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Physical Fitness of Young Boys from Military Training School In Relation To Protein Intake

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ABSTRACT:

This longitudinal study deals with the assessment of physical fitness of young boys attending military training school (n=200, 10-15 years). Physical fitness evaluation of subjects was done by using fitness evaluation tests like home-step test (for aerobic endurance), sit ups test (general strength) and sergeant jump test (elastic strength). The protein intake of the subjects was computed on the basis of 3 day's dietary recall. For subjects from age group 13-15 years, results of sit ups test and sergeant jump tests showed positive correlation with protein intake ($r=0.1057$, $p>0.05$; 0.2261, $0.01<p<0.05$, respectively). However, no such correlation was derived for the results of home step test among both the age groups. In the younger age group of boys (10-12 years), protein intake was found to be positively correlated with sergeant jump test's outcome but negative correlation with the outcome of sit ups test($r=0.2920$, $p<0.01$; $r=-0.2521$, $0.01<p<0.05$). It is said that proteins are not basically used as primary energy providers; instead they are the building blocks of the body and have immense use in repairing and maintenance of the cellular and muscular strength.

Keywords: *physical fitness, home-step test, sit ups test, sergeant jump test, protein intake*

INTRODUCTION:

School going children form the bedrock of the society. Quality education to these future pillars enlists a major responsibility for the parents, family and society. Schools providing military training are one of the most appropriate educational organizations to educate a child in all aspects. The aims of such organizations are to spread soldierly qualities namely discipline, courage, vigilance, patriotism and values of life in the society, which can help to mould a growing child into a good, responsible citizen of the nation (Lee, S. M. et al., 2007).

The physical and mental development of today's children determines the prosperity and peace of tomorrow. Damage incurred during childhood may affect irreversibly the personality of the child, Therefore, special attention should be given by all concerned for meeting the needs and problems of all aspects of development (Ghai, O. P. et al., 2004). Physical activity is important for children and adolescents. It increases physical fitness, lowers body fat, strengthens bones, reduces the risk of cardiovascular and metabolic disease, and decreases anxiety and depression. The human body evolved to be physically active.

Physical exercise is any bodily activity that enhances or maintains physical fitness, overall health and wellness. It is performed for various reasons. These include strengthening muscles and the

cardiovascular system, honing athletic skills, weight loss or maintenance and for enjoyment. Frequent and regular physical exercise boosts the immune system, and helps prevent the "diseases of affluence" such as heart disease, cardiovascular disease, diabetes and obesity. It also improves mental health, helps prevent depression, helps to promote or maintain positive self-esteem, and can even augment an individual's sex appeal or body image, which again is also linked with higher levels of self-esteem. Childhood obesity is a growing global concern and physical exercise may help decrease the effects of childhood obesity in developed countries (Steinbeck, K. S., 2001). Physical fitness is generally achieved through exercise, correct nutrition and enough rest.

The physical dimensions of the body are much influenced by nutrition and sport training - type, duration and intensity particularly in rapidly growing period of childhood and adolescence. Body needs the right balance of nutrients like protein to fuel the fitness. Even if, one is not competing in a sport with a finish line, eating right can help to train harder, delay the onset of fatigue and aid in the workout recovery. With the right diet one can achieve peak performance (http://www.eatright.org/Public/landing.aspx?TaxID=6442451999). There is a strong relation between the dietary intake and physical development in regard to the growth status of children.
It is challenging to make general recommendations for nutritional needs for adolescents because not only age but also stage of physical maturity and level of physical activity must be considered. The nutrient intake of children depends upon the type of food, its quality and quantity consumed by them (Hoch, A. Z. et al., 2008).

What one eats before, during and after exercise can affect how well one performs. The right diet supports the training programme of children and adolescents and helps them to recover more quickly, reducing the risk of getting injured. This function is mainly taken care of by one of the major macronutrient, protein. Protein plays an important role in an active adolescent's diet as the nutrient helps repair and strengthen muscle tissue. Protein is critical in building muscle mass. This means that protein can go towards building and maintaining lean body mass. For maintenance of existing lean body mass and accrual of additional lean body mass during the adolescent growth spurt also, protein of good quality and quantity is required. Muscle growth happens only when exercise and diet are combined. Research has shown that timing of protein intake plays a role. Eating high-quality protein (such as meat, fish, eggs, dairy or soy) within two hours after exercise - either by itself or with a carbohydrate - enhances muscle repair and growth (Kreider, R. B. et al., 2010 and http://www.eatright.org/Public/content.aspx?id=6442477918).

When protein intakes are consistently inadequate, reductions in linear growth, delay in physical maturation and reduced accumulation of lean body mass may be seen (http://www.epi.umn.edu/let/pubs/img/adol_ch3.pdf). Proteins are required for many reasons, including building and repairing muscles, fighting off infections and carrying oxygen in the blood. Proteins also help for building enzymes, hormones and vitamins, especially important for adolescents (Kreider, R. B. et al., 2010 andhttp://www.livestrong.com/article/431401-should-teens-have-protein/). Adolescent sport persons expend more energy than the average person and their bodies need additional nutrients to recover from intense physical activity.

This research is an attempt to determine physical fitness of young boys from military training school in relation to their dietary protein intake.

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METHODOLOGY:

Study Design:

This longitudinal study was carried out with the aim of the assessment of the energy intake in relation to anthropometric measurements among boys attending military training school. This research involved studying the same group of military school going boys over an extended period of one year. Data was measured at successive times spaced at four uniform time intervals (i.e. 0, 4, 8 and 12 months of study period in a year). Periodical monitoring of body measurements and assessing nutritional status was done.

Selection of Subject and Sample Size:

For the present study, young boys attending a military school were purposively chosen. Total 200 (two hundred) boys were selected, out of which one hundred (100) boys belonged to the age group of 10-12 years and one hundred (100) boys belonged to the age group of 13-15 years.

Physical Fitness:

Aerobic endurance of boys under this study was tested by home step test. General strength of subjects was assessed by sit ups test and the elastic strength of the subjects was evaluated by Sergeant jump test. Standard test procedures and norms were used for comparison.

Protein Intake:

Food intake data of each subject was collected using 24 hour's dietary recall method. This was done to collect the data for consecutive three days. Protein content of three day's diets was calculated using food composition tables (Gopalan, C. et al., 2012).Means were considered for comparisons.

Statistical Analysis:

Mean (M), standard deviation (SD) and range (R) of the data was derived. Comparisons among and between the studied groups were done using critical ratio (CR) test. For within age group analysis, one-way repeated measures analysis of variance (ANOVA) was used. Correlations (r) were derived using Pearson's Product Moment Coefficient of Correlation.

RESULTS AND DISCUSSION:

Mean age of 10-12 years age group boys was 11.24±0.71 and for the 13-15 year age group it was 13.79±0.63 (Table 1).

Table 1: Age Wise Classification of Subjects

Sr. No.	Age Groups (Yrs)	No. of Subjects (N=200)	Age (Yrs)	
			M±SD	Range
1	**10-12**	100	11.24±0.71	10.00-12.49
2	**13-15**	100	13.79±0.63	13.03-14.89

The home step test is designed to measure the aerobic fitness, which is important for overall health. This test assesses the fitness level based on how quickly the heart rate recovers after

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exercise. The fitter is the subject, the quicker the heart rate will return to normal after exercise (http://www.sparkpeople.com/resource/fitness_articles.asp?id=1115).Performing such a test has the benefit of monitoring the fitness level. Significant periodical improvement was noticed in the performance of home step test of subjects aged 10-12 yrs as pulse rate reading showed reduction at the end of the study period (Table 2).

Table 2: Data for Home Step Test for Subjects for 0, 4, 8 and 12 Months of Study Period

Sr. No.	Study Periods	Pulse Rate (beats/ minute) M±SD (Range)	F Values	Data for Home Step Test: Performance Assessment of Subjects Based on Pulse Rate Measurement After Step Up and Step Down for 1 Minute							Total
				Excellent	Good	Above Average	Average	Below Average	Poor	Very Poor	
				No. & %	No. & %	No. & %	No. & %	No. & %	No. & %	No. & %	
1	**Age Group 10-12 Yrs (n=100)**										
i	0 Month	112.00±21.99 (62.00-174.00)	4.52*	0	0	0	0	1	6	93	100
ii	4 Month	112.00±21.67 (63.00-175.00)		0	0	0	0	0	5	95	100
iii	8 Month	109.00±21.86 (61.00-168.00)		0	0	0	1	2	4	93	100
iv	12 Month	105.00±21.42 (58.00-163.00)		0	0	4	0	0	4	92	100
2	**Age Group 13-15 Yrs (n=100)**										
i	0 Month	121.00±18.33 (68.00-170.00)	4.45*	0	0	0	0	0	1	99	100
ii	4 Month	118.00±18.21 (70.00-169.00)		0	0	0	0	0	1	99	100
iii	8 Month	116.00±18.12 (67.00-165.00)		0	0	0	0	0	1	99	100
iv	12 Month	112.00±18.00 (62.00-162.00)		0	0	0	0	1	0	99	100
CR values for between group comparison during 0 month of the study period (i.e. comparison between subjects from age groups 10-12 and 13-15 yrs during 0 month of the study period)											**3.21***
CR values for between group comparison during 12 month of the study period (i.e. comparison between subjects from age groups 10-12 and 13-15 yrs during 12 month of the study period)											**2.62***

* - Significant at both 5 % and 1% levels ($p<0.01$); ** - Significant at 5 % level but insignificant at 1 % level ($0.01<p<0.05$); Values without any mark indicate insignificant difference at both 5% and 1% levels ($p>0.05$).

Mean pulse rate of subjects aged 10-12 yrs and 13-15 yrs during 0, 4, 8 and 12 months of study period was recorded as 112.00±21.99, 112.00±21.67, 109.00±21.86 and105.00±21.42 beats/minute and 121.00±18.33, 118.00±18.21, 116.00±18.12 and 112.00±18.00 beats/minute, respectively. Significant difference was noticed between study periods for pulse rate of subjects from age group 10-12 yrs ($F=4.52$, $p<0.01$). Similarly, significant difference was noticed between study periods for pulse rate of subjects from age group 13-15 yrs ($F=4.45$, $p<0.01$). This difference is attributed to greater individual variations in the pulse rate.

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Performance of subjects for home step test was assessed based on the pulse rate measurement and it was noticed that there was found improvement in the test results at the end of the study period for younger subjects aged 10-12 yrs; however, no such results were obtained for older subjects aged 13-15 yrs (Table 2).

Comparison between subjects from age groups 10-12 and 13-15 yrs for home step test results at the beginning and at the end of the study period was significant (CR=3.21 and 2.62 respectively, $p<0.01$). Subjects from age group 10-12 yrs showed better results for home step test than subjects for age group 13-15 yrs.

For this study, sit ups test was used to check and evaluate the development of abdominal muscles of subjects. Abdominal muscle strength and endurance is important for core stability and back support. This sit up test measures the strength and endurance of the abdominals and hip-flexor muscles (http://www.topendsports.com/testing/tests/home-situp.htm).
Mean numbers of sit ups made by subjects in 30 seconds were recorded as 16.95±6.41, 19.32±6.82, 22.45±6.86 and 24.67±7.11 for age group of 10-12 yrsand 13.27±4.52, 15.41±4.69, 18.12±4.84 and 21.14±4.97 for age group of 13-15 yrs respectively ,during 0, 4, 8 and 12 months of the study period. Significant improvement for sit ups test was noticed for subjects from both age groups (F=24.98 and 51.30, respectively, $p<0.01$) (Table 3).

Table 3: Data for Sit Ups Test for 0, 4, 8 and 12 Months of Study Period

Sr. No.	Study Periods	No. of Sit Ups in 30 Seconds M±SD (Range)	F Values	Data for Sit Ups Test: Performance Assessment of Subjects Based on No. of Sit Ups in 30 Seconds					
				Excellent	Above Average	Average	Below Average	Poor	TOTAL
				No. & %	No. & %	No. & %	No. & %	No. & %	
1	**Age Group 10-12 Yrs (n=100)**								
I	0 Month	16.95±6.41 (7.00-36.00)	24.98*	26	6	26	18	24	100
Ii	4 Month	19.32±6.82 (8.00-39.00)		35	24	12	19	10	100
iii	8 Month	22.45±6.86 (11.00-42.00)		49	27	15	6	2	100
Iv	12 Month	24.67±7.11 (11.00-45.00)		58	26	11	4	1	100
2	**Age Group 13-15 Yrs (n=100)**								
I	0 Month	13.27±4.52 (4.00-26.00)	51.30*	6	7	22	29	36	100
ii	4 Month	15.41±4.69 (6.00-28.00)		13	11	25	28	23	100
iii	8 Month	18.12±4.84 (9.00-31.00)		22	16	35	24	3	100
iv	12 Month	21.14±4.97 (11.00-35.00)		37	30	26	6	1	100
CR values for between group comparison during 0 month of the study period (i.e. comparison between subjects from age groups 10-12 and 13-15 yrs during 0 month of the study period)									**4.69***
CR values for between group comparison during 12 month of the study period (i.e. comparison between subjects from age groups 10-12 and 13-15 yrs during 12 month of the study period)									**4.07***

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* - Significant at both 5 % and 1% levels ($p<0.01$); ** - Significant at 5 % level but insignificant at 1 % level ($0.01<p<0.05$); Values without any mark indicate insignificant difference at both 5% and 1% levels ($p>0.05$).

For sit ups test, comparison between subjects from both age groups 10-12 and 13-15 yrs at the beginning and end of the study period was significant (CR=4.69 and 4.07, respectively, $p<0.01$). Subjects from age group 10-12 yrs showed better performance for sit ups test than 13-15 yrs students. This might be attributed to the greater flexibility and tender age of the younger students. At the end of the study period, majority of subjects (58% and 37%) from age group 10-12 yrs and 13-15 yrs, respectively were categorized as "excellent" as far as performance for sit ups test is concerned. Only 1% subjects from both age groups and 4% and 6% of subjects from 10-12 and13-15 yrs age groups were categorized as "poor" and "below average", respectively. Quite higher % of subjects from age groups 10-12 and 13-15 yrs (26% and 30%, respectively) were categorized "above average" for their assessment of sit ups test. From the results of sit ups test, it can be said that engagement in physical activities at young age can improve performance for sit ups test.

Sergeant jump test is an effective tool to monitor the development of the person's elastic leg strength. The better the vertical jump develops; the better becomes the sporting speed, agility, and quickness of the sports person (http://www.higher-faster-sports.com/importanceofverticaljump.html).The effectiveness of this simple test helps in knowing the child's development over the longitudinal span of time. The distance covered by subjects while conducting the sergeant jump test during the four study periods has been tabulated in Table 4.

Table 4: Data for Sergeant Jump Test for Subjects for 0, 4, 8 and 12 Months of Study Period

Sr. No.	Study Periods	Jump Distance (cm) M±SD (Range)	F Values	Data for Sergeant Jump Test: Performance Assessment of Subjects Based on Jump Distance					
				Excellent	Above Average	Average	Below Average	Poor	TOTAL
				No. & %	No. & %	No. & %	No. & %	No. & %	
1	Age Group 10-12 Yrs (n=100)								
i	0 Month	19.23±1.99 (12.04-25.37)	98.99*	0	0	0	4	96	100
ii	4 Month	21.10±1.99 (13.91-27.24)		0	0	0	37	63	100
iii	8 Month	22.55±1.85 (15.36-28.69)		0	0	0	66	34	100
iv	12 Month	23.85±1.90 (16.66-29.99)		0	0	1	82	17	100
2	Age Group 13-15 Yrs (n=100)								
i	0 Month	23.68±2.53 (15.37-29.59)	61.14*	0	0	1	79	20	100
ii	4 Month	25.55±2.45 (17.24-31.46)		0	0	4	84	12	100
iii	8	26.98±2.51		0	0	14	83	3	100

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	Month	(18.69-32.91)							
iv	12 Month	28.28±2.51 (19.99-34.21)		0	0	50	48	2	100
CR values for between group comparison during 0 month of the study period (i.e. comparison between subjects from age groups 10-12 and 13-15 yrs during 0 month of the study period)									**13.81***
CR values for between group comparison during 12 month of the study period (i.e. comparison between subjects from age groups 10-12 and 13-15 yrs during 12 month of the study period)									**13.82***

* - Significant at both 5 % and 1% levels ($p<0.01$); ** - Significant at 5 % level but insignificant at 1 % level ($0.01<p<0.05$); Values without any mark indicate insignificant difference at both 5% and 1% levels ($p>0.05$).

Mean distance jumped by subjects from age groups of 10-12 and13-15 yrs during the study periods 0, 4, 8 and 12 months was noted 4 as 19.23±1.99 and 23.68±2.53, 21.10±1.99 cm, respectively and 25.55±2.45, 22.55±1.85 and 26.98±2.51, 23.85±1.90 and 28.28±2.51 cm, respectively (Table 4).For subjects from both age groups 10-12 and13-15 yrs, significant periodical improvement for sergeant jump test results was noticed (F=98.99 and 61.14, respectively, $p<0.01$). This progressive positive within-group improvement is a positive impact of regular exercise training.

At the beginning and end of the study period, comparison between subjects from age groups 10-12 and 13-15 yrs showed significant difference (CR=13.81 and 13.82, respectively, $p<0.01$). Older boys were more efficient as far as the results of sergeant jump test are concerned. This could be attributed to the height of older subjects who were taller than younger subjects.50% of subjects from the older age group (13-15 yrs) were categorized as "average" for their assessment based on sergeant jump test (Table 4). Only 2 % subjects aged 13-15 yrs were categorized as "poor". 17 and 82% subjects aged 10-12 yrs were categorized as "poor" and "below average" as far as sergeant jump test result is concerned.

Protein is needed for nutrient transfer in the blood, connective tissue support, and the repair of tissue in response to periods of exercise. Individuals engaged in sports training require a slightly higher intake of protein. Protein can also be used as an energy source, particularly when carbohydrate reserves are very low.

For the boys under this study, mean daily protein intake of subjects during 0, 4, 8 and 12 months of the study period was found as 57±9, 63±9, 68±8 and 70±9 g for boys aged 10-12 yrs and 64±9, 71±8, 74±9 and 78±10 g for boys aged 13-15 yrs, respectively (Table 5).

Table 5: Data on Protein Intake of Subjects for 0, 4, 8 and 12 Months of Study Period

Sr. No.	Study Period	Age Groups (Yrs)					
		10-12 (n=100)			**13-15** (n=100)		
		M±SD	**Range**	**F Values**	**M±SD**	**Range**	**F Values**
1	**Protein (g)**						
i	0 Month	**57**±9	39-76	**27.36***	**64**±9	42-89	**10.44***
ii	4 Month	**63**±9	42-83		**71**±8	47-86	
iii	8 Month	**68**±8	46-88		**74**±9	44-95	
iv	12 Month	**70**±9	46-88		**78**±10	49-95	
CR Values		**5.22***			**6.04***		

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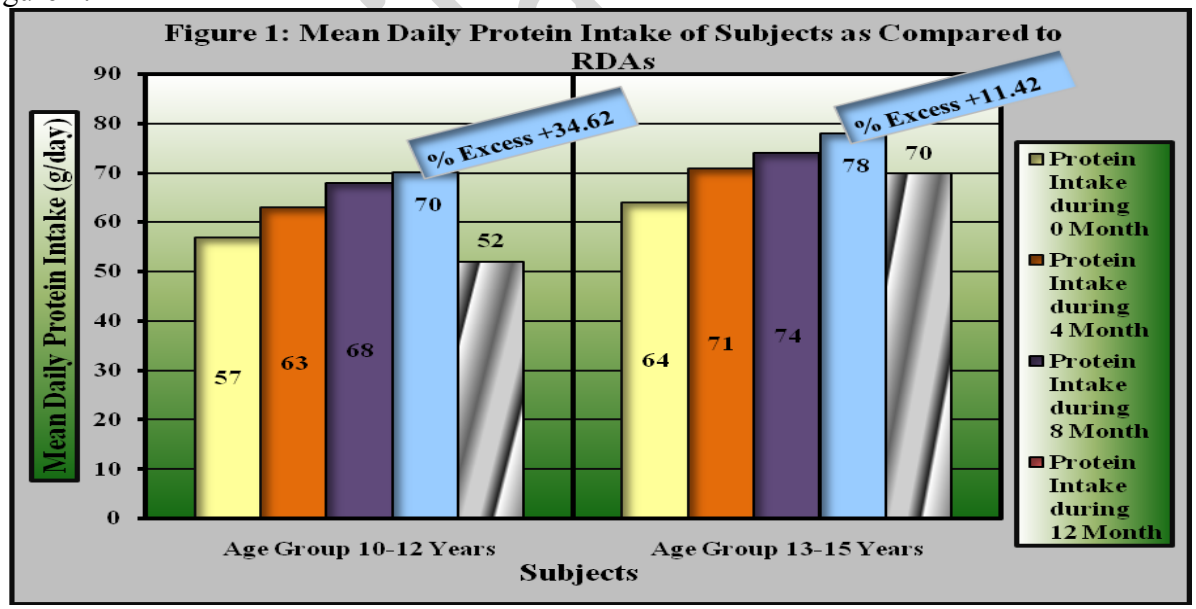
* - Significant at both 5 % and 1% levels ($p<0.01$); ** - Significant at 5 % level but insignificant at 1 % level ($0.01<p<0.05$); Values without any mark indicate insignificant difference at both 5% and 1% levels ($p>0.05$).

Subjects from both age groups depicted individual variations for protein consumption (minimum value for protein intake was noted as 39 and 42 g and maximum value of protein intake was 88 and 95 g, respectively for subjects from age groups 10-12 and 13-15 yrs). Due to greater variations in individual consumption of protein by the subjects, comparison between study periods 0, 4, 8 and 12 months was found to be significant ($F=27.36$ for age group 10-12 yrsand $F=10.44$ for age group 13-15 yrs, $p<0.01$). Sources of protein in the diet of subject were basically milk, sprouts, pulses and cereals. Non vegetarian subjects reported consumption of non vegetarian foods at home only which included eggs, chicken and mutton.

Beghin, L. et al. (2014) investigated intake of protein among adolescents aged 12.5 to 17.5 yrs in line with RDA. The median of dietary protein intake of Chinese children and adolescents studied by Du, W. W. et al. (2012) decreased from 60.0 g/d in 1991 to 52.6 g/d in 2009. Protein intake of urban school children (10-15 yrs) from Secunderabad, Andhra Pradesh, India studied by Chitra, U. and Reddy, C. R. (2007) was found to be insufficient.

During 0 and 12 months of study periods, comparisons were made between age groups 10-12 and 13-15 years for protein consumption. It was found out that older subjects had significantly higher consumption of protein than younger subjects ($CR=5.22$ at 0 month and $CR=6.04$ at 12 months, $p<0.01$, Table 5).

Comparison of protein intake of subjects was made with RDAs and results are demonstrated in Figure 1.



Subjects from age group 10-12 yrs showed mean daily protein intake higher than the RDA. At the end of the study period, these subjects had 34.62% excess protein intake as compared to RDA. Subjects from age group 13-15 yrs showed lower mean daily protein intake than the RDA

at 0 month. Higher mean daily protein intake was observed during 4, 8 and 12 months of study period, with % excess calculated as 11.42 at the end of the study period for subjects aged 13-15 yrs.

Abdeen, Z. et al. (2011) reported inadequate protein intake among 15.07% of Palestinian school-aged boys (11-16 years). Intake of protein of Turkish adolescents studied by Garipagaoglu, M. et al. (2008) was found to be adequate compared with the recommendations whereas Antal, M. et al. (2007) reported high intake of protein among Hungarian school children, aged from 11 to 14 yrs.

Table 6: Correlates of Protein Intake (12 Months)

Parameters	Correlation Coefficient Values (r)	
	Age Group 10-12 Yrs (n=100)	**Age Group 13-15Yrs** (n=100)
Protein Intake vs. Home Step Test	-0.0068	-0.0584
Protein Intake vs. Sit Ups Test	-0.2521**	0.1057
Protein Intake vs. Sergeant Jump Test	0.2920*	0.2261**

* - Significant at both 5 % and 1% levels ($p<0.01$)
** - Significant at 5 % level but insignificant at 1 % level ($0.01<p<0.05$)
Values without any mark indicate insignificant difference at both 5% and 1% levels ($p>0.05$).

Among subjects from age group 10-12 yrs, with the exception of Sergeant jump test, results of home step test and sit ups test reflected inverse relationship with protein intake ($r= 0.2920$, $p<0.01$; -0.0068, $p>0.05$; and -0.2521, $0.01<p<0.05$ respectively, Table 6).

For subjects from age group 13-15 yrs, fitness evaluation test namely, sit ups and sergeant jump tests showed positive correlation with protein intake ($r=0.1057$, $p>0.05$; and 0.2261, $0.01<p<0.05$, respectively). However, no such correlation was derived for test like home step.
From the results of the present study, it can be said that physical fitness level can be seen in relationship with dietary protein intake. It is said that proteins are not basically used as primary energy providers; instead they are the building blocks of the body and have immense use in repairing and maintenance of the cellular and muscular strength.

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