

DIETARY INTAKE AND PHYSICAL ACTIVITY OF BOLIVIAN SCHOOLBOYS AT HIGH ALTITUDE.

G.B. Post*, H.C.G. Kemper*, C. Lujan, R.M. Arze, G. Parent, H. Spielvogel and J. Coudert.

*Dept. of Health Science, Faculty of Human Movement Sciences, Vrije Universiteit, Amsterdam, The Netherlands

A population of about 50 schoolboys from 10-12 years old living in the city of La Paz - Bolivia at an altitude between 3600 and 4100 m are studied. Food consumption and physical activity is measured by 24-hours interviews. Also anthropometric data are collected. Three different kinds of schools are involved: 1. A French-Bolivian school (FB), with children of a relative high social standard, 2. a school in Villa Fatima (VF), children with a relative low social standard, and 3. a school in El Alto (EA), with children of medium to low social standard. The mean energy intake is about 2000 kcalories whereas the estimated mean energy expenditure is about 2250 kcal. Significant differences are found in energy intake; children of FB have higher energy intakes than children of VF and EA. Also significant differences are found in energy expenditure, although in a different direction, higher in boys of VF and EA. Total skinfolds is shown significant higher in FB (41 mm) compared to VF (27 mm) and EA (31 mm). The relationship between dietary intake and physical activity show a tendency to marginal energy intakes compared to the energy expenditure in boys with a low socio-economic status, supported by the mean of total skinfolds.

Introduction

During childhood and adolescence children with similar genetic backgrounds but different nutritional status show differences in height, more than children of different genetic backgrounds and similar nutritional status (Frisancho et al., 1980). The fact that adolescents of poor nutritional status are significantly shorter than their counterparts of good nutritional status indicates that under conditions of poor nutrition the role of genetic factors on growth in height is overridden by the influence of environmental factors. Therefore it was interesting to look at lifestyle factors, such as nutrition and habitual physical activity in relation to health factors and growth of prepubertal boys at high altitude.

Within the framework of a co-ownership between the Vrije Universiteit van Amsterdam, the Université de Clermont Ferrand and the Instituto Boliviano de Biología de Altura a study took place in La Paz-Bolivia, with grants from the European Community.

This study is part of a research program 'Effects of nutrition and physical activity on physical capacities in prepubertal children living at altitude'. The results of the nutrition and daily physical activity of 10 - 12 years old schoolboys will be described.

Subjects and methods

La Paz is the capital of Bolivia (Latin America), and situated at an altitude of about 4000 meters high with a population of about 2 million.

From all the boys measured in 1990 we selected 47 schoolboys of 10 to 12 years of age. Three different kinds of schools were involved. From a French-Bolivian (FB) school 7 boys are studied. This school is situated in down-town La Paz, the richer part of the city. In the slopes of the hills from La Paz we studied 23 boys from a school in Villa Fatima (VF), a poor to very poor part of the city. At a higher plateau of La Paz 17 boys of a school in El Alto (EA) were studied. The socio-economic status (SES) of the boys were as follows; of the FB school high, of the school of VF low, and of the school EA medium to low. The genetic background of the boys was overall indian, with more spanish/european influences in the FB boys. Dietary information was obtained with a 24 hours recall method. A Bolivian nutritionist interviewed the child, with the mother as stand-in to supply the information if necessary, for instance about details of the meals and ingredients in soups etcetera. All the interviews took place during home visits. Common used



utensils, such as plates, bowls and cups, were showed to estimate the quantities. Ingredients of meals were weighed if possible on a pair of scales.

During the same visit the boy was asked about all his physical activities over the last 24 hours.

In the institute (IBBA) anthropometric measurements took place, for example weight, height, and skinfold thicknesses.

Data analysis

The food intakes were determined by converting household measures to grams and coding food items separately. The nutrient composition was obtained primarily from the Bolivian table of food composition (1984), for selected items from the INCAP table (1961), and from the SVEN table, and finally supplemented by the Dutch food composition table (NEVO, 1989).

The activities, measured by the interview in duration, were ranged in 4 different intensities and converted to energy in kilocalories: (a) sleep 0.8 kcal/min, (b) light activities (sitting, standing) 1.5 kcal/min, (c) medium activities (walking, cycling) 3.5 kcal/min, and (d) heavy activities (running, carrying loads) 7.0 kcal/min, based on children age 10-12 years, weight 30 - 35 kg (Bar-Or 1983).

Finally the ANOVA and the Scheffé tests (independent values) were used to calculate the statistical significance ($P \leq 0.05$) of nutrient intake and physical activity between schools.

Results

The mean energy intake (table 1) of the high SES boys (FB) was about 2200 kilocalories (kcal), and of the low SES boys (VF and EA) about 2000 kcal. The differences between the high and the two low SES groups were statistical different.

Table 1. Mean energy (kcalories) and nutrient (grams) intake and st.dev. of three groups of schoolboys

School	Energy kcal sd	Protein g sd	Fat g sd	Carbohydrate g sd
FB	2195 * ± 540	64 + ± 19	55 * ± 28	369 + ± 76
VF	1975 ± 610	58 ± 26	37 ± 26	355 ± 97
EA	2020 ± 522	62 + ± 24	38 ± 27	360 ± 67

* statistical different ($P \leq 0.05$) from VF and EA

+ statistical different ($P \leq 0.05$) from VF

The daily physical activity of the lower SES schoolboys was significant different from the high SES, showing higher medium and heavy activities (table 2). This resulted in a mean energy output for of 1925 kcal the high SES group compared to 2400 kcal of the low SES groups (table 2). These differences are significant.

The anthropometric differences (table 3) between the three groups were as follows; the high SES boys were significant taller and heavier than the boys with lower SES levels. The sum of the 4 skinfolds showed that the boys of the low SES groups had significant lower fat than the boys of the higher SES class.

Discussion and conclusions

The relationship between dietary intake and physical activity show a tendency to marginal energy intakes compared to the energy output in boys with a low SES. Whereas boys of the higher SES show a tendency of a positive energybalance, reflected in the sum of 4 skinfolds. The low fat intake (table 1) may be a part of the explanation of the low energy intake in the lower SES groups. Another study of 7 to 11 years old children in La Paz - Bolivia (Moreno-Black 1983) showed almost the same findings as well as for the

Table 2. Mean daily physical activity (minutes) and the energy costs (kcal) and st.dev of three groups of schoolboys

School	Sleep min sd	Light min sd	Medium min sd	Heavy min sd	Energy kcal sd
FB	601 ±58	753 * ±225	75 * ±81	6 * ±11	1925 * ±350
VF	596 ±67	623 ±158	154 ±101	69 ±62	2420 ±450
EA	616 ±27	635 ±75	101 + ±45	62 ±38	2385 ±275

* statistical different ($P \leq 0.05$) from VF and EA+ statistical different ($P \leq 0.05$) from VF

Table 3. Mean and standard deviation (sd) of anthropometric data of three groups of schoolboys.

School	Height cm sd	Weight kg sd	Sum of 4 skinfolds mm sd
FB	140.2 + ±6.1	37.1 * ±7.6	41.4 * ±15.9
VF	130.5 ±4.0	29.1 ±3.6	27.1 ±5.9
EA	139.7 + ±9.0	35.7 + ±6.0	31.3 + ±10.8

* statistical different ($P \leq 0.05$) from VF and EA+ statistical different ($P \leq 0.05$) from VF

energy intake as for the energy output. On the other hand it is necessary to realize that the used methods for determining dietary intake and physical activity pattern (24-hours interviews) only gives limited information. Although in a developing country like Bolivia it might not be expected that a day to day variation should be very great especially for the lower SES groups. The struggle for life will need the most of the energy.

References

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