EFFE\textsc{C}T OF 30 D\textsc{A}Y S A\textsc{B}DOMINALS C\textsc{H}ALLENGE V\textsc{E}RS\textsc{U}S 30 D\textsc{A}Y S P\textsc{L}ANKS C\textsc{H}ALLENGE ON W\textsc{A}IST C\textsc{U}RCUMFERENCE AND A\textsc{B}DOMINAL S\textsc{K}IN F\textsc{OLD} M\textsc{E}ASUREMENTS IN H\textsc{E}ALTHY Y\textsc{O}UNGE R I\textsc{N}DIVIDUALS: R\textsc{A}N\textsc{D}OMIZED C\textsc{L}INICAL T\textsc{R}IAL

Santosh Metgud \textsuperscript{1}, Charleen D'Silva *\textsuperscript{2}, Anand Heggannavar \textsuperscript{3}.

\textsuperscript{1} Associate Professor and HOD, Department of Orthopedic Manual Therapy, KLE University’s Institute of Physiotherapy, KLE University, Belagavi, Karnataka, India.
\textsuperscript{2} Post Graduate Student, Department of Orthopedic Manual Therapy, KLE University’s Institute of Physiotherapy, KLE University, Belagavi, Karnataka, India.
\textsuperscript{3} Assistant Professor, Department of Orthopedic Manual Therapy, KLE University’s Institute of Physiotherapy, KLE University, Belagavi, Karnataka, India.

ABSTRACT

Background: With urbanization and development there is reduction in physical activity. According to statistics, about 10-20\% of children in India are obese. This number increases to upto 30\% among adolescents. About 2/3\textsuperscript{rd} of children with obesity continue to be obese in adult life. A number of physical health problems are associated with obesity.

Purpose: To evaluate and compare the effect of 30 days abdominals challenge versus 30 days planks challenge on waist circumference and abdominal skin fold measurements in healthy young individuals.

Materials and Methods: 60 subjects aged between 18 to 30 years were included. The subjects were conveniently selected and then divided into 2 groups: 30 days Abdominals challenge and 30 days Planks challenge. Demographic data and waist circumference, hip circumference, waist hip ratio and skin fold measurement at the abdominals was noted pre and post the intervention. Subjects had to follow a set protocol with respective rest periods in between for 30 days.

Results: Post intervention a mean difference of 2.58 ± 1.87 was seen in the waist circumference in the Abdominals group whereas a mean difference of 1.88 ± 1.39 was noted in the waist circumference in the Planks group. The abdominal skin fold measurements showed a mean difference of 5.10 ± 3.32 in the Abdominals group while a mean difference of 4.14 ± 3.14 was seen in the Planks group. There was no statistical significance found between both the groups with p value more than 0.0001.

Conclusion: The 30 days Abdominals challenge and 30 days Planks challenge are equally effective in reduction of waist circumference and abdominal skin fold measurements.

KEY WORDS: Abdominal Obesity, Abdominal Skin Fold Measurements, 30 Days Abdominals Challenge, 30 Days Planks Challenge.

Address for correspondence: Dr. Charleen D'Silva, PT, Post Graduate Student, Department of Orthopedic Manual Therapy, KLE University’s Institute of Physiotherapy, KLE University, Belagavi, Karnataka, India. E-Mail: charleen_dsilva@yahoo.in

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INTRODUCTION

Quality of life of individuals varies and it is influenced by lifestyle, infrastructure, emotional and social wellbeing. People who are inactive are more likely to gain weight. Obesity is a worldwide epidemic and is characterized by excess adipose tissue. It contributes to numerous chronic diseases and early mortality.

To predict weight related risk, BMI and waist circumference are most commonly used. Measurements of height, weight, circumferences and skinfolds are used to estimate body composition. The principle behind the skin fold measurement technique is that the amount of subcutaneous fat is proportional to the total amount of body fat and it is assumed that close to one third of the total fat is located subcutaneously [1]. Skin fold measurement at the abdomen is taken at the vertical fold; 2 cm to the right side of the umbilicus with the subject in standing [1].

Waist circumference is measured with the subject standing, arms at the sides, feet together and abdomen relaxed, a horizontal measure is taken above the umbilicus and below the xiphoid process [2]. In Asian populations; abdominal or central obesity is more common than obesity defined by BMI. A study in India observed that about 20% of adults who were not overweight or obese as per the BMI definition still had abdominal obesity [3].

Hip circumference is measured with the subject standing erect and feet together, a horizontal measure is taken at the maximal circumference of buttocks [4]. Health risk is very high for young men when WHR is more than 0.95 and for young women when WHR is more than 0.86 [5].

As there is an increase in the awareness among the people about the various risk factors associated with obesity, many individuals are undergoing different weight reduction programs. According to statistics, about 10-20% of children in India are obese. This number increases to up to 30% among adolescents. About 2/3rd of children with obesity continue to be obese in adult life [6]. So, obesity is becoming an evolving health problem and it has to be taken care of.

Abdominals and plank exercises consume less time and so they can be incorporated in hectic schedules. These exercises have individual benefits like crunches, sit ups and leg raises work only on the anterior portion of the core muscles whereas planks work on the entire core muscles as well as many other muscles in the body [7]. Since the 30 days Abdominals and 30 days Planks challenge is being used by many health clubs, a comparison as to which one is more beneficial has to be studied.

MATERIALS AND METHODS

An approval for the study was obtained from the Institutional Ethical Committee. 60 subjects aged between 18 to 30 years, both males and females and individuals who were not undertaking any other forms of treatment for weight reduction were included. Exclusion consisted of individuals with recent spinal trauma, upper or lower limb fractures and low back pain with / without neurological symptoms. Subjects were conveniently selected and randomly divided into 2 groups: 30 days abdominals challenge and 30 days planks challenge. Demographic data was collected. Waist circumference [2], hip circumference [4], waist hip ratio and skin fold measurement at the abdominals [1] was measured using the skin fold caliper pre and post the 30 days intervention. Subjects had to follow a set protocol with respective rest periods in between for 30 days.

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**Fig. 1:** 30 days Abdominals challenge exercises.
EXERCISE PROTOCOL

30 days Abdominals challenge

<table>
<thead>
<tr>
<th>Day</th>
<th>Exercises</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day 1</td>
<td>15 sit ups, 5 crunches, 5 leg raises, 10 seconds planks</td>
</tr>
<tr>
<td>Day 2</td>
<td>20 sit ups, 8 crunches, 8 leg raises, 12 seconds planks</td>
</tr>
<tr>
<td>Day 3</td>
<td>25 sit ups, 10 crunches, 10 leg raises, 15 seconds planks</td>
</tr>
<tr>
<td>Day 4</td>
<td>REST DAY</td>
</tr>
<tr>
<td>Day 5</td>
<td>30 sit ups, 12 crunches, 12 leg raises, 20 seconds planks</td>
</tr>
<tr>
<td>Day 6</td>
<td>35 sit ups, 15 crunches, 15 leg raises, 25 seconds planks</td>
</tr>
<tr>
<td>Day 7</td>
<td>40 sit ups, 20 crunches, 20 leg raises, 30 seconds planks</td>
</tr>
<tr>
<td>Day 8</td>
<td>REST DAY</td>
</tr>
<tr>
<td>Day 9</td>
<td>45 sit ups, 30 crunches, 30 leg raises, 38 seconds planks</td>
</tr>
<tr>
<td>Day 10</td>
<td>50 sit ups, 50 crunches, 30 leg raises, 38 seconds planks</td>
</tr>
<tr>
<td>Day 11</td>
<td>55 sit ups, 65 crunches, 33 leg raises, 42 seconds planks</td>
</tr>
<tr>
<td>Day 12</td>
<td>REST DAY</td>
</tr>
<tr>
<td>Day 13</td>
<td>60 sit ups, 75 crunches, 40 leg raises, 50 seconds planks</td>
</tr>
<tr>
<td>Day 14</td>
<td>65 sit ups, 85 crunches, 42 leg raises, 55 seconds planks</td>
</tr>
<tr>
<td>Day 15</td>
<td>70 sit ups, 95 crunches, 42 leg raises, 60 seconds planks</td>
</tr>
<tr>
<td>Day 16</td>
<td>REST DAY</td>
</tr>
<tr>
<td>Day 17</td>
<td>75 sit ups, 100 crunches, 42 leg raises, 65 seconds planks</td>
</tr>
<tr>
<td>Day 18</td>
<td>80 sit ups, 110 crunches, 48 leg raises, 70 seconds planks</td>
</tr>
<tr>
<td>Day 19</td>
<td>85 sit ups, 120 crunches, 50 leg raises, 75 seconds planks</td>
</tr>
<tr>
<td>Day 20</td>
<td>REST DAY</td>
</tr>
<tr>
<td>Day 21</td>
<td>90 sit ups, 130 crunches, 52 leg raises, 80 seconds planks</td>
</tr>
<tr>
<td>Day 22</td>
<td>95 sit ups, 140 crunches, 55 leg raises, 85 seconds planks</td>
</tr>
<tr>
<td>Day 23</td>
<td>100 sit ups, 150 crunches, 58 leg raises, 90 seconds planks</td>
</tr>
<tr>
<td>Day 24</td>
<td>REST DAY</td>
</tr>
<tr>
<td>Day 25</td>
<td>105 sit ups, 160 crunches, 60 leg raises, 95 seconds planks</td>
</tr>
<tr>
<td>Day 26</td>
<td>110 sit ups, 170 crunches, 60 leg raises, 100 seconds planks</td>
</tr>
<tr>
<td>Day 27</td>
<td>115 sit ups, 180 crunches, 62 leg raises, 110 seconds planks</td>
</tr>
<tr>
<td>Day 28</td>
<td>REST DAY</td>
</tr>
<tr>
<td>Day 29</td>
<td>120 sit ups, 190 crunches, 62 leg raises, 115 seconds planks</td>
</tr>
<tr>
<td>Day 30</td>
<td>125 sit ups, 200 crunches, 65 leg raises, 120 seconds planks</td>
</tr>
</tbody>
</table>

30 days Planks challenge

<table>
<thead>
<tr>
<th>Day</th>
<th>Exercises</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day 1</td>
<td>20 seconds</td>
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<tr>
<td>Day 2</td>
<td>20 seconds</td>
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<tr>
<td>Day 3</td>
<td>30 seconds</td>
</tr>
<tr>
<td>Day 4</td>
<td>30 seconds</td>
</tr>
<tr>
<td>Day 5</td>
<td>40 seconds</td>
</tr>
<tr>
<td>Day 6</td>
<td>REST DAY</td>
</tr>
<tr>
<td>Day 7</td>
<td>45 seconds</td>
</tr>
<tr>
<td>Day 8</td>
<td>45 seconds</td>
</tr>
<tr>
<td>Day 9</td>
<td>60 seconds</td>
</tr>
<tr>
<td>Day 10</td>
<td>60 seconds</td>
</tr>
<tr>
<td>Day 11</td>
<td>60 seconds</td>
</tr>
<tr>
<td>Day 12</td>
<td>90 seconds</td>
</tr>
<tr>
<td>Day 13</td>
<td>REST DAY</td>
</tr>
<tr>
<td>Day 14</td>
<td>90 seconds</td>
</tr>
<tr>
<td>Day 15</td>
<td>90 seconds</td>
</tr>
<tr>
<td>Day 16</td>
<td>120 seconds</td>
</tr>
<tr>
<td>Day 17</td>
<td>120 seconds</td>
</tr>
<tr>
<td>Day 18</td>
<td>150 seconds</td>
</tr>
<tr>
<td>Day 19</td>
<td>REST DAY</td>
</tr>
<tr>
<td>Day 20</td>
<td>150 seconds</td>
</tr>
<tr>
<td>Day 21</td>
<td>150 seconds</td>
</tr>
<tr>
<td>Day 22</td>
<td>180 seconds</td>
</tr>
<tr>
<td>Day 23</td>
<td>180 seconds</td>
</tr>
<tr>
<td>Day 24</td>
<td>210 seconds</td>
</tr>
<tr>
<td>Day 25</td>
<td>210 seconds</td>
</tr>
<tr>
<td>Day 26</td>
<td>REST DAY</td>
</tr>
<tr>
<td>Day 27</td>
<td>240 seconds</td>
</tr>
<tr>
<td>Day 28</td>
<td>240 seconds</td>
</tr>
<tr>
<td>Day 29</td>
<td>270 seconds</td>
</tr>
<tr>
<td>Day 30</td>
<td>300 seconds</td>
</tr>
</tbody>
</table>

Fig. 2: 30 days Planks challenge exercises.

STATISTICAL ANALYSIS

Post the intervention paired and un-paired t-test was used to analyze the data which was assessed on the basis of p value which should be < 0.0001.
RESULTS

Table 1: Demographic data.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Abdominals group</th>
<th>Planks group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>20.58 ± 1.97</td>
<td>22 ± 1.57</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>22.19 ± 2.74</td>
<td>24 ± 3.51</td>
</tr>
</tbody>
</table>

Table 2: Analysis of 30 days Abdominals challenge group using paired t-test (n=29).

<table>
<thead>
<tr>
<th>PARAMETERS</th>
<th>Mean ± SD</th>
<th>p value</th>
<th>t value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hip circumference</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre</td>
<td>101.24 ± 8.68</td>
<td>&lt;0.0001</td>
<td>5.88</td>
</tr>
<tr>
<td>Post</td>
<td>99.87 ± 8.30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Waist circumference</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre</td>
<td>77.77 ± 7.67</td>
<td>&lt;0.0001</td>
<td>8.2</td>
</tr>
<tr>
<td>Post</td>
<td>75.39 ± 7.63</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Waist Hip Ratio</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre</td>
<td>0.76 ± 0.05</td>
<td>0.0003</td>
<td>4.12</td>
</tr>
<tr>
<td>Post</td>
<td>0.75 ± 0.05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Abdominal skin fold</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre</td>
<td>33.69 ± 5.51</td>
<td>&lt;0.0001</td>
<td>8.27</td>
</tr>
<tr>
<td>Post</td>
<td>28.58 ± 4.97</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3: Analysis of 30 days Planks challenge group using paired t-test (n=27).

<table>
<thead>
<tr>
<th>PARAMETERS</th>
<th>Mean ± SD</th>
<th>p value</th>
<th>t value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hip circumference</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre</td>
<td>105.52 ± 8.27</td>
<td>&lt;0.0001</td>
<td>9.05</td>
</tr>
<tr>
<td>Post</td>
<td>103.72 ± 7.81</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Waist circumference</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre</td>
<td>79.24 ± 8.16</td>
<td>&lt;0.0001</td>
<td>7.03</td>
</tr>
<tr>
<td>Post</td>
<td>77.35 ± 8.12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Waist Hip Ratio</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre</td>
<td>0.74 ± 0.05</td>
<td>0.06</td>
<td>1.95</td>
</tr>
<tr>
<td>Post</td>
<td>0.74 ± 0.05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Abdominal skin fold</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre</td>
<td>35.63 ± 7.38</td>
<td>&lt;0.0001</td>
<td>6.85</td>
</tr>
<tr>
<td>Post</td>
<td>31.48 ± 6.50</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4: Comparison between the groups using un-paired t-test.

<table>
<thead>
<tr>
<th>PARAMETERS</th>
<th>Abdominals group</th>
<th>Planks group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hip circumference</td>
<td>1.36 ± 1.24</td>
<td>1.79 ± 1.03</td>
</tr>
<tr>
<td>Waist circumference</td>
<td>2.58 ± 1.87</td>
<td>1.88 ± 1.39</td>
</tr>
<tr>
<td>Waist Hip Ratio</td>
<td>0.013 ± 0.01</td>
<td>0.006 ± 0.01</td>
</tr>
<tr>
<td>Abdominal skin fold</td>
<td>5.10 ± 3.32</td>
<td>4.14 ± 3.14</td>
</tr>
</tbody>
</table>

As seen in Table 2, there was a significant difference in the waist circumference, hip circumference, Waist Hip Ratio and abdominal skin fold measurements in the Abdominals group with p value <0.0001. The results shown in Table 3 states that there was a significant difference in the waist circumference, hip circumference and abdominal skin fold measurements in the Planks group with p value <0.0001. While the Waist Hip Ratio had no significant difference with a p value of 0.0620.

As seen in Graph 1, post intervention a mean difference of 2.58 ± 1.87 was seen in the waist circumference in the Abdominals group whereas a mean difference of 1.88 ± 1.39 was noted in the waist circumference in the Planks group. The abdominal skin fold measurements showed a mean difference of 5.10 ± 3.32 in the Abdominals group while a mean difference of 4.14 ± 3.14 was seen in the Planks group. There was no statistical significance found between both the groups with p value >0.0001.

DISCUSSION

The study was done to find the effect of 30 days Abdominals challenge versus 30 days Planks challenge on waist circumference and abdominal skin fold measurements in healthy young individuals. 60 subjects participated in this study out of which there was 1 dropout in the Abdominals group and 3 dropouts in the Planks group due to occurrence of back pain and musculoskeletal injuries such as ligament tear and sprains.

Exercise programs (aerobic or resistance training) may lead to differential regional adipose tissue depot loss, possibly by differential regional alterations of adipose tissue depot metabolism.

Several studies have shown that exercise induced relative loss of fat seems to be higher...

It is seen that people practicing vigorous activities on a regular basis had lower subcutaneous skinfold thicknesses and waist-to-hip ratios than those not performing these activities [10].

A study done by Frank I. Katch et al reported that the conventional sit up exercises does not preferentially reduce adipose cell size or subcutaneous fat thickness in the abdominal region to a greater extent compared to other adipose sites and significant changes in fat cell size may occur in the absence of changes in fatfolds, girths or total body composition [11].

As seen in Table 3 the Waist Hip Ratio had no significant difference in the Planks group which is supported by a study, that reductions in visceral and total abdominal fat occurs in the absence of changes in body mass and waist circumference [12].

In the Planks group, subjects had to hold plank position for a duration which progressively increased each successive day. The rectus abdominis and transverse abdominis are primary supporters during plank exercises while the obliques also stabilize the plank position isometrically. Subcutaneous fat is reduced in localities where muscles are active and in proportion to their activity [13].

Since there was no significant difference between Abdominals and Plank groups proving that both the groups were equally effective in showing results. The limitations of this study were that subjects more than 30 years of age were not included, daily dietary intake was not checked, long term effect of the exercises were not taken into account due to a short study duration and gender distribution in both the groups was unequal. Future studies on comparison of these exercises on BMI and weight of an individual could be done. Objective outcomes like ultra sonography and EMG could also be used.

CONCLUSION

Post the intervention, there was a 3.06% change noted in waist circumference in the Abdominals group whereas a change of 2.38% was observed in the Planks group. While the abdominal skin fold measurements showed 15.16% change in the Abdominals group and 11.64% change in the Planks group. Clinically, the Abdominals group was more effective but statistically there was no significant difference found between both the groups. Thus, the 30 days Abdominals and 30 days Planks exercises were equally effective in showing results on waist circumference and abdominal skin fold measurements.

ABBREVIATIONS

BMI - Body Mass Index
WHR - Waist Hip Ratio
ABS group - Abdominals group

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We express our sincere gratitude to all the subjects who participated in this study. We are also grateful to the management and staff of KLE's Institute Of Physiotherapy for allowing us to conduct this study.

Conflicts of interest: None

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