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Comparison of forward walking versus backward walking on level surface on body composition in pre obese individuals in the age group of 20-40 years

Ashwini Dangi[*], Utkarsha Nirbhavane[**]

[*] M.Sc.(PT in Cardiological and Respiratory Sciences), Associate Professor, Terna Physiotherapy College, 3rd Floor, Terna Medical College campus, Sector 12, Nerul, Navi Mumbai 400 706

[**] B.P.Th., Terna Physiotherapy College, 3rd Floor, Terna Medical College campus, Sector 12, Nerul, Navi Mumbai 400 706

Abstract- Background: Backward walking also known as 'Retro' walking has shown to have many health benefits. Backward walking is found to be beneficial in improving the body composition and cardiorespiratory fitness than forward walking on treadmill. Walking on a level surface requires no sophisticated equipment's and can be done according to subject's convenience. However no study till date was found comparing forward walking versus backward walking on level surface in pre obese individuals. Hence the objectives of the study were to assess and compare the effects of forward walking and backward walking on level surface on BMI, waist to hip ratio (WHR) & percent body fat in pre obese individuals

Methodology : 30 pre obese subjects with BMI 25.0- 29.9 between 20- 40 years of age were selected . All the outcome measures (body weight, BMI, WHR % Body fat) were measured on the first day. Subjects were randomly divided into 2 groups. Group A walked forwards while group B walked backwards on a 30 metre track for 30 minutes for 4 weeks, 5 times a week. At the end of the 4 weeks all the outcome measures were assessed again.

Results :Intragroup analysis of both groups pre and post intervention showed statistically significant values for all outcome measures [Body weight (p value <0.0001), BMI(p value = 0.0010), WHR(p value = 0.0017),% body fat(p value = 0.0017) for group A and Body weight(p value< 0.0001), BMI(p value < 0.0001),WHR(p value = 0.0005), % body fat(p value< 0.0001) for group B]. Intergroup analysis showed statistically non significant values for all outcome measures [Body weight(p value = 0.7610), BMI(p value = 0.4206),WHR(p value = 0.6613), % body fat(p value = 0.1416)

CONCLUSION: Forward walking and backward walking were equally effective in reducing body composition in pre obese individuals.

Index Terms- Body composition, Backward walking, Forward walking, Preobesity, Retrowalking

I. INTRODUCTION

Obesity is defined as abnormal or excessive fat accumulation that presents a risk to health.[1] Overweight and obesity are both labels for ranges of weight that are greater than what is generally considered healthy for a given height. Overweight and obesity are major risk factors for number of chronic diseases, including diabetes, cardiovascular diseases, musculoskeletal disorders especially osteoarthritis, cholelithiasis, respiratory diseases.[2, 3 ,4]

Obesity has reached epidemic proportions in India in the 21st century, with morbid obesity affecting 5% of the country's population. Prevalence of obesity in India is upto 50% in women and 32.2% among Men [5]. Obesity rates have reached epidemic proportions in western hemisphere constituting over 25% of population in US and 15% in Europe.[5] Economic growth, modernization, urbanization and globalization of food markets are just some of the forces thought to underlie the epidemic.

Pre obesity is defined as having BMI ranging from 25-29.9. [2] BMI characterizes body fat mass and is extremely valuable tool to define obesity and pre obesity.[6] It helps to analyze morbidity and mortality associated with modest degrees of pre obese. Pre obesity is the consequence of imbalance between energy intake and spending.[7]

There are different ways to measure the amount of adiposity or fat present in an individual's body. The commonest ones are simple weighing, body mass index, waist to hip ratio and % body fat. Body mass index (BMI) provides a significantly more accurate representation of body fat content and is commonly used tool to assess body fat composition.[5] Waist to hip ratio (WHR) estimates central obesity and it refers to distribution of body fat by measuring the hip circumference at its widest part and dividing that into waist circumference and thus can be used to categorize the levels of risk.[8]

Physical activity is a structured exercise programme which has been known to achieve weight loss and thus helpful in treating obesity[8,9] It is the discretionary component of energy expenditure and there is evidence that falling levels of physical activity are contributing to obesity epidemic. Walking is a rhythmic, dynamic, aerobic activity of large skeletal muscles that confers the multifarious benefits with minimal adverse effects.[9,10,11]

Backward walking also known as 'Retro' walking, is said to have originated in ancient China, where it was practiced for good health. In modern world, it has become popular in Japan, China, and parts of Europe, where it is used to build muscle, improve sports performance and promote balance.[12, 13]

E .Terblanche et al(2004) in his study 'The effect of backward locomotion training on body composition and cardiorespiratory fitness of young women' found that backward walking lead to a significant decrease in body fat.[14] Hooper TL et al (2004) compared the effects of forward and backward walking

on heart rate and oxygen consumption on treadmill.[15] Backward walking elicited greater percent HRmax and VO_2max than forward walking.

However, there has been no study as per our knowledge comparing forward walking versus backward walking on level surface on body composition. Level surface walking does not require any sophisticated equipments and can be done as per the subject's convenience. Hence, the purpose of the present study was to analyze and compare the effects of forward walking and backward walking on body composition in pre obese subjects.

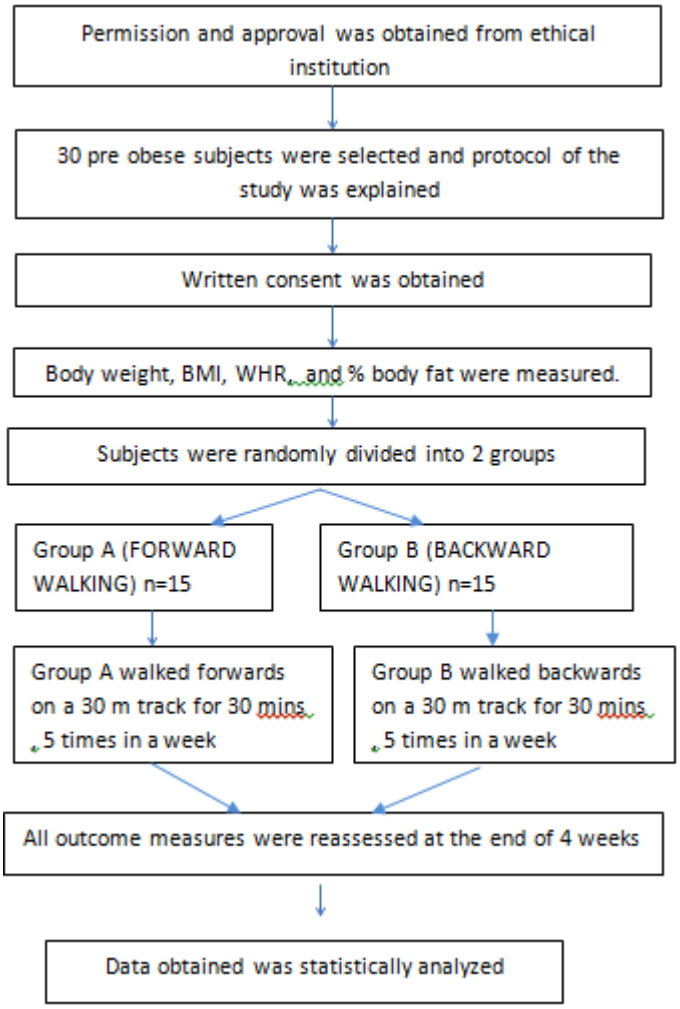
II. METHODOLOGY

30 pre obese subjects between the age group of 20 to 40 years were selected according to inclusion and exclusion criteria to participate in this prospective, randomized trial. The inclusion criterion was individuals with BMI between 25- 29.9 in the age group of 20-40 years. The exclusion criteria were :

1) Individuals with BMI less than 25 or more than 29.9
2) Individuals having any pulmonary, cardiovascular or lower limb musculoskeletal conditions in which walking is difficult.
3) Individuals participating in any kind of physical activity.
4) Unwillingness to participate

Before beginning with the study, approval from local ethical committee was obtained. The study purpose was explained to the subjects and a written consent was taken. Demographic data was obtained and outcome measures were calculated. Body weight was taken in kilograms, height in metres and BMI was calculated using a formula= weight (kilograms)/ height^2 (metres)[16]. Weight circumference was measured at 1 inch above umbilicus and hip circumference was measured at reater trochanter level. Their ratio was calculated as WHR. Skin fold measurements were taken using a DYNATRON skin fold calliper at 7 different sites - triceps, subscapular, pectorals, midaxillary, abdominals, suprailiac, and thigh[17]. All measurements were taken on right side of the body. 3 measurements were taken per site and an average value was calculated. % Body fat was then calculated using Jackson Pollock 7 caliper method All outcome measures were assessed on the first day. The subjects were divided by random number table into groups of 15 each. Group A walked forward on a 30 metre track for 30 minutes, 5 times in a week for 4 weeks. Group B walked backward on 30 metre track for 30 minutes, 5 times in a week for 4 weeks. Subjects in both groups were instructed to walk fast and cover as much distance as possible. At the end of 4 weeks their BMI, waist to hip ratio and skin fold measurements and % body fat were again measured and the data was statistically analysed

FLOW CHART OF STUDY DESIGN



III. RESULTS

In the present study we have compared forward walking versus backward walking on level surface on body composition in pre obese individuals in the age group of 20-40 years.
Graph pad prism version 6.0 was used in this study.

Baseline analysis was performed for both the groups using unpaired t - test.

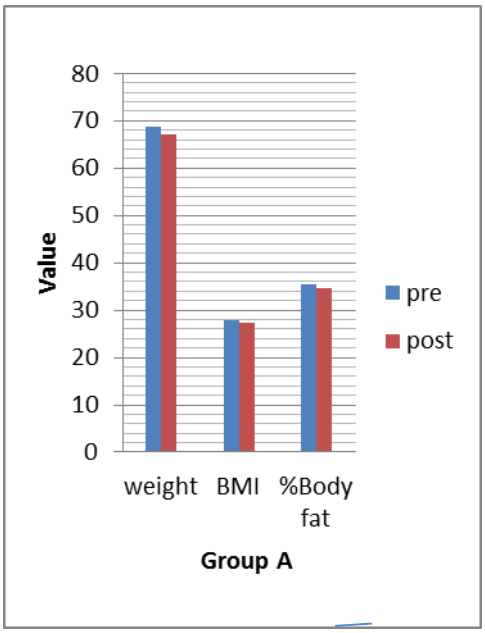
TABLE 1: Baseline analysis of groups A and B

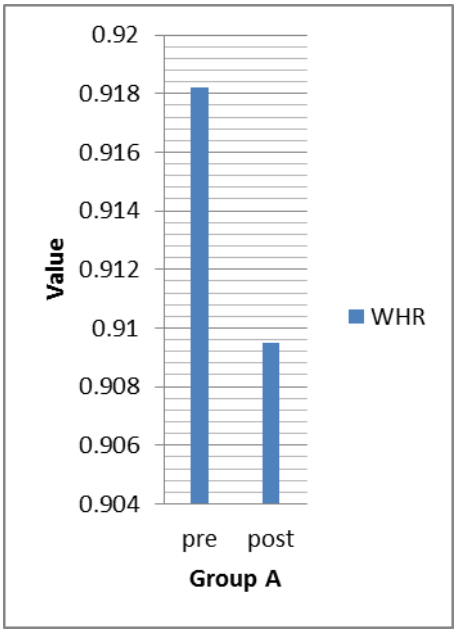
VARIABLES	GROUP A	GROUP B	p VALUE
AGE	31.8666 ± 6.7217	4.7450 ± 4.74505	0.6452
SEX	14 females, 1 male	14 females, 1 male	-
BODY WEIGHT	68.6533 ± 9.9503	70.1933 ± 7.3400	0.6448
BMI	27.7466 ± 1.8032	28.4593 ± 1.3272	0.2437
WHR	0.91826 ± 0.0687	0.91333 ± 0.0613	0.8426
% BODY FAT	35.3346 ± 2.7851	36.6713 ± 1.7704	0.1409

(All outcome measures showed statistically non significant p value pre intervention between two groups. Hence both groups were comparable).

Intra group analysis was done using paired t- test while Inter group analysis was done using unpaired t- test .

FIGURE 1 : Comparison of body weight, BMI, WHR, percent body fat pre and post intervention in group A





(Mean and SD for body weight pre intervention is 68.6533 ± 9.9503 and post intervention is 67.2333± 9.7140 with p value <0.0001

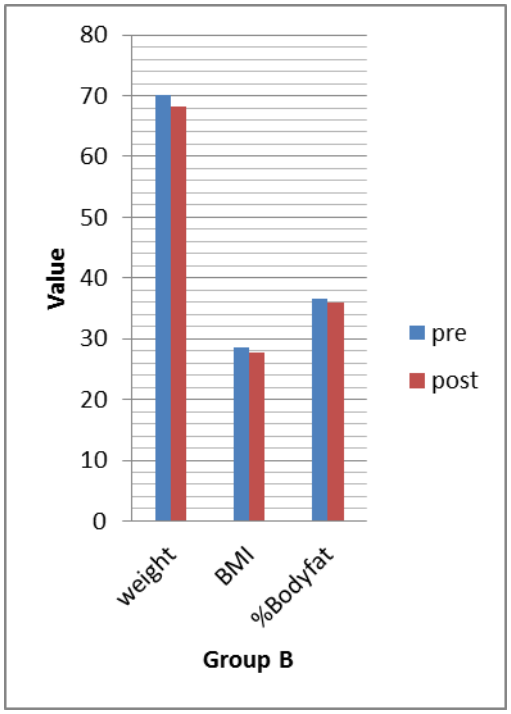
Mean and SD for BMI in pre intervention is 27.7466± 1.8032and post intervention is 27.246 ± 1.6697 with p value = 0.0010

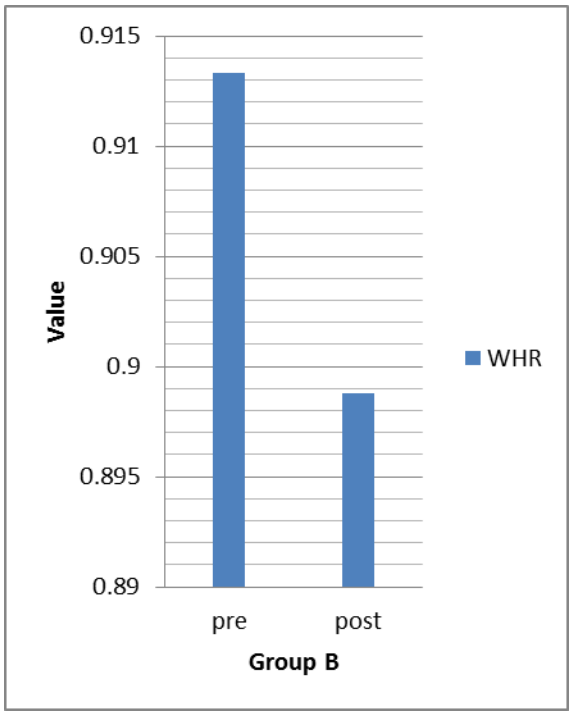
Mean and SD for WHR in pre intervention is 0.9182 ± 0.0687 and post intervention is 0.9095 ± 0.0666 with p value = 0.0011

Mean and SD for % Body fat in pre intervention is 35.3346 ±2.7851 and post intervention is 34.5866± 2.4348 with p value = 0.0017)

p value for all the outcome measures in group A showed statistically significant results.

FIGURE 2 : Comparison of body weight, BMI, WHR, percent body fat pre and post intervention in group B





(Mean and SD for body weight in pre intervention is 70.1933 ± 7.3400 and post intervention is68.2333± 7.3481 with p value <0.0001

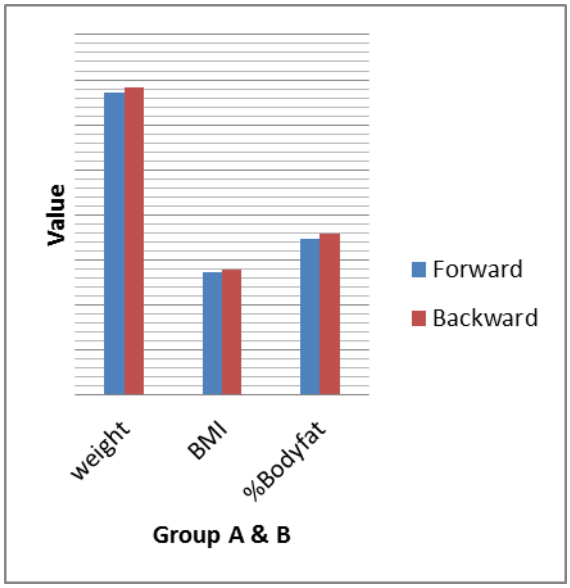
Mean and SD for BMI in pre intervention is 28.4593± 1.3272 and post intervention is 27.7266± 1.4331 with p value <0.0001

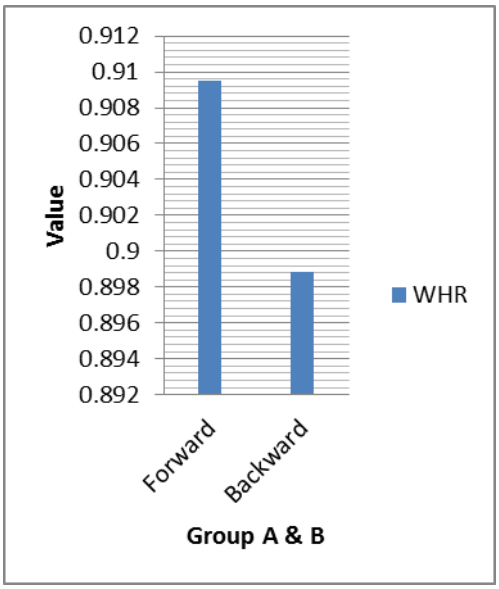
Mean and SD for WHR in pre intervention i s 0.91333 ± 0.0613 and post intervention is 0.8988± 0.0606 with p value = 0.0005

Mean and SD for % Body fat in pre intervention is 36.6713± 1.7704 and post intervention is 35.874± 2.0522 with p value <0.0001)

p value for all the outcome measures in group B showed statistically significant results.

FIGURE 3 : Comparison of body weight, BMI, WHR, percent body fat post intervention between groups A and B





(Mean SD of body weight post intervention in group A is 67.2333 ±9.7140 and group B is68.2333 ±7.3481 with p value =0.7610

Mean SD of BMI post intervention in group A is 27.246 ± 1.6697and group B is 27.7266±1.4331 with p value = 0.4206

Mean SD of WHR post intervention in group A is 0.9095 ± 0.0666 and group B is 0.8988±0.0606 with p value = 0.6613

Mean SD of % Body fat post intervention in group A is 34.5866± 2.4348 and group B is 35.874±2.0522 with p value 0.1416)

p value of all the outcome measures between group A and group B showed statistically non significant results.

IV. DISCUSSION

Obesity is an increase in body weight as a result of excess accumulation of fat and is a result when calorie value of food intake exceeds energy output.[5] The prevalence of obesity and overweight is increasing and is associated with numerous chronic conditions therefore it is important to implement effective interventions for treatment of excess body weight. However for weight loss it is necessary that energy expenditure should be more in the form of physical exercise[7].

Walking forwards was found to be statistically significant in improving body composition in pre obese individuals in this study.

Walking helps to increase basal metabolic rate (BMR). BMR is the minimum amount of calories that is needed by body at rest. Walking plays an important role in reducing fat free mass and thus helps to improve body composition. Exercise stimulates an enzyme, hormone sensitive lipase, to dissolve the lipid or triglyceride molecule into fatty acids and glycerol molecule[18].This process of breaking triglycerides is known as lipolysis. There is negative energy balance created through regular exercise contributing towards reduction of total body fat. In general, total body mass decreases in response to sustained periods of negative energy balance, and the proportion of body mass loss is approximately 75% adipose tissue and 25% fat free mass(FFM).Due to increased energy demands during exercise the rate of triglyceride hydrolysis is enhanced.[19] Adipose tissue lipolysis increases even during low intensity exercises. The lipolytic rate increases progressively during prolonged exercise at low to moderate intensity[19].Thus regular physical activity such as walking can significantly reduce body weight as energy expenditure increases and thus burn more calories.

Backward walking was also found to be effective in improving body composition in this study. Backward walking results in increased metabolic cost and cardiovascular demand. The increased metabolic cost during backward locomotion is due to novel activity which require increasingly greater motor unit recruitment in order to complete the task. Backward walking consumes more energy and thus helps in improving aerobic capacity.[14]

Backward walking requires greater quadriceps activity than forward walking. Greater motor unit recruitment may increase oxygen demand to the point that muscle contractile output requires greater support through anaerobic pathways. The increased cardiovascular demand during backward walking could be due to different action of quadriceps, which is primarily a

decelerator during forward walking and accelerator during backward walking.[20] Backward walking has shown to increase oxygen uptake and is found that backward walking causes high energy expenditure to a level high enough to maintain cardiorespiratory fitness. This high energy expenditure required during backward walking may contribute to reduce body weight.
In the present study, both forward walking and backward walking were equally effective in improving body composition. Terblanche E et al (2004) studied the effect of backward locomotion training on body composition and cardiorespiratory fitness in young women. It was found that the metabolic cost decreased during backward walking within 12 exercise sessions as the subjects could have got accustomed to this novel task within 12 sessions. In the present study, 20 exercise sessions of backward walking were given without any change in the exercise intensity. Since the subjects could have got accustomed to backward walking within 12 exercise sessions, similar reductions in metabolic cost may have occurred between the two interventions, thus, explaining equal improvement in body composition with both the interventions.

V. LIMITATIONS

In the present study, the sample size was small. Also the duration of the study was 4 weeks with no change in the intensity of exercise.

There was no follow up done after 4 weeks to assess the beneficial effects of forward and backward walking after cessation of the intervention.

Hence, a longer duration study can be recommended along with a follow up after a month of cessation of therapy to study the long – lasting beneficial effects of both interventions on body composition.

VI. CONCLUSION

Forward walking and backward walking both were equally effective in reducing body composition in pre obese individuals. Hence either of the techniques can be incorporated in a weight loss programme for pre obese individuals.

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AUTHORS

First Author – Ashwini Dangi, M.Sc.(PT in Cardiological and Respiratory Sciences), Associate Professor, Terna Physiotherapy College, 3rd Floor, Terna Medical College campus, Sector 12, Nerul, Navi Mumbai 400 706, Email id : ashwinidangi@rediffmail.com
Second Author – Utkarsha Nirbhavane, B.P.Th., Terna Physiotherapy College, 3rd Floor, Terna Medical College campus, Sector 12, Nerul, Navi Mumbai 400 706, Email id : utkarshanirbhavane@gmail.com

Corresponding Author : Ashwini Dangi, Email id : ashwinidangi@rediffmail.com, Contact no: 9920441490