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Resting Heart Rate as a Measure of Cardiovascular Endurance in Swimmers and Non-Swimmers

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ABSTRACT

Swimming is generally considered to be a healthy leisure activity for both the young and the old. Regular swimming builds endurance, muscle strength and cardio-vascular fitness. Hence the current study compares the cardiovascular functional abilities of young freestyle swimmers practicing regularly and non-swimmers. The present Study was carried out at tertiary health centre of Municipal Corporation of Greater Mumbai on medical students after the informed and written consent. Sixty male medical students of age group 18 – 25 years fulfilling the inclusion criteria were included. The study was carried out by forming 2 groups. One group was the study group, comprising of 30 students who are swimmers, practicing for at least 3 months regularly with one session of 30-60 minutes duration per day and minimum three days in a week were include in the study group. The control group comprised of 30 students who are non-swimmers. Their resting heart rate was measured by recording the radial pulse rate by palpatory method for complete one minute in all the subjects. The data was recorded and analysed for the statistical significance using student's't' test. P less than 0.05 were considered the level of significance. In the present study, we observed that Mean value of resting heart rate is lower in students of the swimming group (Mean resting heart rate 69.8± 0.9) as compared to non swimmers (Mean resting heart rate 82.8.8± 2.1) and they are statistically significant (p =0.000). Regular swimming builds endurance, muscle strength and cardio-vascular fitness. In swimmers the Mean Resting Heart Rate was significantly lower than non-swimmers. So this study shows the importance of physical exercise like swimming performed regularly helps to improve the cardiovascular endurance in the form of more economical heart functioning.

Key words: Cardiovascular Functional Ability, Mean Resting Heart Rate, Swimmers and Non-Swimmers

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INTRODUCTION

Healthy living and physical fitness are closely related. Evidences suggest that sedentary and negative lifestyle habits lead to gradual deterioration of physical well-being or even disability. Incidences of cardiovascular diseases, cerebrovascular accidents have increased around the world due to poor life style involving little or no physical activity. Having high blood pressure and not getting enough exercise are closely related. As people are getting aware of increasing risks of negative life styles, they have also realized the importance of physical exercise in decreasing the incidences of health-related problems.

Swimming is generally considered to be a healthy leisure activity for both the young and the old. Increasing age is associated with increasing disability and functional impairments and reduction or postponement of such a decline can increase longevity. Advancing age is associated with increasing disability and functional impairments which may be contributed by functional decline in cardiovascular, pulmonary, musculoskeletal, and other systems [1].

Any kind of exercise is better for the heart than no exercise at all. Walking is often held up as the gold standard more vigorous activities do even more for the heart than walking. Swimming is an excellent form of exercise. Because the density of the human body is very similar to that of water, the water supports the body and less stress is therefore placed on joints and bones. Swimming is frequently used as an exercise in rehabilitation after injuries or for those with disabilities. Resistance swimming is one form of swimming exercise. It is done either for training purposes, to hold the swimmer in place for stroke analysis, or to enable swimming in a confined space for athletic or therapeutic reasons. Resistance swimming can be done either against a stream of moving water (often termed a swimming machine) or by holding the swimmer stationary with elastic attachments.

Swimming is primarily an aerobic exercise due to the long exercise time, requiring a constant oxygen supply to the muscles, except for short sprints where the muscles work anaerobically. As with most aerobic exercise swimming is believed to reduce the harmful effects of stress. Swimming can improve posture and develop a strong lean physique, often called a "swimmer's build.

Swimming works the heart and lungs. This trains the body to use oxygen more efficiently, which is generally reflected in declines in the resting heart rate and breathing rate. It uses the arms, the legs, and other muscle groups in between. This improves muscle strength and flexibility. In swimming Water supports and cushions the body, eliminating the kind of pounding associated with running. Because it’s easy on the joints and muscles, swimming is often recommended for people with arthritis and other chronic conditions. The resistance of water also allows you to work out vigorously with little chance of injury.

Regular swimming builds endurance, muscle strength and cardio-vascular fitness. It can serve as a cross-training element to regular workouts. Before a dry land workout one can use the pool for a warm-up session. Swimming with increasing effort to gradually increase the heart

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rate and stimulate the muscle activity is easily accomplished in the water. After a land workout, swimming a few laps can help to cool-down, move blood through the muscles to help them recover, and help to relax as glide through the water. The current study looks into comparison of cardiovascular functional abilities of young freestyle swimmers practicing regularly and non-swimmers.

MATERIALS AND METHODS

The present Study was carried out at tertiary health centre of Municipal Corporation of Greater Mumbai on medical students after the informed and written consent. Prior to testing, pre-test instructions were given and test was properly explained and demonstrated. Sixty male medical students of age group 18 – 25 years fulfilling the inclusion criteria were included.

The study was carried out by forming 2 groups. One group was the study group, comprising of 30 students who are swimmers, practicing for at least 3 months regularly with one session of 30-60 minutes duration per day and minimum three days in a week were include in the study group. The control group comprised of 30 students who are non-swimmers. Students with history of any valvular heart diseases, who have undergone any major surgery like abdominal, cardiac and pulmonary, students with acute illness such as respiratory tract infection, gastroenteritis and students with history of any neuromuscular disorders and skeletal abnormalities, were excluded from the study. Their resting heart rate was measured by recording the radial pulse rate by palpatory method for complete one minute in all the subjects.

Statistical analysis: The data was recorded and analysed for the statistical significance using student's't' test. p less than 0.05 was considered the level of significance.

RESULTS

In the present study, we observed that Mean value of resting heart rate is lower in students of the swimming group (Mean resting heart rate 69.8± 0.9) as compared to non swimmers (Mean resting heart rate 82.8.8± 2.1) and they are statistically significant (p =0.000,Table-1,2 and 3,Fig-1).

Table 1: NUMBER OF SWIMMERS AND NON-SWIMMERS WITH HEART RATE

Heart Rate	Swimmers	Non-Swimmers
Less Than 72	30	0
More Than 72	0	30
Total	30	30

Table-2: COMPARISON OF HEART RATE IN SWIMMERS AND NON-SWIMMERS

	N	Mean	S.D.	Minimum	Maximum
Swimmers	30	69.8	0.9	68	72
Non-Swimmers	30	82.8	2.1	79	87

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Table-3: ANALYSIS OF HEART RATE IN SWIMMERS AND NON-SWIMMERS BY INDEPENDENT T-TEST

	Group	N	Mean	S.D.	t-Value	DF	p-value	Mean Difference	95 % C.I. limit	
									Lower	Upper
Heart Rate	Swimmers	30	69.8	0.9	-31.66	40.62	0.000	-13	-13.829	-12.17
	Non-Swimmers	30	82.8	2.1						

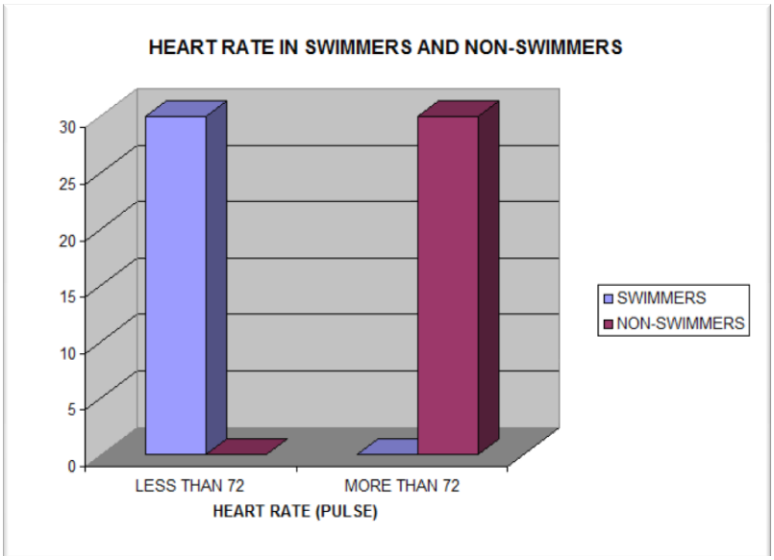

Fig-1: NUMBER OF SWIMMERS AND NON-SWIMMERS WITH HEART RATE

DISCUSSION

Regular swimming builds endurance, muscle strength and cardio-vascular fitness. It can serve as a cross-training element to regular workouts. Before a dry land workout, one can use the pool for a warm-up session. Swimming with increasing effort to gradually increase heart rate and stimulate muscle activity is easily accomplished in the water. After a land workout, swimming a few laps can help to cool-down, move blood through your muscles to help them recover, and help to relax as glide through the water. Spending time in a group workout, whether water aerobics or a master's swim practice, is a great social outlet.

In the present study, it was observed that Mean value of resting heart rate is lower in students of the swimming group (Mean resting heart rate 69.8± 0.9) as compared to non swimmers (Mean resting heart rate 82.8.8± 2.1) and they are statistically significant (p =0.000). Similar results were obtained by Duraskovic and Lukic [2], Tomljanovic and Cular [3], Kraemer et al [4], Stein and Rottman [5], Mandaric [6] and Tulppo et al [7]. The effects of the applied physical activity i.e. swimming on resting heart rate have led to a more economical heart functioning. The lowering of resting heart rate is mediated by alterations in the autonomic nervous system and by changes in the intrinsic mechanism of the sinus node and right atrial myocytes.

The mechanisms underlying the training induced increase in vagal activity are thought to consist of greater activation of the cardiac baroreceptors in response to the enlargement of blood volume and ventricular filling as well as changes in the opioid and dopaminergic modulation of parasympathetic tone. Lower intrinsic heart rate may be one adaptation mechanism after aerobic training. Subjects with enlarged heart have lower intrinsic heart rate. Therefore it has been hypothesized that cardiac enlargement caused by training accounts for the lower intrinsic heart rate. Another possible mechanism for reduced intrinsic heart rate is that atrial enlargement reduces the stretch-depolarization stimulus altering the resting regulation of heart muscle [8].

Cardiovascular autonomic function is an important determinant of the individual response to aerobic training. High vagal activity at baseline is associated with a superimposed improvement in aerobic fitness caused by aerobic exercise. The reduction of heart rate after regular aerobic exercise is associated with increased of cardiac vagal dominance. Regular aerobic exercise for three months, including 30-60 min sessions, 3-5 days a week, is a sufficient to induce these effects on functional abilities. The vagal dominance reached during regular aerobic exercise can be preserved by weight control and by continuing home-based exercise.

The noted statistically significant differences occurred under the influence of the applied recreational aerobic exercise model i.e. swimming, on the basis of which it can be concluded that the applied exercise model does have a positive effect on the transformation of the functional abilities of the subjects of the swimmers group.

CONCLUSION

In swimmers the Mean Resting Heart Rate was significantly lower than non-swimmers. So this study shows the importance of physical exercise like swimming performed regularly helps to improve the cardiovascular endurance in the form of more economical heart functioning. The recreational aerobic exercise performed can be recommended for use in everyday activities in fitness clubs. In addition, it can serve as a basis for the development of new aerobic programs aimed at the future.

REFERENCES

[1] Kay-Tee Khaw. Healthy aging. BMJ 1997; 315: 1090-1096.

[2] Duraskovic R, Vuckovic S & Lukic N. The medical control of women and recreational activities. Beograd: Faculty of Physical Education at the University of Zagreb 1992; 4: 64-70.

[3] Tomljanovic M, Sekulic D and Cular. The differences in anthropological qualities between those who take part in fitness programs and those who do not within the high school population. Kinesiology for the 21st century, 1999, 174-177.

[4] Kraemer W, Keuning M, Ratamess N, Volek J, Mccormick M, Bush A, Nind B, Gordon S, Mazzetti S, Newton R, Gomez A, Wickham R, Rubin M, & Hakkinen K. Medicine and Science in Sports and Exercise 2001; 33 (2): 259-269.

[5] Stein PK, Ehsani AA, Domitrovich PP, Kleiger RE & Rottman JN. American Heart Journal 1999; 138 (3): 567-576.

[6] Mandaric S. Facta Universitatis, Series: Physical Education and Sport, 2001, 1 (8), 37-49.

[7] Tulppo MP, Hautala AJ, Makikallio TH, Laukkanen RT, Nissila S, Hughson RL & Huikuri HV. J App Physiolo 2003; 95 (1): 364-372.

[8] Victor L Katch, Frank L Katch, William D Mcardle. Exercise Physiology (Energy, Nutrition and Human performance), 6th edition, Lippincott Williams and Wilkins, 2007, pp.166-171 and 937-986.