedure**

In order to find out actual effect of treatment factors and significant differences among the four group Analysis of Co – Variance was applied. In case of significant difference LSD post hoc test was employed to find out which of the difference between adjusted group means were statistically significant. The level of significant set at 0.05 level.

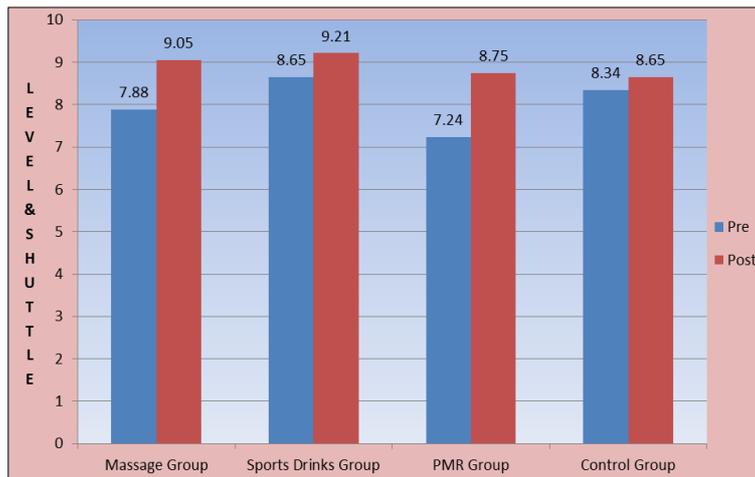
**Table 1:** Analysis of Co–Variance of the Means of three Experimental Groups and Control Group in relation to examine cardio respiratory endurance.

Mean	Group				Sum of scores	df	Means of Sum of Squares	‘F’ Ratio	
	Massage Group	Sports Drinks Group	PMR Group	Control Group					
Pre Test	7.88	8.65	7.24	8.34	A	11.33	3	3.778	0.963
					W	141.14	36	3.921	
Post Test	9.05	9.21	8.75	8.65	A	2.05	3	0.68	0.220
					W	111.17	36	3.09	
Adjusted Post Test	9.17	9.07	9.39	8.40	A	5.64	3	1.88	3.373*
					W	19.6	35	0.56	

Significance at 0.05 level of significance  
 N =40, A =Among Means Variance, W = Within Group Variance  
 F = Ratio needed for Significance at 0.05 level of Significance = df (3, 36) =2.86

Table shows that there is significant difference among three experimental group and one control group in 20mt Endurance

Run performance as 'F' value 3.37 is higher than the tabulated 'F' value 2.86 at 0.05 level.



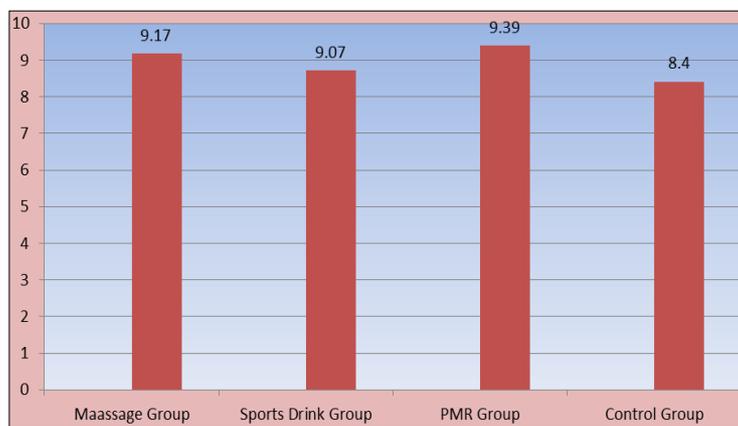
**Diagram 1:** shows that the pre and post-test means of three experimental groups and control group in 20mt endurance run performance. In these test measurement counted no of level and shuttle.

**Table 2:** Paired Adjusted Final Means and Difference between Means for the Three Experimental Group and Control Group in performance of cardio respiratory endurance.

Massage Group	Sports Drinks Group	PMR Group	Control GROUP	Means Difference	C.D at 5% level
9.17	9.07			0.1	0.66
9.17		9.39		0.22	
9.17			8.40	0.77*	
	9.07	9.39		0.22	
	9.07		8.40	0.67*	
		9.39	8.40	0.99*	

Table shows that there are significant difference between the Massage Group & Control Group and PMR Group & Control Group and Sports Drink Group & Control Group as the mean

differences 0.77, 0.67 and 0.99 respectively are greater than the critical difference value 0.66 required for significance at 0.05 level.



**Diagram 2:** shows that adjusted final means of three experimental groups and control group in 20mt endurance run performance.

**Table 3:** Analysis of Co – Variance of the Means of three Experimental Groups and Control Group in Relation to examine muscular endurance.

Mean	Group				Sum of scores		df	Means of Sum of Squares	'F' Ratio
	Massage Group	Sports Drinks Group	PMR Group	Control Group	A	W			
Pre Test	46.30	42.54	38.61	32.00	A	1119.45	3	373.150	0.183
					W	8550.95	36	237.526	
Post Test	52.60	46.68	46.40	33.71	A	1899.26	3	633.09	2.475
					W	9205.68	36	255.71	
Adjusted Post Test	46.59	44.19	47.57	41.04	A	240.36	3	80.12	1.592
					W	1761.9	35	50.34	

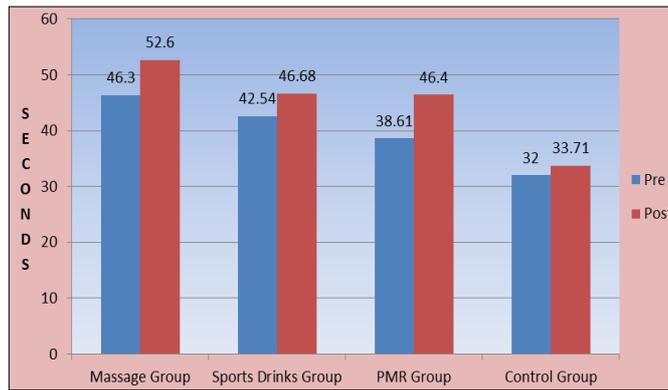
Significance at 0.05 level of significance

N =40, A =Among Means Variance, W = Within Group Variance

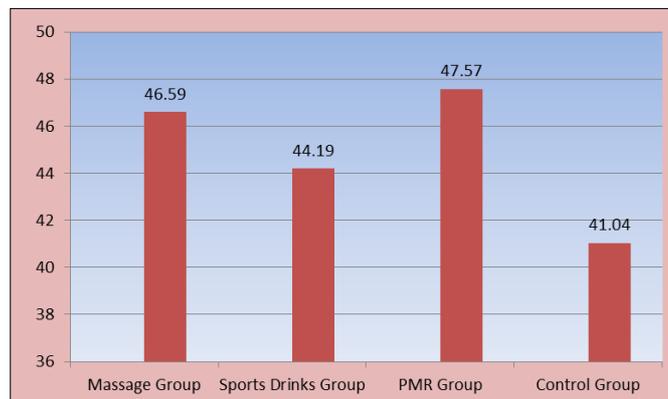
F = Ratio needed for Significance at 0.05 level of Significance = df (3, 36) =2.86

Table shows that there is a no significant difference among three experimental groups and control group in Bent Arm

Hang performance as 'F' value 1.59 is lower than the tabulated 'F' value 2.86 at 0.05 level



**Diagram 3:** shows that that pre and post-test means of three experimental groups and control group in Bent Arm Hang performance. In these test measurement taken in seconds.



**Diagram 4:** shows that adjusted final means of three experimental groups and control group Bent Arm Hang performance.

**Table 4:** Analysis of Co – Variance of the Means of three Experimental Groups and Control Group in relation to examine static arm strength.

Mean	Group				Sum of scores		df	Means of Sum of Squares
	Massage Group	Sports Drinks Group	PMR Group	Control Group	A	W		
Pre Test	32.57	28.43	23.42	28.03	A	419.96	3	139.988
					W	1632.24	36	45.340
Post Test	32.70	29.61	24.39	28.95	A	359.74	3	119.91
					W	1778.74	36	49.41
Adjusted Post Test	28.44	29.30	28.97	29.03	A	3.6	3	1.20
					W	227.15	35	6.49

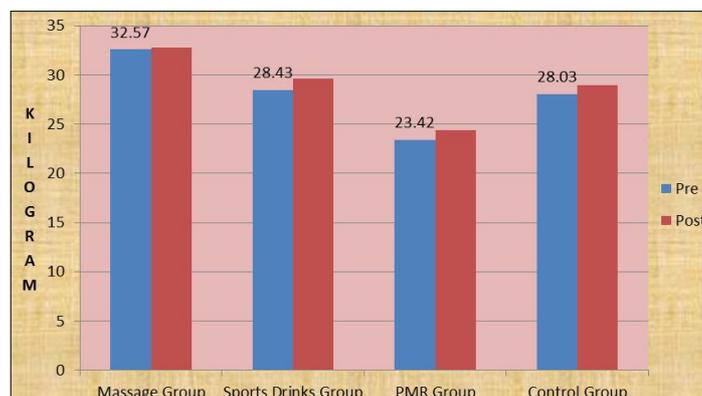
Significance at 0.05 level of significance

N =40, A =Among Means Variance, W = Within Group Variance

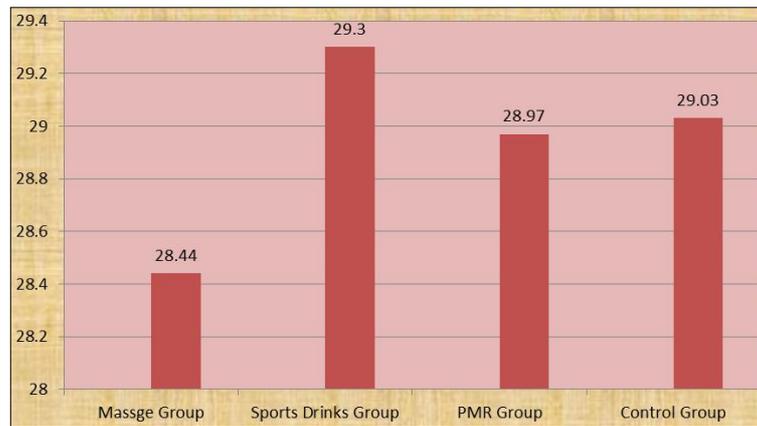
F = Ratio needed for Significance at 0.05 level of Significance =  $df(3,36) = 2.86$

Table shows that there is a no significant difference among three experimental groups and control group in Hand Grip

performance as 'F' value 0.18 is lower than the tabulated 'F' value 2.86 at 0.05 level.



**Diagram 5:** shows that the pre and post-test means of three experimental groups and control group in Hand Grip performance. In these test measurement taken in KG.



**Diagram 6:** shows that adjusted final means of three experimental groups and control group in Hand Grip Performance.

### Discussion

It is evident from the table 3 that no significant difference has been found in the performance of static arm strength. The reason may be the exercise for inducing fatigue was 30 min continuous run which might have not caused higher level of fatigue in the muscles of the wrist joint. The present findings has been supported by the study conducted by Bajaj P that massage is not an effective treatment modality for enhancing long term restoration of post exercise muscles strength.

The study shows that no significant change in the performance of Bent Arm Hang following the application of three recovery means after 30 min of exhaustion. The result may be attributed to the fact that running 30 min might have not caused significant level of fatigue in the muscles of shoulder joint.

Above findings supported by the study conducted by Tidas PM (1997) observed that manual massage does not appear to be impressive effect on the retention and recovery of muscular strength and endurance following eccentric exercise. Walter A.A (2009) suggested that nutritional supplement did not alter muscular strength.

### Conclusion

On the bases of the present study following conclusion are down:

- Additional fatigue recovery means are always helpful for recovery of the athletes after physical and physiological fatigue or exhaustion.
- PMR, Massage and Nutritional Drinks are effective recovery means for performance in different motor components.
- Nutritional drinks are not found as good as PMR and Massage in the performance of speed of limb movement, static strength, muscular endurance and test of speed and agility.
- Massage is an effective recovery means for cardio respiratory endurance.
- Progressive Muscles Relaxation is found to be an effective recovery means for performance related to strength, and cardio respiratory endurance.
- In strength and endurance dominant sports events Hypertonic nutritional drinks are found to be fatigue recovery means for the measure of explosive strength and cardio respiratory endurance.
- PMR and Nutritional drinks both are effective fatigue recovery means in endurance activity, but where one is to be administered for inducing recovery PMR should be given preference in comparison to nutritional drinks.

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