Research Paper

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Effect of Different Times of The Day on Recovery After Endurance Workout

Physical Education

KEYWORDS :

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ABSTRACT

The purpose of the study was to compare the amount of recovery at different times of the day i.e. Morning, Afternoon and Evening. For the purpose of the study the researcher has selected a total of seven subjects (University level Middle distance runners) randomly with the age 20±2 years from LNUPE, Gwalior to participate in the study. The recovery was assessed through the heart rate (HR) and respiratory rate (RR). The subjects were made to run for a distance of 1500 meters at their 70-80% intensity of reserved heart rate at different times of the day. The HR and RR were recorded just after the finish of the run and after 2 minutes. The recovered HR and RR (from the reserved) were compared with the help of one way analysis of variance. No significant differences were found in the amount of recovery at different times of the day in HR and RR.

INTRODUCTION

In this study the researcher is basically dealing with post exercise recovery. It occurs after the cessation of exercise and is related to removal of metabolic by -products, the replenishment of energy stores, and the initiation of tissue repair. After the cessation of exercise body does not return to resting state. This phenomenon is illustrated by elevation in oxygen consumption known as excess post exercise oxygen consumption (EPOC) seen in response to bout of exercise. The ability of an individual to perform prolonged moderate work in a hot and dry climate apparently is not limited by the evaporative processes as he or she is in hot, humid condition. In a hot and dry environment the ambient air can absorb large amounts of moisture before becoming saturated. When working in this kind of climate, however, heat must still be taken from the core to the skin for heat dissipation in order to maintain normal body temperature. Like work in hot, humid conditions, this requires adjustments on the circulatory system from its normal state. As a result of the increased strain on the circulatory system to furnish sufficient blood to the active muscles and to the skin for heat dissipation, it can be seen that work in climates close to or above skin temperature can place severe strains on the cardiovascular system, even when the external air is relatively dry. Because of the fact that the entire process of exercising in hot climates (especially with high relative humidity), dehydration is a strong possibility and preventive measures should be taken to avoid it (Larry. L, 1981).

Research on exercise and time of day is growing, but still limited and not without controversy. Everyone has their preferences and ideas as to when be the best time to exercise. Some like to train in the morning and starting the day with a good workout, others squeeze in their training sessions around lunchtime while most tend to train after work in the late evening or at night. The question remains, however, when the best time to train is? While the science of how our body works indicates that late afternoon workouts are usually best for optimum performance, the adaptive nature of our bodies are such that we can learn to operate at peak efficiencies at almost any time of the day by training ourselves to do so.

Therefore in this study the researcher has made an attempt to find out the recovery responses of athletes after endurance run.

STATEMENT OF THE PROBLEM

The purpose of the study is to find out that which time of the day either morning, afternoon or evening, results in quicker recovery of the athlete after endurance run.

METHODS

SELECTION OF SUBJECTS

A total of seven subjects were selected purposely to participate in the study. The subjects were University level athletes (Middle Distance Runners) from LNUPE, Gwalior. The age of the subjects was 20±2 years. The subjects were undergoing a similar kind of training regime and approximately having a similar kind of schedule off the ground in terms of diet, lifestyle, studies, daily activities like sleeping hours etc.

SELECTION OF VARIABLES, TESTS AND CRITERION MEASURES

Keeping in mind the feasibility criteria and the specific purpose of the present investigation, the below mentioned variables were found appropriate to measure the recovery.

S. No.	Variables	Tests	Criterion measures
1.	Heart Rate	Telemetry watches	Beats/minute
2.	Respiratory Rate	Palpation Test	Numbers/minute

The researcher did the manipulation in the independent variable by giving the endurance run (1500 mtr) at different times of the day.

Morning (0600 to 0700 hrs)
Afternoon (1200 to 1300 hrs)
Evening (1700 to 1800 hrs)

INSTRUMENT RELIABILITY

The telemetry watches and stop watches for measuring heart rate and respiratory rate were standard and calibrated.

ADMINISTRATION OF THE TEST AND COLLECTION OF DATA

In order to acquaint the subjects with the specific purpose of the research being conducted, all the subjects were assembled in the athletic track of L.N.U.P.E. Gwalior. All the necessary information pertaining to the requirement of the testing procedure was imparted to them. To make the research findings more authentic, positive attitude towards investigation was emphasized.

The data for the physiological responses and recovery pattern of athletes was obtained with the help of selected measures of cardio-respiratory parameters i.e HR and RR. The data on HR, RR were taken prior to the experimental program at resting conditions. On the basis of the Resting Heart Rate of the subjects, their maximum heart rate (MHR) and target heart rate was calculated with the help of Karvonen formula (MHR = 206.9 - (0.67 × age)) (Tanaka H. 2001). After that they were made to run for 1500 mtr distance at the intensity of 70-80% of their MHR.

Method of calculating MHR: If somebody is having the age of 23 years and resting heart rate (RHR) 65 beats/min. The MHR will be equal to 206.9 - (0.67 × 23) = 191. The reserve heart rate was calculated by subtracting the RHR from MHR (191-65=126). If we have to calculate target heart rate (THR) of 70 - 80 % of the intensity of MHR, follow the below steps : Calculate reserve target heart rate → 126*70% = 88 B /min, 126*80% =101B/min Add it with RHR → 65 + 88 = 153 B/ min, 65 + 101 = 166 B/ min So, target heart rate zone for this athlete would be between 101 -166 B/ min.

To control the intensity, telemetry watches were used.

The exercise program was administered for five days and at different times of day (first day- morning; third day- afternoon; fifth day- evening). Immediately after the finish of the run, the baseline data was collected on both the variables. The data was recorded for fifteen seconds. After an active rest of 105 seconds, recording was again done for fifteen seconds. Later on the scores were converted as per minute by multiplying it by 4.

The test administrations of all the selected variables were as follows:

Heart Rate
Equipments: Telemetry watch, record sheets, pen, and pencil.

Scoring: The heart rate was recorded in beats/ minutes

Respiratory Rate
Equipments: Stop watches, record sheets, pen, and pencil.

Procedure: The number of breaths taken in each minute was referred as breathing frequency or Respiratory rate and this was assessed keeping the hand on each subjects stomach and reading were taken for complete one minute.

Scoring: The respiratory rate was recorded in numbers / minutes

RESULT
The data analysis was done through IBM SPSS Statistics (20th version). The difference of reserved heart rate at baseline measurement and after 105 seconds was taken as a score for recovery in heart rate. Likewise, in case of respiratory rate, same procedure was followed. The descriptive statistics is shown as below in table 1.

Table 1
Descriptives of recovered HR and RR from the reserved

		N	Mean	Std. Deviation	Std. Error
Hr_ recovery	Morning	7	52.57	21.59	8.16
	Afternoon	7	45.71	14.39	5.44
	Evening	7	50.28	15.80	5.97
	Total	21	49.52	16.89	3.68
Rr_ recovery	Morning	7	26.28	10.79	4.08
	Afternoon	7	22.85	7.19	2.72
	Evening	7	25.14	7.90	2.98
	Total	21	24.79	8.44	1.84

Table 1 reveals the various descriptive statistics of the data on HR and RR (recovered HR and RR from the reserved) during different times of day. In case of HR, the mean recovery was found the greatest (52.57) in the morning and lowest (45.71) in the afternoon. Likewise, in case of RR, the mean recovery was found the greatest (26.28) in the morning and lowest (22.85) in the afternoon.

For the comparison of means of the recovered HR and RR (from reserved) one way analysis of variance was employed. But, there is an assumption of the homogeneity of variances in Anova. So, to test that assumption, Levene's Test was employed and the table for the same is given below.

Table 2
Test of Homogeneity of Variances

	Levene Statistic	df1	df2	Sig.
Hr_recovery	.565	2	18	.578
Rr_recovery	.565	2	18	.578

From Table 2, it is evident that the Levene's Statistic was found insignificant (p>0.05). It confirms that the variances of the data on recovered HR and RR (from reserved) at different times of the day were homogeneous.

After that the researcher has employed one way Anova for the comparison of the means. The table for the same is given below.

Table 3
ANOVA for the data on recovered HR and RR from the reserved

		Sum of Squares	df	Mean Square	F	Sig.
Hr_recovery	Between Groups	170.66	2	85.33	.277	.761
	Within Groups	5540.57	18	307.81		
	Total	5711.23	20			
Rr_recovery	Between Groups	42.66	2	21.33	.277	.761
	Within Groups	1385.14	18	76.95		
	Total	1427.81	20			

The above ANOVA table shows that the differences between the means of recovered HR and RR (from reserved) were insignificant as the P value was found greater than 0.05 in both the variables i.e. HR and RR.

DISCUSSION
Body temperature is usually at its lowest (31.6 degree c) in the early morning hours, and it is highest (about 37.4 degree c) in the late afternoon or early evening. According to experts, this variation is created to the circadian rhythm seen in other areas of physiology and is affected by daily routines such as sleeping, eating, light, and time.

This investigation was undertaken to enquire the differences in the recovery after exercise at different times of the day. Here, in this study recovery was assessed in morning, afternoon and evening. The descriptive statistics shows that the mean recovery scores in case of HR and RR were best in morning followed by evening and afternoon. But, one way analysis of variance shows no significant differences among the means of the recovered HR and RR (from reserved). So, the researcher concluded that the recovery after exercise cannot be affected by the diurnal variations.

Out of the abundantly reviewed literature the results of some of the studies has been quoted here, which investigated similar concepts. Martin L. (2001) studied the effect of time of day on physiological responses to running at the speed at the lactate threshold. His findings suggest that, despite the diurnal variation in body temperature, other physiological responses to running at lactate threshold speed are largely unaffected. Souissi N. et. al. (2007) conducted a study entitled, "Effect of Time of Day on Aerobic Contribution to the 30-s Wingate Test Performance". His results suggested no difference in blood lactate concentrations from morning to afternoon.

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