

Title: Nutritional State, Food Intake and Physical Activity in Aruban School Children

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Abstract:

Poor nutrition due to excess caloric intake is the result of a positive energy balance that is maintained over a period of time and which can be observed in the earliest stages of life. This study was therefore undertaken for the purpose of analyzing food energy intake behavior and physical activity in 1,776 school children, who underwent anthropomorphic nutritional evaluation. A high prevalence of childhood obesity was found, as well as a high proportion of school children with excessive energy intake and a high percentage of school children classified as sedentary. Among those identified as obese, food energy intake behavior and low physical activity levels justified a different nutritional classification from that of healthy school children, a greater number of whom were characterized by lower food energy intake. These results point to the need to take immediate steps to

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improve eating habits and to increase levels of moderate and intense physical activity in order to combat the problem of childhood obesity in the study population.

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Introduction

Childhood obesity constitutes to be one of the principal health problems in most of the countries where such behavior and its principal causes are studied.^{1,2}

The ratio of food energy intake to the level of physical activity is one of the principal environmental factors related to childhood obesity^{2,3}. It is generally accepted that increased physical activity plays a significant role in reducing the prevalence of the illness and can even help to prevent it altogether^{4,5}.

The goal of this study was to observe the relationship in Aruban school children between physical activity and food energy intake, and anthropometric nutritional classification.

Methods

An anthropometric nutrition, physical activity and food energy intake study was undertaken with 1,776 school children between six and eleven years of age. The distribution of the 1,776 school children selected, by age and sex, was as follows: 244 six year olds, 286 seven year olds, 282 eight year olds, 291 nine year olds, 308 ten year olds, and 365 eleven year olds. 868 (48.8%) were girls, and 908 (51.1%) were boys.

The anthropometric nutritional evaluation was carried out by measuring weight and height, and the resulting body mass indexes were determined. For classification purposes, the results of these measurements were compared with the WHO reference group percentiles.⁶ The children were classified as healthy, overweight, or obese.

Research into physical activity was carried out by means of a survey administered to the parents of the children under study covering customary physical activity classified by type, frequency, and duration.

Research into food energy intake was performed by means of semi-quantitative surveys covering frequency of food consumption, which were evaluated by an automated system.⁷

Results

The anthropomorphic nutritional classification of the 1,776 children studied was as follows: 1,045 healthy children, 208 overweight children, and 523 obese chil-

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Physical activity and food energy intake tendencies for the 1,776 children studied were as follows: 1,376 (77.4%) were classified as sedentary and 400 (22.5%) as active, while food energy intake was determined to be appropriate in 552 children (31%) and inappropriate in 1,224 (68.9%). Of the latter, excess calorie intake was found in 989 (55.6% of the 1,776 children studied). See Tables 1 and 2.

Physical activity surveys revealed that of the 1,776 school children studied, 1,376 (77.4%) did not regularly participate in moderate or intense physical activity at all, walked for less than 10 minutes every day, and spent three to four hours watching television or playing video games. These children were therefore classified as sedentary, while 400 children who did participate in intense physical activity for over 20 minutes every day and moderate physical activity for over 40 minutes every day were classified as active.

The active children walked for an average of 40 to 60 minutes per day, although the number of steps per minute for those walks was not given. They spent 60 minutes watching television. Only 27 participated in some type of sport, 16 participated in aerobic exercise, 12 participated in dance, and all 400 played games involving intense physical activity.

Based on semi-quantitative food consumption surveys, the percent distribution of calories in the diets of the 989 (55.6%) children with excess calorie intake was as follows: 15% to 18% from proteins, 28% to 32% from neutral fats, 50% to 57% from carbohydrates, with 8%-12% of the latter consisting of simple or refined sugars.

Of the 523 obese children, 475 (90.8%) were found to have an excess calorie intake of 127% or greater and 48 (9.1%) showed appropriate calorie intake. 467 (89.2%) were sedentary and 56 (10.7%) were active. A total of 419 (80.1%) of these children were obese, sedentary, and exhibited excess calorie intake.

Of the 467 sedentary obese children, 48 (10.2%) had appropriate calorie intake, which means that the positive energy balance leading to obesity in these children must be related to their level of sedentariness.

The 56 (10.7%) active obese children shown in table 1 exhibited excess calorie intake, which also led to a positive energy balance. In this case, it was most likely due to the amount of food energy ingested and possibly greater efficiency in the utilization of energy released metabolically.

Among the 1045 healthy-weight children in this sub-sample, 720 (68.8%) were classified a sedentary and 325 (31.1%) with inappropriate excess energy intake, but with a food energy intake distribution closer to the internationally accepted standard, and never exceeding 110% of the appropriate energy intake. However,

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it is important to point out that these levels of sedentariness and excess calorie intake were lower than those found in the obese children. These poor lifestyles were found among all children in proportions that are not appropriate for a healthy population.

It was observed that excessive calorie intake tended to increase with age, from 46.3% in six year-old children to 84.1% in 11 year-olds. Sedentariness also increased with age in the children studied, from 70% in six year-olds to 81.3% in 11 year-olds. These tendencies are consistent with the increased rate of childhood obesity with age found in the school children studied.

In relation to sex, it was found that 59.4% of the girls and 52% of the boys showed excess calorie intake, while 79.2% of the girls and 75.7% of the boys were sedentary.

Discussion

This data is indicative of the high level of sedentariness and the high frequency of excess food energy intake among the population studied, which is consistent with the high proportion of overweight and obesity found.

Overweight and obesity are directly caused by a positive balance between food energy intake and energy expenditure over a prolonged period of time, which provides a basis for the large quantity of scientific research dedicated to these two factors. It is generally accepted that increased levels of obesity can be explained through increased food energy intake and sedentariness^{8,9}.

However, it is important to point out that the results of some studies suggest that information regarding the cause-effect relationship between physical activity and childhood obesity is lacking, and that not enough data is available to determine the quantity and types of physical activity required to achieve and maintain a healthy body weight. In addition, too little data is available to determine the time of day when moderate and intense physical activity should be performed in order to prevent or reduce obesity^{10,11}, but it has been accepted that regular, systematic participation in moderate and intense physical activity offers significant health benefits, including the prevention of obesity¹².

A study of the relationship between physical activity and childhood obesity revealed that children whose total physical activity amounted to less than one hour per day tended to be more obese than those who participated in physical activity for more than two hours every day¹³. Other studies of physical activity tendencies have revealed that physical activity is higher among boys and among school children with greater economic resources, which indicates that lack of knowledge among poorer children leads to a more negligent attitude with regard to childhood obesity^{14,15}.

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One of the causes of sedentariness in school children that favors childhood obesity is the disappearance of regular walking, to the point that some individuals will go several days without walking the distances necessary, at the pace required, to achieve appropriate energy expenditure, and this tendency is even greater during the weekends. It has also been reported that girls walk less frequently than boys¹⁶.

Childhood obesity is also influenced by certain environmental conditions such as fear for personal safety due to violence in the community and the risk of traffic accidents, which causes mothers to resort to excessive amounts of television and computer games to entertain their children. This relationship demonstrates that all factors that may contribute to childhood obesity must be taken into account when analyzing the causes of the illness^{17,18}.

It is generally accepted that childhood obesity is directly related to the elevated consumption of food products containing high concentrations of simple or refined sugars and fried foods, as well as poor dietary habits and lack of moderate and intense physical activity. It has also been pointed out that different individuals whose diets contain equivalent energy densities may accumulate different levels of neutral fats in their adipose tissue, due to differences in the efficiency of free energy utilization in the body's general biosynthetic processes, and in the efficiency of other types of biological processes. It has been suggested that these differences may be due to differing metabolic structures based on variations in individual genes; furthermore, a variety of environmental factors that may lead to diverse types of metabolic expression when acting upon individual genes also contributes to these differences¹⁹.

Failure to take other risk factors into account when analyzing the relationship between physical activity and obesity can lead to faulty conclusions, such as the observations of one study that found responses from parents of obese children that indicated a high level of intense physical activity; however, further questions allowed researchers to discover elevated consumption of foods containing high levels of simple or refined sugars and other poor dietary habits in the obese children, thus explaining their obesity, despite the fact that those children could be considered active, according to their parents' responses. These indications highlight the importance of a full, detailed evaluation of all risk factors for obesity, in order to identify its causes and possible solutions, as suggested in the "Global Strategy on Diet, Physical Activity, and Health" adopted at World Health Assembly 57 held in 2004^{20,21,22}.

Based on the findings obtained, and due to the adverse biological implications of those findings, an intervention program designed to combat both overweight and obesity in a holistic fashion is being implemented. This program is oriented principally toward parents, teachers, food handlers, merchants, and school-age children themselves—in short, the entire population—in order to make the food given to children healthier and, at the same time, increase the amount of regular and sys-

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tematic moderate and intense physical activity both in and out of school. This is a job for everybody—it requires participation on an economic, social, and political level if we truly wish to first stop the spread of this scourge and reduce its medium and long-term prevalence²².

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Conclusions

The differences found among obese, overweight, and healthy children based on excess food energy intake and sedentariness confirm that the poor lifestyles described in scientific literature as causes of obesity are found among Aruban school children.

These suggestions justify the urgent implementation of effective intervention measures to protect the population of the country from this illness and its possible complications during childhood and later in life.

Works Cited

1. Janssen I, Katzmarzyk PT, Boyce WF, Vereecken C, Mulvihill C, Roberts C, Currie C, Pickett W; The Health Behaviour in School-Aged Children Obesity Working Group*. Comparison of overweight and obesity prevalence in school-aged youth from 34 countries and their relationships with physical activity and dietary patterns. *Obes Rev.* 2005;6(2):123-32.
2. Seidell JC. Epidemiology of obesity. *Semin Vasc Med.* 2005;5(1):3-14.
3. Ball EJ, O'Connor J, Abbott R, Steinbeck KS, Davies PS, Wishart C, Gaskin J, Baur LA. Total energy expenditure, body fatness, and physical activity in children aged 6-9 y. *Am J Clin Nutr.* 2001;74(4):524-8.
4. Huang TT, McCrory MA. Dairy intake, obesity, and metabolic health in children and adolescents: knowledge and gaps. *Nutr Rev.* 2005;63(3):71-80.
5. Trost SG, Sirard JR, Dowda M, Pfeiffer KA, Pate RR. Physical activity in overweight and nonoverweight preschool children. *Int J Obes Relat Metab Disord.* 2003;27(7):834-9.
6. World Health Organization. *Physical Status: the use and interpretation of anthropometry.* Geneva:WHO;1995 (Technical Report Series 854)
7. The Food Processor Standard Programs SQL. ESHAPort SQL. ESHA Security SQL www.esha.com

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8. Vieno A, Santinello M, Martini MC. Epidemiology of overweight and obesity among Italian early adolescents: relation with physical activity and sedentary behaviour. *Epidemiol Psichiatr Soc*. 2005;14(2):100-7.

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9. Deforche B, De Bourdeaudhuij I, Tanghe A, Debode P, Hills AP, Bouckaert J. Role of physical activity and eating behaviour in weight control after treatment in severely obese children and adolescents. *Acta Paediatr*. 2005;94(4):464-70.

10. Rennie KL, Livingstone MB, Wells JC, McGloin A, Coward WA, Prentice AM, Jebb SA. Association of physical activity with body-composition indexes in children aged 6-8 y at varied risk of obesity. *Am J Clin Nutr*. 2005;82(1):13-20.

health

11. Wareham NJ, van Sluijs EM, Ekelund U. Physical activity and obesity prevention: a review of the current evidence. *Proc Nutr Soc*. 2005;64(2):229-47.

holistic

12. Predel HG, Tokarski W. Influence of physical activity on human health. *Bundesgesundheitsblatt Gesundheitsforschung Gesundheitsschutz*. 2005;48(8):833-40.

13. Ekelund U, Sardinha LB, Anderssen SA, Harro M, Franks PW, Brage S, Cooper AR, Andersen LB, Riddoch C, Froberg K. Associations between objectively assessed physical activity and indicators of body fatness in 9- to 10-y-old European children: a population-based study from 4 distinct regions in Europe (the European Youth Heart Study). *Am J Clin Nutr*. 2004;80(3):584-90.

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14. Mo F, Turner M, Krewski D, Mo FD. Physical inactivity and socioeconomic status in Canadian adolescents. *Int J Adolesc Med Health*. 2005 Jan-Mar;17(1):49-56.

healing

15. Montgomery C, Reilly JJ, Jackson DM, Kelly LA, Slater C, Paton JY, Grant S. Relation between physical activity and energy expenditure in a representative sample of young children. *Am J Clin Nutr*. 2004;80(3):591-6.

humanity

16. Harten N, Olds T. Patterns of active transport in 11-12 year old Australian children. *Aust N Z J Public Health*. 2004;28(2):167-72.

17. Burdette HL, Whitaker RC. A national study of neighborhood safety, outdoor play, television viewing, and obesity in preschool children. *Pediatrics*. 2005;116(3):657-62.

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18. Philippas NG, Lo CW. Childhood obesity: etiology, prevention, and treatment. *Nutr Clin Care*. 2005;8(2):77-88.

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19. Chellini E, Talassi F, Corbo G, Berti G, De Sario M, Rusconi F, Piffer S, Caranci N, Petronio MG, Sestini P, Dell'Orco V, Bonci E, Armenio L, La Grutta S; Gruppo Collaborativo SIDRIA-2. Environmental, social and demographic characteristics of chil-

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dren and adolescents, resident in different Italian areas. *Epidemiol Prev.* 2005;29 (2 Suppl):14-23.

20. Nawalyah AG, Bong HL. Food intake and physical activity patterns of obese children in primary schools in Kuching, Sarawak, Malaysia. *Asia Pac J Clin Nutr.* 2004;13(Suppl):S146.

21. Zellner K, Jaeger U, Kromeyer-Hauschild K. Height, weight and BMI of school-children in Jena, Germany--are the secular changes levelling off?. *Econ Hum Biol.* 2004;2(2):281-94.

22. Organización Mundial de la Salud. Estrategia mundial sobre régimen alimentario, actividad física y salud. 57 Asamblea Mundial de la Salud. Ginebra:OMS;2004: (WHA57.17)



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Table 1. Physical activity and food energy intake in school children studied

Intake	Phys. Activity		Anthropometric Classification			Total
	Phys. Activity	Act .	Healthy	Overweight	Obese	
Appropriate	Phys. Activity	Act .	106	0	0	106
		Sed .	334	64	48	446
	Subtotal		440	64	48	552
Deficient	Phys. Activity	Act .	4			4
		Sed .	231			231
	Subtotal		235			235
Excessive	Phys. Activity	Act .	205	29	56	290
		Sed .	165	115	419	699
	Subtotal		370	144	475	989
Total			1045	208	523	1,776

Table 2. School children who are sedentary or who have inappropriate excess energy consumption.

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Classification	School Children Studied	Sedentary	Excessive intake	Sedentary with excessive intake
Healthy weight	1045	730 (69.8%)	370 (35.4%)	165 (15.7%)
Overweight	208	179 (86.2%)	144 (69.2%)	115 (55.2%)
Obese	523	467 (89.2%)	475 (90.8%)	419 (80.1%)
Total	1,776	1376 (77.4%)	989 (55.6%)	699 (39.3%)

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