

COMPARISON OF CRYOLIPOLYSIS AND STRENGTH TRAINING IMPACTS ON REVERSIBILITY OF LORDOSIS IN OVERWEIGHT WOMEN

¹Ghoncheh Kabiri and ²Bijan Goudarzi

^{1,2}Department of Sport Pathology, Boroujerd Branch, Islamic Azad University, Boroujerd, Iran

Email: milfendereski212@gmail.com

¹(Corresponding Author)

ABSTRACT

This study was conducted with the aim of "Comparison of two methods cryolipolysis and strength training on reversibility of WHR and lordosis in overweight women. Statistical society of this study have been the women having abdominal lipid and lumbar lordosis who had referred to cryolipolysis center located in Tehran, Iran, in the time of between the beginning of October 2014 until the beginning of March 2015. For this purpose, three groups of 10, a total of 30 people were selected with simple sampling of mentioned statistical society. Flexible ruler was used in order to assess lordosis and caliper tools to assess WHR. Then each of the two cryolipolysis and resistive groups were exposed to cryolipolysis and strength training treatment for 8 weeks. Then no practices were given to tried people to assess the reversibility of the effect of each offered exercises for 8 weeks. Also a control group was added to the two mentioned groups to make a comparison basis. The results of data analysis on spss22 software with methods of ANOVA, MANOVA, U-Mann-Whitney, Kruskal-Wallis, Kolmogorov Smirnov and T-test revealed that reversibility of WHR in cryolipolysis method is lower than that of strength training. Also there was no significant difference between strength training and cryolipolysis methods in lordosis and the obtained result is not in effect of method.

KEYWORDS: cryolipolysis, strength training, lordosis,

1.1 INTRODUCTION

Advances in technology has reduced physical activity and created physical and psychological complications, including different skeletal and muscle deformities. Overweight is sign of chronic imbalance between the amount of consumable food and energy expenditure. Obesity is caused by genetic factors, edacity, change the metabolism of adipose tissue, decrease of physical activity without reducing the amount of consumable food. Obesity is the stored fat in the body more than average which is dependent on the type and total number of fat cells and overweight is called as the body weight according to height and body size of a person that be more than the normal weight standard (Sobhani et al, 1999). The prevalence of overweight is increasing in all societies and age groups in the world with an alarming rate. Obesity has become one of the important factors of disease and deaths that is preventable. The risk of emergence of diseases such as arthritis, lung problems, sleep apnea, type II diabetes, insulin resistance, metabolic syndrome, hypertension, hyperlipidemia, thromboembolism, gallstones, infertility, gout, heart failure, hypertension and cancer is increased commensurate with the severity of overweight in men and women and the risk of death is higher in overweight people (Vylarl et al., 2005; Zamboni et al., 2005).

Weight increase causes increase of exerted force on the spine and this overload causes changes in the spine. One of the problems that overweight makes in the abdominal area for individuals is lumbar lordosis (Robinson, 2001). Which can affect quality of life. The lumbar lordosis is a convex curvature in the spin area that is an adaptation in humans. Increase lumbar lordosis in humans will not return to genetic reasons in all cases. This complication in children is increased in the beginning of standing and walking time. The lumbar lordosis. The lumbar lordosis also increases in women during pregnancy (Wagner, 2012). Studies show that the incidence rate of spinal abnormalities in women is more than men (Vylarl et al., 2005). Wrong moving habits has diverted spinal alignment from its natural state and causes problems such as lordosis, and in the more advanced stages, lumbar hyper-lordosis (Yvdas et al., 2000).

Diagnosis spinal abnormalities and measuring connection angles is possible with using a variety of invasive and non-invasive methods (Wagner, 2012). Cryolipolysis is a non-invasive method that brings controlled cold to treat target areas and removes the fat cells in the treated area.

Cryolipolysis is one of the most common and latest methods of non-surgical treatment of local obesity. This method actually causes slow and planned death of fat cells that caused reduce of fat thickness within two to six months

(Zamboni et al., 2005). Therefore, the researcher is looking to examine and measure the amount of reversibility of lumbar lordosis after the period of two months of cryolipolysis in the area of the abdomen and flank of the first group and strength training on abdominal muscles of the second group.

1-2 Problem statement:

There is conflicting information about the relationship between body mass index with anomalies. Fabrice et al (2005) have examined changes of body condition in individuals suffering from obesity disease. In their research sample 78/1 percent of obese triable individuals and 23/3 percent of non-obese triable individuals had abnormal lumbar lordosis. (Fabrice et al., 2005).

In this regard, Kratnva et al (2007) stated that the increase in adipose tissue can cause to hide the skeletal abnormalities, but on the other hand the increase may have had an important role in enhancing the stability of the spine. Yvdasv et al (2006) also in two studies with an emphasis on lumbar spine area concluded that the difference in body mass index amount can't be effective on amount of lumbar lordosis in standing condition in men without back pain phenomenon. (Yvdas et al., 2006).

Women have less muscle than men. On the other hand, women during pregnancy which is associated with increased abdominal size, apply more pressure to the vertebral column. In addition, Relaxin hormone that is secreted during pregnancy, creates a relaxant effect on all joints of the body including spinal joints (Kagvnyv et al., 1999) and some of the researchers know this hormone effective on creating low back pain in pregnant women (Brydsn and et al., 1998). Weight increase causes an increase in the force to the vertebral column and this overload causes changes in the spine. There is a connection between obesity and destruction of inter-vertebral discs (Parkvlavhmkaran, 1992). Obviously, the lower part of the spinal column is more affected by overload. On the other hand, spine arches have a fundamental role at absorbing the incoming pressure and reinforcing it (Sobhani, 1999).

With regard to the above, this study seeks to answer the question that whether the reversibility of lordosis and WHR in obese women after reducing the abdominal fat are different in two cryolipolysis and strength training methods?

Research purposes

1-4-1 the main objective:

Comparison of cryolipolysis and strength training effects on the reversibility of lordosis and abdominal obesity (WHR) in treated overweight women

1-4-2 Specific objectives:

1. Study effect of cryolipolysis on the reversibility of abdominal fat (WHR) in treated overweight women.
2. Study effect of cryolipolysis on the reversibility of lordosis in treated overweight women.
3. Study effect of strength training on the reversibility of abdominal fat (WHR) in treated overweight women.
4. Study effect of strength training on the reversibility of lordosis in treated overweight women.
5. Comparison of the reversibility of lordosis in cryolipolysis and resistance training in treated overweight women.
6. Comparison of the reversibility of abdominal fat (WHR) in cryolipolysis and resistance training in treated overweight women.

1-5 Research Hypotheses:

1-5-1 the main hypothesis:

Cryolipolysis is affected more than strength training in the reversibility of lordosis and abdominal obesity in treated overweight women.

Sub-hypotheses:

The amount of WHR in overweight women during the reversibility is more than the post-test period in the group cryolipolysis.

The amount of lumbar lordosis of overweight women during the reversibility is more than the post-test period in the group cryolipolysis.

The amount of WHR in overweight women during the reversibility is more than the post-test period in the group strength training.

The amount of lordosis of overweight women in during the reversibility is more than the post-test period in the group strength training.

There is significant difference between the reversibility of lumbar lordosis in three groups of cryolipolysis, resistance training and control in treated women with abdominal fat

The reversibility of abdominal fat in cryolipolysis is more than resistance training in treated women with abdominal fat

Definitions of research words and idioms:

Abdominal obesity:

Obesity can be described as excessive residuum and fat accumulation in body tissues.

Obesity is usually created from eating too much of body physiological need.

Operational definition: abdominal obesity is considered as waist-to-hip (WHR) greater or equal to 8/0 in women and WHR greater or equal to 9/0 in men.

Strength

training

Conceptual definition: appropriate exercises and sport that is recommended to strengthen the abdominal and spine muscles.

Operational definition: given exercises to patient for strengthen of abdominal and spine muscles and treatment and improve of lumbar lordosis in during 8 weeks

Lumbar lordosis:

Conceptual definition: vertebral column in the lumbar area is along with natural arch. Excessive increase of lumbar arch in this area is called kyphosis or lumbar hyperlordosis (Yvdas et al., 2000).

Operational definition: In this way to measure the amount of lumbar lordosis from Yvdas method, is used from flexible ruler. For this purpose, the examiner determines and marks two T12 to S2 references point (Magi, DJ, 2002). After the two vertebrae were marked, we put one end of the ruler on the eleventh thoracic vertebrae and the other end on the first sacral vertebra and a curvature in accordance with lumbar curvature creates in ruler by pressing it and lumbar lordosis angle is calculated by formula (1-1) after the implementation of the curve on paper.

$$\theta = 4 \left[\text{Arctg} \left(\frac{2H}{L} \right) \right]$$

Formula (1-1)

In this formula θ is curve angle, L distance between initial and final point of the curve, and H the distance between the deepest point of the curve to line L (Hart, D. Voros, S. 1986).

WHR:

Conceptual definition: WHR or waist-to-hip ratio is the most important criterion for predicting a person's risk of obesity. WHR is an indicator of examination for obese people.

Operational definition: to hip individuals that is measured by tape measure, is said WHR or waist-to-hip ratio and to obtain it, waist (WC) was measured and registered in the most narrow part of it and hip circumference (HC) in the most prominent part then the waist-to-hip ratio (WHR) is measured. Abdominal obesity is as $\text{WHR} \geq 0.9$ for women and $\text{WHR} \leq 0.9$ for men.

Cryolipolysis:

Concept definition: Non-invasive way to eliminate fat cells that is done by professionals. In this method by using -8 degree to zero degree cold, the fat cells are eliminated and are excreted from the body within one month. Operational definition: using cold by cryolipolysis machine for 45 minutes in two abdominal points and two points on the sides and finally, after one or two months between 20 and 35 percent body fat is excreted.

RESEARCH METHODOLOGY

This study is from type of semi-experimental with pretest and post test and design a control group and two experimental group that compares the effect of strength training and cryolipolysis in reversibility of fat and lumbar lordosis in women with abdominal fat. Researcher in this study measures the amount of lumbar lordosis, waist-to-hip ratio (WHR), strength training to increase the strength of the abdominal muscles and cryolipolysis methods to reduce abdominal fat mass and is studied the relationship between these variables with together. First after complete description of the study for testing people, their consent were taken to participate in research.

Then individuals that were referred to Iran's cryolipolysis central, their personal details including weight, age, diet, abdominal fat mass, lumbar lordosis, body mass index and waist-to-hip ratio was measured as free. The inclusion criterion to study was having abdominal obesity and lumbar lordosis. Initial screening for lumbar lordosis was measured with flexible ruler and the diameter of abdominal fat with using calipers. Those who had 20 to 50 mm of fat in the abdominal and lumbar lordosis more than 30 degrees were included in this study. After evaluating these criterions, these people were divided randomly into three groups of 10 subjects matched. The first group for 2 months and repeat 3 times a week did strength training to reduce lordosis and abdominal fat mass. The practices were stopped after two months and people returned to their normal life style. After two months of detraining the amount of their abdominal fat mass and lordosis was measured again. Second group were under cryolipolysis two sessions in four abdominal and flank side. And the amount of their abdominal fat and lordosis were measured again after 2 months. The third group who was the control group, were not given any training.

3-3 Community and statistical sample and sampling method:

Statistical Society of this study was women with abdominal fat mass referred to Iran Cryolipolysis center to treat cryolipolysis for reducing fat mass in 1393 who also had lumbar lordosis. After obtaining the initial agreement, a total of 30 people of them was selected as purposeful and the count total and then they were randomly divided into three groups of 10 people, including control group, strength training and cryolipolysis group.

3-6 Data collection method:

Data collection method is the type of field and library. In library part has collected the needed information in this study with using of books and articles.

3-7 The data collection tool
In this study, we have used the following tools:

1. Personal Information Questionnaire
2. Digital Scale
3. Tape measure: the length of two meters to measure waist circumference, hip circumference with an accuracy of 1 mm.
4. Caliper: is tool to measure thickness of the fat layer of skin fold for initial screening.
5. Flexible ruler: is the narrow tape to length of 30 cm and a width of 1 cm of special metal and covered by plastic that bends just in a direction that in this case remains in the same shape and can take many forms and easily transferred to the paper. In various industries such as:

A variety of drawing, carpentry, sewing and physical education specifically used to measure the curves of the spine.

Measurement method (WHR):

Size of (WHR) was obtained by dividing the size of waist circumference to hip circumference.

$$WHR = ((m \text{ cm}) \text{ waist circumference}) / ((M \text{ cm}) \text{ hip circumference})$$

The waist measurement method:

To measure the subjects waist circumference, First, they was wanted to stand with a light dress, then, the narrowest part of the trunk (about 2 cm above the navel) was measured with a tape measure. Subjects were standing in normal mode, tape measure also has not put pressure to tape or was not too free.

3-12 hip circumference measurement methods:

To measure waist circumference, subjects stand in normal mode, then we put meter circumference greater part of the hip bump and hip circumference were measured. In this case, the pressure didn't enter to skin or tape measure was not too free.

Information gathering method

The beginning process in this study was in this case that the researcher has referred to Iran cryolipolysis center and selected the subjects of research, then, 30 subjects with lordosis and abdominal fat mass were selected as statistical sample used in the study. In the following researchers measures the amount of lordosis, abdominal fat and women's WHR. Then divided statistical sample using in the research into three groups: control, experimental with empirical and strength training with the cryolipolysis therapy method and took pre-test from them. Finally, after do abdominal strength training 8 weeks for first experimental group and two cryolipolysis meeting for a second experimental group, did second measurement, Then after 8 weeks that the experimental group returned to normal life, the second measurement was taken to determine the reversibility amount.

3-14 statistical methods

To analysis the research data were used T-dependent and T-independent statistical methods that calculations were performed with using spss software version 22.

Findings

In this chapter, first describes the statistical data in three periods pre-test, post-test and reversible in three groups of cryolipolysis, power and control by report of Indicators of central tendency and dispersion and then we analyze the collected data. The used method in this study to analyze the data is analysis of variance (ANOVA) or analysis of covariance (ANCOVA), t-test, U-Mann-Whitney, Kruskal-Wallis and Kolmogorov–Smirnov test.

Research hypotheses test:

4-4-1 first sub-hypothesis:

WHR in overweight women during the reversibility is more than the post-test period in the cryolipolysis group. Because the scores number of people in each group will change (from 30 points to 10 points), we run again the normal test of data distribution.

Table 3-4: Normality test of variables distribution

Kolmogorov–Smirnov test			
Significant degree	numbers	Statistics	
0/200	10	0/112	WHR2
0/200	10	0/123	WHR3

Kolmogorov–Smirnov test result is meaningless in regarding post-test data and reversibility two cryolipolysis and control test ($p > 0.05$), so we conclude that the distribution of variables are normal. In order to test this hypothesis, we used paired t-test.

Table 4-4: post-test t-test and period of reversibility

sig	Df	T			Error standard deviation	Standard deviation	Average	
			high limit	low limit				
0/520	9	-0/669	0/00714	-0/01314	0/00448	0/01418	-0/00300	Post test- period of reversibility

According to findings of table above it is clear that there is not significant correlation between the amount of WHR in reversibility period in the cryolipolysis group and post-test period of this group. Due to the significance level ($520 / 0\text{sig} =$) is more than $05/0$ ($05/0P>$), the test is not significant in terms of statistical. In other words, given the very small difference in WHR average in reversibility period of cryolipolysis group ($797/0=\mu$) of the post-test group ($794/0=\mu$) the first hypothesis can be rejected.

4-4-2-second sub-hypothesis:

The lumbar lordosis in overweight women during the reversibility is more than post-test period in the cryolipolysis group.

To test this hypothesis should compare the post-test scores of cryolipolysis method and control group with their scores in the reversibility stage. Because the scores number of people in each group will change (from 30 points to 10 points) we run again the normal test of data distribution.

Table 4-5: Normality test of variables distribution

Kolmogorov–Smirnov test			
Significant degree	Numbers	Statistics	
0/200	10	0/241	LORDOSIS ₂
0/103	10	0/212	LORDOSIS ₃

The result of Smironov Kolmogorov-test is meaningless in regarding post- test data and the reversibility of cryolipolysis group ($05/0<p$), so we conclude that the distribution of variables are normal.

Table 4-6: post-test t-test and period of reversibility

sig	Df	T			Error standard deviation	Standard deviation	Average	
			High limit	Low limit				
0/279	9	1/152	0/88893	0/28893	0/26034	0/82327	0/30000	Post test- period of reversibility

According to findings of table above it is clear that there is no significant correlation between the lordosis amount in reversibility period in cryolipolysis group and post-test period of this group. Due to the significance level of test ($279/0\text{sig} =$) is more than $05/0$ ($05/0p>$) so the test is not significant statistically. In other words, hypothesis is rejected, given the very small difference of abdominal fat average in reversibility period of cryolipolysis group ($100/34=\mu$) of the post-test group ($400/34=\mu$).

4-4-3-third sub-hypothesis:

WHR in overweight women during the reversibility period than post-test period in the strength training group is more.

Because the scores number of people in each group will change (from 30 points to 10 points), we run again the normal test of data distribution.

Table 4-7: Normality test of variables distribution

Kolmogorov–Smirnov test			
Significant degree	Numbers	Statistics	
0/200	10	0/164	WHR2
0/191	10	0/219	WHR3

The result of Smirnov Kolmogorov-test is meaningless in regarding post- test data and the reversibility of strength training group ($0.05 < p$), so we conclude that the distribution of variables are normal. In order to test this hypothesis, we use the paired t-test .

Table 4-8: post-test t-test and period of reversibility

sig	Df	T			Error standard deviation	Standard deviation	Average	
			High limit	Low limit				
0/427	9	-0/832	0/00859	-0/01859	0/00601	0/01900	-0/00500	Post test- period of reversibility

According to findings of table above it is clear that there is no significant correlation between the WHR amount in reversibility period in resistance group and post-test period of this group. Due to the significance level of test ($4.27/0.05 = 85.4$) is more than $0.05/0.05 > 1$ so the test is not significant statistically. In other words, third-hypothesis is rejected, given the very small difference of abdominal fat average in reversibility period of resistance group ($100/34 = \mu$) of the post-test group ($400/34 = \mu$).

4.4.4 The fourth sub-hypothesis:

lordosis in overweight women during the reversibility is more than post-test period in the resistance training group. Because the scores number of people in each group will change (from 30 points to 10 points), we run again the normal test of data distribution.

Table 4-9: Normality test of variables distribution

Kolmogorov–Smirnov test			
Significant degree	Numbers	Statistics	
0/067	10	0/254	LORDOSIS2
0/019	10	0/287	LORDOSIS3

The result of Smirnov Kolmogorov-test is meaningless in regarding post- test data of the resistance training group ($0.05 < p$), so we conclude that the distribution of variables are normal, but in regarding the reversibility period data is not normal, so for hypotheses test is used the U-Mann-Whitney nonparametric test.

Table 4-10: post-test t-test and period of reversibility

Significant	Z	Wilcoxon	Mann–Whitney	Rating Average	Numbers	Method
0/529	0/656-	96/500	41/500	9/65	10	Post-test
-	-	-	-	11/35	10	Period of reversibility

According to findings of table above it is clear that there is no significant correlation between the lumbar lordosis in reversibility period in strength group and post-test period of this group. Due to the significance level of test ($5.2/0.05 = 104$) is more than $0.05/0.05 > 1$ so the test is not significant statistically. In other words, fourth-hypothesis is rejected, given

the very small difference of lordosis average in reversibility period of strenght group ($900/32=\mu$) of the post-test group ($400/34=\mu$).

4-4-5-fifth sub-hypothesis:

There is significant difference between the reversibility of lumbar lordosis in three groups of cryolipolysis, strenght training and control in treated women with abdominal fat.

We used from the nonparametric equivalent of variance analysis, due to the non-normal distribution of data.

Table 4-11: Kruskal-Wallis test results

Rating Average	Number	method	
14/40	10	Cryolipolysis	Lordosis in reversibility stage
11/05	10	Power	
21/05	10	Control	
	30	Sum	

According to contained data in the table above the average of lordosis reversibility rating belongs to the control group is in the first rating, cryolipolysis in the second rating, and resistance training in the third rating.

Table 4-12: Chi-Square

Lordosis reversibility	
6/792	Chi-Square
2	Degree of freedom
0/034	Significant

According to contained data in the table above due to the significant level of 05/0 ($05 / 0P <$) is less then conclude that there is a significant difference between the groups in terms of reversibility LORDOSIS. To know there is a significant difference between which groups, we have used the Mann Whitney test.

Table 4-13: U- Mann-Whitney

Significant	Z	Wilcoxon	Mann-Whitney	Rating Average	Number	Method
0/481	-0/727	95/500	4/500	11/45	10	Cryolipolysis
-	-	-	-	9/55	10	Power
0/123	-0/156	84/500	29/500	8/45	10	Cryolipolysis
-	-	-	-	12/55	10	Control
0/007	-2/67	70	15	7	10	Power
-	-	-	-	14	10	Control

Due to the results of the U Mann Whitney test it is clear that there isn't significant difference between cryolipolysis group with the control group and strenght group. But there is significant difference between lumbar lordosis reversibility in strenght group and control. So, the fifth hypothesis is confirmed.

4-4-6-sixth sub-hypothesis:

There is significant difference between the reversibility of WHR in three groups of cryolipolysis, resistance training and control in treated women with abdominal fat.

Table 4-14: Levene's test results

Significant	Degree of freedom 1	Degree of freedom 1	Levene's test
0/103	27	2	2/479

According to contained data in the table above due to the significant level of 05/0 ($P > 0.05$) is more then conclude that the groups variance is homogeneous.

Table 4-15: One-way analysis of variance

Significant level	F test	Average squares	of Degree freedom	of Sum of Squares	
0/015	4/892	0/007	2	0/014	Between Groups
		0/001	27	0/039	Within Groups
			29	0/053	Sum

According to contained data in the table above due to the significant level of 05/0 ($P < 0.05$) is less then conclude that there was a significant difference between the groups in terms of reversibility WHR. We used the Scheffe post hoc test to know there is significant difference between which groups:

Table 4-16: Scheffé table

95% Confidence						
Low limit	High limit	Significant	Standard deviation	average difference	Method	Method
0/0001	-0/0881	0/051	0/01703	-0/04400	Resistance	Cryolipolysis
-0/0039	-0/0921	0/031	0/01703	-0/04800	Control	
0/0881	-0/0001	0/051	0/01703	0/04400	Cryolipolysis	Resistance
0/0401	-0/0481	0/973	0/01703	-0/00400	Control	
0/0921	0/0039	0/031	0/01703	0/04800	Cryolipolysis	Control
0/0481	-0/-401	0/973	0/01703	0/00400	Resistance	

According to the results of Scheffe post hoc test it is clear that there is a significant difference between the groups cryolipolysis and the control group, but there is no significant difference between the resistance group and the control group. In other words, the difference of scores during reversible abdominal fat between the control group and cryolipolysis is the result of cryolipolysis. But the difference between the scores of abdominal fat reversible between

resistance group with control is the result of chance. Then the sixth-hypothesis is confirmed. There is no significant difference between cryolipolysor of resistance group.

4-4-7- the main hypotheses:

Cryolipolysis more than strength training affects in reversibility of lumbar lordosis and WHR in treated overweight women.

we use the multivariate analysis of variance (MANOVA), In order to test the hypothesis.

4-4-2-1- M.BOX test:

Table 4-17: M.BOX Table

5/044	M.BOX
0/750	Ratio F
6	First release degree
18168/923	Second release degree
0/609	Significant degree

M.BOX test indicates the equality of Variance- Covariance tables of the dependent variables. This test is to the default of multivariate analysis of variance that dependent variables vector follows from a multivariate normal distribution. The multivariate analysis of variance assumption is fulfilled when this test is not meaningful.

4-4-2-2- Effect size test:

Table 4-18: Effect Size

Chi Eta share	Significant	F Statistics	Amount	Test	Independent variable
0/999	0/000	8704/978b	0/999	Pillai effect	Error
0/999	0/000	8704/978b	0/001	Lambda- Viklez	
0/999	0/000	8704/978b	669/614	Hetling Effect	
0/999	0/000	8704/978b	669/614	greatest root on	
0/193	0/019	3/223	0/385	Pillai effect	Method
0/197	0/020	3/187b	0/645	Lambda- Viklez	
0/201	0/022	3/145	0/503	Hetling Effect	
0/247	0/013	5/107c	0/378	greatest root on	

The table above is to demonstrate effect significant of each independent variable on variable or dependent variable. For this purpose, in the multivariate analysis of variance use from 4 test but always report one of these tests. This test is usually Wilkes lambda with values between 0 and 1 and whatever its value is closer to 0, the average of independent variables groups in each of the dependent variables are different from one another. However, the pillai effect is more powerful. In the above table can be seen that all 4 tests are meaningful, this means the independent variables and the

interaction of them have caused significant differences about dependent variables. Also the square of Etta share is the variance share of independent variables that is obtained with select of effect size estimate and whatever the amount of it is more than 14/0, represents a greater effect size.

CONCLUSION

This study notes the reversibility of lordosis and WHR with using two methods of strength training and cryolipolysis in women with abdominal fat mass. There was not a significant reduction in the standard deviation of lordosis after 8 weeks of detraining. The important thing that is in breeding and treatment program is the continuity and perseverance in corrective and power training. It is necessary Individuals put training programs in their daily activities in a consistent way to correct the lordosis and WHR. It is necessary to say that strength training is needed to simultaneous strengthen of main and accessory muscles. When practitioners and the reform program be discontinued, lordosis with time returns to its original state, even after a short time has not reversible and goes to improvement. In the case of lordosis and WHR reversibility with using cryolipolysis method has been done the extensive research but according to the results of this study can be said WHR variables reversibility has been affected by cryolipolysis procedure and scores difference of WHR reversibility between resistance and control group is due to chance. Also lordosis reversibility has been affected by resistance training and scores difference of lordosis reversibility between cryolipolysis and control group is due to chance.

REFERENCES

- Altan O, Vedats, omera. (1999)**, Waist Circumference and waist to Hip Ratio in Turkish Adults Interrelation with other risk Factors and Association with cardiovascular Disease. *Int. J. Cardiology*. 70(1): 43-50.
- Andrew A Nelson, Daniel Wasserman, Mathew M Avram (2009)**, Cryolipolysis for reduction of excess adipose tissue. *Semin Cutan Med Surg*. 28(4):244-9.
- Andrew A. Nelson, MD, Daniel Wasserman, MD, and Mathew M. Avram, MD, (2009)**, Cryolipolysis for Reduction of Excess Adipose Tissue, JD1085-5629/09/\$-see front matter © Elsevier Inc. All rights reserved. doi:10.1016/j.sder.11.004
- Bray G A, Gray D S. (1984)**. Obesity part I-pathogenesis western Journal of Medicine 149: 429-447.
- Fabris de Souza SA, Faintuch J, Valezi AC, Sant'Anna AF, Gama-Rodrigues JJ, de Batista Fonseca IC, et al. (2005)**. Postural changes in morbidly obese patients. *Obes Surg* 2005; 15(7): 1013-6.
- Faigenbaum AD, Westcott WL, Micheli LJ, Outerbridge AR, Long CJ, LaRosa-Loud R, et al. The Effects of Strength Training and Detraining on Children (1996)**. *The J. Strength and Conditioning. Res.* 10(2):109-14.
- Gardner move MG, stokes Ian AF, (1998)**, The Effects of Abdominal Muscle Coactivation on Lumbar spine stability spain, vol B,(2): 86-92
- Guo. M, Zhong G Q, Alimujiang. (2008)**, Effect of BMI and WHR on Lumbar Lordosis and sacrum slant Angle in Middle and Elderly Women, *zhongguo Gushang* 21(1):30-1.
- Hammer LD, Wilson DM, et al. (1991)**. Impat of pubertal Development on Body Fat Distribution Among white, His panicand. *J. Pediatrics* 118: 975-980.
- Hart DL, Rose. SJ (1982)**. Reliability of A Noninvasive Method for Measuring the Lumbar curve. *J. Sport Phys Ther*, (8): 180-184.
- Jakicic J M. and ponnelly E, et al. (1993)**. Association Between Blood and Different Measures of body Fat Distribution. *Int. Obesity*. 17: 131-137.
- Kendall F P, McCreary EK. (1983)**. provance, PG: Mascle Testing and Function, 4 the ed 4, wiliams & wilkins, Baltimore.
- Leroux Michel A. PhD; Zabjek, Karl MSc; Simard, Geneviève; Badeaux, Johanne; Coillard, Christine MD; Rivard Charles H. MD1 (2000)**, A Noninvasive Anthropometric Technique for Measuring Kyphosis and Lordosis: *An Application for Idiopathic Scoliosis*. 25(13): 1689-1694.
- Murrie V. L., A. K. Dixon, W. Hollingworth, H. Wilson, T. A. C. Doyle,(2003)**, Lumbar Lordosis: Study of Patients With and Without Low Back Pain, *Clin. Anatomy*.16:144 –147.
- Norris CM (1994)**. Abdominal muscle training physio therapy in sport 5, pp: 10-14.
- PanJabi M, et al. (1989)**. Physiologic strains in the Lumbar spinal Ligaments, spine 7:192.
- Rafaela Vidal, Laura Segura, Paulo Vergara, (2015)**, Hernán Pinto Journal of Surgery; 3(1-1): 6-7.
- Robaki A.L., Fowler. N E, et al. (2005)**, Body Mass as a Factor in stature change, *Clin. Biomech.* (Bristol, Avon), 20(8): 799-805.

- Robinson K. (2001)**, Robinson nutrition principles. Translator Khaldi N, Tehran, Salemi press.
- Shavandi N., Shahrjerdi S, Heidarpor R, Sheikh Hoseini R. The effect of 7 weeks corrective exercise on thoracic kyphosis in hyper-kyphotic students (2011).** *J Shahrekord Univ Med Sci.* 13(4):42-50 [Article in Farsi].
- Sinaki M, Itoi E, Wahner HW, Wollan P, Gelzcer R, Mullan BP, et al (2002).** Stronger back muscles reduce the incidence of vertebral fractures: a prospective 10 year follow-up of postmenopausal women. *Bone.* 30(6):836-41.
- Sobhani A. Gh, Azari H. (1999)**, Kinesiology of body joints and spine. Tehran, Art World
- Tanaka S, Togashi K, Rankinen T, Perusse L, (2002)**, Leon A et al. Is adiposity abnormal body weight? Relevant for cardiovascular disease risk? *Int. J. Obes. Relat. Metab. Disord.* 26(2): 176183.
- Teixria P. J, Sardinaha L. B, going S. B and Lohman T. G. (2001)**, Total and Regional fat serum Cardiovascular disease risk factors in lean and obese children and adolescents. *Obesity Res.* 9: 432442.
- Toppenberg R, Bullock M. (1986).** The interrelation of spinal curve pelvic Tilt and Muscle Length in The Adolescent female. *Australian J. Physiotherapy.* 32: 6-12.
- Vielle R., M.D, levassor N, M.D, Rellardon N, et al. (2005)**, radiographic analysis of the sagittal alignment and balance of the spine in asymptomatic subjects. *J. Bone Joint Surg Am.* 87:260-267
- Villareal DT, Apovian CM, Kushner RF and Klein S. (2005)**, obesity in older adults: technical review and position statement of the American society for nutrition and NAASO, the obesity society. *Obes. Res.* 13:1849-63.
- Wagner H, (2012)**, spinal lordosis optimizes the requirements for a stable erect posture, wagner et al. theoretical biology and medical modeling 9:13-7.
- World Health Organization. (2000)**, Obesity: preventing and managing the global epidemic report of a WHO consultation. *World health Organ. Tech. Rep. Ser.* 894:1-253.
- Youdas J W, M. (2000).** Lumbar Lordosis and pelvic inclination In Adults with chronic LBP. *Physical Therapy.* 261-75.
- Youdas J. W. Garrett, T. R. Egan, K. S. Therneau, T. M. (2000).** Lumbar lordosis and pelvic inclination in adults with chronic low back pain. *Physical Therapy.* 80.
- Youdas, J. W., Hollman, J., Krause, D. (2006).** "The effects of gender, age, and body mass index on standing lumbar curvature in persons without current low back pain." *Physiother Theory Pract.* 22(5):229-37.
- Zamboni M, mazzali G, zoico E, harris TB, meigs JB, di Francesco V, fantin F, bisoli L and bosello O. (2005)**, the consequences of obesity in the elderly :a review of four unresolved questions. *Int. Obs.* 29:1011-29.
- Zhongguo Gu Shang. (2008)**, Effect of BMI and WHR on lumbar lordosis and sacrum slant angle in middle and elderly women; 21(1):30-1, Guo JM1, Zhang GQ, Alimujiang. PUBMED.