International Journal of Current Advanced Research
ISSN: O: 2319-6475, ISSN: P: 2319-6505, Impact Factor: 6.614
Available Online at www.journalijcar.org
Volume 8; Issue 01(F); January 2019; Page No. 17076-17079
DOI: http://dx.doi.org/10.24327/ijcar.2019. 17079.3184

Research Article

COMPARISON BETWEEN THE EFFECT OF WATER BASED EXERCISES AND LAND BASED EXERCISES ON BALANCE IN OBESE INDIVIDUALS

Neha .A. Bandekar., Parag kulkarni., Manali Akre and Ajay Kumar

Department of Periodontology, GDCH Nagpur

A R T I C L E I N F O

Article History:
Received 10th October, 2018
Received in revised form 2nd November, 2018
Accepted 26th December, 2018
Published online 28th January, 2019

Key words:
obesity, hydrotherapy, balance, SEBT, BMI

A B S T R A C T

Aim: To study the effect of water based exercises and land based exercises on balance in obese individuals.
Background: Excessive body weight negatively affects balance. Hydrotherapy has been the subject of investigations regarding balance recovery.
Methodology: This was an experimental pre/post study. 30 obese individuals with BMI > 3Okg/m^2 between 45 to 55 years were evaluated using Star Excursion Balance Test and were divided into two groups – A and B. The subjects of group A underwent a land based exercise program and subjects of group B underwent a water based exercise program for balance for 4 weeks, with three sessions per week, each session lasting for 30 minutes. Each session was divided into three phases: a warm up phase, a fundamental phase with balance exercises and a cool down phase. The subjects were reassessed after the fourth week of the program using SEBT. The data was analyzed statistically by means of students unpaired t test.
Results: Water based balance exercises promoted significant increase in the obese individuals balance as compared to land based balance exercises as assessed using the SEBT ($p < 0.001$).
Conclusions: water based exercises rather than land based exercises are more effective in improving balance in obese individuals.

INTRODUCTION

Obesity is defined by the WHO as 'abnormal or excessive fat accumulation that may impair health' Individuals are labeled as obese when their BMI (BODY MASS INDEX) is equal to or above 30 kg / m^2 by WHO.

BMI or quetelet index is the body mass (weight) divided by the square of the body height and is universally expressed in units of kg /m^2 and is a tool for medical diagnosis of obesity[1]. Obese individuals may have certain impairments in balance.

Increased overall body weight causes increased COM displacement and speed due to decreased plantar sensitivity due to hyper activation of plantar mechanoreceptors[2]. Increased trunk segment mass causes limited thoracolumbar flexion, anterior shift in COM towards limits of BOS leading to postural instability[3].

Increased abdominal fat contributes to increased lumbar lordosis and anterior shift of the COG[4]. An increase in body mass requires an additional force production for movement thus strength is decreased also obesity compromises the ability to resist muscular fatigue thus impairing balance control[5].

Corresponding author:* **Neha .A. Bandekar
Department of Periodontology, GDCH Nagpur

SEBT (Star Excursion Balance Test) is a dynamic test that requires strength, flexibility and proprioception and it is considered as a highly representative non instrumented dynamic test for testing balance ability[6].

Hydrotherapy is the use of water for treatment purposes and is used in treatment of various ailments.

It is also employed to train and improve balance.
It works on the principles of buoyancy, hydrostatic pressure and Archimedes principle.

MATERIALS AND METHODS

Study Design

Type of study : comparative study
Population : obese individuals (BMI > 30kg/m^2)
Duration of study: 12 months

Sample Design

Type of sampling: convenient sampling
Sample size : 30
Location : metropolitan city

Materials Used

swimming pools picture
Pen

Pencils
Paper
Cardboard
Tape
Ruler
Stopwatch
SEBT scales picture

Inclusion Criteria

1. obese patients with BMI > 30 kg /m^2
2. patients with age group of 45 to 55 years
3. patients willing to participate

Exclusion Criteria

1. neurological disorders
2. CNS diseases especially epilepsy
3. recent fractures of lower limb
4. patients with hydrophobia
5. severe febrile infectious diseases (plantar warts, tinea pedis)
6. severe respiratory diseases
7. cardiac instability (uncontrolled hypertension)
8. bowel or bladder incontinence
9. impaired sensations.

Procedure

30 subjects who were willing to participate were included in the study and were divided into 2 groups: group A (15 subjects) and group B (15 subjects).

All participants were screened as per the inclusion and exclusion criteria.

Purpose of the study and procedure was explained to the subjects prior to the study.

A written informed consent was taken from all subjects prior to participation.

The SEBT was performed with the participants standing in the middle of a grid formed by eight lines extending out at 45 degree from each other.

The participants were asked to reach as far as possible along each of the eight lines, make a light touch on the line and return the reaching leg back to the centre, while maintaining single leg stance with the other leg in centre of the grid.

The test was done and then the reach limit was marked with a marker and values were noted and preserved for further study.

The subjects of group A were asked to perform the following exercises on land for a period of 4 weeks: spot marching, tandem standing (with reach outs), tandem walking, backward walking.

After the exercises were performed balance was assessed using SEBT after 4 weeks and was compared with previous values.
The same exercises were performed in aquatic pool for a period of 4 weeks.

After performing the exercises, balance was assessed using SEBT after 4 weeks and was compared with the previous values of the subject.

The data was collected and statistically analyzed.

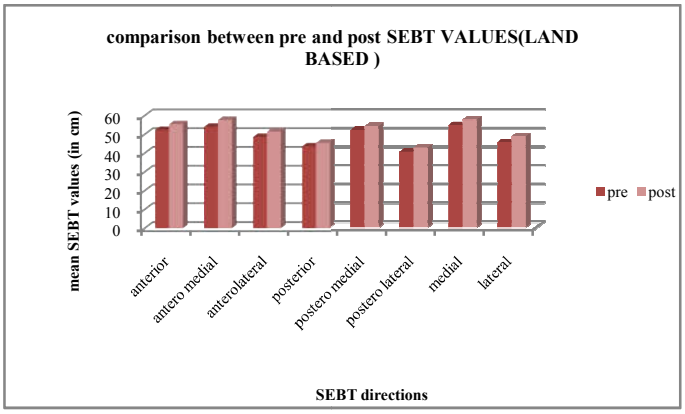
RESULTS

There was statistical significant difference between effect of land based and water based exercises on balance in obese individuals ($p<0.001$)

Statistical analysis

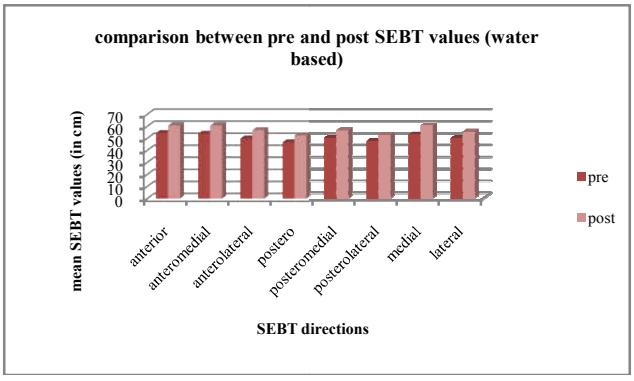
AGE	MEAN	SD
Land based	49.73	±3.15
Water based	50.2	±3.7

The above table shows descriptive statistics of age group



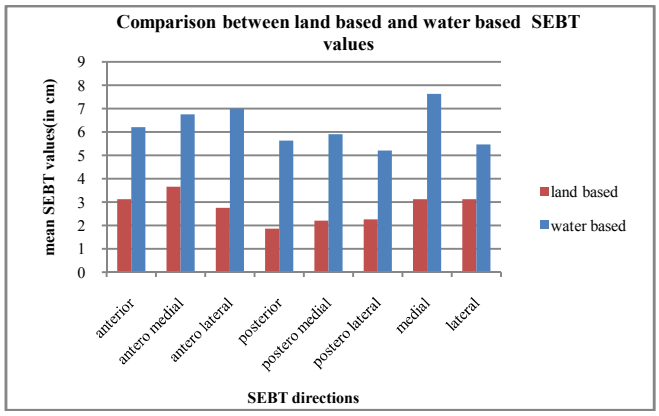
Graph 1

	Pre values	Post values	P value	significant
Anterior	52.4	55.53	< 0.0001	Yes
Antero medial	54.13	57.8	<0.0001	Yes
Antero lateral	48.73	51.5	<0.0001	Yes
Posterior	43.73	45.6	<0.0001	Yes
Postero medial	52.2	54.4	<0.0001	Yes
Postero lateral	40.6	42.86	<0.0001	Yes
Medial	54.8	57.93	<0.0001	Yes
Lateral	45.66	48.8	<0.0001	Yes



Graph 2

	Pre values	Post values	P value	Significant
Anterior	54.72	60.93	<0.0001	Yes
Antero medial	54.16	60.93	<0.0001	Yes
Antero lateral	50.2	57.2	<0.0001	Yes
Posterior	47.06	52.7	<0.0001	Yes
Postero medial	50.4	56.5	<0.0001	Yes
Postero lateral	47.6	52.8	<0.0001	Yes
Medial	53.03	60.66	<0.0001	Yes
lateral	50	55.46	<0.0001	Yes



Graph 3

Post values	Land based	Water based	P value	significant
Anterior	3.13	6.21	0.0172	Yes
Antero medial	3.66	6.76	0.19	No
Antero lateral	2.76	7	0.0107	Yes
Posterior	1.86	5.63	0.0032	Yes
Postero medial	2.2	6.1	0.4058	No
Postero lateral	2.26	5.2	<0.0001	Yes
Medial	3.13	7.63	0.2121	No
lateral	3.13	5.46	0.0124	Yes

DISCUSSION

The study was done among the sample size of 30 obese subjects, the age group ranging from 45 to 55 years.

Balance was assessed using the SEBT before the program. The exercise program was continued for 4 weeks, thrice each week for a period of 30 minutes.

The purpose of the study was to compare the effect of water based balance exercises and land based balance exercises on balance in obese individuals.

Obesity (excessive or abnormal fat accumulation) has negative effects on an individual's health. Obesity causes anterior shift of the body's COM, reduces relative muscular strength and decreases muscular fatigue resistance[5]. These limitations lead to motor delays and insufficient corrective torque contributing to balance impairments. Previous studies show that exercises performed in the aquatic pool in patients with impaired balance improves balance[7]. It has been recognized that exercising in water can be an effective and useful mode of therapeutic exercise.

The result of the study indicates that there is statistically significant improvement in balance of obese individuals after undergoing water based balance exercise program as compared to land based balance exercise program.

The reason for improvement in land based group is because of stimulation of mechanoreceptors which improves proprioception and helps in improving balance. The probable reason for better improvement of balance in water based group is that water is viscous, it decelerates movement and retards falls, which prolongs the time available for regaining balance when the body gets out of balance , floating acts as a support which increases individuals confidence and reduces fear of losing balance . In this way individuals are challenged beyond the limits of stability without being afraid of consequences of imbalance which may occur on ground[8].

Also as water provides almost 14 percent more resistance than air, muscles are forced to work more harder and thus get more toned, exercising in water also helps to burn calories[9]. The resistance of the water increases muscle strength and joint mobility, water based exercises are low impact and improve muscle tone and enchance balance function [10].

Thus all these factors contribute in improving balance.
Thus our study concluded that water based balance exercises show better improvement in balance as compared to land based balance exercises in obese individuals.

CONCLUSION

This study concludes that water based balance exercises are better in improving balance in obese individuals as compared to land based balance exercises.

Acknowledgement

We thank principal sir, guide and all the staff of DPO's Nett College of Physiotherapy, Thane, respected parents for support, co-operation and last but not the least almighty for keeping spirits high throughout the study.

References

1. Aviva must, *et al* (1991).Reference data for obesity :85th and 95th
2. Percentiles of body mass index (wt /ht^2) and triceps skinfold thickness [1-4] .American society for clinical nutrition 1991; 53:839-46.
3. P.Capodaglio, *et al* (2012).balance control and balance recovery in obesity. Curr Obes Rep 2012 1:166-17
4. Gilleard W, *et al*. "effect of obesity on posture and hip joint movements during a standing task, and trunk forward flexion motion". *International journal of Obesity, London*; Feb 2007.
5. Sung min son (2016). Influence of obesity on postural stability in young adults. Osong Public Health Res Perspect 2016 7 (6), 378-381.
6. Maffiuletti NA, *et al*. Postural instability of extremely obese individuals improves after a body weight reduction program entailing specific balance training. *J Endocrinol Invest*. 2005; 28:2–7.
7. Phillip A. Gribble, *et al* (2012). Using the Star Excursion Balance Test to Assess Dynamic Postural-Control Deficits and Outcomes in Lower Extremity Injury: A Literature and Systematic Review. *Journal of Athletic Training*: May/Jun 2012, Vol. 47, No. 3, pp. 339-357.
8. Resende *et al*. (2008). Effects of hydrotherapy in balance and prevention of falls among elderly women. *Brazilian Journal of Physical Therapy*, 12(1), 57-63.
9. Yesar Alikhajeh, *et al*. "Effects of Hydrotherapy In Static And Dynamic Balance Among Elderly Men". Procedia-Social and Behavioral Sciences 46(2012) 2220-2224.
10. Tahseen, Ismat. "TRY Aquacises to Help You Get Svelte." *Timesgroup.com*, 2017, times of india. indiatimes.com/life-style/health-fitness/health-news/try-aquacises-to-help-you-get-svelte/articleshow/61057014.cms.
11. PRIYA, M.Anu. "Hydrotherapy for Obesity." *Www.practo.com*, 2016, www.practo.com>post.

12. Sarkar Aparna, *et al*. Effects of obesity on balance and gait alterations in young adults. *Indian Journal of Physiology and Pharmacology*. 2011 Jul-Sept; 55(3): 227-233.
13. Fabris de Souza SA, *et al*. Postural changes in morbidly obese patients. Obes Surg 2005; 15: 1013–1016
14. Downs S, *et al* (2013). The Berg Balance Scale has high intra- and inter- reliability but absolute reliability varies across the scale: a systematic review. *Journal of Physiotherapy* 59:93-99.
15. Aviva must, *et al* (1991). Reference data for obesity: 85th and 95th
16. Percentiles of body mass index (wt /ht^2) and triceps skinfold thickness $^{1-4}$. American society for clinical nutrition 1991; 53:839-46.
17. DENNIS A. *et al* (1986). Relationship between Body Mass Indices and Measures of Body Adiposity. *American Journal Public Health* 1986; 76:992-994.
18. Cecilie Fjeldstad, *et al* (2008). The influence of obesity on falls and quality of life. Dynamic Medicine 2008, 7:4.
19. Phillip A. Gribble, *et al*. Interrater Reliability of the Star Excursion Balance Test. *Journal of Athletic Training* 2013;48(5):621-626
20. Cynthia C Norkin, Pamela K Levangie.joint structure and function-a comphrensive analysis: 3rd edition; ch 14; FA Davis Publications: 2001.
21. Teasdale N, *et al*. Reducing weight increases postural stability in obese and morbidly obese men. *International journal of obesity, London*; Jan 2007.
22. Hannah Del Porto, *et al*. Biomechanical effects of obesity on balance. *International journal of exercise science*; 2012.
23. Kinzey SJ, *et al*. The reliability of the Star Excursion Balance Test in assessing dynamic balance. *J Orthop Sports Phys Ther*. 1998; 27(5):356-360.
24. Becker, *et al*. Comprehensive aquatic therapy. Butterworth-heimann, London 1997.

How to cite this article:

Neha .A. Bandekar *et al* (2019) 'Comparison Between the Effect of Water Based Exercises and Land Based Exercises on Balance in Obese Individuals', *International Journal of Current Advanced Research,* 08(01), pp. 17076-17079.
DOI: http://dx.doi.org/10.24327/ijcar.2019.17079.3184

****