



ISSN: 2456-0057

IJPNPE 2020; 5(2): 05-09

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www.journalofsports.com

Received: 05-05-2020

Accepted: 08-06-2020

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Effect of soy supplementation on hand grip and back strength of tribal female players

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Abstract

Background: Protein is important for sports person to maintain body mass, repair, maintenance and for performance, hence the aim of the present study was to enhance strength by providing protein supplement in the form of soy ladoos.

Objective: To find out effect of nine months Soy supplement on strength variables, hand grip strength and back strength in female players of tribal area.

Materials and Method: Ninety-six female players from tribal sports campus of (average age = 14.44, height= 150cm, weight = 40.49kg) were selected for the present study. Subjects were randomly divided into experimental group (N = 49) and control group (N = 47). The subjects of experimental group consumed soy ladoo of 50gm/day (10.3gm protein) for nine months. Hand grip strength and back strength of all the subjects were measured before the experiment and at every three months of supplementation of soy ladoos. Data was analyzed by SPSS package version.

Results: Significant effect of soy ladoo supplementation was observed ($p < 0.00$) between pre, mid, pre-post and post measures of Hand grip strength and back strength in experimental group. Soy ladoo supplementation significantly improved performance in hand grip strength and back strength of experimental group (respectively $P < 0.00$; $F = 44.00$; $ES = .321$, $P < 0.000$; $F = 23.59$, $ES = .202$)

Conclusion: Consumption of soy ladoo of 50 gm/day (10.3 gm protein) improved hand grip strength and back strength in tribal players.

Keywords: Hand grip strength (HGS), back strength (BS), soy ladoo (SL), tribal female players (TFP), dynamometer

Introduction

Strength is the ability of body to apply force and it relates to various body parts and muscle groups. Hand grip and Back Strength are important screening tool for the measurement of overall strength. Hand grip strength is the amount of force produced by hand, it measures the maximum isometric strength of the hand and fore arm muscles, it is important in sport involving catching, throwing, lifting etc. Back strength measures capacity of a person to sustain external load without injury. It is important in sports involving whole body strength like running, jumping etc.

Soy is high quality complete protein as compared to animal protein. A general thought is that animal protein especially whey are more effective but soy is equally effective in building muscle mass and strength (Vriese De. S 2018) [1]. It consists of large amount of protein (43%), with all the eight essential amino acids, and good amount of fiber, calcium, iron and lecithin, hence it is known "Miracle Bean or Wonder Bean" (Awasthi. A 2014) [2]. It is a good source of protein for vegetarian (Srilakshmi B 2018) [3]. In spite of being a "controversial crop", many researchers found that the soy protein supplementation lead to increased body mass, enhance performance and decreases fatigue in training sessions (Dragan I *et al* 1992) [4-9]. The nutritional status of tribal female players were assessed and it was found that the protein intake is below RDA. Hence, the present study was undertaken to find out the effect of soy supplement on strength of the tribal female players.

Materials and Methods

Selection of the subjects: Ninety-six tribal female players (TFP) age = 14.45 y \pm 0.16, weight = 40.49 \pm .64 kg, height = 150 \pm 0.007cm who were resident of sports hostel, Kanker, Bastar,

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CG, were selected for the present study. Subjects were randomly divided into experimental group EG (N = 50) and control group CG (N = 46). Soy laddoo, prepared from processed soy flour, besan (Bengal gram flour), sugar, almond, cashew nut and ghee is implemented to the experimental group. The EG consumed the soya laddoo (SL) of 50 gm/day (10.3 gm protein), CG did not consume SL. The subjects trained for four hours along with their regular school program. All the subjects were physically fit and reported no use of medication or nutritional supplements during the study. Prior to testing, written informed consent was taken from all participants to participate in the study. The experimental protocol was approved by the Institutional Ethics Committee for Human Research (246/IEC/PRSU/2018). After familiarization with the protocol, nutritional orientation (i.e., dietary procedures to be adopted throughout the testing period) the SL was included in the diet of the players. Performance of HGS and BS were measured for subjects of both the groups before the start of the

experiment and after the intervention of SL supplement.

Selection of the Variables: HGS is a measure of muscular strength or the maximum force or tension generated by one's fore arm muscles of dominant hand. BS is a measure of the strength of the muscles of the lower back. HGS and BS is dependent variable measured by dynamometer and soy supplementation is independent variable.

Experimental Design: HGS and BS were tested in beginning of the study. Experimental design before and after with control group design was used. Data was collected in four phases before the supplement and at every three months of soy supplement. Descriptive and ANCOVA and Trend analysis were used for analyzing the data, analysis of the data were done by using SPSS package version.

Result and Discussion

Dependent Variable: Hand Grip test

Table 1: Mean Score and Standard Deviation of TFP

Institution	N	Mean/SD	Pre test	Mid test	Pre-post test	Post test
TFP supplement	49	Mean	19.42	22.12	26.13	30.35
		SD	5.22	5.29	6.77	9.04
TFP non-supplement	47	Mean	21.89	20.36	22.16	21.27
		SD	8.13	5.52	6.62	5.37
Total	96	Mean	20.63	21.26	24.18	25.91
		SD	6.88	5.45	6.95	8.72

Dependent Variable: Back Strength Test

Table 2: Mean Score and Standard Deviation of TFP

Institution	N	Mean/SD	Pre test	Mid test	Pre-post test	Post test
TFP supplement	49	Mean	30.54	36.04	39.75	43.70
		SD	9.35	9.07	10.4	10.60
TFP non-supplement	47	Mean	34.09	33.52	34.93	35.75
		SD	16.33	9.47	8.86	9.14
Total	96	Mean	32.28	34.80	37.39	39.81
		SD	6.88	5.45	6.95	8.72

Table 1 and 2 shows mean score of HGS and BS test before, during and after the soy supplement. Mean score gain in supplement group of TFP in HGS and BS is 10.93 and 13.16 respectively.

Table 3: Analysis of variance: Comparison of means of HGS between experimental and control groups of TFP

Observation	Source of variance	Sum of squares	Df	Mean Squares	F ratio	Significance value
Pretest	Between Groups	146.73	1	146.73	3.16	.078
	Within Groups	4354.02	94	46.31		
	Total	4500.76	95			
Posttest	Between Groups	1980.83	1	1980.83	35.45	.000
	Within Groups	5252.49	94	55.87		
	TOTAL	7233.33	95			

Table 3 reveals statistically significant difference $F(1, 94) = 35.45$ in post-test means of HGS of EG and CG after 9 months of soy supplement.

Table 4: Analysis of variance: Comparison of means of BS between experimental and control groups of TFP

Observation	Source of variance	Sum of squares	Df	Mean Squares	F ratio	Significance value
Pretest	Between Groups	301.40	1	301.40	1.72	.193
	Within Groups	16465.77	94	175.16		
	Total	16767.18	95			
Posttest	Between Groups	1517.28	1	1517.28	15.42	.000
	Within Groups	9247.29	94	98.37		
	Total	10764.58	95			

Table 4 shows statistically significant difference $F(1, 94) = 15.42$ in the post-test means of BS of EG and CG after 9 months of soy supplement.

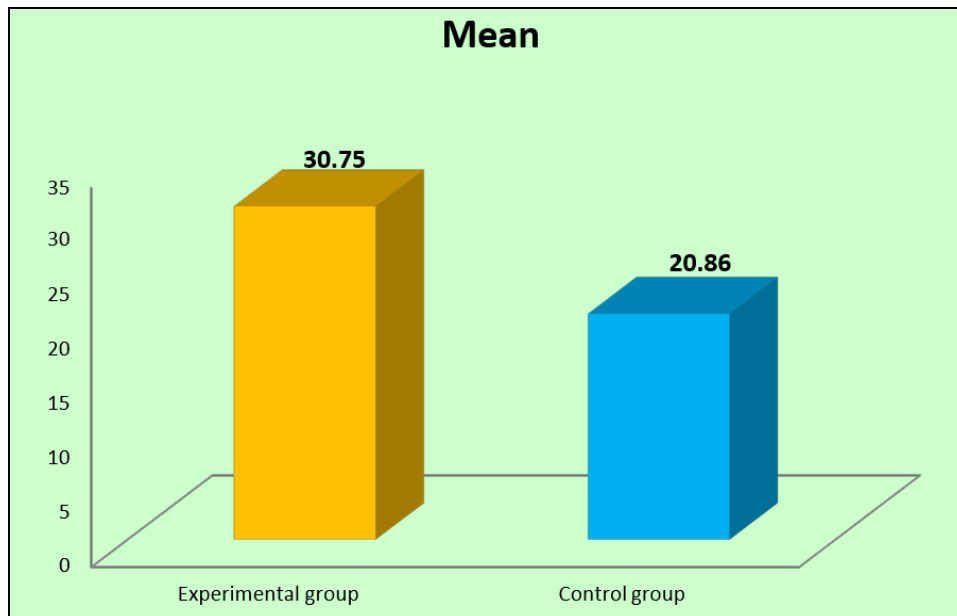


Fig 1: Comparison of adjusted post-test means of HGS among EG and CG

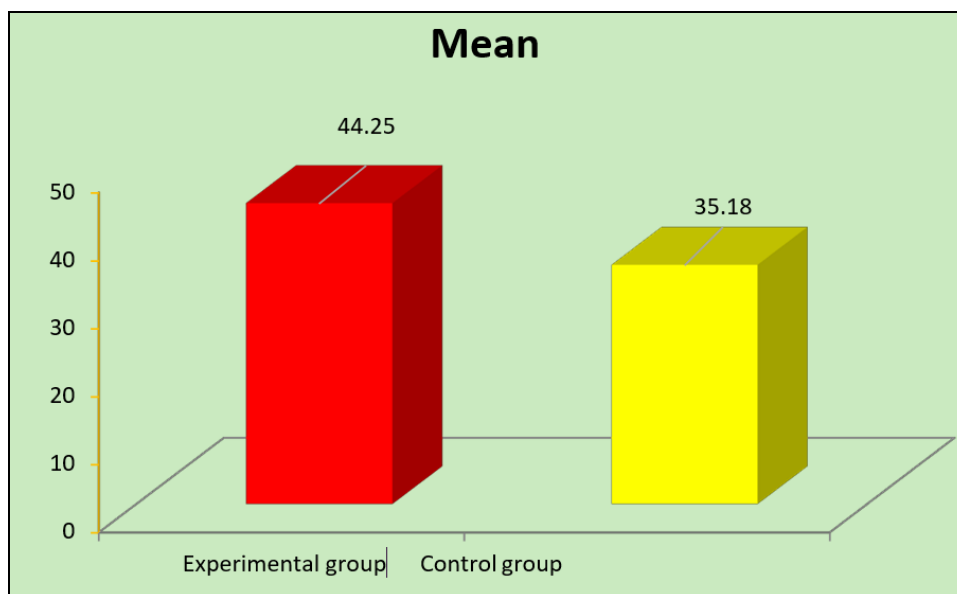


Fig 2: Comparison of adjusted post-test means of BS among EG and CG

Figure 1 & 2 The estimated marginal effect which gives the adjusted post-test means controlling for covariate i.e. pretest measurement and performance for each group (experimental and control groups). This means the effect of covariate has

been statistically removed which clearly shows significant improvement after the soy supplement to experimental groups after adjusting the post-test means.

Table 5: Analysis of covariance and comparison of adjusted Post-test mean of soy supplement between EG and CG of TFP

Tests		Value of sum of square	Df	Value mean square	F ratio	Sig.	Partial eta squared
Hand grip	Contrast	2268.97	1	2268.97	44.00	.000	.321
Test	Error	4795.80	93				
Back strength	Contrast	1935.45	1	1935.45	23.59	.000	.202
Test	Error	7629.24	93	82.03			

Table 5 reported significant difference in adjusted post-test mean scores of HGS between EG and CG ($F(1, 93) = 44.00, p < 0.00$). Moderate effect (.321) after the soy supplementation was seen when compared with Cohen’s guidelines of effect size (0.2-small effect, 0.5-moderate effect, 0.8-large effect). The partial eta squared value of .321 justifies 32% effect of soy supplement (Independent variable) on HGS performance (dependent variable) of dominant hand in EG. Also,

significant difference in the adjusted post-test mean scores of BS was reported between EG and CG ($F(1, 93) = 23.59, p < 0.00$). Small effect (.202) after the soy supplementation was seen when compared with Cohen’s guidelines of effect size. The partial eta squared of justifies 20% effect of soy supplement (Independent variable) on BS performance (dependent variable) in EG.

Table 6: Trend analysis of players of TFP

Source	Factor 1	Type iii sum of squares	d/f	Mean square	F	Sig
Hand grip	Linear	1620.724	1	1620.724	43.85	.000
Strength test	Error (factor1)	3473.81	94	36.95		
Back Strength	Linear	2949.92	1	2949.92	36.54	.000
Test	Error (factor1)	7588.41	94	80.72		

Table 6 supports linear trend between soy supplementation and HGS performance for EG ($F(1, 95) = 43.85, P < 0.000$) and between soy supplement and BS performance for EG ($F(1, 94) = 36.54, P < 0.000$). Trend made that models/fit the data into a straight line, it provides the grip test best fit that can be used to represent determine if there is any particular pattern. It is simple regression X is time and the equation determine the trend and in the variable Y.

Discussion

Performance of HGS and BS showed improvement due to intervention of SL supplement for 9 months. Munson recommended 20-25gm of protein every 3-4hr. from various sources to maintain muscle protein synthesis, 4.2gm per kilo during training and 0.3 gm per kilo of body mass post exercise for football players participating in football at least 2-3days/week (Munson. T 2016) [10]. For better muscle protein synthesis 1.6 to 2.2gm/kg/day is consumed during pre and post workouts for additional benefit (Cintineo. PH 2018) [11]. Commonly used sports supplements are dietary supplements based on protein (branched chain amino acids, whey) (Kubat I *et al.* 2017) [12]. In a review article it is reported that protein supplement leads to muscular hypertrophy and enhance muscle strength in trained and untrained individuals (Pasiakos.S 2014) [13]. Similar trend was reported in another meta-analysis that protein supplementation increased muscle mass, and strength during prolonged resistance type exercise training in younger and older subjects (Cermak MN *et al.* 2012) [14].

Soy protein is ideal to attain protein requirements prior to and during endurance exercise and it's hard to beat soy (Born.S 2016) [15]. Not only in gaining muscle mass and strength but also modestly help in lowering blood cholesterol and soy foods are environmentally friendly (Messina M *et al.* 2018) [16]. Soy protein coupled with resistance training helps to build muscle mass and is better for heart health than whey (Duggal N 2016) [17].

There are evidence that protein supplement is needed of sports person for better performance (Philips. M.S 2016) [18]. On comparing supplementing and non-supplementing athletes, the results suggests female master athlete may switch on to dietary supplements rather than nutrient dense food choice for daily nutritional needs (Beshgetoor. D and Nichols F.J 2003) [19]. Hence, it is found that protein supplementation especially soy which has good amount of protein leads increase in HGS and BS of sports person when measure with dynamometer.

Conclusion

In the present study it is found that after soy supplementation improved performance of HGS and BS. Upward trend is seen in the supplement group than the non-supplement group. The finding of the present study suggests soy protein supplementation (soy) is useful in improving strength

Acknowledgement

We are thankful to the sports person of Tribal school Kanker for their cooperation and participation in the study.

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