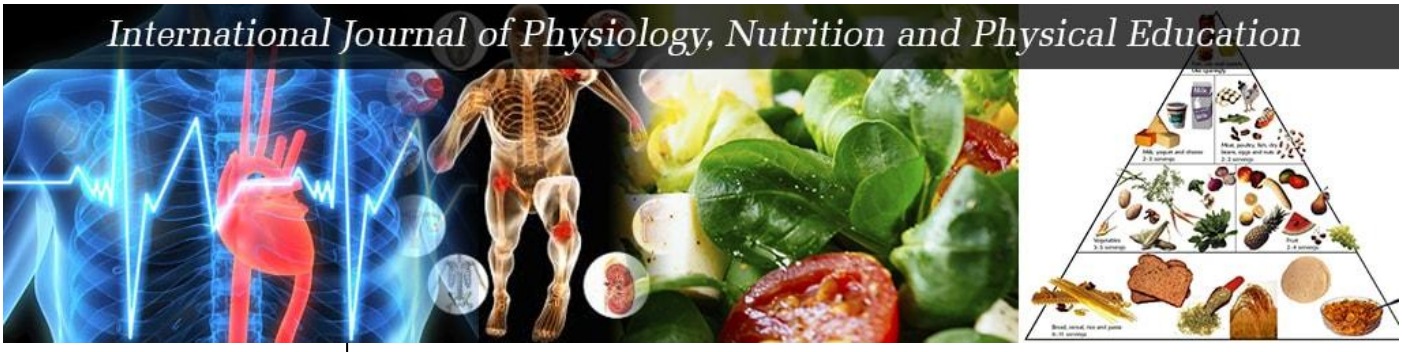

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Impact of supervised and planned exercise regime training on health related fitness variable i.e. muscle strength in obese individuals

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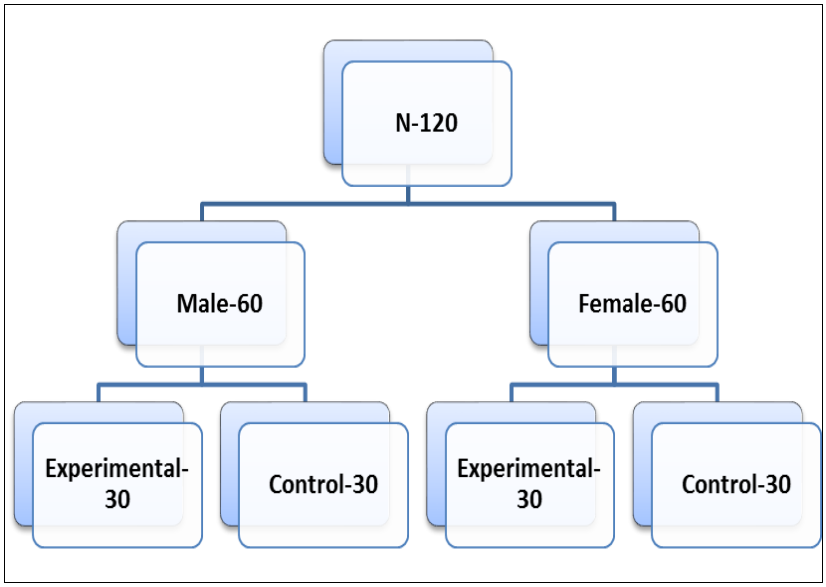
Abstract
Obesity is the prime public health problem that has emerged as a challenge and needs to be tackled at the earliest as it is permeating every aspect of life. Obesity affects the fitness and hence health related variable like strength too gets affected. The aim of the study was to investigate the impact of 12 week of supervised and planned exercise regime training on health related variable like muscle strength in obese individuals. In this study 120 obese subjects were recruited; experimental group [n = 60; 30 male + 30 female] and control group [n=60; 30male+30female]. Experimental group participants joined supervised and planned session for 60 min per day, 5 days per week for 12 weeks, whereas control group was not provided with functional gym training, but were doing exercise without planned regime. Post test score showed significant changes in the experimental group of both the gender moreover gender influence was also evident on application of ANOVA. It was concluded that meticulously planned exercise protocol when executed under supervision for 12 weeks demonstrated a better result than unplanned workout.

Keywords: Obesity, muscle strength, physical fitness, exercise

Introduction
Obesity is a catastrophic epidemic which has overpowered the health system and taxed the nation's economy. Obesity is the prime public health problem that has emerged as a challenge and needs to be tackled at the earliest as it is permeating every aspect of life. Globalization has changed the entire scenario of human life right from food habits to life style, as the comforts of life are easily available and assessable if one can afford it. An Asian Indian, a person is considered to be obese when BMI $\geq$ 25Kg/m^2 (Mahajan and Batra 2018) [5]. Excess Body fat has negative implication on overall wellness through its influence on chronic disease risk, ability to perform physical activity and body image. Obese individuals tend to have poor levels of physical fitness. Hence, low level of physical fitness is in conjunction with higher prevalence of chronic ailment resulting to high mortality rate (Kim and So 2013) [3]. Physical fitness is requisite for every human irrespective of gender and age. Work suffers if there is lack in physical strength (Reddy 2012) [8]. Strength and flexibility declines with time due to which person experience myogenic pain and posture disorder. Exercise enhances the fitness and other abilities of an individual, which is essential for living a healthy and quality of life (Shahana *et al* 2010, Kirandi 2016) [10, 4].
Exercise training is linked with weight loss and combats the negative health impact of obesity (Skrypnik *et al*. 2015) [11]. Exercise if done in a whimsical manner can do more harm than good and can be sheer waste of energy; hence, a study was planned to investigate the impact of 12 week of supervised and planned exercise regime training on health related fitness variable like muscle strength in obese individuals

Methods
Ethical permission was taken from institutional ethical committee and then volunteers at fitness centers were approached. Informed consent was obtained from the agreed participants. After meeting the inclusion criteria, 120 subjects were selected by snowball sampling and were

then randomly allocated into two groups: [1] Experimental (Attending fitness centers and having exercise with specific regime under supervision) and [2] Control (Attending fitness centers and having exercise without specific regime and supervision). Obese subjects aged between 26 years to 40 years. Distribution of 120 obese subjects follows:



Muscle strength (1 Repetition maximum) were performed for all subjects before and after 12 weeks of study period (Pre – Post-test design).

Table 1: Study design layout'

Functional Gym Training Programme [Cardio + Strength + Flexibility]	Exercise Program
Total Exercise Duration	12 weeks
Frequency	5 days / week
Session	60 minutes
Intensity	Moderate
Time of Training	Morning and Evening

- Before Training 5 min. Dynamic warm – up and after training 5 min cool – down was compulsory.
- The training load was increased progressively after every two weeks respectively.
- Slightly Changes in load and volumes according to the fitness level of the subjects.

Statistical Analysis

For analyzing difference between experimental and control group t-test analysis and Two way ANOVA with post-hoc analysis were applied (MS Excel 2007). Influences of experimental protocol, gender as well as their influences were evaluated during the analysis keeping the level of significance at $p < 0.05$.

Result

Table 2: Descriptive statistical analysis of health related fitness variable for obese males participated in the study as members of control group

Health Related Fitness Variable	Pre-test	Post-test	r value	t-value
Muscle Strength(Kilograms)	45.73 ± 6.03	43.51 ± 5.43	0.8396	**2.8044**
Values are mean ± SD of 30 individuals. Bold font t-values are indicating that the difference between the pre-test and post-test values are statistically significant with probability (p) is less than 0.05. Critical t-value (p = 0.05) is 2.0452				

Table 3: Descriptive statistical analysis of health related fitness variable for obese males participated in the study as members of experimental group.

Health Related Fitness Variable	Pre-test	Post-test	r value	t-value
Muscle Strength (Kilograms)	46.50 ±5.86	57.98 ± 8.01	-0.207	**6.907**
Values are mean ± SD of 30 individuals. Bold font t-values are indicating that the difference between the pre-test and post-test values are statistically significant with probability (p) is less than 0.05. Critical t-value (p = 0.05) is 2.0452				

Table 4: Descriptive statistical analysis of health related fitness variable for obese females participated in the study as members of control group

Health Related Fitness Variable	Pre-test	Post-test	r value	t-value
Muscle Strength (Kilograms)	16.27 ± 3.87	15.34 ± 3.21	0.190	0.941
Values are mean ± SD of 30 individuals. Bold font t-values are indicating that the difference between the pre-test and post-test values are statistically significant with probability (p) is less than 0.05. Critical t-value (p = 0.05) is 2.0452				

Table 5: Descriptive statistical analysis of health related fitness variable for obese females participated in the study as members of experimental group.

Health Related Fitness Variable	Pre-test	Post-test	r value	t-value
Muscle Strength (Kilograms)	17.13 ± 3.91	22.38 ± 3.39	0.769	**10.933**
Values are mean ± SD of 30 individuals. Bold font t-values are indicating that the difference between the pre-test and post-test values are statistically significant with probability (p) is less than 0.05. Critical t-value (p = 0.05) is 2.0452				

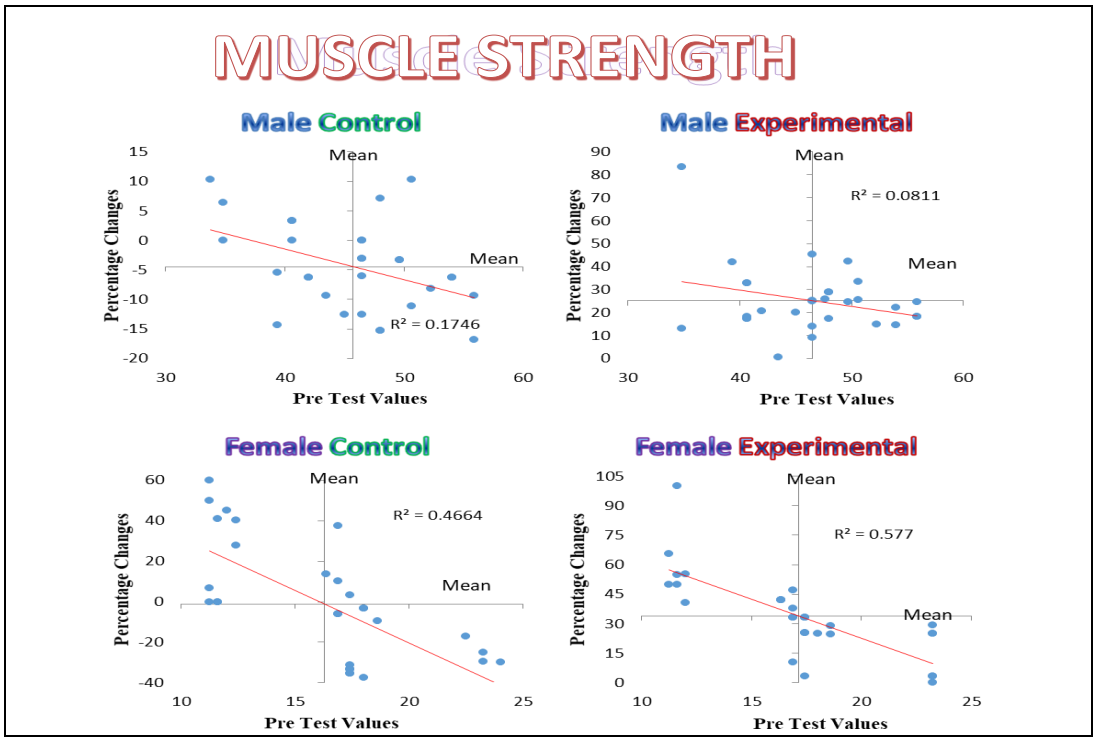


Fig 1: Distribution of percentage changes of individual participant's Muscle Strength after the test period against their respective pre-test values

Pre-test mean values for muscle strength (Figure 1.) was low for the females of control group as well as for experimental group than their male counterparts. Female of control group also showed a higher positive percentage changes with lower pre-test value and higher negative percentage changes with higher pre-test value.

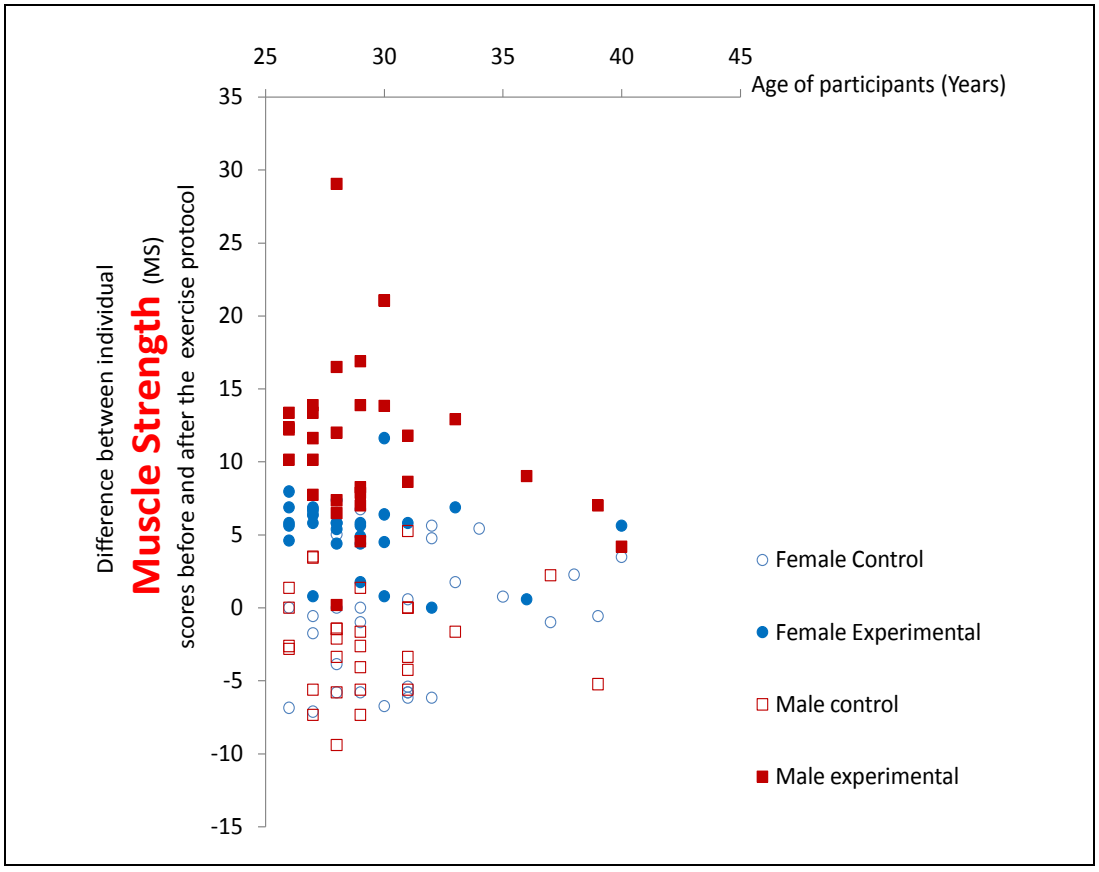


Fig 2: Scatter plot of changes (during period of study) in Muscle Strength scores of participants against their age.

Concurrently, there was positive increase on higher end in muscle strength among male participants of experimental group when compared with the female participants of experimental group. Whereas as on the other hand, both genders of control group had a lower value in muscle strength when compared to their experimental group, as indicated in figure 2. Whereas no impact of participants' age was noted in terms of changes in muscle strength.

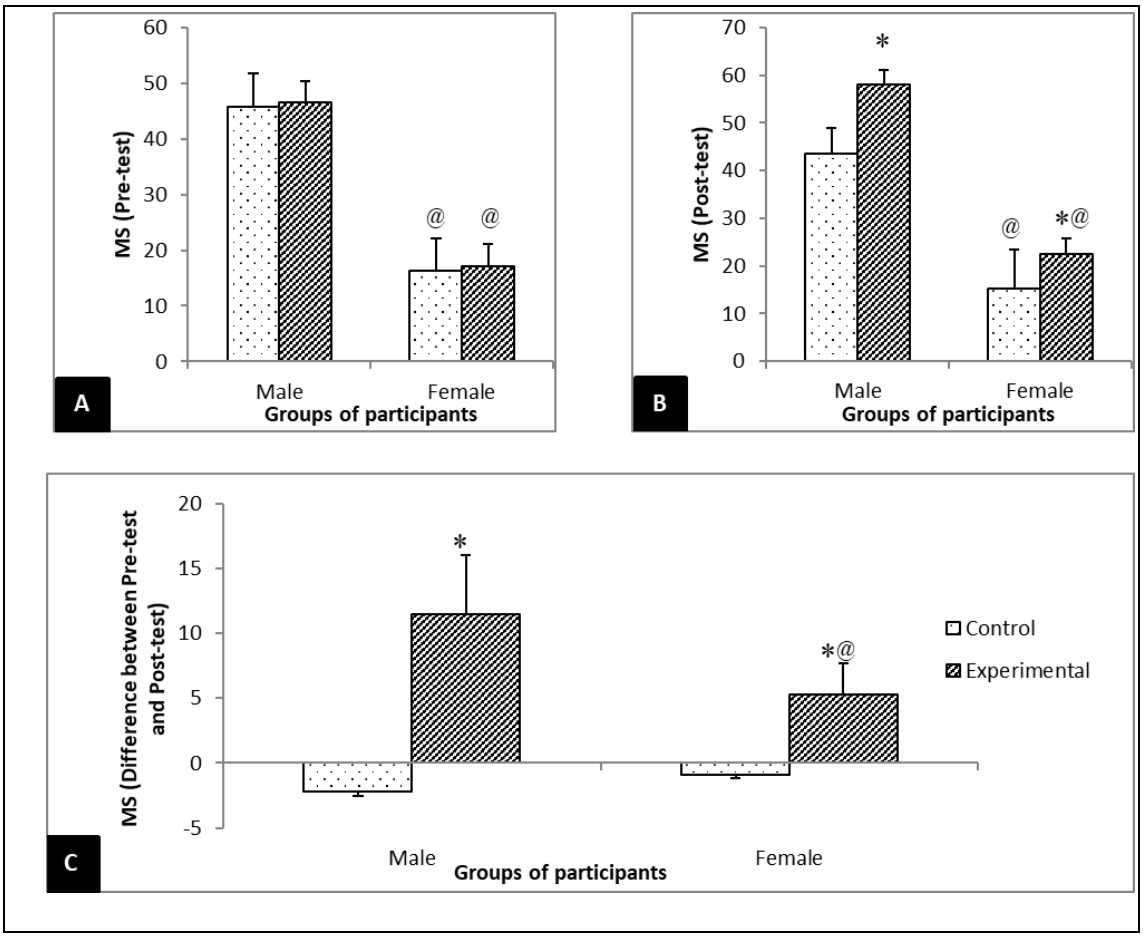


Fig 3: [A] Group-wise average values of muscle strength (Kg) of participants, [B] Group-wise average values of post-test muscle strength (Kg) of participants and [C] Group-wise average of differences in muscle strength (Kg) between pre-test and post-test values of participants. Each column represents mean values for 30 participants and line with cap indicates the SEM. * indicates statistically significant difference in comparison to the respective control group. @ indicates statistically significant difference between the gender-wise groups.

This is a comparative presentation of parameter values with column diagram. Height of each column represents the mean value and error bar represents the standard error of mean. Left column with light shade represent the values from control volunteers and the right column with deep shade represent the values from experimental volunteers. Pre-test Muscle Strength scores are presented graphically in 'A', which shows at the pre-test level, there was no difference between the control and experimental values. However, there were significant differences between the genders in both control and experimental groups. This gender differences were also existed in the post-test values of muscle strength, as presented in Panel B. In addition, there were significant differences between the control and experimental groups. Similarly, alterations in muscle strength values were also found to be significantly different between the control and experimental groups for participants of both genders. Additionally the differences between the pre-test and post-test values showed significant difference in between the male and female participants.

Discussion

Resistance training adds to muscle strength hence the present study which involved the blend of aerobic, resistance and PNF (proprioceptive neuro muscular facilitation) technique resulted into significant gain in muscle strength of experimental groups of both gender in their post test scores. Current observation was in confirmation with studies conducted by Mazzetti *et al*. (2000) [6] where increase in muscle strength in supervised group was related to progression training. It has been suggested that improvement in muscle strength was due to neurological adaptation, muscle fiber transformation and muscle hypertrophy (Mazzetti *et al*. 2000) [6]. Resistance training further might have activated fast twitch fibers induced gain in muscle strength (Mazzetti *et al*. 2000) [6]. Study by Storer *et al*. (2014) [12] further supports the result of present study when subjects of supervised group exhibited greater improvement in muscle strength than self-trained group for the same duration of training period .i.e. 12 weeks. This improvement in the strength could be due to periodized training type and employed exercise intensity. Study by Joo (2015) [2] further reconfirms the report of significant increase in the muscle strength of the subjects inducted in combined type of physical training for stipulated period of12 weeks; as exercise beside enhancing the enzymatic activities also increased the ATP storage and creatine phosphate in muscle and further added on to the size of muscle fibers. However, findings by Mills (1994) [7] for muscle strength did not match with the result of present study which might be due to difference in the age, protocol followed, duration and intensity of exercise followed during the course of study.

In present study, where individual percentage changes were concerned both experimental group reflected positive changes in the said variable with high pre-test score which was in contrast to that of respective control groups. This positive change in muscle strength transformation in the experimental subjects was in confirmation with other studies by Hunter *et al*. (2002) [1]. Despite of non-involvement of dietary intervention, present study as well as study conducted by

Sarsan *et al*. (2006) [9] reported for improvement in muscle strength. In present study, though influence of age was not evident, gender influence was present when compared against their respective control and experimental groups in pre as well as post-test.

Summary

- Current study evince the positive effects of planned and supervised exercise protocol on the variable Muscle Strength.
- Pre-test values are important for the outcome of the tested exercise protocol.
- Age was not an important criterion in terms of current parameters.
- Significant differences between the male and female participants were observed. The gender differences were contributed by both pre-existing and gender dependent performances in muscle strength parameter.

Conclusion

Meticulously planned exercise protocol when executed under supervision for 12 weeks demonstrated a better result than unplanned workout.

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