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Impact of Treadmill Training on Heart Rate Recovery among Healthy Versus Obese Collegiate Men

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Abstract: ***Aim: To analyze the impact of treadmill training on heart rate recovery among healthy vs obese collegiate men. Background: Heart rate recovery following a physical exertion reflects the integrity of the autonomic control of the heart. Delayed heart rate recovery indicates a poor parasympathetic modulation, which is said to be an underlying factor for cardiac disorders in later life. There are few literatures which suggest that obesity is linked with autonomic derangement of heart. Aerobic training in general has been found beneficial in improving the autonomic integrity of the cardiovascular system. This study focuses on the influence of aerobic training in the form of treadmill exercise on improving the heart rate recovery time in obese young collegiate men. Methods: 30 subjects were randomly separated into two groups as follows:15 healthy collegiate men in one group and 15 obese collegiate men in another group. Heart rate values obtained from a standard 12 lead ECG machine is recorded before starting the treadmill training in both groups, then treadmill training starts with continuous monitoring of the heart rate throughout the session, the duration of which is about 30mins per day and it continues for 4 weeks. The heart rate recovery would be screened from the heart rate values pre & post training. Results: Heart rate recovery seems to improve following treadmill training among both healthy & obese collegiate men. Conclusion: The study was conducted to assess the effect of treadmill training on heart rate recovery in healthy and obese collegiate men. The study concluded that both the group A and B reveal effective changes in heart rate recovery. However, group B (obese) collegiate men showed drastic change than group A (normal BMI).***

Keywords: Body mass index, Treadmill, Heart rate recovery, obesity

1. Methodology

Study Design: Experimental study.
Study Type: Comparative study (pre-training and post-training type)
Study Duration: 4 weeks
Study Sample: 30 men (group A -15 and group B -15)
Study Setting: School of Physiotherapy, Vistas.
Sample Selection: Convenient sampling.

Inclusion Criteria:
- Collegiate men
- Only Male
- Age category 18 to 25 years
- Occasionally engaged in aerobic exercise activity
- Normal BMI men (group A)
- BMI-Over weight category (group B)

Exclusion Criteria:
- Any recent injury that requires medical attention
- Had significant musculoskeletal, neurological, visual, vestibular, cardiorespiratory, cognitive disorder
- Any recent surgeries
- Dyspnea
- hypertension

Outcome Measures:
- Heart rate measured from ECG.

Tools Used:
- Treadmill machine
- Standard 12 lead ECG machine.
- Weight machine
- Height measuring tape
- sphygmomanometer

2. Procedure

Individuals were explained about the procedure and selected according to the inclusion and exclusion criteria. Informed consent was obtained from all the subjects

Subjects were separated into two groups, 15 in Group A (normal BMI) and 15 in Group B(Obese).

Both the groups underwent a 30 minutes of treadmill walking at moderate intensity – 60-65 % of their maximal heart rate before & during which their heart rate is monitored using ECG machine. At the termination of the exercise, the heart rate recovery time, i.e the time taken for the heart rate to return to its basal state is calculated from the datas obtained from the ECG from first to fifth minute from the termination of exercise. And the values of both groups were compared where the obese category revealed some abnormalities in recovery time.

Now both the groups underwent a four weeks of treadmill training based upon ACSM guidelines.

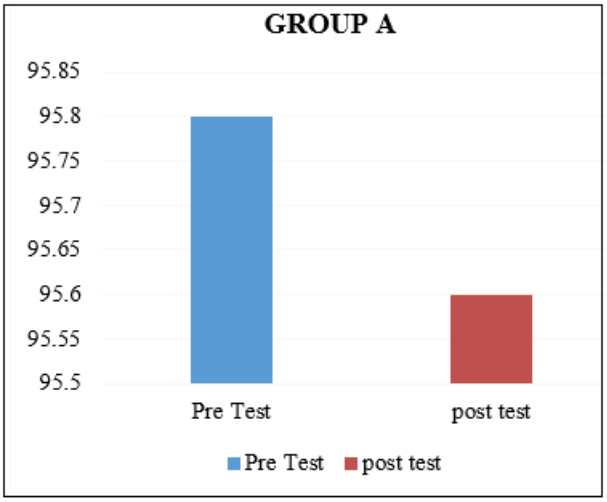
Following the four weeks of training, their heart rate recovery was again monitored & the values of both the groups were compared again for any positive changes.

3. Data Analysis and Interpretation

Group A: (normal BMI)

Table 1: Pretest and Post test values

Group-B	Mean		Standard Deviation		t-Value	p-Value
	Pre	Post	Pre	Post		
Heart rate value	95.8	95.6	2.38	2.30	1.16	0.0003

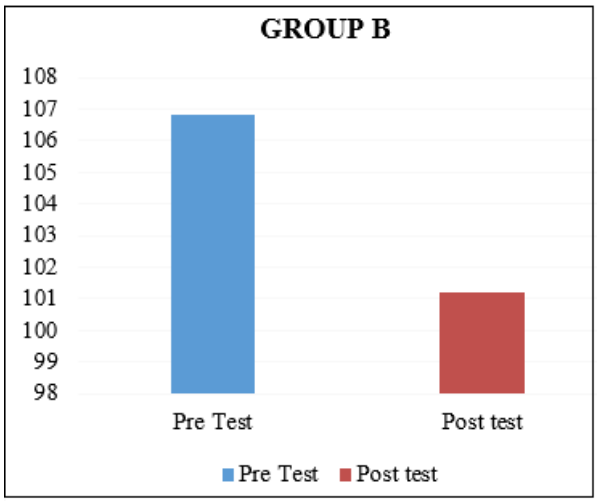


Graph 1: Comparison of pre-test and post-test heart rate value scores in Group -A

Group B: (OBESE)

Table 2: Pretest and Post test values

Group-B	Mean		Standard Deviation		t-Value	p-Value
	Pre	Post	Pre	Post		
Heart rate value	106.8	101.2	1.51	1.54	9.73	0.0001

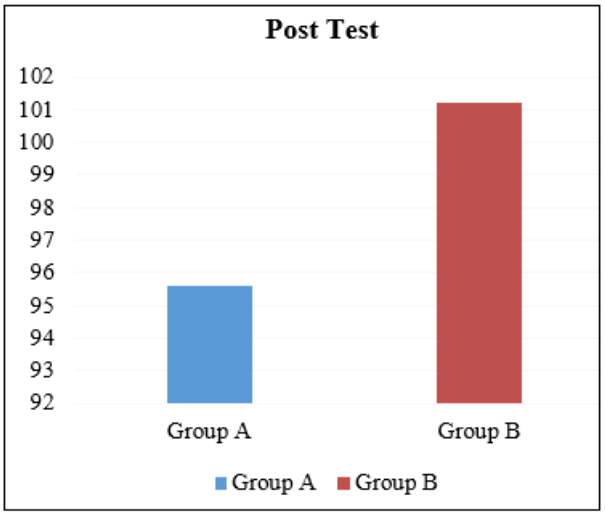


Graph 2: Comparison of pre-test and post-test heart rate value scores in Group -B

Group A & B:

Table 3: Comparison of post-test trail making testscores in both post groups

Heart rate value	Mean	Standard Deviation	t-Value	p-Value
	Post Test	Post Test		
Group-A	95.6	2.3	1.16	0.0003
Group-B	101.2	1.54	9.73	0.0001



Graph 3: Comparison of post-test heart rate values in both post groups A and B

4. Result

The statistically values of the group A (normal BMI) and the group B (obese) for heart rate recovery are T value 1.16, the P value < 0.003 and T value 9.73, P value < 0.001 respectively. Hence this study result showed statistical improvement in heart rate recovery of both group A and group B. but there is a statistically greater improvement in the group B (obese) than group A (Normal BMI).

5. Conclusion

The study was conducted to assess the effect of treadmill training on heart rate recovery among healthy and obese

collegiate men. It concluded that both the groups revealed effective changes in heart rate recovery. However, group B (obese) showed more positive changes than group A (normal BMI) which might be attributed to the fact that the obese population showed more interest & dedication as they were much concerned about their health status.

References

[1] Nishime E.O, Cole C.R, Blackstone E. Het al. : "Heart rate recovery and treadmill exercise score as predictors of mortality in patients referred for exercise ECG". JAMA 2000; **284**: 1392.
[2] Cole C.R, Blackstone E.H, Pashkow F.Jet al. : "Heart-rate recovery immediately after exercise as a predictor of mortality". N Engl J Med 1999; **341**: 1351.
[3] Cole C.R, Foody J.M, Blackstone E.Het al. : "Heart rate recovery after submaximal exercise testing as a predictor of mortality in a cardiovascular healthy cohort". Ann Intern Med 2000
[4] Gibbons R.J, Balady G.J, Beasley J.Wet al. : "ACC/AHA guidelines for exercise testing: A report of the american college of cardiology/american heart association task force on practice guidelines". J Am Coll Cardiol 1997; **30**: 260.
[5] Myers J, Do D, Herbert W, Ribisl P and Froelicher V.F : "A nomogram to predict exercise capacity from a specific activity questionnaire and clinical data". Am J Cardiol 1994; **73**: 591.
[6] Reid M.C, Lachs M.S and Feinstein A.R : "Use of methodological standards in diagnostic test research: Getting better but still not good". JAMA 1995; **274**: 645.
[7] Lauer M.S, Francis G.S, Okin P.Met al. : "Impaired chronotropic response to exercise stress testing as a predictor of mortality". JAMA 1999; **281**: 524.
[8] Imai K, Sato H, Hori M, Kusuoka Het al. : "Vagally mediated heart rate recovery after exercise is accelerated in athletes but blunted in patients with chronic heart failure". J Am Coll Cardiol 1994; **24**: 1529
[9] Mark D.B, Shaw L, Harrell F.Eet al. : "Prognostic value of a treadmill exercise score in outpatients with suspected coronary artery disease". N Engl J Med 1991; **325**: 849.
[10] Morrow K, Morris C.K, Froelicher V.Fet al. : "Prediction of cardiovascular death in men undergoing noninvasive evaluation for coronary artery disease". Ann Intern Med 1993; **118**: 689.
[11] Carter III R, Watenpaugh DE, Wasmund WL, Wasmund SL & Smith ML (1999). Muscle pump and central command during recovery from exercise in humans. *Journal of Applied Physiology*, 87: 1463-1469.
[12] Savin WM, Davidson DM & Haskell WL (1982). Autonomic contribution to heart rate recovery from exercise in humans. *Journal of Applied Physiology*, 53: 1572-1575.
[13] Chorbajian T (1971). Nomographic approach for the estimation of heart rate recovery time after exercise. *Journal of Applied Physiology*, 31: 962-964.
[14] Ashley EA, Myers J & Froelicher V (2000). Exercise testing in medicine. *Lancet*, 356: 1592-1597.
[15] Cole CR, Blackstone EH, Willson FJ, Snader CE & Lauer MS (2009). Heart-rate recovery immediately after exercise as a predictor of mortality. *New England Journal of Medicine*, 341: 1351-1357.
[16] Salinger J, Opavský J, Stejskal P, Vychodil R, Olák S & Janura M (1998). The evaluation of heart rate variability in physical exercise by using telemetric Variapulse TF 3 system. *Gymnica*, 28: 13-23.
[17] Task Force of the European Society of Cardiology and the North American Society of Pacing and Electrophysiology (1996). Heart rate variability. Standards of measurement, physiological interpretation, and clinical use. *Circulation*, 93: 1043-1065.
[18] Rowell LB & O'Leary DS (1990). Reflex control of the circulation during exercise: chemoreflexes and mechanoreflexes. *Journal of Applied Physiology*, 69: 407-418.
[19] Kluess HA, Wood RH & Welsch MA (2000). Vagal modulations of the heart and central hemodynamics during handgrip exercise. *American Journal of Physiology*, 279: H1648-H1652
[20] Warren JH, Jaffe RS, Wraa CE & Stebbins CL (1997). Effect of autonomic blockade on power spectrum of heart rate variability during exercise. *American Journal of Physiology*, 273: R495-R502
[21] Forjaz CLM, Matsudaira Y, Rodrigues FB, Nunes N & Negrão CE (1998). Post-exercise changes in blood pressure, heart rate and rate pressure product at different exercise intensities in normotensive humans. *Brazilian Journal of Medical and Biological Research*, 31: 1247-1255.
[22] Oida E, Moritani T & Yamori Y (1997). Tone-entropy analysis on cardiac recovery after dynamic exercise. *Journal of Applied Physiology*, 82: 1794-1801.
[23] Grasso R, Schena F, Gulli G & Cevese A (1997). Does low-frequency variability of heart period reflect a specific parasympathetic mechanism? *Journal of the Autonomic Nervous System*, 63: 30-38.
[24] Yeragani VK, Srinivasan K, Vempati S, Pohl R & Balon R (1993). Fractal dimension of heart rate time series: an effective measure of autonomic function. *Journal of Applied Physiology*, 75: 2429-2438.
[25] Brown SP, Li H, Chitwood LF, Anderson ER & Boatwright D (1993). Blood pressure, hemodynamic, and thermal responses after aerobic exercise. *Journal of Applied Physiology*, 75: 240-245.
[26] Miyamoto Y, Hiura T, Tamura T, Nakamura T, Higuchi J & Mikami T (1982). Dynamics of cardiac, respiratory, and metabolic function in men in response to step work load. *Journal of Applied Physiology*, 52: 1198-1208.
[27] Takahashi T, Okada A, Hayano J, Tamura T & Miyamoto Y (2000). Influence of duration of cool-down exercise on recovery of heart rate in humans. *Therapeutic Research*, 21: 48-53.
[28] Hagberg JM, Hickson RC, Ehsani AA & Hollos JO (1980). Faster adjustments to and recovery from submaximal exercise in the trained state. *Journal of Applied Physiology*, 48: 218-224.
[29] Brown TE, Beightol LA, Koh J & Eckberg DL (1993). Important influence of respiration on human R-R

interval power spectra is largely ignored. *Journal of Applied Physiology*, 75: 2310-2317.

[30] Sandvik, L, Eriksson, J, Ellestad, MH, et al. Heart rate increase and maximal heart rate during exercise as predictors of cardiovascular mortality: a 18-year follow-up study of 1960 healthy men. *Coron Artery Dis* 1995; 6:667-679