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Original Research Article

Does Short Term Institutionalized Intervention Improve Nutritional Status of Young School Children?

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A b s t r a c t

An experimental validation to substantiate the fact that short term institutionalized intervention of regular nutritious food with proper exercise regime like games and yoga will improve both physical health and mental ability of school going children was arbitrated. The experimental model was carried out at PSG College of Arts & Science, Coimbatore, Tamil Nadu, India for the participant school children from Government schools of Coimbatore and Nilgiris Districts. The study was evidenced in the Young Students Scientist Programme conducted for 20 days period for class IX students of these schools during May 2014. The children showed tremendous improvement in both intellectual ability and healthiness at the end of the study period.

K e y w o r d s

Health improvement
Nutrition
School children
Institutionalized intervention

Introduction

PSG College of Arts & Science (PSGCAS), Coimbatore had organised the fourth phase of Young Students Scientist Programme (YSSP) for government school students from Coimbatore and Nilgiris districts which was conducted from 5th to 24th May 2014. The programme was catalysed and supported by Tamil Nadu State Council for Science and Technology, DOTE campus, Chennai and was held for a total of 20 days. The objective of the programme was to encourage students to acquire more interest in science and technology. The programme had ignited a passion for research in science among the students and had trained them to carry out simple scientific experiments.

The programme was a residential programme and the students stayed in the PSGCAS campus for a period of 20 days period. The participants were class IX students from each school. 80 students from about 30 different Government and aided schools have taken part in the programme. The students were given

special training in various subjects. Experts in various disciplines had delivered lectures, Field trips to research institutions and industries were part of the training. Students were also encouraged to take up science and technology model projects during the training programme. Yoga and sports, for one hour each day and soft skills and personality development classes were also part of the programme in every day activity schedule.

As it was an in-house training programme, a planned nutritious food with routine physical activity regime was scheduled for this short period. Every day morning the children were made to perform yoga for an hour from 6 am to 7 am and then the breakfast, lunch and dinner were all planned and executed almost at fixed timings. The snacks which were given in the mean time were also planned to provide nutritional supplements to cater their packed day's work schedule. All evenings the children played some games and thus the institutionalized intervention was evaluated for their improvement in nutritional status in these children. At the beginning of the programme, the Professors of Department of Nutrition, PSGCAS highlighted the importance of nutritious eating habits and the ill effects of obesity. The students were then taken to Clinical Nutrition laboratory for assessment of nutritional status (BMR, BMI, Height, Weight, Obesity index, Body type, Fat index, Blood Pressure, etc.). The same was also measured at the end of training period to endorse the objectives of the study.

Materials and methods

Selection of students

The students aged 13 to 14 years of both the gender passed out 9th standard hailing from Coimbatore and Nilgiris District were selected for the YSSP programme. The toppers in the class belonging to either Government or Government aided Schools were recruited for the training. Convenience sampling method was adopted. Totally 41 students from Coimbatore district and 30 students from Nilgiris district were subjected for training.

Intervention

Dietary intervention: The food was provided by the institution through high tech mess in the premises. The diet included all the essential food groups namely cereals and millets, pulses and dhals with non vegetarian food weekly once, green leafy and other vegetables, fruits, milk and milk products inclusive of curds and ghee, sugar, fats and oils. The menu was cyclic in nature and included all the food groups respectively.

Physical activity: Every day morning and evening the participants were subjected to physical activity. Early morning at 6 am the students practiced yoga and in the evening from 5 pm to 6.30 pm they were engaged in sports followed by leisure activities up to 8 pm.

Conduct of study

The anthropometric measurements were done prior to training period (initial values) and after the intervention and training; again the final anthropometric assessment was carried out. The data were recorded and analyzed statistically.

Statistical analysis

Descriptive statistics, and paired and student's "t" tests were performed using SPSS version 16.0 software.

Results and discussion

Demographic profile of YSSP participants

Demographic profile covering age, sex, family type and family size of the participants having average IQ are presented in Table 1. Majority of the participants were from 14 years (70%) of age followed by 15years age group (25.7%). Negligible number of participants belonged to 13years (2.9%) and 17 years (1.4%) age groups. Higher percentage of the subjects were male (Coimbatore 37.1%; Nilgiris 25.7%); and were from nuclear (90%) and Small Sized (74.6%) families.

Initial anthropometric profile of the participants

Table 2 and Fig.1 reveal the mean difference on weight between male and female participants of YSSP at the beginning of the training programme. Height and weight (body mass) are the two body dimensions most commonly used to monitor the growth of children and adolescents.

Body weight is most often divided into its lean and fat components: Body weight equals fat-free mass plus fat

mass. Fat-free mass includes skeletal muscle, bone, other connective tissues, body organs, and water. Fat mass includes subcutaneous (beneath the skin) and visceral (internal) adipose tissue. In general both male (weight gain 2.43 kg; t = 6.404) and female (weight gain 2.12 kg; t = 3.807) participants gained weight after the programme with the mean difference at 1% level.

Table 1. Demographic profile of YSSP participants.

Profile			Frequency	Percentage
Age	13 years		2	2.9
	14 years		49	70.0
	15 years		18	25.7
	17 years		1	1.4
	Total		**70**	**100.0**
Sex	Coimbatore	Male	26	37.1
		Female	15	21.5
	Nilgiris	Male	18	25.7
		Female	11	15.7
	Total		**70**	**100.0**
Family type	Nuclear		63	90.0
	Joint		5	7.1
	Extended		2	2.9
	Total		**70**	**100.0**
Family size	Small		53	74.6
	Medium		17	23.9
	Large		1	1.4
	Total		**70**	**100.0**

Table 2. Mean difference on weight of male and female participants before and after YSSP.

Weight	Sex	N	Mean	Std. Deviation	Std. Error Mean	't' value	Significance (*p*)
Initial	Male	44	41.6136	11.01841	1.66109	6.404	0.000
Final	Male	44	44.0455	10.29779	1.55245		
Initial	Female	26	42.0385	8.41180	1.64969	3.807	0.001
Final	Female	26	44.1538	8.00846	1.57059		

Fig. 1: Mean weight of male and female participants before and after YSSP.

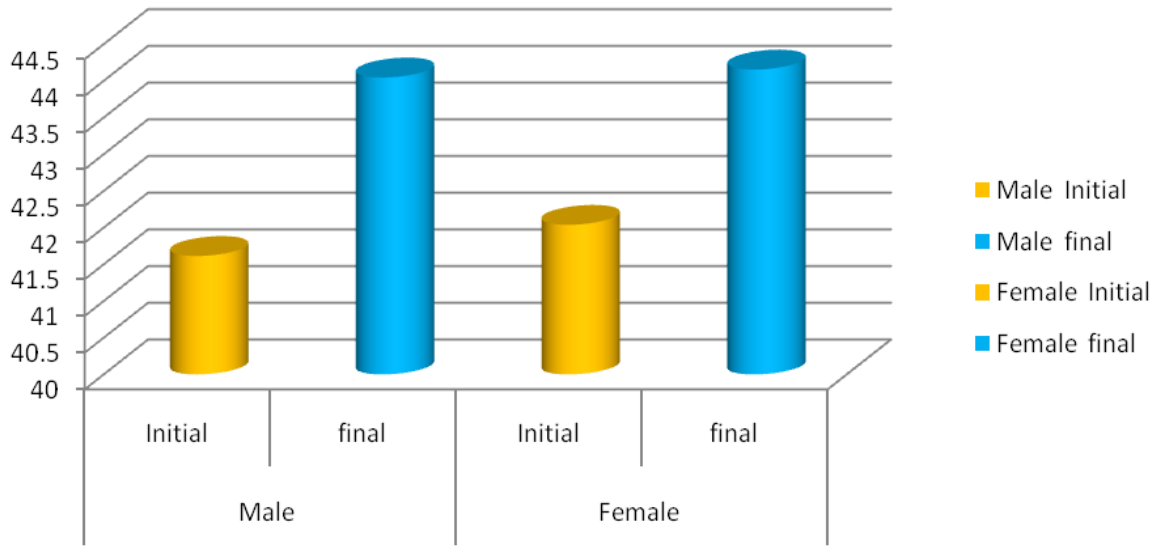


Table 3. Mean difference on weight between Coimbatore and Nilgiris male participants.

Area	Mean weight			N	Std. Deviation	Std. Error Mean	't' value	Significance (*p*)
Coimbatore	Male	Initial	44.6154	26	12.20845	2.39427	2.275	0.028
Nilgiris	Male	Initial	37.2778	18	7.36291	1.73545		
Coimbatore	Male	Final	46.6538	26	11.51327	2.25794	2.098	0.042
Nilgiris	Male	Final	40.2778	18	6.91805	1.63060		

Body weight also shows a well-defined adolescent spurt. Peak weight velocity (PWV) occurs after Peak Height Velocity (PHV), and is greater in boys than in girls. The adolescent spurt in body weight in boys includes principally gains in bone tissue and skeletal muscle, and to a lesser extent, in fat mass. Girls, on the other hand, experience a slightly less intense spurt in height, a less marked increase in skeletal muscle, but a continuous increase in fat mass (Malina, 1999). Hence based on this concept, the gender difference could be observed among adolescents. However, Coimbatore boys and girls were found to have a unique initial weight pattern in which they almost compete each other but they have also gained a significant weight gain among themselves after completing the YSSP training programme.

Table 4. Mean difference on weight between Coimbatore and Nilgiris female participants.

Area	Sex		Mean	N	Std. Deviation	Std. Error Mean	't' value	Significance (*p*)
Coimbatore	Female	Initial	44.1333	15	7.64261	1.97331	1.521	0.141
Nilgiris	Female	Initial	39.1818	11	8.91985	2.68943		
Coimbatore	Female	Final	45.4000	15	7.62327	1.96832	0.924	0.365
Nilgiris	Female	Final	42.4545	11	8.57162	2.58444		

Significant difference on weight between Coimbatore (t = 2.275) and Nilgiris (t = 2.098) male participants was observed before and after YSSP. Coimbatore participants were found to have higher body weight and gain in weight (Gain in weight - 2.034 kg) when compared to that of Nilgiris (Gain in weight – 3 kg) participants.

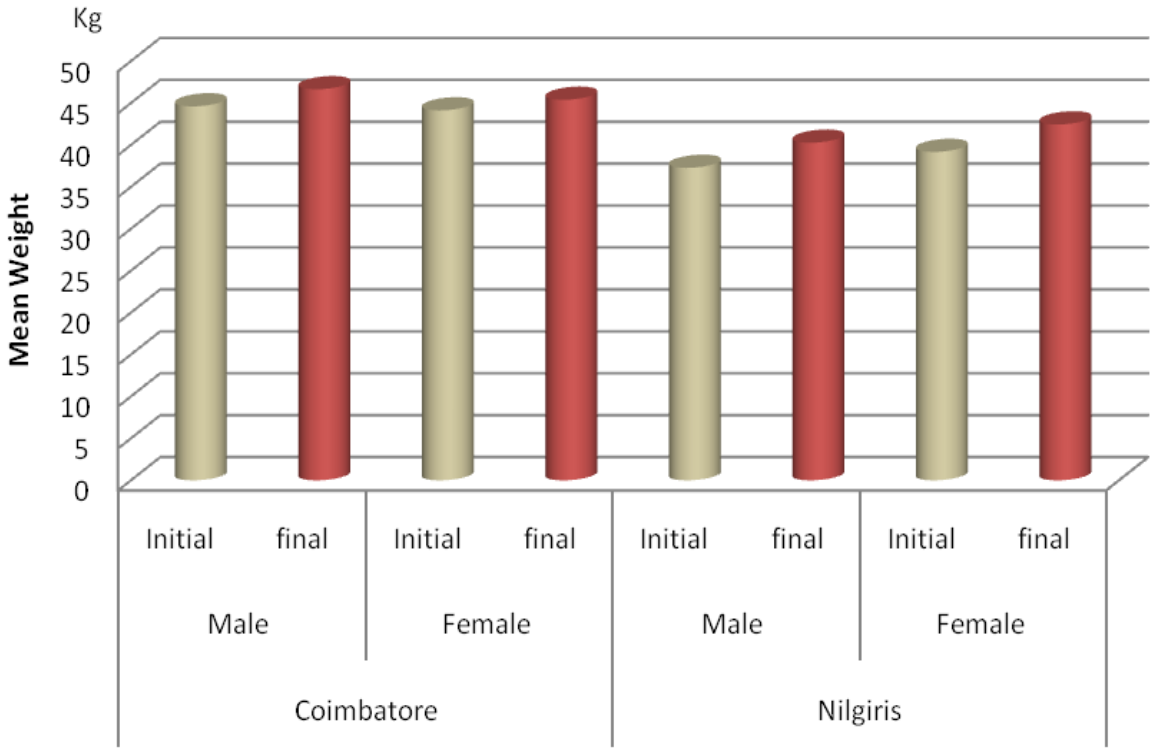
Female participants from Coimbatore were observed to have higher body weight when compared to that of Nilgiris participants with the gain in weight of 1.2667 Kg; whereas the female participants from Nilgiris gained 3.2727 kg after the programme.

Surprisingly irrespective of the district they hailed from, all the participants gained weight after the programme. The male participants from Coimbatore (t = 3.952) and both male (t = 5.532) and female (t = 3.537) participants from Nilgiris were observed to show significant mean difference on weight between pre and post training for a period of 20 days. Table 5 and Fig. 2 express the same.

Table 5. Mean difference on weight of male and female participants before and after YSSP.

Area	Mean weight			N	Std. Deviation	Std. Error Mean	't' value	Significance (*p*)
Coimbatore	Male	Initial	44.6154	26	12.20845	2.39427	3.952	0.001
		Final	46.6538	26	11.51327	2.25794		
	Female	Initial	44.1333	15	7.64261	1.97331	2.040	0.061
		Final	45.4000	15	7.62327	1.96832		
Nilgiris	Male	Initial	37.2778	18	7.36291	1.73545	5.532	0.000
		Final	40.2778	18	6.91805	1.63060		
	Female	Initial	39.1818	11	8.91985	2.68943	3.537	0.005
		Final	42.4545	11	8.57162	2.58444		

Fig. 2: Mean weight of Coimbatore and Nilgiris participants before and after YSSP.



An institutionalized feeding of a planned food through organized feeding pattern would have been the reason for such a weight gain. Proper nutrition can promote optimal growth and development of children and lead a healthy life as stated by the Dietary Guidelines Advisory Committee (DGAC, 2010) on the Dietary Guidelines for Americans, 2010. Of course, healthy eating helps to reduce one's risk for developing obesity, osteoporosis, iron deficiency, and dental caries (cavities) (CDC, 1998).

Irrespective of gender, change in BMI was noted among the subjects. The number of undernourished subjects (61.4%) was found to get reduced after YSSP (51.4%); optimal nutrition was observed among higher percentage of the subjects (38.6%) after YSSP when compared to pre training (30%) through YSSP. At this juncture, it makes the investigators to assume that the meticulous physical activity and an optimal nutrition during the training period would have contributed to such an improvement in their nutritional status. In fact, this has been documented well and correlates with the overall change in their nutritional status. Thus, even the percentage of underweight has improvised. Indeed, there was a shift in the percentage of overweight category from 4.3% to 7.1% and obese category has reduced from 4.3% to 2.9%. Hence, such positive energy balance due to sound nutrition and regular physical activity is indicative and has been found to augment the overall nutritional status.

Table 6. Mean Body Mass Index (BMI) of YSSP participants.

BMI	Nutritional status	Initial		Final	
		Frequency	Percentage	Frequency	Percentage
<18.5	Under Nutrition	43	61.4	36	51.4
18.5-22.9	Optimal Nutrition	21	30.0	27	38.6
23-25	Over Weight	3	4.3	5	7.1
25-30	Obese	3	4.3	2	2.9
Total		70	100.0	70	100.0

Fig. 3: Mean Body Mass Index (BMI) of participants before and after YSSP.

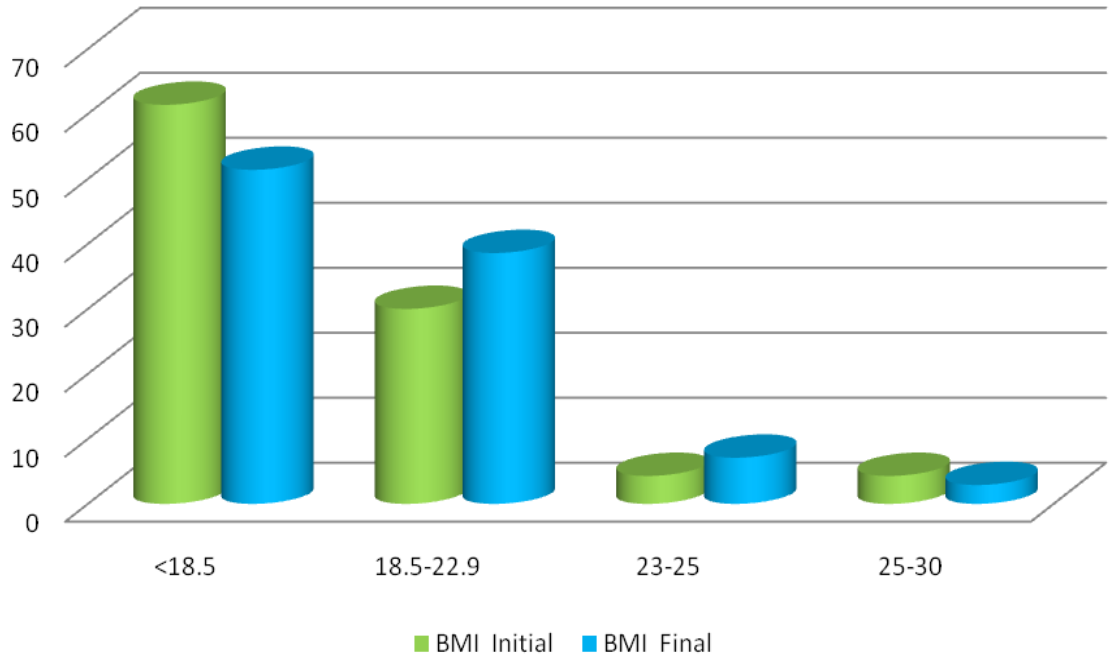


Table 7. Mean difference of BMI between Coimbatore and Nilgiris male participants

BMI		Sex	N	Mean	Std. Deviation	Std. Error Mean	't' value	Significance (*p*)
Initial	Male	Coimbatore	26	17.7415	3.60160	0.70633	1.745	0.088
		Nilgiris	18	16.0739	2.21833	0.52286		
Final	Male	Coimbatore	26	18.5808	3.28755	0.64474	1.410	0.166
		Nilgiris	18	17.3778	1.79724	0.42361		

Table 8. Mean difference on BMI between Coimbatore and Nilgiris female participants.

BMI		Sex	N	Mean	Std. Deviation	Std. Error Mean	't' value	Significance (*p*)
Initial	Female	Coimbatore	15	18.58067	3.371974	0.87064	0.356	0.725
		Nilgiris	11	18.11727	3.133149	0.52286		
Final	Female	Coimbatore	15	19.11333	3.288479	0.84908	0.439	0.665
		Nilgiris	11	19.65455	2.829969	0.42361		

However overweight was recorded among 7.1% after YSSP compared to 4.3% of the participants before YSSP. Obesity was found among 4.3% whereas the same was seen among only 2.95% after YSSP (Table 6 and Fig. 3). Such a sharp rise in BMI was noted in these young participants whose growth spurts should have been deemed as reason, because any such organized feeding for a period of month would not make the adults to raise their BMI so sharply. Unless otherwise it has been a high caloric or restaurant food, such changes in adults may not be possible.

No significant difference was observed on BMI between Coimbatore and Nilgiris male and female participants inspite of enhancement of BMI. The mean BMI of male participants from Coimbatore and female participants from Nilgiris have recorded a change from under nutrition to optimal nutrition and an improvement of BMI among the rest of their counterparts (Table 7 and Table 8).

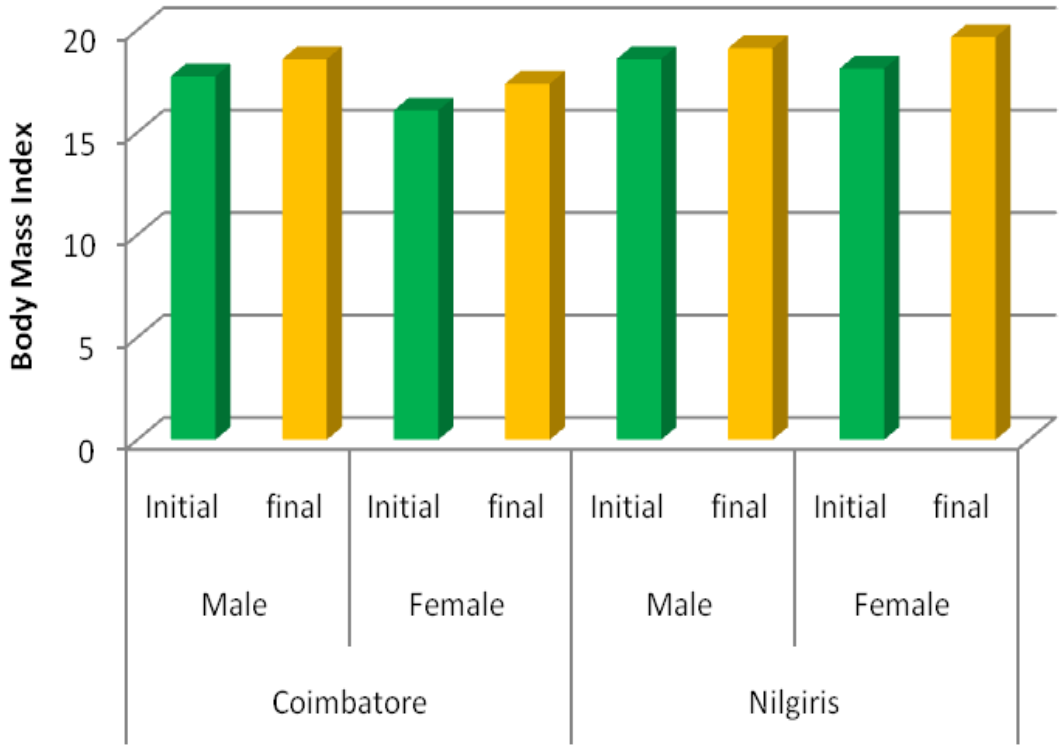
The training through YSSP at PSGCAS revealed a boost in BMI of both male and female participants from Coimbatore (male, t = 3.991; female, t = 2.037) and Nilgiris (male, t = 5.504; female, t = 3.764) with significant mean difference. Table 9 and Fig. 4 represent the same. Undernourished male participants (Mean = 17.7415) from Coimbatore and Nilgiris

(Mean = 18.1173) due to gain in weight were also found to enter into optimal nourishment (Coimbatore, Mean = 18.5808; Nilgiris, Mean = 19.6545) category (Table 9).

Table 9. Mean difference on BMI of participants before and after YSSP.

Area	Mean Body Mass Index (BMI)			N	Std. Deviation	Std. Error Mean	't' value	Significance
Coimbatore	Male	Initial	17.7415	26	3.60160	0.70633	3.991	0.001
		Final	18.5808	26	3.28755	0.64474		
	Female	Initial	18.5807	15	3.37197	0.87064	2.037	0.061
		Final	19.1133	15	3.28848	0.84908		
Nilgiris	Male	Initial	16.0739	18	2.21833	0.52286	5.504	0.000
		Final	17.3778	18	1.79724	0.42361		
	Female	Initial	18.1173	11	3.13315	0.94468	3.764U	0.004
		Final	19.6545	11	2.82997	0.85327		

Fig. 4: Mean body Mass Index (BMI) distribution among participants before and after YSSP.



Conclusion

Though the purpose of this YSSP programme was meant to nurture the young students with a sound knowledge on basic sciences and humanities and thereby inclining their mind to have hooked to become a tomorrow's scientist, yet during the tenure of 20 days has shaped not only their wisdom but their body composition also. Thus, from the present study it is quite imperative that even a short but institutionalized feeding with scrupulous leisure and physical activity would yield a sound nutritional status and wellness.

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