DISCUSSION OF FINDINGS
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The popular saying that “progress is the most important product” has great significance in physical education. By measuring at the beginning and at the end of training period, it is possible to compare the individual scores to show progress or retrogression.

PONDERAL INDEX:

The results of our study had led us to conclude that, the normal diet plus readymade supplement group and high fat and protein diet group had significantly reduced in the ponderal index when compared to control group. This means that NSD group and HFP group were significantly effective in increasing weight of the subjects than normal diet. It also signifies that no significant changes were observed in improvement of height of the subjects in any group, so, it can be concluded that the selected diet has no effect on increasing the height of individual.

In relation to weight Meneval, has also reported that variable resistance circuit training and proper dietary practices is helpful in enhancing the lean body weight, thus, total body weight of the subjects.

Similarly, Manichem in the year 1983, had concluded that, different stages of weight training shows significant improvement in weight as well as lean body weight of the girl students.
**CRURAL INDEX, FORE ARM INDEX AND UPPER ARM LENGTH**

No significant improvement has been observed in the crural index, fore arm length, and upper arm length in any of the groups. It was expected that proper dietary regimen might have some effect on the increase in the length of the body segments, but no significant changes have been observed in the present study. It seems that by the age of 18–20 years, the growth of the bones in relation to length is almost complete, and additional diets or weight training is not effective in enhancing it.

**CHEST GIRTH, UPPER ARM GIRTH, THIGH GIRTH, AND CALF Girth:**

The NSD and HFP diets were more effective in increasing girth measurements of chest, upper arm, thigh, and calf in comparison to normal balance diet. No significant increase in the fat % of the subjects which proves that increase in girth measurement was due to increase in lean body mass and subsequent hypertrophy of the muscles.

As Amino Acids are constantly liberated into the bloodstream from the muscle fibers as a result of wear and tear of the muscle and also amino acids in right proportion are absorbed by the muscle fibers from the blood stream for repairing the wear and tear and to also add more protein molecules to existing myofibrils if the load on the muscle is gradually increased (i.e., the phenomenon of super compensation), which results in the hypertrophy of the muscles.
Hypertrophy is the phenomenon where by crossectional area of the muscle is increased as a result of long term exercise but it is subjected to the limits set by ones’ genetic background, living style and above all dietary factors. The study that we have undertaken clearly shows that NSD diet is better than HFP diet and HFP diet is better than the normal balanced diet group in promoting hypertrophy of the muscle. The muscles leading to increase in its power and bulks very readily absorb the creatine content of the nutritional supplement.

Dr. Greenhaff and his colleagues performed biopsies on muscles to study the effects of creatine loading. They discovered that consuming atleast 20 gms of creatine a day in divided doses for one week led to an average increase in muscle creatine concentration of about 25%.

It is also believed that when muscles takes in more creatine it also brings water along with it. This promotes a phenomenon called cell volumizing or cellular hydration. When a muscle cell is hydrated, it gets bigger and this may create improved conditions for new muscle growth.

Number of studies indicates that short term creatine supplementation increases total body mass (Hultman et al; 1996, Williams et al; 1999). In addition, long term creatine supplementation during training has been reported to promote greater gains in strength (Earnest et al; 1995, Peeters et al; 1999), fat free mass (Krieder et al; 1998, Stone et al;1999).
Kreider R.B. (1999), has also reported somewhat similar results in his study ‘Dietary supplements and promotion of muscle growth with resistance training’ that supplementation of amino acids during training significantly affect body composition, strength, and muscle hypertrophy.

P.D. Balsom, et al., in 1993, had also demonstrated that creatine supplementation can significantly increase body mass and that it was responsible for improved performance in high-intensity intermittent exercise.

Another content of the nutritional supplement is Phophagen, which is an important part of the energy compound called ATP. Over 95% of the body’s creatine pool are stored inside muscle cells. Phosphagen supplementation helps ‘saturate’ muscles with creatine. When the muscle holds extra creatine, it has more reserve fuel for intense exercise which can result in substantial place in power. Phosphagen is a nutrient formed from three specific amino acids and is also found in various whole foods, such as red meat (Phosphagen is derived from sources free of animal products). Phosphagen saturates muscle tissue with creatine, an essential precursor component of muscle energy production by increasing muscle creatine concentrations; athletes can recover more quickly between bouts of intense physical activities such as weight training.
The finding of our study are supported by the result of the study conducted by Richards et al., where by they examined the effect of phosphagain (p) a protein supplement on lean body mass (determined through dual energy x-ray absorptiometry) after resistance training. They found significant gains in the lean body mass excluding bones.

**BIACROMIAL LENGTH**

Biacromial length was significantly greater in NSD than control group. However, there was significant difference between HFP and control group.

This increase in the lengths can be attributed to the increased lean body mass between the two-acromial points.

**BODY COMPOSITION (Lean Body Mass)**

The findings of our study had clearly indicated that NDS diet significantly increased greater lean body mass than normal diet. However, there is no significant difference between the increase of lean body mass of HFP and control groups.

The loss of body fat is dependent upon the balance between intake and expenditure of calories. The amount of calories burned dependent upon the intensity and duration of activity.
Researchers of American Medical Association investigated the ‘Effect of Calcium Supplementation on muscle mass in male athletes’. The athlete’s diet were supplemented with 500 to 2000 mg of calcium daily. The results showed that the subjects not only increased bone mineral density but lean body mass as well. Our study too has reported enhanced lean body mass, which may be attributed to the calcium present in the readymade nutritional supplement used in the study.

The findings of a study are also in line with the finding of the study conducted by Jebb et.al. in which the subjects gained significant lean body mass and put on significant fat mass, when they were subjected to overfeeding of nutritional supplement (where macro-nutrient balance was altered) during high resistance weight training performance.

Kreider, et al; reported in their study ‘Effect of creatine supplementation on body composition, strength and sprint performance’, that 28 days of creatine supplementation (16 gm per day) resulted in a 1.1 kg greater gain in lean body mass in college football players undergoing off season resistance training.

In addition, Vandenberge et al; had also concluded that effect of long term creatine intake is beneficial to muscle performance during resistance training, they observed that untrained females ingesting creatine (20g per day for 4 days followed by 5g per day for 66 days) during resistance training observed significantly greater gains in lean body mass (1.0 kg) than subjects ingesting a placebo during training. The gains in lean body mass were maintained while ingesting
creatine (5g per day) during 10-week period of detraining and in the four weeks after supplementation stopped.

Chrusch MJ et al; too concluded in their study, that ‘Creatine supplementation combined with resistance training in older men’ increases lean tissue mass and improves leg strength, endurance and average power in men of mean age of 70 years.

Francaux M et al; had also reported in their study ‘Effects of training and creatine supplement on muscle strength and body mass’ that creatine and placebo group increased the isokinetic force by 6%. No change in body mass was observed in the control and placebo groups during the entire experimental period while the body mass of the creatine group was increased significantly by 2 kg (P< 0.001).

**PERFORMANCE (Bench Press, Squat, and Dead lift)**

Results of the study had clearly shows that performance on bench press, squat and dead lift of all the three groups had significantly increased after the completion of the experiment, however, the increase was greater in NSD group than HFP group and HFP group’s performance was greater than control group.

The results of a study had also shown that that the girths of various body parts had significantly increased due to increase in lean body mass of the body. As crossectional area of a muscle is directly proportional to the strength, thus, enhanced girth measurements, means more musculature resulting in increased strength and thus
improvement in the performance of the subjects on the chosen variables

The body weight is made up of lean body mass and fatty tissues. The lean body mass is responsible for providing the necessary strength. Studies indicate that athletes who were very lean but have heavy muscle are more superior in performance. On the other hand athletes who have substantial amount of adipose tissues have increased energy demands owing the inert weight of fat.

Studying the physique types of some of the world top lifters can support the finding of the study. Mike McGhee was one of the outstanding lifter who is characterized by the attractive physical characteristic, his 28 inches thigh have empowered him to squat with 420 lbs.

The amazing thighs and proportional arms of Vasily Alexev who hold three world records is well known to the whole lifting world. The attractive musculature Bill Stripling one of the world’s topest weight lifter has also definitely enabled him in his performance. He also was graced by his heavy thighs.

Our findings on the effects of various nutrients of readymade supplement on the chosen variables of our study are supported by numerous studies:

Casey, A. et al; (1996), reported in their study ‘Creatine ingestion favorably affects performance and muscle metabolism during maximal exercise in humans’ that a creatine dose of 5g is given
four times a day for five to seven days to ensure muscle creatine increases. A control group is given a placebo (glucose or some other relatively inert substance) in a double blind manner. It is evident that work performed during sets of multiple repetition strength tests may be enhanced by creatine supplementation, typically by 5-15%.

There is scientific evidence showing strenuous physical activity (like weight training) may substantially increase the body’s need for magnesium. Scientific data shows the effect of magnesium supplementation on muscular strength.

L.R. Brilla and T.F. Haley conducted a study to see the effect of magnesium supplementation on strength training in humans, subjects were supplemented with magnesium at a level of 3.6 mg/lb of body weight/day for 7 weeks (this is 720 mg/day for a 200 lb male). At the end of seven weeks, it was found that absolute strength as well as strength adjustment for body weight increased dramatically.

Researchers speculate that the mechanism of action was due to an increase in protein synthesis at the ribosomal level of muscle cell. This has also been supported by the findings of present study as the supplement used in the present study was also having magnesium as one of the ingredient.

Potassium plays an important role in cellular transport and hydration much like sodium. It actually works in concert with sodium to activate a mechanism in cells called the ‘Sodium/Potassium pump’. This ‘pump’ moves water and other nutrients back and forth between the interior and exterior of the cells, maintaining proper physiological
balance, nerve function and muscle performance.

M.I. Lindinger in one of his study ‘Potassium Regulation during Exercise and Recovery in Humans’ speculated that potassium is typically excreted from cells into the blood streams during intense muscular exercise. This decrease in intracellular potassium and increase in plasma potassium have been implicated in causing fatigue.

In addition, J.R. Wilson, et al; checked the contribution of potassium to exercise induced vasodilation in humans, they reported that increase in plasma potassium also acts to help vasodilation and perfusion of blood through muscular capillaries, which helps to deliver nutrients to active muscles.

Zinc is a mineral involved in the action of several harmones, including insulin, growth harmones, testosterone and estrogen. It’s also involved in more than 200 enzymatic reactions. A. Cardova, et al; reported in their study ‘Behavior of Zn in Physical Exercise’ that people who exercise may need more zinc and infact, experience a higher risk of zinc deficiency. They showed that supplemental zinc, 25 mg/day, actually blocked the normal exercise-induced increases in free radicals in blood stream. This antioxidant effect may be one of the things, which accounts for zinc’s apparent role in supporting immune function and preventing infections.

Vitamins and minerals play an important role in maintaining the proper biological functioning of everything from muscle to memory. Vitamins and Minerals contributes to good health, muscle growth, and proper fat burning by regulating the metabolism
and assisting the biochemical processes that release energy from digested food.

Vitamin-C has a multitude of beneficial biological effects, these benefits range from vitamin-C’s powerful antioxidant and immuno-supportive effects to its role in ligament and tendon synthesis. Vitamin-C have the ability to share electrons to the free radical molecules in the body. Vitamin-C not only acts as a direct antioxidant, but it is also responsible for regenerating the oxidized form of Vitamin-E in the body. Researchers speculated that 3 to 6 gm/day, vitamin-c is essential to the person involved in intensive training.

R.G. Tucker, et al; seen the influence of sleep, work, acute starvation, Thiamin intake and bed rest on human Riboflavin (V-B₂) Excretion, and concluded that increased energy expenditure and hard work increase riboflavin requirements. So, a hard working athlete must supplement their diet with atleast 10-20 mg/day of riboflavin.

Pyridoxine (V-B₆) has very close connection with amino acid metabolism. One result of V-B₆ deficiency is a decrease in the uptake of amino acids by muscle cells (this especially applies to hard training athletes trying to maximize muscle gains). Scientists believe this response may be due to significant reductions in growth harmone and insulin secretion. It is recommended that 0.10 mg/gm of protein intake can serve the purpose.
Discussion of Hypothesis

In light of results obtained the hypothesis formulated in the beginning of the study are discussed below:

1. It was hypothesized that NSD diet would have more significant effects than normal balanced diet and HFP diet, results of our study clearly shows that except in Crural Index, forearm length and upper arm length all the other anthropometric measurements, body composition and performance of power lifter is significantly greater in NSD diet than HFP and normal balance diet. Thus, major part of our hypothesis is accepted.

2. It was further hypothesized HFP diet would have more significant effect than normal balance diet on anthropometric measurement, body composition and performance of power lifters, the results obtained also shows except in crural index, forearm length and, upper arm length, all other chosen variables is significantly greater in HFP diet than control group i.e. normal balance diet. Thus, major part of this hypothesis is also accepted.