

Nutrition and Education. III. Educational achievement and food habits of Chilean elementary and high school graduates¹

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SUMMARY. The objective of this study was to correlate the educational achievement (EA) of Chilean elementary and high-school graduates with their food habits. For this purpose, a random sample of 550 schoolers from the Metropolitan Area of Santiago, Chile, graduating from elementary and high school (1:1) of both sexes (1:1), from public and private schools and from high, medium and low socioeconomic status (SES) (1:1:1), was selected. Food habits were determined through a specially designed questionnaire and defined as the frequency of consumption of the food groups, expressed as days per week. The EA was established through the Achievement Evaluation Program (AEP) and Academic Aptitude Test (AAT) in elementary- and high-school graduates-, respectively. Results revealed that EA was found significantly and positively correlated with the frequency of consumption of dairy products, meat products and eggs, in both elementary and high school graduates. A significant and inverse correlation between EA and the frequency of vegetables and fruits consumption was observed in both educational levels, and with miscellaneous products, only in elementary school graduates. Food habits explained 24.4% and 16.6% of the EA variance, in elementary and high school graduates, respectively. The frequency of consumption of dairy products was the independent variable with the greatest explanatory power in EA variance (approximately above 70% of the explained variance). These results are important to consider for educational planning focused on the School Feeding Program.

RESUMEN. Nutrición y Educación. III. Rendimiento escolar y hábitos alimentarios de escolares chilenos que egresan de educación básica y media. Este estudio tuvo como objetivo correlacionar el rendimiento escolar (RE) de escolares que egresan de Educación Básica y Media, con sus hábitos alimentarios. Con este propósito, se seleccionó una muestra aleatoria de 550 escolares del Área Metropolitana de Santiago, Chile, los cuales egresaban de Educación Básica y Media (1:1), de colegios públicos y privados (1:1), de ambos sexos (1:1) y de nivel socioeconómico (NSE) alto, medio y bajo (1:1:1). Los hábitos alimentarios se determinaron mediante un cuestionario especialmente confeccionado para tal efecto y se definieron como la frecuencia de consumo de los grupos de alimentos expresada en días por semana. El RE se determinó mediante el Programa de Evaluación del Rendimiento (PER) y la Prueba de Aptitud Académica (PAA) en los egresados de Educación Básica y Media, respectivamente. Los resultados revelaron que la RE correlacionada positiva y significativamente con la frecuencia de consumo de productos lácteos y de productos carnicos y huevos, e inversamente, con la frecuencia de consumo de verduras y frutas, en ambos niveles de enseñanza. Sólo en los egresados de Educación Básica el RE correlacionó inversa y significativamente con la frecuencia de consumo de productos misceláneos. Los hábitos alimenticios explicaron el 24.4% y 16.6% de la varianza del RE, en los egresados de Educación Básica y Media, respectivamente. La frecuencia de consumo de productos lácteos fue la variable independiente con el mayor poder explicatorio en la varianza del RE (aproximadamente 70% de la varianza explicada). Estos resultados se consideran relevantes en lo que respecta a la planificación educacional focalizada al Programa de Alimentación Escolar.

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INTRODUCTION

In Chile, few research works have been carried out to determine population's food habits. Some of them have evaluated the effect of the mother's schooling level on food habits of lactating infants and preschoolers (1, 2).

In the sample of the present study, food habits were adequate compared with the Model Allowance of the Ministry of Health of Chile, and significantly and positively associated with socioeconomic status (3, 4). Likewise, only in highschool graduates food habits significantly differed when judged by type of school and age of the schoolers (4). On the other hand, findings from studies of several authors indicate that food habits are associated with nutrition education and nutrition knowledge, besides socioeconomic and sociocultural status (2, 58). Other investigators have described that food habits change according to sex and race (9, 10). Furthermore, some authors have emphasized that food habits affect the nutritional and health status (11).

As stated previously, socioeconomic conditions affect food habits; at the same time, schoolers' food habits would reflect parents' experience (12).

Taking into account all of the above considerations, the purpose of our study was to correlate food habits with the educational achievement of Chilean elementary and high school graduates from different socioeconomic status, because the latter has been described as an important determinant of food habits, as well as of educational achievement. In other context, this study is based on the fact that in Chile almost no research has been carried out in regard to the matter.

MATERIAL AND METHODS

Sample

A random sample of 550 Chilean adolescent schoolers graduating from elementary and high school (1:1) was chosen in the Metropolitan Area of Santiago, Chile. Schoolers belonged to 13 educational establishments that were deliberately selected in seven communes. In each educational establishment, schoolers were randomly selected from 8th grade of elementary school and from 4th grade of high school. In this manner, the sample included the same number of schoolers by type of school (public and private, 1:1), sex (males and females, 1:1) and socioeconomic status (SES) (high, medium and low, 1:1:1). Schoolers with ages comprised between 13 and 19 years old (13-16 yr and 16-19 yr in elementary and high school, respectively), and in low SES, were significantly older in relation to other strata. The field study was carried out in the second semester of 1982.

Socioeconomic Study

SES was determined through a socioeconomic scale

which includes schooling, occupation of the household head, and housing (conditions, property, water supply, sanitation and goods) (13).

Food Habits

Food habits were determined through a questionnaire individually applied to the schooler by trained interviewers. Food habits were defined as the frequency of food consumption groups (expressed as days per week): Group I. Dairy products (milk, cheese, fresh cheese and yoghurt); Group II. Meat products and eggs (meat, fish, viscera, poultry, shellfish and eggs). Group III. Vegetables and fruits. Group IV. Legumes, cereal, cereal products, oils, butter, margarine, sugar and bread. Group V. Miscellaneous products (tea, coffee, juices, carbonated beverages, almonds, nuts, peanuts and candies).

Educational Achievement

Educational achievement (EA) was measured by means of the Achievement Evaluation Program (AEP) in schoolers graduating from elementary school, national achievement test of language and mathematics, administered by the Ministry of Education at the end of 8th grade. Results in the present study are expressed as percentage of achievement of both language and mathematics test, in three categories: high (> 40%), medium (30-40%) and low (< 30%). On the other hand, in high school graduates, EA was measured through the Academic Aptitude Test (AAT), a national verbal and mathematics test administered by the university system to prospective students. Results are expressed as the mean between both scores, the verbal and the mathematics parts. Scores range between 0-900, and in our study, three categories were established: high (≥ 600), medium (450-600) and low (< 450). Scores < 450 prevent schoolers to postulate for university entrance. Both instruments, AEP and AAT are of wide national covering and have been submitted to adequate processes of validity and reliability.

Statistical Analysis

Statistical procedures included analysis of variance, Student's "t" test, Pearson's correlation coefficients, and stepwise multiple regression (14).

RESULTS AND DISCUSSION

The frequency of consumption of the food groups, according to EA (AEP) categories, is presented in Table 1. Schoolers that obtained a low percentage of achievement registered a significantly lower frequency of consumption of dairy products to compared with the other categories and meat products and eggs in relation to the upper category of EA. No association was observed for the other food groups.

Table 2 shows a multiple regression between EA (AEP) (dependent variable) and the frequency of consumption of the different food groups (independent variables). EA (AEP)

TABLE 1

EDUCATIONAL ACHIEVEMENT (ACHIEVEMENT EVALUATION PROGRAM, AEP) AND FOOD HABITS OF CHILEAN ELEMENTARY SCHOOL GRADUATES.

Food groups	AEP			F
	% of achievement			
	< 30	30-40	> 40	
	Frequency of consumption (days per week)			
I	4.58a ± 2.42 (74)	5.60b ± 2.16 (72)	6.62c ± 1.17 (101)	24.006**
II	4.23a ± 1.82 (74)	4.04a ± 1.74 (75)	4.98b ± 1.79 (101)	6.90**
III	6.52 ± 1.21 (75)	6.19 ± 1.38 (75)	6.18 ± 1.35 (101)	1.70NS
IV	7.00 ± 0.00 (75)	7.00 ± 0.00 (75)	7.00 ± 0.00 (101)	1.00NS
V	6.63 ± 1.08 (75)	6.37 ± 1.49 (75)	6.52 ± 1.12 (101)	79NS

Note: Results are expressed as mean ± standard deviation. The number of cases in each group is given in parenthesis. Means with the same letter are not significantly different at the 0.05 level of probability based on Student's "t" test.

**p < 0.01; NS = Not significant.

Food groups: I. Dairy Products, II. Meat Products and Eggs, III. Vegetables and Fruits, IV. Legumes, Cereal Products, Oils, Butter, Margarine, Sugar and Bread, and V. Miscellaneous Products.

TABLE 2

MULTIPLE REGRESSION TABLE OF EDUCATIONAL ACHIEVEMENT (ACHIEVEMENT EVALUATION PROGRAM, AEP) (DEPENDENT VARIABLE) AND FOOD HABITS (INDEPENDENT VARIABLES) OF CHILEAN ELEMENTARY SCHOOL GRADUATES

Food groups	Multiple	r ²	r ² Change	Simple r ¹	B	Beta
I	0.45301	0.20521	0.20521	0.45301***	2.071236	0.42815
II	0.45732	0.20915	0.00393	0.17269***	0.4689255	0.08446
III	0.48150	0.23184	0.02270	0.13430*	01.219556	0.15377
V	0.49407***	0.24411***	0.01227	0.13443*	01.96344	0.11096
Constant					43.69262	

¹ * p < 0.05; *** p < 0.01, N = 246.

Food Groups: I. Dairy Products, II. Meat Products and Eggs, III. Vegetables and Fruits, V. Miscellaneous Products.

was found significantly and positively correlated with the frequency of consumption of dairy products ($r = 0.453$, $p < 0.01$), meat products and eggs ($r = 0.172$, $p < 0.01$) and inversely correlated with vegetables and fruits ($r = 0.134$, $p < 0.05$) and miscellaneous products ($r = 0.134$, $p < 0.05$) (Multiple $r = 0.494$, $p < 0.01$); $r^2 = 0.244$). The frequency of consumption of dairy products was the independent variable with the greatest explanatory power in EA (AEP) variance (20.5%), followed by vegetables and fruits (2.2%), miscellaneous products (1.2%) and meat products and eggs (0.4%). This fact is directly and significantly correlated with socioeconomic and sociocultural conditions, where by, controlling for SES, the relationship found between EA (AEP) and schooler's food habits are explained to a certain extent for such conditions. Therefore, the frequency of consumption of dairy products and meat products and eggs, was significantly higher in high SES schoolers which also presented a significantly lower consumption of vegetables and fruits, especially of onions, squash and potatoes (3).

The frequency of consumption of food groups by EA (AAT) categories is given in Table 3. As can be observed, a similar situation to that found for elementary school graduates occurs. Schoolers obtaining the highest values in AAT presented a significantly higher frequency of consumption of dairy products, meat products and eggs, and

a significantly lower frequency of consumption of vegetables and fruits, mainly of onions, cabbage, potatoes and squash (4)

A multiple regression between EA (AAT) (dependent variable) and the frequency of consumption of food groups, is indicated in Table 4. EDA (AAT) was found to be significantly and positively correlated with the frequency of consumption of dairy products ($r = 0.342$, $p < 0.01$) meat products and eggs ($r = 0.244$, $p < 0.01$) and inversely correlated with the frequency of consumption of vegetables and fruits ($r = 0.129$, $p > 5$) (Multiple $r = 0.407$, $p < 0.02$; $r^2 = 0.166$). The frequency of consumption of dairy products was the independent variable with the greatest explanatory power in EA variance (11.6%), followed by meat products and eggs (2.8%) and vegetables and fruits (2.0%). Controlling for SES, it can be appreciated that the relationship found between EA (AAT) of highschool graduates and their food habits are significantly related with socioeconomic and sociocultural conditions, because high SES schoolers registered a significantly higher frequency of consumption of dairy products, meat products and eggs, and a lower frequency of consumption of vegetables and fruits (4).

Consequently, as informed previously, SES was the independent variable with the greatest explanatory power in

TABLE 3
EDUCATIONAL ACHIEVEMENT (ACADEMIC APTITUDE TEST, AAT) AND FOOD HABITS OF CHILEAN HIGH-SCHOOL GRADUATES

Food groups	AAT			F
	< 450	450-600	≥ 600	
	Frequency of consumption (days per week)			
I	4.58a ± 2.36 (103)	5.09a ± 2.34 (90)	6.62b ± 1.25 (69)	19.55**
II	4.65a ± 1.85 (105)	4.88a ± 1.94 (93)	5.62b ± 1.59 (69)	6.13**
III	6.64a ± 0.92 (105)	6.55ab ± 1.01 (93)	6.25b ± 1.24 (69)	3.03*
IV	7.00 ± 0.00 (105)	6.96 ± 0.42 (93)	7.00 ± 0.00 (68)	0.92NS
V	6.79 ± 0.76 (105)	6.70 ± 1.05 (93)	6.46 ± 1.40 (68)	2.05NS

Note: Results are expressed as mean ± standard deviation. The number of cases in each group is given in parenthesis. Means with the same letter are not significantly different at the 0.05 level of probability based on Student's "t" test.

* $p < 0.05$; ** $p < 0.01$; NS = Not significant.

Food groups: I. Dairy Products, II. Meat Products and Eggs, III. Vegetables and Fruits, IV. Legumes, Cereal Products, Oils, Butter, Margarine, Sugar and Bread, and V. Miscellaneous Products.

TABLE 4
 MULTIPLE REGRESSION TABLE OF EDUCATIONAL ACHIEVEMENT (ACADEMIC APTITUDE TEST, MT)
 (DEPENDENT VARIABLE) AND FOOD HABITS (INDEPENDENT VARIABLE) OF CHILEAN HIGHSCHOOL
 GRADUATES

Food groups	Multiple r	r ²	r ² Change	Simple r ¹	B	Beta
I	0.34194	0.11692	0.11692	0.34194***	15.61314	0.28968
II	0.38125	0.14535	0.02843	0.24361***	12.79233	0.19329
III	0.40612	0.16493	0.01958	0.12932*	-15.93798	0.13838
V	0.40702***	0.16566***	0.00073	0.05963	-4.838065	0.02727
Constant					494.5429	

1 * p < 0.05; *** p < 0.01; N = 261.

Food Groups: I. Dairy Products, II. Meat Products and Eggs, III. Vegetables and Fruits, V. Miscellaneous Products.

EA variance in elementary school (31.4%), as well as highschool graduates (30.2%), representing approximately 80% of the explained variance (15). In the present study, the frequency of consumption of dairy products was the independent variable with the greatest explanatory power in EA, although it is necessary to underline some facts (16, 17). In elementary school graduates the frequency of consumption of dairy products was found to be significantly and positively correlated with SES ($r = 0.491$, $p < 0.01$; the negative sign is due to the fact that more lower grades in the SES scale belong to higher levels in SES). The percentage of height for age according to the National Center for Health Statistics Tables (NCHS) is ($r = 0.206$, $p < 0.01$) and for calcium intake ($r = 0.440$, $p < 0.01$). In high school graduates a similar situation was observed, since the frequency of consumption of dairy products was also found significantly and positively correlated with SES ($r = 0.429$, $p < 0.01$), the percentage of height for age being ($r = 0.218$, $p < 0.01$) and for protein intake ($r = 0.296$, $p < 0.01$) (15-17).

These results reveal that the EA problem is multicausal, so that all the variables affecting it are related. The fact that in elementary school graduates EA correlates positively and significantly with SES, the frequency of consumption of dairy products, the percentage of height for age, and the calcium intake is a very important finding for the School Feeding Program in Chile.

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