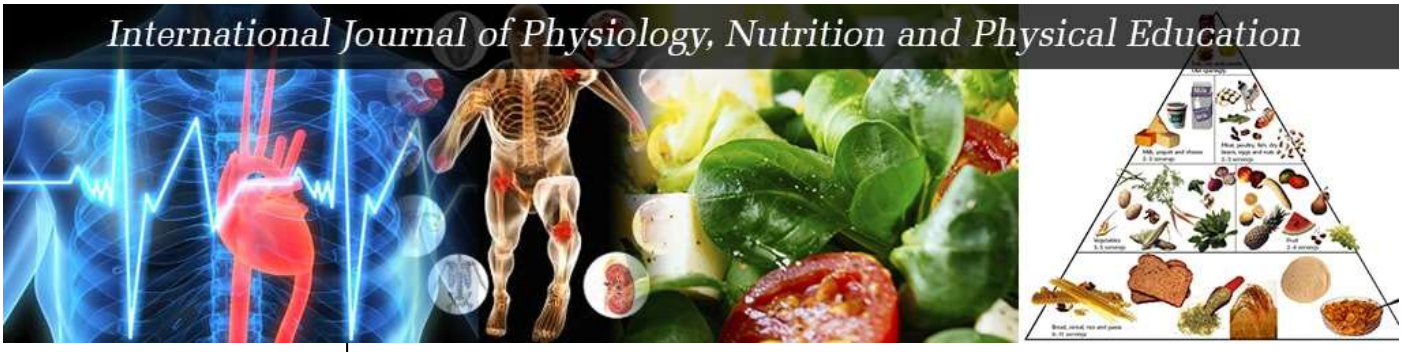

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A comparative study between active recovery and passive recovery on heart rate

Manoj Kumar Ahirvar and Dr. Minakshi Pathak

Abstract
The presented study was to identify the recovery treatment difference of active recovery and passive recovery on heart rate. In the study total 10 subjects were taken (10 male) all were national player of middle distance runners from Bhopal SAI centre. Their age ranging from 18 to 25 years. The data were assessed through heart rate monitor. The collected data was analyzed by computing the descriptive statistics to find out standard deviation and mean among active and passive recovery on heart rate at 0 min. and at 2 min., one way-ANOVA and the LSD post hoc. Test. For testing the hypothesis, the degree of significance was set at 0.05. Statistical analysis was conducted by using statistical packages for social science (IBM SPSS 20 Version). As a result the findings state that The value of f-statistics is having significant difference among active and passive recovery on heart rate at 0 min. and at 2 min because P value is smaller than 0.05. Thus the null hypothesis is fail to accept and it is concluded that the active recovery treatment is more effective than passive recovery treatment (21.026, p<0.05).hence we can suggest that after an exercise or physical activity athlete should do active recovery to lower their heart rate.

Keywords: Heart rate, active recovery, passive recovery

Introduction
Heart rate, sometimes referred to as pulse rate, is the frequency of a heartbeat and is measured in beats per minute (bpm). The heart beats at a certain rate in response to physiological demands made by the body, such as the need to breathe in oxygen and release carbon dioxide. Numerous factors also influence it, including as heredity, level of stress, physical fitness, or psychological state, food, medications, hormonal condition, environment, and illness or disease, as well as the interactions between these elements. It typically matches the pulse recorded at any peripheral site, if not exactly.

One of the finest ways to engage in active healing is to walk. You can also jog slowly if you're a runner. Slow-motion running or walking can improve blood flow and aid in healing.

A wonderful strategy to engage in an active rehabilitation is to cycle at a relaxed speed. It does not exert strain on your joints and has a modest impact. You can ride a bicycle outside or on a stationary bike.

Active Recovery refers to a sequence of low-intensity exercises performed after strenuous activity. Its primary objective is to revitalize the body and hasten recovery rather than increasing strength or fitness. Active recovery is more than just getting up and moving, despite popular belief. It includes exercises intended to increase blood flow, improve the supply of nutrients, and speed up the removal of metabolic waste during intense exercise. It is not the result of haphazard motions, but rather a deliberate and intentional approach.

Enhanced circulation is the foundational idea behind Active Recovery. Low-intensity exercise increases blood flow, which helps provide essential nutrients to the muscles for growth and repair. Moreover, it speeds up the elimination of metabolic waste, which accumulates during vigorous exercise and results in exhaustion and discomfort in the muscles. Active recovery supports total recovery and reduces post-exercise soreness through this physiological mechanism.

Restoring your body to its pre-exercise state is the primary objective of passive recovery. Athletes and those who consistently push their bodies to the maximum may find this to be very

helpful. It can be in many different ways, involving exercises like yoga, stretching, massages, and even naps.

After a strenuous workout, passive recuperation is an excellent approach to take care of your body and mind. You may provide your body weight with the passive rest it requires to heal and get ready for the next day by making the time to drink enough water, get enough sleep, receive massage therapy, meditate, and control your stress levels. Passive recuperation, when combined with good behaviours and exercised in moderation, can facilitate greater blood circulation and faster muscle repair. Additionally, it can lessen the chance of injury, increase mental health, increase energy levels, and encourage better sleep.

Therefore in this study we investigate and compare the passive recovery and active of heart rate that which recovery intervention is more suitable to manage heart rate in control or to the homeostatic level.

Procedure and Methodology

Ten individuals in all, ten of whom were male national middle distance runners, were recruited for this study from the Bhopal SAI center. They are between the ages of 18 and 25. Every participant was informed of the goal of the study. Prior to taking part in the testing procedures, each individual gave their consent. According to the feasibility criterion and in accordance with the understanding of experts and researchers, the study chose the active and passive recovery treatments on heart rate at 0 and 2 minutes for analysis. The heart rate monitor on the apparatus was used to evaluate the data.

In order to determine the standard deviation and mean among male middle distance runners who underwent active recovery at 0 and 2 minutes and passive recovery at 0 and 2 minutes, the obtained data was analyzed using descriptive statistics and one way ANOVA. The degree of significance was fixed at 0.05 to test the hypothesis. The statistical analysis was carried out using IBM SPSS 20 Version, one of the statistical tools for social science. Tables 1, 2, and 3 summarize the results, while Figure 1 shows a graphical representation of the standard deviation and mean value.

Results and Interpretation

Table 1: Descriptive statistics for recovery intervention of heart rate

Recovery intervention	N	Mean	Std. Deviation	95% Confidence Interval for Mean	
				Lower Bound	Upper Bound
0 min. active recovery	10	139.700	6.56	135.002	144.398
2 min. active recovery	10	119.500	8.33	113.541	125.459
0 min. passive recovery	10	145.400	10.94	137.569	153.231
2 min. passive	10	120.600	9.96	113.469	127.731
Total	40	131.300	14.51	126.658	135.942

The values of mean and standard deviation recovery intervention for active recovery at 0 min. and 2 min. and passive recovery at 0 min. and 2 min. male middle distance runners are exhibited in table 1. The mean score of active recovery at 0 min. 139.7±6.56 and at 2 min. mean score of active recovery is 119.500±8.33, and the mean score of passive recovery at 0 min. 145.400±10.94 and at 2 min. mean score of passive recovery is 120.600±9.96 are shown respectively.

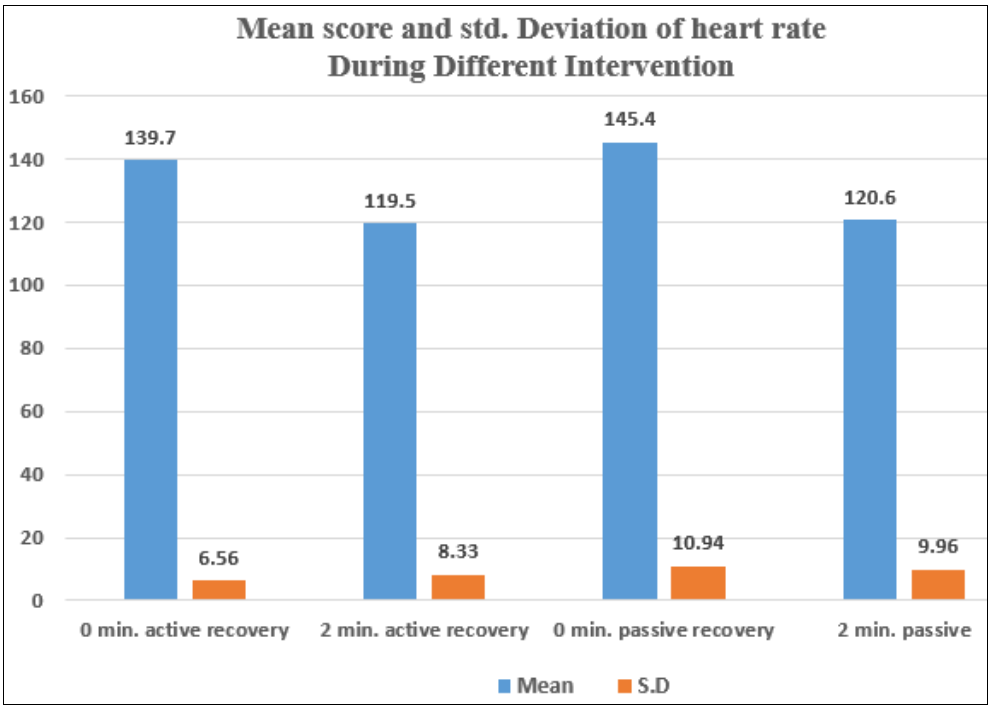

Fig 1: Graphical Representation of active recovery and passive recovery Mean score and Std. Deviation of heart rate

Table 2: The ANOVA table for recovery intervention of heart rate

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	5231.000	3	1743.667	21.026	.000
Within Groups	2985.400	36	82.928		

The result shows that recovery treatment within different type of recovery F (3,36) = 21.026, $p<0.05$. It means the recovery treatments of 2 different types significantly differ so, interaction of recovery treatments with sessions does influence the recovery methods in case of heart rate.

As f value is significant test of simple effect in syntax of SPSS was further computed to test the interaction of the trails within different recovery treatment and result are shown below.

Table 3: Pairwise Comparisons of heart rate at 0 min and 2 min. of active and passive recovery

(I) Pre-post	(J) Pre-post	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Active recovery 0 min.	Active re. 2min.	20.2000*	4.0725	.000	11.941	28.459
	Passive rec. 0min.	-5.7000	4.0725	.170	-13.959	2.559
	Passive 2min.	19.1000*	4.0725	.000	10.841	27.359
Active 2 min.	Active 0 min.	-20.2000*	4.0725	.000	-28.459	-11.941
	Passive 0 min.	-25.9000*	4.0725	.000	-34.159	-17.641
	Passive 2min.	-1.1000	4.0725	.789	-9.359	7.159
Passive 0 min.	Active 0 min.	5.7000	4.0725	.170	-2.559	13.959
	Active 2 min.	25.9000*	4.0725	.000	17.641	34.159
	Passive 2 min.	24.8000*	4.0725	.000	16.541	33.059
Passive 2 min.	Active 0 min.	-19.1000*	4.0725	.000	-27.359	-10.841
	Active 2 min.	1.1000	4.0725	.789	-7.159	9.359
	Passive 0 min.	-24.8000*	4.0725	.000	-33.059	-16.541

* The mean difference is significant at the 0.05 level

The difference between mean among 2 different recovery treatment in heart rate at 0 mint. and 2 min. were displayed. As per the table the significant difference found in active recovery at 0 min. with active recovery at 2 min. and passive recovery at 2 min. same significant difference found in active recovery 2 min. with active recovery at 0 min. and with passive recovery at 0 min., significant difference among passive recovery at 0 min. with active recovery at 2 min. and with passive recovery at 2 min. and the last intervention the passive recovery at 2 min. with active recovery at 0 min. and with passive recovery at 0 min.

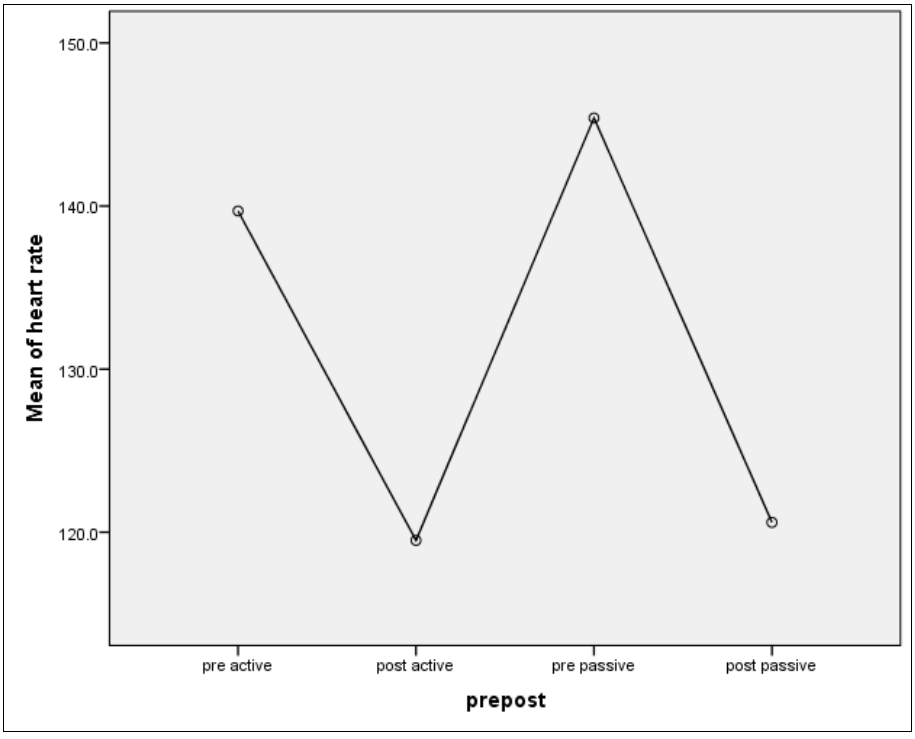

Fig 2: Graphical Representation of Quardic Trend During active recovery and passive recovery

Discussion and Conclusion

The study's findings indicate that it means the recovery treatments of 2 different types significantly differ so, interaction of recovery treatments with sessions does influence the recovery methods in case of heart rate where the significant difference found in active recovery at 0 min. with active recovery at 2 min. and passive recovery at 2 min. same significant difference found in active recovery 2 min. with active recovery at 0 min. and with passive recovery at 0 min. ,significant difference among passive recovery at 0 min. with active recovery at 2 min. and with passive recovery at 2 min. and the last intervention the passive recovery at 2 min. with active recovery at 0 min. and with passive recovery at 0 min. the study concluded that active recovery treatment is more

effective as compare to passive recovery treatment, according to Nick Draper *et al*. Heart rate was continuously recorded, RPE was taken right after rising, and fingertip capillary blood samples were taken at each focussing phase. The heart rate while climbing did not significantly differ between the active and passive recoveries. Climbers who adhered to the active recovery strategy saw lower heart rates at the end of the focused phase than those who followed the passive recovery technique, although their heart rates were still higher throughout the active phase. Climbers' heart rates were able to drop throughout the focussing period that came after active recovery, in contrast to the passive recovery condition.

According to the findings of Laily Mita Andriana *et al*., active recovery outperformed passive recovery in terms of maximizing heart rate following exercise ($p<0.05$). Active recovery fared better than passive recovery in terms of optimizing body temperature ($p<0.05$). In order to maximize post-exercise recovery and avoid overreaching, it was determined that active recovery, as opposed to passive recovery, was preferable following moderate-intensity continuous training.

There were statistically significant variations between the active and passive conditions' gross [Vdot] O_2 and HR recovery data analyses, with the active recovery scores being greater. But the "cost" of the extra labor needed for the active recovery was the only thing that affected how much these situations differed from one another. We conclude that the active recovery treatment at 0 min. and 2 min. time point as compare to passive recovery treatment is more effective after exercise or physical activity because here in this study we got the significant difference among active and passive recovery where passive recovery shows higher mean value than active recovery which interpret that active recovery helps to recovery the heart rate fast and initiate to normal level or we can say at homeostatis level faster than in the passive recovery. Therefore the null hypotheses is failed to accept in this research study.

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