“IMPACT OF RESISTANCE TRAINING ALONG WITH VEGETARIAN AND OMNIVOROUS DIET ON MUSCLE GROWTH AND MUSCLE STRENGTH: A COMPARATIVE STUDY”

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ABSTRACT

INTRODUCTION:
Exercise play vital role in human well being and the people of today’s era are very much aware about it. To maximize their result, along with training, they know the importance of correct food for their growth. Infact nutrition play major role to increase muscle growth and strength than training itself. Resistance training is a type of exercise that uses outside resistance to improve hypertrophy, strength, and endurance. [2] Lifting weights and working out alone won't help you build muscle or increase strength or hypertrophy. [4]

AIM:
The aim of our study to determine the impact of resistance training on individual taking either vegetarian diet or omnivoros diet on muscle growth and strength.

SUBJECT AND METHOD:
First we distributed google form among the members who were going to gym for at least 6 months of duration. After seeing all the google forms and on the basis of our inclusion and exclusion criteria we selected 105 individuals for our study. Among them 52 are ones who were followed vegetarian diet and 53 were the ones who follow omnivorous diet. All the participants had performed resistance training and follow their respective diet for 6 months. Before starting the training we measured the biceps girth of both side and biceps strength by girth measurement and 1RM. After completion of 6 months, we again measured the biceps girth and strength by girth measurement and 1RM in both groups.

RESULT:
After the SPSS and analysis the results came out which stated that the Group B had significant improvement in circumference of biceps of both side as well as muscle strength of biceps. In Group A there was also growth of biceps and increase strength of biceps muscle but as compared to group B it was not that significant.

CONCLUSION:
This study suggests that the individuals were taking omnivoros diet had more increase in muscle growth and muscle strength as compare to the individuals who were taking vegetarian diet.

KEY WORDS: RESISTANCE TRAINING, VEGETERIAN DIET, OMNIVOROUS DIET, 1 RM

INTRODUCTION:
A person's capacity for adaptation through exercise training enables them to compete at the pinnacle of their sporting event and/or keep up their top physical condition for the duration of their lives. Our understanding of the adaptations that emerge from exercise is always expanding as a result of our ongoing effort to learn how to prescribe exercise to maximise health and/or performance outcomes. In addition to highlighting significant unanswered questions regarding how we adapt to training, this review will concentrate on recent and novel findings into adaptations to endurance and strength training. [1]

EXERCISE TRAINING:
Adaptations are changes in the food storage, quantity and type of metabolic enzymes, quantity of contractile protein, and stiffness of the connective tissue, to name just a few. Consequently, although though exercise is frequently referred to as a single stimulus and we have searched for universal responses, how any individual responds to exercise training will differ based on factors we understand and (likely) many more that we do not. This article will, as is customary, concentrate on what we already know while highlighting crucial issues about how we respond to training. [2] Exercise is typically divided into power/strength and aerobic/endurance activities. Strength training is traditionally done with a relatively high load for a brief period of time, whereas endurance training is traditionally done with a relatively low load over a longer period of time. Pure strength and endurance training, however, is uncommon. Concurrent exercise is the phrase for the majority of activities that combine strength and endurance. [2]
STRENGTH TRAINING:

Resistance training is a type of exercise that uses outside resistance to improve hypertrophy, strength, and endurance. It covers a wide range of activities, such as: Bodyweight exercises like push-ups and pull-ups, Weightlifting, using tools from the gym such as kettle bells, barbells, and bands [2]. Muscles can adapt or change thanks to resistance training. Resistance training can benefit from the following in addition to strength and hypertrophy adaptations: Power is the capacity to exert the greatest amount of force in the shortest amount of time, often known as explosive power. Muscular endurance is the capacity to exert and maintain force for a lengthy period of time. Stability: promotes joint stability and range of motion. Strength training causes neuromuscular adaptations that increase muscle strength and power. resistance exercise through time changes in strength, mass, and brain adaptations. Studies on resistance training (8–12 weeks of training) show that brain changes lead to an early improvement in strength. Once neural adaptations start to plateau with extended strength training, muscle mass progressively grows and drives the subsequent gains in strength. [2]

NEURAL ADAPTATION

Neural adaptations are the initial signals of muscle adaptation to strengthening workouts. Several studies have shown that changes to the neural system play a major role in the early strength increases brought on by resistance training. In a seminal study, Moritani and DeVires discovered that “neural variables” were responsible for the considerable gains shown in the first four weeks of an eight-week resistance-training regimen [3]. The ongoing strength increases with repeated resistance training are explained by a secondary brain adaptation. During the sixth and twelfth months, brain adjustments go through their second phase. [3] Lifting weights and working out alone won’t help you build muscle or increase strength or hypertrophy. A regular exercise regimen and a healthy diet are both necessary for any form of body composition change, whether fat loss or muscle building. Although muscle growth is gradual, people can achieve their strength goals more quickly with the appropriate diet and healthy eating habits. [4] This macronutrient is crucial since proteins make up a major portion of muscle tissue, Amino acids make up protein. They are crucial for growth and repair and are frequently referred to as the building blocks of proteins. [4] Around 0.81 grams of protein per kilogram of body mass is sufficient for sedentary people. Thus, a 150-pound individual would consume around 55.5 grams of protein per day. The Academy of Nutrition and Dietetics and the American College of Sports Medicine both advise active people to consume 1.2 to 1.7 grams of protein per kilogram of body weight. If you weigh 150 pounds, this equates to 95 to 136 grams of protein each day. According to a recent study that looked at 49 other studies, 1.6 grams of protein per kilogram of body mass is the recommended daily intake for building muscle. This translates to 109 grams of protein daily for the 150-pound individual. [4] The term “diet” frequently connotes the utilization of a particular nutritional intake for health or weight management purposes [5].

RELATION OF RESISTANCE TRAINING WITH VEGITERAIN DIET AND OMNIVOROUS DIET:

Current protein recommendation for muscle growth is 1.7 grams - 2.6 grams of protein per kilogram of body weight per day. [8] The other hindrance for vegans is the amino acid leucine: one of three BCAAs and key regulators behind muscle growth. The simple fact is that plant proteins are lower in leucine. Moreover, we need about 40-45 mg of leucine per kilogram of body weight per day. So, somebody who is 80 kilograms will require 3.6 grams of leucine per day. [8] Research conducted in 2021 more or less asked this question, endeavoring to find what happens when you match the protein in the diet of a vegan and omnivore, have them perform weight training, give them protein powder supplements, and see who gains more muscle and strength. [8, 9] Specifically, the untrained young men supplemented with either whey protein powder (the omnivores) whilst the vegans were given soy protein powder. They also consumed diets in whole foods. In this study we are going to check whether the types of diet play such significant role in strength training or it is the total amount of protein that body require irrespective of source is important? [8, 9]

MUSCLE STRENGTH:

Although the precise method by which exercise increases strength is yet unknown, its fundamental ideas are well known. Overall, two processes—neural changes that improve nerve-muscle connection and cell hypertrophy, or enlargement—appear to be at work. Hypertrophy is brought on by increased muscle protein synthesis and the cellular integration of these proteins Increased actin and myosin concentrations increase the number of potential power strokes, which allows the muscle to be stronger. Several hormones and a substantial hereditary component both contribute to hypertrophy. The ability to simultaneously activate more muscle cells, and subsequently more power strokes, is important to the neurological underpinning of increased muscle strength. This procedure is known as synchronous activation. [11]

The Mechanisms behind Muscle Growth:

The thickening and proliferation of these repaired myofibrils results in muscular hypertrophy (growth). When the rate of muscle protein synthesis exceeds the rate of muscle protein breakdown, muscular development occurs. [11] There is lot of myth among the people, so we decided to clarify this myth by conducting this study which compromising, impact of resistance training along with vegetarian and omnivorous diet on muscle growth and strength. We specify this study to resistance training as majority of individuals in gyms are doing this kind of training and they mainly divide their diet between vegetarian and omnivorous. So we take individuals in our study who follow either on of the diet with resistance training.
The purpose of our study is to determine the effect of resistance training on individuals who are taking either vegetarian diet or omnivorous diet on their muscle growth and muscle strength.

MATERIAL AND METHODOLOGY
- Design: Comparison Study
- Study Population: Gym Going People
- Study Setting: Gym In Vadodara
- Study Sampling: Convenient Sampling
- Study Duration: 6 Months Study
- Sample Size: 105

INCLUSION CRITERIA:
- Age group
- Gym since 6 months
- No previous injury
- Willing to participate
- No disease
- Diet veg, omnivorous

EXCLUSION CRITERIA:
- Age group
- Previous injury 24
- Gym less than 6 months

REQUIRED MATERIALS
- Pen and paper
- Google form
- Measuring tape
- Barbell
- Bench press

PROCEDURE
- Each participant was given a Google form. All participants according to the selection criteria were invited to participate in the study. A total 105 population were taken who were fulfilling the inclusion and exclusion criteria. The participants were explained about the study procedure. Participants consent was taken and were asked to sign the consent form and fill the google form.

DATA COLLECTION PROCEDURE
- All participants fulfilling the selection criteria were asked to fill the Google form. Through Google form we collect the necessary information which was required for our study such as participants weight, duration of gym, age, types of diet and so on. After collecting the information we took the measurement and strength of biceps via girth measurement and 1RM.

OUTCOME MEASURES
1) 1 Repetition Maximum
Repetition maximum is often expressed as 1RM or one repetition maximum. This indicates the heaviest weight you can lift with maximum effort in a single repetition. A 1RM is your personal weightlifting record for a barbell or any other weightlifting exercise. Before testing 1 RM perform a few warm up sets of exercise to get muscle ready so that muscles less likely to injure:
   - Choose which exercise you are going to test (Barbell curl)
   - Warm up with light cardio activity and dynamic stretching for at least 15 min.
   - Do six to ten reps of barbell curl about half of what you think your max will be. Then rest for at least one to two minutes.
   - Increase the weight up to 80% of what you think your max will be. Do 3 reps, and then rest for at least one minute.
   - Add weight in approximately 10% increment and attempt a single rep each time, resting for at least one to two minutes in between each attempt.
   - The maximum weight you can successfully lift with good form and technique is your 1RM

2) Girth Measurement
Girth measurement is a technique for determining how the dimensions of the body change overtime. Girths are measurements of the circumference at typical anatomical places on the body. It can be used to determine body size, composition, and to track changes in these parameters because it is measured with a tape. The measurement spot needs to be marked. Make sure the tape is neither too tight or too loose before recording. It must be horizontal and flat against the skin. The upper arm's midpoint is where the measurement is taken. This measurement is also referred to as relaxed arm girth, upper arm circumference, biceps circumference, and arm circumference.
RESULTS:
SPSS version 20.0 was used for analyzing the data. The comparison of vegetarian and omnivorous diet on muscle growth and muscle strength were done by using this system. All the variables were analyzed through this system. Using these criteria, the comparison between variables were found. Positive t value indicates that the GROUP B subjects improvement was better than GROUP A. A p-value of less than 0.05 was considered statistically significant. The total number of participants were 105 in which the participants were divided into two groups. The Group A vegetarian10 and Group B was omnivorous.

Table 1: Age Distribution

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>18 - 20</td>
<td>9</td>
</tr>
<tr>
<td>21 – 23</td>
<td>19</td>
</tr>
<tr>
<td>24 – 26</td>
<td>27</td>
</tr>
<tr>
<td>27 - 30</td>
<td>50</td>
</tr>
</tbody>
</table>

Graph 1: Age Distribution
The age ranged between 18-20 has 9 participants, 21-23 has 19 participants, 24-26 has 27 participants and 27-30 has 50 participants. There is unequal distribution of the data as the age ranged between 18-30 was included.
Table 2: Descriptive Statistics of Group A data

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>70.49</td>
<td>10.77</td>
</tr>
<tr>
<td>Right Biceps Circumference</td>
<td>35.71</td>
<td>3.01</td>
</tr>
<tr>
<td>Left Biceps Circumference</td>
<td>35.52</td>
<td>3.02</td>
</tr>
<tr>
<td>Barbell Curl</td>
<td>50.0</td>
<td>3.02</td>
</tr>
</tbody>
</table>

Graph 2: Group A Descriptive Analysis

The Table No. 1 shows the descriptive analysis of the Group A data. The mean value of weight is 70.4 kg with standard deviation 10.7. The mean Right Biceps circumference is 35.7 with standard deviation 3.01 whereas left biceps circumference mean is 35.52 with standard deviation 3.02. The mean value of the Barbell Curl is 50.0 with standard deviation 10.02

Table 3: Descriptive Statistics of Group B data

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>67.00</td>
<td>14.87</td>
</tr>
<tr>
<td>Right Biceps Circumference</td>
<td>33.35</td>
<td>3.27</td>
</tr>
<tr>
<td>Left Biceps Circumference</td>
<td>33.23</td>
<td>3.21</td>
</tr>
<tr>
<td>Barbell Curl</td>
<td>44.10</td>
<td>11.22</td>
</tr>
</tbody>
</table>
Graph 3 : Group B Descriptive Analysis

The Table No. 2 shows the descriptive analysis of the data of Group B. The mean value of weight is 67.0 with standard deviation 14.8. The mean value of right biceps circumference is 33.35 with standard deviation 14.87, similarly of left biceps circumference is 33.23 with standard deviation 3.21. The mean value of Barbell Curl is 44.10 with standard deviation 11.22 respectively.

Table 4: Intragroup Analysis Group A

<table>
<thead>
<tr>
<th>Test Statistics - Group A</th>
<th>Right Biceps Circumference</th>
<th>Left Biceps Circumference</th>
<th>Barbell Curl</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre-Post</td>
<td>Pre-Post</td>
<td>Pre-Post</td>
</tr>
<tr>
<td>Z</td>
<td>-6.285b</td>
<td>-6.275e</td>
<td>-6.278e</td>
</tr>
<tr>
<td>Asymp. Sig. (2-tailed)</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
</tr>
<tr>
<td>a. Wilcoxon Signed Ranks Test</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. Based on negative ranks</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. Based on positive ranks</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The Table No.4 Shows the statistical analysis of the data of Group A. The tests says that in Right Biceps Circumference, the pre and post values of the it shows significant differences, that means there is increase in circumference of the biceps. Similarly Left Biceps Circumference shows significant differences between the pre and post training. The Barbell Curl pre and post data also shows significant differences between pre and post training. The p value for all three outcome measure is 0.00 (p<0.05) under 95% confidence interval.

Table 5: Intragroup Analysis Group B

<table>
<thead>
<tr>
<th>Test Statistics - Group B</th>
<th>Right Biceps Circumference</th>
<th>Left Biceps Circumference</th>
<th>Barbell Curl</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre-Post</td>
<td>Pre-Post</td>
<td>Pre-Post</td>
</tr>
<tr>
<td>Z</td>
<td>-6.341b</td>
<td>-6.342b</td>
<td>-6.361b</td>
</tr>
<tr>
<td>Asymp. Sig. (2-tailed)</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
</tr>
<tr>
<td>a. Wilcoxon Signed Ranks Test</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. Based on negative ranks</td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

The Table No.5 shows the statistical analysis of the Group B data. The pre and post training values of Right Biceps Circumference shows statistical differences between the data. Similarlyin Left Biceps circumference and Barbell curl shows statistical difference is there between the data. The p value is 0.00 (p<0.05) which says that there is significant differences between the pre and post training data respectively with 95% confidence interval.
Table 6: Intergroup Analysis

<table>
<thead>
<tr>
<th></th>
<th>Right Biceps Circumference</th>
<th>Left Biceps Circumference</th>
<th>Barbell Curl</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mann-Whitney U</td>
<td>232.500</td>
<td>266.500</td>
<td>815.000</td>
</tr>
<tr>
<td>Wilcoxon W</td>
<td>1610.500</td>
<td>1644.500</td>
<td>2193.000</td>
</tr>
<tr>
<td>Z</td>
<td>-7.353</td>
<td>-7.134</td>
<td>-3.656</td>
</tr>
<tr>
<td>Asymp. Sig. (2-tailed)</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
</tr>
</tbody>
</table>

The Table No.6 shows the comparison between the two groups. The right Biceps circumference shows z value -7.35 which says that the differences in group B is more compare to group A. There is significant differences between the two groups (p<0.05). Similarly, for the Left biceps circumference the Z value is -7.13 which says that group B has more differences compare to group A. There is significant differences between the two groups. (p<0.05) Lastly, the Barbell curl has Z value -3.56 which says that the group B has more differences compare to group A with significance(p<0.05). There was 95% confidence interval.

DISCUSSION

This study was intended to compare the impact of omnivorous and vegetarian diet on muscle strength and muscle growth on the gym population who are doing gym more than 6 month. The subjects were randomly selected from gym with both gender were included and the age criteria was between 18-30 years. The participants who were included were physically and mentally fit and had no history of any previous injury.

Our research was taken among 105 subjects who were between 18-30 age group. Group A consisted of 52 subjects, whereas group B consisted of 53 subjects. The subjects of group A followed vegetarian diet with resistance training whereas group B followed omnivorous diet with resistance training. All the subjects had to follow strength training program for 6 months. The bilateral girth measurement was done for biceps and also measured the strength of biceps by one maximum repetation (1RM).

The inclusion criteria were the subjects who were doing gym for at least 6 months of duration. The subjects who were excluded were the ones had any disease or any previous injuries or who were above 30 years or below 18 years old. Resistance training leads to trauma and injury of the cellular proteins in muscles, this promotes cell-signaling message to activate satellite cells to begin a cascade of events leading to muscle repair and growth. Several growth factors are involves that regulate the mechanism of change in protein number and size within the muscles. Along this for building muscles and gaining strength require sufficient and consistent nutrition. When these two factors i.e. proper training
and sufficient nutrition along with other other minor requirements fulfilled muscle size and number of fibers increases and that’s lead to increase in strength and size.

After the SPSS and analysis the results came out which stated that the Group B had significant improvement in circumference of biceps of both side as well as muscle strength of biceps. In Group A there was also growth of biceps and increase strength of biceps muscle but as compared to group B it was not that significant.

Dayan Hudon (2021) concluded that protein source does not affect resistance training induced adaptation in individuals men consuming adequate amount of protein and observed that 1.6 grams of protein per kilogram of body weight per day, from either mixed whole foods and whey protein supplementation, or plant based whole foods and soy protein isolate supplementation, is the same for muscle growth and strength. From this it can be said that the adequate amount of protein is important for muscle growth and strength irrespective source of protein. However there is no denying in this fact that for individuals who are taking vegan diet find hard to get enough protein and leucine as compare to omnivorous. [8]

Jozo Grpic (2020) observed that individuals can increase muscle strength and muscle size by participating in resistance training programs. Resistance training was found to be an effective way to improve the muscle strength and muscle growth. [12] Dacoley (2015) stated that In nutrition, diet is the sum of food consumed by a person or other organism.[1] The word diet often implies the use of specific intake of nutrition for health or weight-management reasons (with the two often being related). Although humans are omnivores, each culture and each person holds some food preferences or some food taboos. This may be due to personal tastes or ethical reasons. Individual dietary choices may be more or less healthy.

Complete nutrition requires ingestion and absorption of vitamins, minerals, and essential amino acids from protein and essential fatty acids from fat-containing food, also food energy in the form of carbohydrate, protein, and fat. Dietary habits and choices play a significant role in the quality of life, health and longevity.

Jozo Grpic (2020) concluded that the 1RM test generally has good to excellent test–retest reliability, regardless of resistance training experience, number of familiarization sessions, exercise selection, part of the body assessed (upper vs. lower body), and sex or age of participants. Researchers and practitioners, therefore, can use the 1RM test as a reliable test of muscular strength.

LIMITATION

- The study population is limited due to time constraints.
- There is various type of strength training which we did not specify in this study due to time limitation.
- The study is not gender specific therefore; the gender comparison is not possible.

FURTHER RECOMMANDATION

- The duration and the time interval of the study should be increased along with an increase in sample size.
- The study should be done with specific type of strength training so we can get the accurate impact of various diet on muscle growth and strength.
- Gender compared study should be conducted for better analysis.

CONCLUSION

From this study, by using the girth measurement for biceps growth and 1RM for biceps strength we can conclude that the subjects of group who were taking omnivorous diet had better improvement in their result as compared to other group who were taking vegetarian diet.

REFERENCE

10. in The Oxford Dictionary of Sports Science & Medicine (3) Length: 40 words