International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Impact Factor (2012): 3.358

Correlation of Weight Loss and Health Related Fitness Parameters in Obese Patients

Dr. Sanna Khan[1], Dr. Sujata Yardi[2], Dr Anu Arora[3]

[1]Physiotherapist, Department of Physiotherapy, Pad. Dr D Y Patil University, Navi Mumbai, India
[2]Former Dean, Professor and Director, Department Of Physiotherapy, Pad. Dr D Y Patil University, Navi Mumbai, India
[3]Associate Professor, Department of Physiotherapy, Pad. Dr D Y Patil University, Navi Mumbai, India

Abstract: ***The present study aims to find the correlation between loss of body weight and health related fitness parameters in obese individuals subjected to 12 weeks of structured exercise program. Background: There have been studies in past on obesity management wherein the main outcome measure is considered as loss in body weight whereas the changes in fitness parameter are totally ignored. It has also been observed that after the initial weight loss there is not much substantial decline in weight after certain period and there are chances of patient getting demotivated even when fitness parameters may continue to increase. Therefore fitness parameters should be given due importance in obesity management. Hence it is important to study the association between the quantum of weight loss and health related fitness parameters over a period time. Furthermore, the influence of exercise training on physical fitness parameters in obese Indian individuals has not been much explored. So, the purpose of this research is to study correlation between health related fitness parameter and the quantum of weight loss over a period of 12 weeks of structured exercise protocol. Method: A total of 60 subjects participated in the study (Control & Experiment group). Outcome measures studied were Total body weight(kg) , Body Compositions (BMI, Waist circumference (cm) , & fat% (OMRON hand held fat analyzer), Strength(hand dynamometer) , Endurance (6MWT). Results: Repeated measure ANOVA, Spearman's test was used to analyze their performance. No correlation exists between weight loss and health related fitness parameters. Conclusion: Significant difference between values of outcome measures were noted between experimental and control group at p <0.05. Decline in body weight and improvement in health related fitness parameters was seen in Experimental group at end of each month. No correlation was seen between weight loss and fitness parameter thus implying weight loss and improvement in health related parameters are independent of each other.***

Keywords: Physical Fitness, Weight, Obesity, Weight loss, Aerobic

1. Introduction

Obesity is defined by the World Health Organization as abnormal or excessive accumulation of fat that presents a risk to health. WHO has recognized obesity as a worldwide disease[1] affecting an estimated 300 million people, with an increasing predominance in both developed and developing countries.[2]The fundamental cause of obesity is an energy imbalance between calories consumed and calories expended. Globally, there has been an increase in Intake of energy-dense foods that are high in fat; and Physical inactivity due to the increasingly sedentary nature of many forms of work, changing modes of transportation, and increasing urbanization. Based on scientific evidence, there are a number of intervention strategies that can be used to induce and maintain significant weight loss.[3] In the Human system; energy expenditure has three primary outlets: Resting metabolic rate, The thermic effect of food, Physical activity. Of the three outlets, physical activity is the one most readily manipulated. An increase in physical exercise thus appears to be a logical method for achieving the negative energy balance necessary for weight loss.[4]Obesity not only causes morbidity, but also has enormous health related implications, with its well-established relations between medical conditions as Hypertension, Coronary Heart disease, Type II diabetes mellitus, Stroke etc. Conventional Methods of Weight Loss are (aerobics, yogic, isometric, isotonic, games, and sports), Dietary Protocols, Medication and Behavioral Modification have been advocated for management of obesity with varying degree of success. Bariatric surgery for severely obese patients has become the mainstay of treatment for management of morbidly obese patients. Only weight loss through exercise improves fitness parameters apart from weight loss. Literature suggests that exercise has been a popular measure for weight reduction in obese individuals. However, it has also been seen that after the initial weight loss with exercise, people get demotivated when they do not see a further drastic decline in body weight with continued exercises. It is important to note that exercise not only brings about a reduction in weight but is also instrumental in improving the health related fitness parameters in the subjects. The influence of exercise training on physical fitness parameters in obese Indian individuals has not been much explored. So, with this research; we wish to study the effect of structured exercise program on body weight. We also wish to study the improvement in health related fitness parameter irrespective of the quantum of weight loss over a period of 12 weeks of structured exercise protocol.

2. Materials and Methods

A total of 60 subjects (30 in experimental & 30 in control group) were enrolled in this study. There were 2 dropouts each from both groups in 1st month. The compliance of the patient to exercise protocol was excellent with less than 8% absenteeism in 3 months. Total body weight was calculated in Weight (kg) using standardize weighing machine. Body Compositions (BMI, Waist circumference[8,9] (cm) measured using flexible inch tape & fat% using hand held OMRON fat analyzer. Strength was measured using hand dynamometer. Aerobic Endurance was assessed using 6MWT.

3. Data Analysis

Data was collected on a data sheet & encoded for computerized analysis using SPSS 16 .Tables were made using Microsoft Word and figures were plotted using Microsoft Excel 2007.The mean age of the experimental group (Mean± SD) was 36.3±6.3 and control group was 35.8±5.5 Statistical analysis of the two group reveal a p value>0.05(insignificant) showing that the two groups are homogeneous with respect to age

4. Descriptive Statistics

Table 1: Comparison of weight over a period of 3 months

Weight	Mean	Std. Deviation	N
BaselineWT	83.1	11.79	28
M1wt	81.6	12.05	28
M2wt	80.2	11.41	28
M3wt	78.2	11.48	28

M1wt= weight at the end of 1st month
M2wt= weight at the end of 2ND month
M3wt= weight at the end of 3RDmonth

Inference-There was reduction of weight at end of each month.

Table 2: Comparison of hand grip over a period of 3 months

Hand Grip	Mean	Std. Deviation	N
Baseline Hgrip	27.6	8.75	28
M1HGRIP	29.2	7.99	28
M2HGRIP	29.9	7.76	28
M3HGRIP	30.6	7.98	28

M1HGRIP=hand grip at the end of 1st month
M2HGRIP= hand grip at end of 2nd month
M3HGRIP= hand grip end of 3 month

Inference-There was improvement of hand grip at end of each month

Table 3: Comparison of weight over a period of 3 months

Waist	Mean	Std. Deviation	N
Base line waist	1.04	9.09	28
M1waist	1.00	8.62	28
M2waist	99.19	8.72	28
M3waist	97.57	8.93	28

M1waist= waist at the end of 1st month
M2waist= waist at the end of 2ND month
M3waist= waist at the end of 3 month
Inference-There was reduction of waist circumference at end of each month

Table 4: Comparison of fat over a period of 3 months

Fat %	Mean	Std. Deviation	N
Baseline FAT	39.6	4.55	28
M1FAT	38.6	4.46	28
M2FAT	37.2	4.38	28
M3FAT	35.3	4.69	28

M1FAT= fat at the end of 1st month
M2FAT= fat at the end of 2nd month
M3FAT= fat at the end of 3rd month
Inference-There was reduction of fat% at end of each month

Table 5: Comparison of distance over period of 3 months

6MWT Distance	Mean	Std. Deviation	N
Baseline 6MDIST	5.4	77.40	28
M1DIST	5.9	70.33	28
M2DIST	6.4	78.52	28
M3DIST	6.8	86.84	28

M1DIST= distance at the end of 1st month
M2DIST= distance at the end of 2nd month
M3DIST= distance at the end of 3rd month
Inference-There was improvement of distance at end of each month

Table 6: Pair wise comparison of weight at each month

(I) factor1	(J) factor1	Mean Difference (I-J)	Std. Error	Sig.*	95% Confidence Interval for Difference	
					Lower Bound	Upper Bound
1	2	1.500*	0.146	0	1.083	1.917
2	3	1.375*	0.194	0	0.822	1.928
3	4	2.021*	0.109	0	1.712	2.33
4	1	-4.896*	0.221	0	-5.525	-4.267

*The mean difference is significant at the .05 level
***Repeated Measure Anova**
Inference- There is a statistically significant ($p<0.05$) decline in the mean weight from Baseline to Month1, Month1 to Month2, Month2 to Month3 and Baseline to Month3.

Table 7: Pair wise comparison of hand grip at each month

Measure	(I) factor1	(J) factor1	Mean Difference (I-J)	Std. Error	Sig.*	95% Confidence Interval for Difference[a]	
						Lower Bound	Upper Bound
HGRIP	1	2	-1.661*	0.392	0.001	-2.776	-0.545
	2	3	-.679*	0.146	0	-1.094	-0.263
	3	4	-.643*	0.147	0.001	-1.063	-0.223
	4	1	2.982*	0.508	0	1.535	4.429

*The mean difference is significant at the .05 level
***Repeated Measure Anova** Inference- The difference in the mean Hand Grip from Baseline to Month1, Month1 to Month2, Month2 to Month3 and Pre experimental to Month3 is statistically significant.

Table 8: Pair wise comparison of waist at end of each month

Measure	(I) factor1	(J) factor1	Mean Difference (I-J)	Std. Error	Sig.*	95% Confidence Interval for Difference[a]	
						Lower Bound	Upper Bound
Waist circumference	1	2	3.589*	0.588	0	1.916	5.262
	2	3	1.643*	0.263	0	0.893	2.393
	3	4	1.625*	0.213	0	1.018	2.232
	4	1	-6.857*	0.606	0	-8.582	-5.133

*The mean difference is significant at the .05 level

***Repeated Measure Anova**

Inference-The difference in the mean Waist circumference from Baseline to Month1, Month1 to Month2, Month2 to Month3 and Baseline to Month3 is statistically significant (p value<0.05)

Table 9: Pair wise comparison of fat % at end of each month

Measure	(I) factor1	(J) factor1	Mean Difference (I-J)	Std. Error	Sig.*	95% Confidence Interval for Difference[a]	
						Lower Bound	Upper Bound
FAT	1	2	1.011*	0.106	0	0.709	1.313
	2	3	1.361*	0.123	0	1.01	1.712
	3	4	1.882*	0.148	0	1.459	2.304
	4	1	-4.254*	0.203	0	-4.831	-3.676

*The mean difference is significant at the .05 level

***Repeated Measure Anova** Inference -The difference in the mean Fat (%) from Baseline to Month1, Month1 to Month2, Month2 to Month3 and Baseline to Month3 is statistically significant. (p<0.05)

Table 10: Pair wise comparison of 6 min walk test at end of each month

Measure	(I) factor1	(J) factor1	Mean Difference (I-J)	Std. Error	Sig.*	95% Confidence Interval for Difference[a]	
						Lower Bound	Upper Bound
MIN6WALK	1	2	-49.815*	11.796	0.002	-83.497	-16.132
	2	3	-44.259*	5.972	0	-61.312	-27.207
	3	4	-45.000*	6.276	0	-62.921	-27.079
	4	1	139.074*	17.3	0	89.674	188.475

*The mean difference is significant at the .05 level

***Repeated Measure Anova**

Inference-The difference in the mean 6MWT Distance from Baseline to Month1, Month1 to Month2, Month2 to Month3 and Baseline to Month3 is statistically significant

Table 11: Correlation between quantum of weight loss and waist circumference

	Spearman (r)	
Wt Diff1 Between. Waist Diff1	Correlation Coefficient	**.276**
	Sig. (2-tailed)	**.139**
	N	**30**
Wt Diff2 Between. Waist Diff2	Correlation Coefficient	**.185**
	Sig. (2-tailed)	**.346**
	N	**28**
Wt Diff3 Between. Waist Diff3	Correlation Coefficient	**.374***
	Sig. (2-tailed)	**.050**
	N	**28**
Wt Diff4 Between. Waist Diff4	Correlation Coefficient	**.399***
	Sig. (2-tailed)	**.035**
	N	**28**

*. Correlation is significant at the 0.05 level (2-tailed).

Inference-Using the Spearman test on the data from baseline to month 3 (r= .276, .185, .374, .399) respectively) (n=28) the results was found to be statistically not significant with the p value >0.05 for a two tailed test.

Table 12: Correlation between quantum of weight loss and 6MWT

	Spearman (r)	
Wt Diff1 Between. 6MWT Distance Diff1	Correlation Coefficient	**.093**
	Sig. (2-tailed)	**.626**
	N	**30**
Wt Diff2 Between. 6MWT Distance Diff2	Correlation Coefficient	**.334**
	Sig. (2-tailed)	**.082**
	N	**28**
Wt Diff3 Between. 6MWT Distance Diff3	Correlation Coefficient	**.213**
	Sig. (2-tailed)	**.277**
	N	**28**
Wt Diff4 Between. 6MWT Distance Diff4	Correlation Coefficient	**.312**
	Sig. (2-tailed)	**.105**
	N	**28**

*. Correlation is significant at the 0.05 level (2-tailed).

Inference- Using the Spearman test on the data from baseline to month 3 (r= .093, .334, .213, .312 respectively) (n=28) the results was found to be statistically not significant with the p value >0.05 for a two tailed test.

Table 13: Correlation between quantum of weight loss and fat %

	Spearman (r)	
Wt Diff1 Between. Fat(%) Diff1	Correlation Coefficient	**-.114**
	Sig. (2-tailed)	**.547**
	N	**30**
Wt Diff2 Between. Fat(%) Diff2	Correlation Coefficient	**-.005**
	Sig. (2-tailed)	**.978**
	N	**28**
Wt Diff3 Between. Fat(%) Diff3	Correlation Coefficient	**.131**
	Sig. (2-tailed)	**.505**
	N	**28**
Wt Diff4 Between. Fat(%) Diff4	Correlation Coefficient	**.249**
	Sig. (2-tailed)	**.201**
	N	**28**

*. Correlation is significant at the 0.05 level (2-tailed).

Inference- Using the Spearman test on the data from baseline to month 3 (r = -.114,-.005, -.131, .249 respectively) (n=28) the results was found to be statistically not significant with the p value >0.05 for a two tailed test.

Table 14: Correlation between quantum of weight loss and hand grip

	Spearman (r)	
Wt Diff1 Between. Hgripdiff1	Correlation Coefficient	**.076**
	Sig. (2-tailed)	**.689**
	N	**30**
Wt Diff2 Between. Hgripdiff2	Correlation Coefficient	**-.360**
	Sig. (2-tailed)	**.060**
	N	**28**
Wt Diff3 Between. Hgripdiff3	Correlation Coefficient	**.141**
	Sig. (2-tailed)	**.474**
	N	**28**
Wt Diff4 Between. Hgripdiff4	Correlation Coefficient	**.053**
	Sig. (2-tailed)	**.788**
	N	**28**

*. Correlation is significant at the 0.05 level (2-tailed

Inference- Using the Spearman test on the data from baseline to month 3 (r =.076,-.360, .141, .053 respectively) (n=28) the results was found to be statistically not significant with the p value >0.05 for a two tailed test.

5. Discussion

Weight reduction in the experiment group the weight reduced from 82.60 kgs to 78.21 kgs over a period of three months. ($p<0.05$) which is statistically significant. Physical activity in the form of structured exercise contributes to the creation of an energy deficit by increasing total energy expenditure viz a viz the energy consumption leading to weight loss.Also literature suggests that the exercise induced weight loss is associated with greater reduction in total body fat. This is confirmed by an eventual decline in the total fat percentage in our study subjects. This also implies that the weight reduction in the study subjects has occurred in the desirable way by the means of fat loss and preserving the lean muscle mass. Aerobic exercise protocol of moderate intensity which was a part of our structured exercise regime accelerated the fat metabolism thus boosting weight loss achieved in the experimental group. In addition, the resistance exercises which were a part of the structured exercise regime, cause an increase in the lean muscle mass which being metabolically active tissue causes an increase in the basal metabolic rate further contributing to an increased energy expenditure & subsequent weight loss. The difference in control group from baseline to 3 month was found to be insignificant ($p>0.05$).

Reduction in Fat Percentage **in** the experiment group from 39.36 % to 35.36 % over a period of three months ($p<0.05$) was found to be statistically significant. The structured exercise protocol administered to experimental group helped to increase muscle activity .This enhanced muscle activity facilitated a relatively greater mobilization of fat from storage area. Low to medium intensity aerobic exercise is an important stimulant for fat oxidation In the Control group weight reduction from baseline to 3rd month was statistically insignificant ($p>0.05$).

Six Minute Walk Test Distance was found to be significant in experimental group from 540.67 meters to 691.96 meters ($p<0.05$) over a period of three months. Improvement in distance could be due to reduce in weight and overall improvement of functional capacity, improvement in muscular strength and endurance In Control group no significant change was seen ($p>0.05$) due to lack of exercise.

Hand grip has significantly improved in the experiment group from 27.78 kegs to 30.61 kegs ($p<0.05$) Hand grip strength is a good indicator of overall strength [5]. The presence of resistance exercise in structured exercise protocol not only help to reduce weight but also contribute to improve strength In Control group no significant change was seen from baseline to 3rd month 30.07kg to 29.68kg ($p>0.05$) as no exercises were done by this group.

Waist circumference has significantly improved in the experiment group from 104.27cms to 97.57cms ($p<0.05$) Reduction in waist circumference in this study can be attributed to reduction in abdominal fat, from total body fat reserves. Fat in the abdominal area is more active metabolically than fat located in the other areas[6] hence when fat was being called up this specific area showed significant reduction in waist circumference.

Correlation On statistical analysis there was no correlation between the decline in weight over a period of three month and the improvement in the fitness parameters. This implies that there is no association between the decline in weight over a period of three month and the improvement in the fitness parameters.

It has been seen that after the initial weight loss with exercise, people get demotivated when they do not see a further drastic decline in body weight with continued exercises. However, from our research, it can be inferred that exercises should be continued because even if it fails to cause reduction in body weight there is a steady improvement in Health Related fitness parameters

6. Conclusion

Improvement in body weight and health related fitness parameters of experimental group were seen from baseline to 3rd month. No correlation was seen between weight loss and fitness parameters. Decline in body weight was steadily over a period of 3 months. Weight and health related parameters are independent of each other.

Clinical implication: A structured exercise protocol should be considered as a viable management option for obese individuals as it not only causes weight reduction but also improves upon health related fitness parameters.

Study Limitations:. In the 1st 3 month of exercise there is a steady decrease in weight and improvement in health related fitness parameters however to prove that this improvement in fitness is independent of the quantum of weight loss, it is important to carry out this study for a still longer duration of time.

Scope for Further Research: Use of molecular markers of obesity like lipoprotein (A) and tunica media thickness

can be used as outcome measures to bring further objectivity to this research.

Acknowledgement

The authors are thankful to Obesity Department & Medicine Department of Pad Dr D Y Patil Research Center, Nerul, Navi Mumbai for their support to the study.

References

[1] Report of a WHO Consultation. Geneva. World Health Organization, Obesity: Preventing and managing the global epidemic 2000(Technical report series no.(894) 6 –60
[2] Mendez, Monteiro and B. M. Popkin, Overweight Exceeds Underweight among Women in Most Developing Countries.2005.p.714-721; Disord.2003; 27:1391-1397.
[3] John M. Jakicic Et Al. Appropriate Study Strategies for Weight Loss and Prevention of Weight Regain For Adults; American College of Sports Medicine. Medicine and Science In Sports And Exercise 2001, 2145 – 2157
[4] James H. Lyznicki Et Al: Obesity: Assessment and Management in Primary Care. American Family Physician; Jul 2001, 1.1-17.
[5] Taina Rantanen and colleagues; "Hand grip strength is a good indicator of overall strength" Journal of the American Medical Association; 1999
[6] Rob Landel, Kornelia Kulig,et al. Intertester Reliability & Validity Of Motion Assessment S During Lumbar Spine Accessory Motion Testing. Phys Ther.2008; 88:43-49..
[7] Tate DF, Jeffery RW, Sherwood NE, Wing RR (1 April 2007). "Long-Term Weight Losses Associated With Prescription Of Higher Physical Activity Goals. Are Higher Levels Of Physical Activity Protective Against Weight Regain". *Am. J. Clin. Nutr.* 85 (4): 954–9. PMID 17413092
[8] Canadian Society For Exercise Physiology.2014 Csep Certified Personal Trainer® And Csep Certified Exercise Physiologist
[9] US Department Of Health And Human Services, National Center for Health Statistics. NHANES III Reference Manuals and Reports. Hyattsville, MD: Centers for Disease Control and Prevention, *1996*.

Author Profile

Dr. Sanna Khan a Physiotherapist. She has specialized in the field of Cardiovascular and Pulmonary conditions from Pad. Dr. D Y Patil University, Navi Mumbai. Her works of interest are in the field of Obesity and Fitness. Areas of Special Interest: Pulmonary and Cardiac Rehabilitation, Orthopedic Rehabilitation, Adult Neuro-Rehabilitation.

Dr. Sujata Yardi (P.T): Former Dean, Professor and Director D Y Patil University, Navi Mumbai. She is having 44 years of vast experience in the field of Physiotherapy. She has Published and Presented numerous Research papers. She also has conducted workshops on various topics like EMG and NCV studies, Update on Electrotherapeutics, Vestibular Rehabilitation, BPPV, Recent Trends in Electrotherapy practice, and Recent Advances in Electrotherapy. She also has received Fellowship Award from IAP in the year 2010. Areas of Special Interest: Pulmonary and Cardiac Rehabilitation, Orthopedic Rehabilitation, Adult Neuro-Rehabilitation, EMG and NC studies.

Dr. Anu Arora, Associate Professor, Department of Physiotherapy, Pad. Dr. D Y Patil University, Navi Mumbai. Areas of Special Interest: Women's Health and Geriatrics. Ante-natal, Post-natal, and Gynecological Conditions, Occupational and Environmental Medicine.