

Effect of Underwater Treadmill Training on Young Obese Adults

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ABSTRACT

Background: Obesity, a chronic disease, is becoming a global public health issues now a days. There are various different proven approaches for weight reduction but carry adverse effects. So people prefer more of exercise training which has permanent impact on body. Despite proven health benefits of aerobic exercise training, traditional modes such land walking and running are associated with increased risk of musculoskeletal injuries due to increase joint compressive forces. On the contrary, the Aquatherapy has an advantage in form of buoyancy which reduces these joint compressive forces thereby providing relative weightlessness and joint unloading.

Objectives: To analyze the effect of underwater treadmill training on anthropometric measures, core strength and endurance and balance in young obese male individuals.

Materials and methods: In this study 14 young obese male individuals (18-35 years of age) were included. BMI, Waist Circumference, Functional reach test, 1-min sit ups, Percent body fat were taken as outcomes before starting the training. The underwater treadmill training was given for 6 weeks, 3 days per week, each session lasting for 25 mins; At the end of 6th week, post readings were recorded.

Results: There was significant difference observed amongst all the parameters i.e BMI ($p > 0.001$), FRT ($p > 0.001$), Waist Girth ($p > 0.001$), 1min sit ups ($p > 0.002$) and percent body fat ($p > 0.003$).

Conclusion: This study shows that Hudson Aquaciser III (underwater treadmill) is an effective method to reduce anthropometric measures like BMI, Waist girth, improve core strength, endurance and balance.

Keyword: Obesity, Hudson Aquaciser III, BMI, FRT, Waist Girth.

I. INTRODUCTION

Obesity is mainly the inference of sedentary lifestyle, physical inactivity, age, socio-economic status, stress, family history, smoking and alcoholism and also bad eating habits. Most important cause is imbalance between energy intake and energy expenditure, lack of exercise, except for genetic factor; hormonal can also be the cause. Rapid urbanization and modernization has been associated with rising levels of obesity.³

Obesity is considered the core of many diseases. Recent studies have identified various negative consequences of excessive weight gain such as gait alterations⁹⁻¹⁰, posture abnormalities¹¹⁻¹² and greater risk of fall due to impaired balance¹³. It is associated with decrease in functional capabilities. Obesity has been linked to host of illness including diabetes, cardiovascular diseases, hypertension, breathing disorders and musculoskeletal problems.

As this chronic disease is now becoming a global public health issue; there are various different proven

approaches for weight reduction like drug therapy, surgeries, behavioural therapy, diet modification and traditional land based exercises and for now recently the aqua exercises like aqua aerobics, deep water running, shallow water running have come into trend. Water has same effects as land based exercises but gives additional benefit by reducing compressive forces on joints minimizing risk of musculoskeletal injuries and undue stress on joints. Avail of aquatic treadmill is novel tool which closely resembles land treadmill. Hence the objective of this study was to see the effect of underwater treadmill training on overweight and obese young males on BMI, percent body fat, waist girth, static balance and core strength. Use of water as an unloading medium reduces core weight and weight of legs, thus decreasing the strength levels needed to move lower extremities during self-initiated gait. Other potential benefits of walking on an underwater treadmill include improved balance, increase in muscle strength due to overcoming water resistance and turbulence, generation of muscle activity, gait patterns similar to those seen over ground walking. Aquatic exercise enjoys a good reputation among patients because exercising in water feels easier and less stressful than on land. Main physical properties of water related to physiological alterations during immersion in water can increase heat exchange between the subject and environment. Change in hydrostatic pressure affects cardiovascular parameters and provides increase in postural support and buoyancy works against force of gravity. The buoyancy property of water results in decompression of joints making the individual to feel weightlessness and to move more smoothly than on land.²⁰

Exercise training widely prescribed as a source of reducing metabolic complications and improving cardio-respiratory capacities, muscle strength and functional capacity. Obese and overweight are consequently individuals with high metabolic risk, experience difficulties to execute traditional land

exercises due to necessity of supporting their own body weight. Therefore exercise modes in which there is no need or less need to support body weight seems to be more preferable and interesting alternative for obese individuals.

II. MATERIALS AND METHODS

In this pre post experimental study design; 14 young male adult with 18-35 years of age were included in study. Ethical approval was taken from Institution ethical committee. Participants with BMI>25kg/m², physically inactive and those willing to take part in study for 6weeks were included. Individuals having hydrophobia or with any recent trauma, open wounds, skin infections, hypothyroidism and any musculoskeletal injuries were excluded from the study. Informed written consent was taken from all participants. Demographic data was collected and weight was measured using weighing scale and height was taken by stadiometer and further Body mass index was calculated using Kg/m² formula and were also categorised according WHO BMI classification i.e 25.0-29.9 kg/m² is overweight and BMI from 30-39.9 kg/m² is obese. Waist girth was measured 1inch above umbilicus using non-elastic measuring tape. Functional reach test was used to assess the static balance by measuring the distance individual can reach as far as possible by standing with feet together with fixed base of support and bending forward from back without lifting feet off ground with shoulder flexion 90° and making fist using metacarpal of 3rd finger as reference point. Core strength was assessed by asking individual to perform maximum no.of curl ups in 1minute with knee bent upto 45° and percentage body fat was directly noted from the inner body fat analyser by asking subject to stand on it. All measurements were recorded before and after 6weeks of underwater treadmill training. Total 18 sessions were completed by each participant. No try was made to modify diet. Each session would last for 25mins

with depth till xiphoid level and water temperature at 30°. Exercising protocol was BOOTCAMP.

Table 1

EXERCISE	TIME	TREADMILL SPEED
Warm-Up Walk	1.5min	5mph
Warm-up skip	1.5min	5mph
Warm-up jog	2min	5mph
Interval run	2.25min	5.2mph
Interval jog	2min	3.5mph
Interval run	4min	5.5mph
Interval jog	2min	3mph
Interval run	5min	6mph
Cool –down walk	5min	Comfortable speed



Figure 1

STATISTICAL ANALYSIS

The data collected was entered in EXCEL sheet and statistical analysis was done using Primer. Paired t test was used to compare the data and p value of 0.05 were considered to be statistically significant.

III. RESULTS

Table 1 shows demographic data of all 14 participants. Table 2 shows BMI, Percent body fat, waist girth, 1min-sit ups and functional reach test before and after

underwater treadmill training. Data was expressed as Mean \pm SD. In this study out of total samples, 21.42% were overweight, 50% were class I obese and 28.58% were class II obese. There was significant reduction in BMI, percent body fat and waist girth with improvement in FRT and 1 min sit up.

IV. DISCUSSION

Our study was to examine the effect of recently designed underwater treadmill training on body composition of young obese male adults and results showed that there was significant improvement and beneficial change in body composition and fitness and also confirmed the accuracy of underwater treadmill as an effective training tool in overweight and obese population. In our study participants were selected according to eligibility criteria.

In present study of total participants according to BMI classification by WHO ; 21.42% were overweight, 50% of them were in class I obese and 28.58% found to be in class II obesity. According to WHO, 39% of adults aged 18 years and over (39% of men and 40% of women) were overweight in 2016. About 13% of the

world's adult populations were obese in 2016. 11% men were obese.

Body mass index, functional reach test, waist girth, percent body fat and 1min-sit up were the outcomes for which the participants were assessed and 6 weeks of underwater treadmill training was given to treat obesity. We found marked significant improvement in BMI, Functional reach test, waist girth, percent body fat and 1min-sit up after 6 weeks of underwater treadmill exercise training. BMI was reduced (1.03 ± 0.37) with small difference though; it was considered because the research suggest chronic heart disease mortality rates increased 30% with 5 kgm^2 increase in BMI. Significant reduction was observed due to reduction in body weight and percentage body fat. Greene P. et al in 2009 also studied the efficacy of underwater treadmill training in obese individuals. They also found a significant improvement in aerobic fitness and body composition in physically inactive overweight individuals. There was significant reduction in B.M.I. and percent body fat. Taheri M. et al in 2015 studied the effects of aquatic exercise in elderly obese males. They found BMI, waist hip ratio and percent body fat decreased significantly, while the trunk muscle mass increased significantly in the aquatic training group.

Improvement in functional reach test was seen and it indicated that the static balance was improved while performing functional task. As the COG line shifts forward due to abdominal obesity, the balance of obese individual is usually affected, so waist girth is reduced, the line of centre of gravity come back to position and balance is improved. Elizabeth F. et al in 2007 studied the effects of aquatic exercises in secondary obese women. They found significant improvement in the aquatic exercise group, for total body weight, cardio-respiratory fitness, flexibility, strength, and health-related quality of life significantly. Insignificant drop in body weight, marked improvement flexibility and full completion

of sessions was observed in the aquatic exercises group. Waist girth was reduced in men. This shows reduction in waist leads to reduction in weight loss; as weight and percent body fat is reduced; waist girth also reduces. Kimberly M. et al in 2009 found significant reductions in waist circumference and waist hip ratio in older overweight women. These results from this study indicate circuit based deep water running elicit significant improvements in cardio-respiratory fitness, strength and abdominal obesity. In our study percentage body fat was significantly reduced after 6 weeks of underwater treadmill training; when men performed regular exercise, energy expenditure increased and created negative energy balance. After 25 minutes of exercise; body temperature rises and more energy is utilized. This mobilizes fat from storage and metabolizes to meet energy demands resulting into fat reduction. Suksom D. et al in 2012 studied the effects of aqua-aerobics exercise in elderly individuals with diabetes mellitus type 2. The results showed significant reduction in body weight, percentage of body fat, a significant increase in VO_2 max and muscular strength at the 12th-wk of training after 12 weeks of aqua-aerobic exercise training. Our study showed reduction in fat percentage and waist girth which helped in increasing the strength of abdominal muscles assessed by performing 1min-sit ups. Roberta L. et al in 2012 studied the effects of water-based exercise in obese older women. They found significant improvement in aerobic capacity, muscle strength and quality of life. They found improvement in functional parameters and not in anthropometric measures.

V. CONCLUSION

Our results show that underwater treadmill training is effectual for overweight and obese population producing modest reduction in body mass index and improvements in body composition and other physical abilities affected by obesity in 6 weeks of training without dietary modification. The mode of exercise used in this study is recommended by ACSM as non

weight bearing exercise in such discrete population. Thus, the findings of study provides the practitioners with evidence that this novel form of intervention is effective and can be used as primary training modality in maintaining weight and treating adult obesity.

VI. REFERENCES

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APPENDIX

Table 1. Demographic data

Particulars	
BMI category	overweight(21.42%) obese class I(50%) obese class II(28.58%)
Mean Age	20.71years.
Mean Height	170.5cm.

Table 2. Pre and post comparison after underwater treadmill training in adult males.

Particulars	pre	Post	Diff.	t-value p-value
BMI	31.16±4.16	30.58±4.43	1.03±0.37	t=10.178 p>0.001
FRT	15.24±2.97	16.3±2.68	-1.06±0.69	t=-5.70 p>0.000
Waist girth	100.1±22.29	99.21±22.65	0.92±0.82	t=4.192 p>0.001
1min sit up	26.21±5.63	28.36±4.84	-2.14±2.14	t=-3.741 p>0.002
%body fat	28.71±7.23	27.88±7.46	0.82±0.87	t=3.562 p>0.003