ORIGINAL ARTICLE

RELATIONSHIP BETWEEN BODY BUILD AND ENDURANCE ON TREADMILL EXERCISES

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HOW TO CITE THIS ARTICLE:
A. Hemalathadevi, P. Venkateswara Rao, K. Madhu Babu. "Relationship between Body Build and Endurance on Treadmill Exercises". Journal of Evidence based Medicine and Healthcare; Volume 2, Issue 16, April 20, 2015; Page: 2384-2389.

ABSTRACT: INTRODUCTION: The type of the body build, efficacy of energy and oxygen supply mechanisms and utilization are the chief determinants of various forms of exertional endurance and achievement in various sporting activities. Therefore, the relationship between these variables of physique, fuel supply and aerobic capacity 6 and the endurance on treadmill stress test are chosen for study. **MATERIALS & METHODS:** Two groups (20 each) of subjects (18-20 years) were chosen based on body weight differences 9<60 Kg BW and > 60 kg BW) for the study. They were further sub grouped based on BMI. **DISCUSSION:** When the body mass Index (BMI) is at the range of 20-25, the endurance was better. However, when the BMI increased to very high value like 30, the endurance decreased. Such individuals with disproportionally high body weight could not endure a longer duration of exercise. This perhaps may be explained on the ground that such very high weight individuals (BMI > 30) may have more body fat than muscles. Excess body fat is dead weight that adds directly to the energy cost of running. In both groups of individuals with BMI of 20 or slightly above could run for longer periods than at extreme lower or higher ends of the BMI scale. **OBSERVATIONS:** The subjects with greater BMI could run for greater length of times, greater distances and achieved greater METs, glucose utilization and oxygen usage (aerobic capacity). The percentage of oxygen saturation (Pulse oxymetry) after exercise fell to a greater degree in high body mass (BMI) subjects indicating better cardio pulmonary function and greater degree of oxygen utilization. Finally, the resting heart rate and magnitude of heart rate rise during exercise are found to be somewhat lower in high body mass index subjects.

KEYWORDS: BMI (Body mass index), Body build, Endurance.

INTRODUCTION:

- Considerable research has dealt with the patterns of physique and fuel supply status as well as the capacity of cardio pulmonary aerobic system as determinants of exercise endurance.[1-2]
- These studies focus principally on various sporting activities.[3]
- The role of the factor in relation to treadmill stress test responses are not fully explored leaving much potential for future investigations.
- The type of body build, efficacy of energy and oxygen supply mechanisms and utilization are the chief determinants of various forms of exertional endurance and achievement in various sporting activities.
- Therefore, the relation-ship between these variables of physique, fuel supply and aerobic capacity and the endurance on treadmill stress test are chosen for study.

- Compared to bicycle work the situation is considerable different in walking, stairs climbing, treadmill walking and other weight bearing activity which require more effort to over-come the body mass.
- The mechanical efficiency in bicycle is relatively constant since the subject does not carry his own body weight while exercising.[4]
- On the other hand, treadmill exercise involves vertical lift with each increment of inclination of the belt.
- Therefore, the efficiency of this activity varies as a function of body mass.

MATERIAL & METHODS:

- Two groups of subjects from among the first year healthy medical students between the age groups of 18-20 years were chosen based on body weight difference for study on treadmills stress test.
- A group of 20 students on the higher side of weighting 60kgs and above were chosen and designated as a group A.
- Another group of 25 students having body weight lesser than 60kgs and above were chosen and designated as group A.
- Another group of 25 students having body weight lesser than 60kgs were selected and designated as group B.
- The mean weight of group a subjects averaged 50.76 +/- 5.78cms respectively.
- The body mass index (BMI) of group A subjected averaged 28.13 +/- 2.23 while that of group B subject was 18.61 +/-1.12.

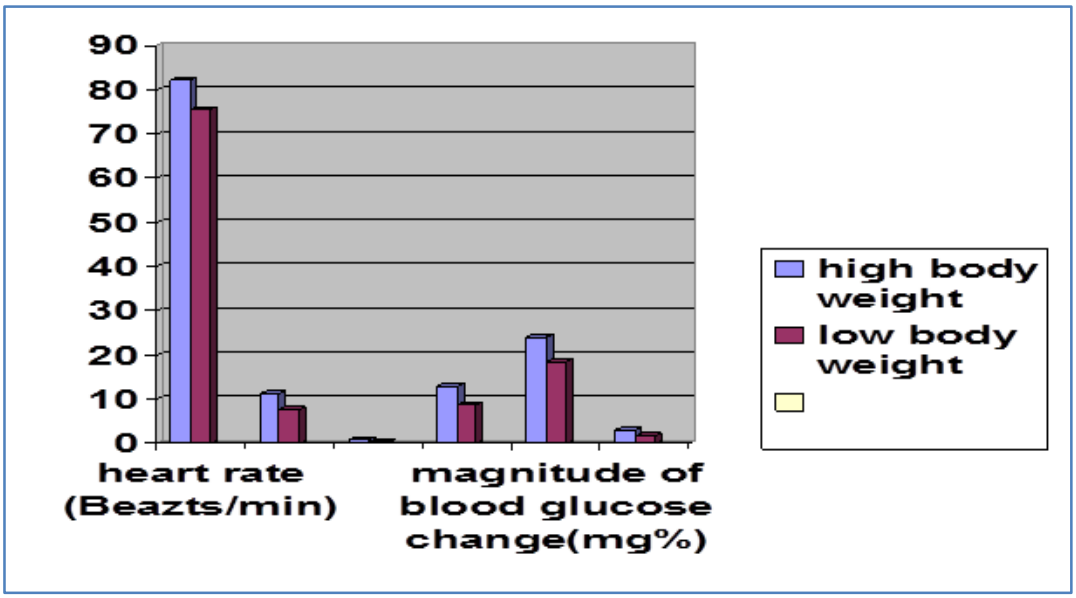
RESULTS:

- A group of 22 students who weight 60 kgs and above were selected and designated as Group-A.
- Their heights and weights were recorded and shown as a ratio, i.e., body mass index (BMI).
- Another group of students who were in the low weight ranges was selected, numbering 25 designated as Group B.
- As in the former case, their body mass indices were determined height and weight.
- The test subjects belong to the age group of 18-20 years.
- The mean weight of Group A subjects is 65.35, +5.31kgs.
- The mean height of height of Group A and Group B subjects are 167.85+8.08 cms and 165.2±5.78 cms respectively.
- The body mass index of Group A subjects averaged 28. 13+2.23 while that of Group B subjects was 18.61+1.12.
- Again, the mean values of the above parameters recorded, and their standard deviation and standard error of mean are noted below this table.
- The group mean values of Para meter in both groups+S.D record at the time of maximal exercise reflecting stress levels in terms of magnitude of heart rate rise, duration of exercise, distance covered and METs are present in table v for comparison.

- The magnitude of blood glucose utilization and change in oxygen saturation with peak exercise are also shown in this table as group mean values along with standard deviation.
- In both cases, the magnitude of glucose utilization increased in relation to duration of exercise more or less on similar lines showing a positive correlation of about 0.8 'r' values, which is highly significant.[5]

HISTOGRAM:

Comparison of a treadmill exercise responses between high body. Weight (Group A) and low body weight (Group B) subjects.



Graph 1

Mean values at peak exercise	High body weight (Group A)	Low body weight (Group B)
Heart rate (beats/min)	82.10	75.52
Duration of exercise (mts)	11.34	7.68
Distance covered (Kms)	0.94	0.49
METs	13.09	8.88
Magnitude of blood glucose change (mg %)	24.10	18.64
Magnitude of difference in o2 saturation (pulse oxymetry)	3.00	1.72

Table 1

DISCUSSION:

- Unlike the exercise testing on bicycle ergometers in which body weight is not lifted, treadmill exercise requires vertical lift of the body through certain height with the changes in inclination of the belt.[4]
- This brings into question the role of body weight as a factor in the performance on treadmill.
- It also shows that between the ranges 20-25 body mass index (BMI) the endurance was better.
- However, when the body mass index (BMI) increased to very high value like 30, the endurance decreased.[6,7]
- Such individual with disprotionaly high body weight could not endure a longer duration of exercise.
- This perhaps may be explained on the ground that such very high weight individuals (BMI>30) may have more body fat than muscles.
- Excess body fat is dead weight that adds directly to the energy cost of running.
- In both groups of individual with Body mass index (BMI) of 20or slightly above could run for longer periods that at extreme lower or higher ends of the BMI scale.[8]
- When the mean values of exercise duration were compared, it was found to be 11.34 minutes for group a subjects and 7.68 minutes for Group B subjects.
- This difference is found to be statistically highly significant, 'p' value being less than 0.001, as seen from Table-V and histogram.
- From these 4 observations, it can be summarized that there is certain optimal range of BMI i.e., between 18-20 where the test results in term of duration of exercise, distance covered METs are the best.
- At either and, above or below this range the performance levels measured by the said parameters decreased.
- Exercise places the greater demands for oxygen supply because oxygen is required for the aerobic production of ATP.
- Reduced endurance may not be due to the increased lactate concentration or associated increase in H^+, per S.E but rather due to inadequate rate of aerobic production of ATP.
- Therefore, the dynamics of oxygen supply and utilization are of immense importance in determining exercise performance.[9,10]
- In the present study that the percentage of oxygen saturation of Hb decreased with exercise, the maximum being declined between 3% in Group A and 1.7% in Group B as shown in table-V and histogram.[9,12]
- This deference is found to be statistically significant with 'p' value of < 0.001.

Sl. No.	Description	High body weight (Group A) B.M.I>20	Low body weight (Group B) B.M.I<20	t-value	p-value
1.	Magnitude of Heart rate	82.10+/- 2.39	75.52+/-10.05	1.97	<00.1

	rise (beats/min)				
2.	Duration of exercise (mts)	11.34+/-2.15	7.68+/-1.27	7.10	<0.001
3.	Distance covered (Kms)	0.94+/-0.27	0.49+/-0.13	7.20	<0.001
4.	METs	13.09+/-2.22	8.88+/-1.52	7.54	<0.001
5.	Magnitude of blood glucose change (mg %)	24.10+/-4.77	18.64+/-3.30	4.53	<0.001
6.	Magnitude of difference in o2 saturation (pulse oxymetry)	3.00+/-0.84	1.72+/-0.83	5.14	<0.01

Table 2: Comparison of peak treadmill exercise responses between Group A (B.M.I>20) and Group B (B.M.I<20) subjects

Values represent group mean values +/- S.

CONCLUSION:

- In final analysis it is inferred that mere body mass even through higher may not be a disadvantage in the vertical lift required of thread stress test.
- The sum total of capacity for substrate utilization and cardiovascular functional adequacy of endurance in treadmill exercise well.

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Date of Submission: 09/04/2015.
Date of Peer Review: 10/04/2015.
Date of Acceptance: 13/04/2015.
Date of Publishing: 14/04/2015.