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Research Article

Study of effects on strength and fatigability of muscle developed in people who gym consuming whey protein (supplement) in comparison to those consuming meat, fish and eggs

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Introduction

Muscle strength refers to the amount of force a muscle can produce with a single maximal effort or the maximum force or tension generated by a muscle [1]. Muscle fatigability is decline in the ability of a muscle to generate force[1]. Components of milk include casein and whey, from this is derived the substance 'Whey'. Whey protein is a mixture of globular proteins isolated from whey, the liquid material created as a byproduct of cheese production[5].

Skeletal muscle is capable of adapting to a progressive high resistance training regime by increasing its size and strength (hypertrophy)[2]. The dietary protocol for muscle building is high protein intake which is provided by whey protein but can also be fulfilled by normal high protein diet. Although use of whey protein would sound as the obvious thing to do, its composition is only protein whereas for total body health there is also a need to provide the necessary micronutrients which can be obtained by natural diet. The muscle mass developed using whey protein might require few months but the same amount of muscle to be built on normal protein diet may take several months.

Although much is known about the productivity of whey protein supplementation in muscle building, little is known about the quality of muscle that is developed by supplementation. Muscle strength and fatigability are a function of adaptability, so can the muscle developed in short period be as effective as that developed by normal diet is the question that needs to be answered. The instruments chosen are hand grip dynamometer and Mosso's ergogram, these particular instruments are chosen even though many others are available because they are non-invasive and happen to be the relevant choice for an undergraduate to perform research through. Many high profile studies with regards to whey protein have been done but none have got down to such basic level to check the strength and fatigability.

The design of the study is based on selection of candidates who fit into the criteria and take their dietary history, calculate BMI and assessing the muscle strength (in Kg) and fatigability (in sec) using the respective instruments.

Does whey protein supplementation provide the same benefit as a normal diet or can the same mass of muscle built on normal diet be better than whey protein supplementation?

Review of Literature

The study design of the research is based on making two groups one with whey protein consumers others with normal diet[3]. The others parameters while considering whey protein consumption with normal diet intake like calculating BMI of the candidates in the study and also the weekly calorie intake (Kcal/week) which might affect the results[4]. The methodology used was Mosso's ergogram and hand grip dynamometer for assessing muscle fatigability and strength respectively [6].

Aims and Objectives

1. To assess the strength of skeletal muscle using hand grip dynamometer.
2. To assess the fatigability of skeletal muscle using Mosso's ergogram.
3. To compare the above parameters in whey protein users and people with normal diet intake.

Materials and Methodology

Type of Study: This was a cross sectional study.

Study Settings: The study was conducted in nearby Gym centers in Nashik.

Sample Size: Sample size of 80 (40 in each group)

Selection Criteria: The participants were selected on the basis of few inclusion and exclusion criteria.

The Inclusion Criteria

- Should be between 18 to 35 years of age.
- Should have been going to gym for a period of at least 2 months.
- Male gender in order to avoid variations related to gender.
- Should have been using supplementation (whey protein) along with normal food for Group A.
- Should have been using only meat, fish and eggs for increase in protein for Group B.
- Willing to participate.
- BMI between 18.5 to 28 kg/m^2.

The Exclusion Criteria

- People with documented cases anemia and other fatigability disorders are to be avoided.
- Not willing to participate.

Study Design: The study proposal was submitted to Institutional Ethical Committee (IEC) and research was carried out after its approval. Present study was conducted among people satisfying the inclusion criteria. The study participants were recruited from the nearby Gym centers in Nashik. Permission to conduct study from the appropriate authorities will be obtained. Written informed consent was taken from all the study participants.

Strength was measured using a hand grip dynamometer and fatigability using Mosso's ergograph. Height and weight were taken and BMI was calculated. Their weekly average dietary intake was also calculated in terms of calories (Kcal) with the help of 'Approximate Calorific value of cooked preparation table'.

Research Instrument: Hand grip dynamometer was used to measure the maximum isometric strength of the hand and forearm muscles.

1. Participant were asked to hold the dynamometer in the hand to be tested (preferably the dominant hand) with the elbow at right angles and arm by the side of the body.
2. The handle of the dynamometer was adjusted as required, when ready participant is asked to squeeze the dynamometer with maximum isometric effort which is maintained for 5 seconds.
3. No other body movements were allowed.

Mosso's Ergographwas used to calculate the time take for a muscle to get fatigued.

1. The instrument was kept on a table of suitable height. Participant was asked to sit comfortably on a stool and to hold the vertical rod with fingers.
2. The cuffs were moved inward so as to hold the wrist firmly. Suitable weight was put on the weight stand and the strip of paper

was adjusted with the writing pencil properly.

3. Metronome was set at rate of 120 per minute. Middle finger was put in the sling and the subject was asked to pull the weight at 60 per minute till the finger is fatigued. 3kg weight was set as standard for all the readings.

Statistical Test used: Independent T test was used

Observation and Results

The participants in group a (supplement users) had a mean age of 25.7 ±5.8 and of group B (normal diet) had 25.07 ± 4.8. Group A had mean BMI of 24.43 ± 2.3 and group B with 24.84 ± 2.98. The weekly dietary intake of group A and B were 13069.35±5928.43 and 11536.67±3817.17. The parameters that had to be compared that is strength and fatigability were, strength 56.30±13.25 in group A and 53.92±16.09 in group B whereas fatigability in group A was 32.35±11.42 and in group B was 31.50±8.83 as shown in the table below.

Group Statistics

	code	N	Mean	Std. Deviation	Std. Error Mean
Age	1	40	25.7000	5.80981	.91861
	2	40	25.0750	4.80591	.75988
Height(cm)	1	40	172.8375	5.13458	.81185
	2	40	173.5875	6.38195	1.00908
Weight(Kg)	1	40	73.0725	8.38913	1.32644
	2	40	72.1275	11.73207	1.85500
BMI(kg/m2)	1	40	24.4313	2.30610	.36463
	2	40	23.8460	2.98636	.47218
Strength(kg)	1	40	56.3000	13.25528	2.09584
	2	40	53.9250	16.09170	2.54432
Fatigability(sec)	1	40	32.3500	11.42546	1.80652
	2	40	31.5000	8.83466	1.39688
Dietary(Kcal/week)	1	40	13069.3500	5928.43435	937.36777
	2	40	11536.6750	3817.17150	603.54781

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Age	Equal variances assumed	4.302	.041	.524	78	.602	.62500	1.19217	-1.74843	2.99843
	Equal variances not assumed			.524	75.352	.602	.62500	1.19217	-1.74974	2.99974
Height(cm)	Equal variances assumed	1.692	.197	-.579	78	.564	-.75000	1.29512	-3.32838	1.82838
	Equal variances not assumed			-.579	74.581	.564	-.75000	1.29512	-3.33025	1.83025
Weight(Kg)	Equal variances assumed	2.869	.094	.414	78	.680	.94500	2.28045	-3.59504	5.48504
	Equal variances not assumed			.414	70.616	.680	.94500	2.28045	-3.60253	5.49253
BMI(kg/m2)	Equal variances assumed	2.220	.140	.981	78	.330	.58531	.59658	-.60239	1.77302
	Equal variances not assumed			.981	73.312	.330	.58531	.59658	-.60359	1.77421
Strength(kg)	Equal variances assumed	.912	.343	.720	78	.473	2.37500	3.29638	-4.18759	8.93759
	Equal variances not assumed			.720	75.240	.473	2.37500	3.29638	-4.19139	8.94139
Fatigability(sec)	Equal variances assumed	3.009	.087	.372	78	.711	.85000	2.28360	-3.69629	5.39629
	Equal variances not assumed			.372	73.355	.711	.85000	2.28360	-3.70083	5.40083
Dietary(Kcal/week)	Equal variances assumed	9.833	.002	1.375	78	.173	1532.67500	1114.86694	-686.85459	3752.20459
	Equal variances not assumed			1.375	66.594	.174	1532.67500	1114.86694	-692.85803	3758.20803

Discussion

Differing from the original hypothesis that whey protein consumers may have less strength or fatigability as compared to normal diet users, the result came out to be having no significant variation in terms of strength and fatigability in both groups. Although the study design was simple and could analyze the required parameters, the limitations in terms of 'Time period' since when these people gym could not be assessed. So the variation in terms of the time since when the individual used to gym and thus to obtain a sample with equal time in gym was not possible. A better study design would be to select participants who would start to gym as part of research, then consume equal amount of whey protein to that of normal dietary protein so that each group will have the same time period in gym, would have been more appropriate. Secondly, the type of exercise done in gym might also affect the above parameters; some may do upper body exercises more while some may improve lower body. Uniformity in the muscle worked upon was needed.

Conclusion

Based on the results obtained, the research is inconclusive, and was unable to find any significant variation in terms of strength and fatigability in whey protein consumers and normal diet consumers. Further research in terms of selecting individual participants who would start the gym at the same time and then form a part of the two groups of whey protein consumers and normal diet consumers, allowing equal amount of gym time would be able to interpret the result more appropriately.

Summary

The study was conducted to check if there is any variation in muscle strength and fatigability in people who gym consuming whey protein (supplement) in comparison to those consuming meat, fish and eggs. Participants were divided into two groups: Group A with whey protein consumers and Group B with normal diet consumers. BMI was calculated and Muscle strength was measured with the help of hand grip dynamometer and fatigability with Mosso's ergogram. The results came out to be inconclusive showing no significant variation in terms of strength and fatigability in the two groups. The questions follows that can a better result be obtained if the time period in gym of each group was same?

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