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## BEHAVIORAL STRATEGY ON NUTRITIONAL EDUCATION

### ESTRATEGIA CONDUCTUAL DE EDUCACIÓN ALIMENTARIA

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#### Abstract

A multi-program strategy on nutritional education with four levels of behavioral complexity and their effects on preferences and choices of feeding products was designed and tested in a sample of 116 scholars, aged seven to thirteen years. A factorial design (Program-by-Grade) was employed. Second, fourth and sixth grades participants were assigned to four intervention programs: situational non-instrumental, situational instrumental, extra-situational and trans-situational. Anthropometric indicators were obtained, and preference/choice of feeding products was evaluated before and after intervention. The activities corresponding to the four programs promoted different behavioral complexity levels. Programs generated changes in students' choices and preferences, specifically with the extra-situational and trans-situational programs in fourth and sixth grades. No beneficial changes were found in any of the programs for the second grade children. Results showed the strategies promoting superior behavioral complexity levels have more impact when children have better linguistic competences.

Key words: behavioral intervention, non-adequate feeding, health psychology, scholars, feeding choices.

#### Resumen

Se diseñó y probó una estrategia de educación alimentaria en la que se aplican cuatro niveles de complejidad conductual y su efecto en la preferencia y selección de productos alimentarios en un grupo de 116 escolares en edades entre los siete y los trece años. Se empleó un diseño factorial (programa por grado), en el que los escolares de segundo, cuarto y sexto grados se asignaron a cuatro programas de intervención: situacional no instrumental, situacional instrumental, extrasituacional y transituacional. Se obtuvieron indicadores antropométricos y se evaluó la preferencia y selección de los productos alimentarios antes y después de la intervención. Las actividades correspondientes a los cuatro programas eran distintas y cada uno promovía competencias de diferente complejidad. Los programas generaron cambios, tanto en la preferencia como en la selección de productos en los escolares, en especial, con los programas extrasituacional y transituacional en cuarto y sexto grados. Los niños de segundo grado no se beneficiaron con ningún programa. Los resultados indican que las estrategias que promueven niveles de competencia superiores en complejidad pueden tener más alcance cuando los niños poseen un mayor repertorio lingüístico.

Palabras clave: intervención conductual, mala nutrición, psicología de la salud, escolares, preferencias alimentarias.

On a worldwide context, developed countries show high incidence of chronic diseases, like hypertension, diabetes mellitus, lipid disorders, sleep apnea, gout, osteoarthritis, coronary heart disease and different types of cancer. Other diseases associated to an increase consumption of fat, salt and/or sugar, and a low consumption of fiber content foods like fruits and vegetables, (Kleinman, 2000; McHill, 1997; Scrimshaw, 1995; Sorensen et al., 1999). These diseases slowly gestate from childhood and may be clinically manifest until adolescence or adulthood. There are physiological problems associated with inappropriate food consumption, and in addition, psychosocial area is affected. In Western cultures, overweight and obesity are linked with low self-esteem, depression and dietary restrictions that can induce eating disorders, like anorexia or bulimia, even during childhood (Hill & Pallin, 1998; Toussaint, 2000).

Mexican statistics show that nearly 70 percent of the adult population presents overweight or obesity (Olaiz-Fernandez, et al., 2006), which represents a risk factor linked to chronic diseases as diabetes mellitus, heart diseases and stroke, the main causes of death. The health problem worsens because school aged children are already affected (Ebbeling, Pawlak & Ludwig, 2002; Zimmet, 2003).

It become crucial to recognize both overweight and obesity are a direct result of the industrial and technological advances that modify the individual lifestyles, which are noticeably altered, primarily associated with feeding and physical activity (Cortez, López, Maldonado, Romero & Ortiz, 2004). The accelerated pace of life one finds in big cities, female incorporation at work, the increase in commuting time, are favorable elements in the decision making toward the high fat, sugar and sodium present in fast foods. In the same way, the reduced living space, the lack of recreational and relaxation places, television and video games as entertainment, as well as the automatic devices inside and outside home have diminished physical activities significantly (Ruano & Pujol, 1997; Tirado, Barbancho, Prieto & Moreno, 2004). Feeding and physical activity are related to energy consumption; the imbalances leads whether in overweight or obesity. There is evidence that these problems appear frequently in individuals living in urban areas, in contrast to those who live in rural areas. When rural people are slowly incorporated by progress or they are influenced by urban zones show similar tendencies.

The burden for society and health services having children and adults being overweight or obesity, the diseases associated to these conditions and the insufficient health services make it indispensable to design educative programs that contribute to prevent these problems. Therefore, the importance of educating on the consumption of a correct diet corresponding with age, health status and physical activity brings relevance.

Diseases derived from unhealthy consumption of foods have become a worldwide problem, there have been unsuccessful efforts to construct an intervention model

for fruits and vegetables consumption and reducing saturated fats and sugar (Baranowski, Weber-Cullen & Baranowski, 1999).

At a national level, nutritional education has come to be through communitarian models whose effectiveness to promote change in habits, has yet to be demonstrated (Arroyo, Pardío & Plazas, 1998; Pardío y Plazas, 1998). A reliable systematized effort of a comprehensive strategy directed towards Mexican population, adaptable to the distinct circumstances of specific populations, are the food consumption and nutrition guidelines, developed by the National Institute of Nutrition "Salvador Zubirán" (Shamah, Vásquez, Cervantes & Chávez, 1997). Nevertheless, this strategy is focused on increasing knowledge on the relevant aspects of correct sustenance and, therefore, its effectiveness is evaluated through an index on the changes to the exposed knowledge. It could be assuming a relationship between knowledge and attitudes on food choice in such a manner that knowledge could predict consumption, but there is evidence on the contrary (López, Alarcón & Gómez, 1994). In the same manner, children and young adults fail to apply this information in respect to healthier eating habits even though they show a positive response to healthy foods (Engell, Bordi, Borja, Lambert & Rolls, 1998; Warwik, Mcllveen & Strugnell, 1999).

The acquired knowledge about good eating habits does not guarantee any change in the feeding behavior of the individuals; because of this reason, it is necessary to design strategies on food choice and consumption that have incidence over the factors that mainly develop and maintain them. Preventive strategies in children and adolescents are incipient; most of the research goes rather to modify habits in adults (Resnicow, et al 2001).

From a psychological perspective, as in other health problems, one of the main obstacles to establish and maintain responses in accordance with a suitable consumption is the temporary gap between the individual's behavior and the consequences over his(her) health. The onset of illness symptoms related to the inadequate eating habits generally appears months or even years after the eating habit is established. Correcting bad eating habits does not have an immediate positive effect on the individual's health; food choice behavior and consumption tends to be regulating by particular temporary circumstances, not always favorable. Therefore, a strategy directed to improve eating habits should promote complex behavioral competences that allows the individual to extend immediate control in particular situations of selection.

An approach that allows the study and development of competences to improve the feeding practices is the psychological model of health proposed by Ribes (1990). The model emphasizes the main role of behavior in the development of the health process. Everything that any individual does or does not do, affects his (her) own health. To analyze the health disease process, the author included two different descriptive categories: process factors and outcome factors. Ribes characterizes the risk levels, and facilitates the development of interventions

That stimulate useful healthy behaviors. Besides, the author consider than the analysis on the history of individual interactions allows us to identify the set of available competences in any given moment; he conceives the situational context as a dispositional behavioral factor, which modulates the grade of exposition to risk factors. Competences may be available on different levels of complexity, which translates into various types of *know how*: what, how, why, and other actions can take place under some circumstances. Such complexity depends on the nature and the grade of participation of linguistic conventions.

In agreement with Ribes (1990) four levels of interaction can be identified in which effective competences can manifest themselves in preventive situations or in a state of risk: 1) Situational non-instrumental interactions: in these instances, the individual will not alter the properties of situational events (objects, people or events) that fully regulates his(her) behavior; they only react differentially. 2) Situational instrumental interactions: the individual's behavior is confined to a concrete situation and their responses are effective to alter the environment; this produces changes in the situation as well as affects his (her) own behavior. 3) Extra-situational interactions: the individual participates in structuring their relations with the environment and in the establishing of effectiveness criteria. The mediation of linguistic behavior defines this type of interaction, the person responds based on his (her) experiences when confronted by different circumstances, or based on non-explicit properties in a particular situation. Confronted in a concrete situation they act "as if" these were the characteristics of a non-present event and this only is possible to evoke it linguistically. 4) Trans-situational interactions: this level presents a greater complexity, the individual faces a situation according on his(her) conceptualizing; the linguistic behavior allows he(her) to abstract generic relationships independently of the present situation. This level of behavior allows, through language, to regulate and determinate the particular events independently of the momentary situations, even he (she) may change the effectiveness criteria that define the situation.

This model facilitates the competences development linked to adequate feeding behavior, in distinct levels of complexity related to the age and grades found in the elementary school. It goes without saying, that the greater the school level, the easier it will be to develop more complex competences that modify either the preference behavior as well as the choice of food products for consumption. According to this, the objective was to design and test a strategy on nutritional education based on the four levels of behavioral complexity devised by Ribes (1990), and its effect on the preferences and choices of food products found in school. Nutritional status of each scholarship also evaluated.

#### Method

##### Participants

Participants were 116 scholars in six groups,

none randomly, intentionally selected and assigned by the Dean of a public elementary school in Mexico City. This was comprised of 57 girls (15 second grade, 21 fourth grade and 21 sixth grade). There were 59 boys (14 second grade, 27 fourth grade and 18 sixth grade). Ages ranged between 7 and 8 years old in second grade, 9 and 11, fourth grade and 11 to 13, sixth grade. The Dean and the teachers signed the informed consent. Participants were randomly assigned to four intervention programs, and were distributed as shown in Table 1.

Table 1  
Total participants by program and grade

Grade	Program				Total
	Situational non instrumental	Situational instrumental	Extra situational	Trans-situational	
Second	7	5	9	8	29
Fourth	10	10	14	14	48
Sixth	11	10	9	9	39
Total	28	25	32	31	116

##### Apparatus and materials

Anthropometric indicators were obtained from the children; height and weight were measured using a medical scale and wall-mounted measuring tape to the nearest 0.1 Kg and 0.1 m, respectively.

For the meals preference and choice test, diverse manufactured food products were used, (fritters, chili popcorns, flour-made imitation pork rinds, chili caramel suckers, chili lollipops with gum), and natural products like apples, pears, oranges, *jícamas* [*Pachyrhizus erosus*] with lemon and chili, and carrots with lemon and chili.

For the intervention program, we utilized diverse items, like pencils, scissors, glue, paper, colors, a workbook, eight posters with illustrations as visual help for the sessions and educational guides.

The workbook contained a variety of information and activities accord to the competence level promoted in each program, with color illustrations and a cartoon character, represented by a fruit or a vegetable who guided the child through the different subjects: presenting/displaying information, formulating questions or giving instructions for the activities.

The purpose of the educational guides was that the researcher could have the objectives from each activity on hand, the proposed didactic technique, the required materials as well as the programmed duration. All materials were structured according to the characteristics of Ribes' levels (1990) and the guidelines of the *Norma Oficial Mexicana* number 043 (Secretaría de Salud, 2005) to promote health and for health education on food and nutrition, except for those related in the representation of food groups. The *Nutritional Pyramid* was use instead of *The Well-feeding Dish*, because school textbooks utilize that. Both have been use in Mexican population and are Alimentary Guides Based on Meals.

Information was registered on specially designed

forms (age, sex and school grades), anthropometric measures, as well as the data on the preference and nutritional product choice during the course of the program.

#### *Situation*

Evaluation took place at the school's patio, prepared for the goals of this study. Measuring tapes were placed on a wall and alongside them a scale to measure weight and size. In addition, five natural and five processed foods were randomly placed on a table. Program application and all the activities were developed in each group's classroom.

#### *Evaluation*

In order to characterize the sample we recorded height, weight and size of each participant, as well as name, age and grade. The preference and choice food was recorded previously and after the intervention during five days. Each participant had to choose among ten different products, five manufactured and five natural, they were then asked to put them in preferential order on a scale of 1 to 10, according to their preference (1 being their most favorite and 10, their least or undesired)<sup>1</sup>. Having made the previous ordering, the child had to select one of the products for his (her) personal consumption.

#### *Procedure*

A factorial design was used. Scholar's grade and assigned program were the independent variables. Comparisons pre-post interventions were made, within and between groups. Each session lasted around fifty minutes according to the specific program. The intervention average was twelve days.

Program's activities were different on structure because they were design to promote different complexity competences. All the sample received the following information: a) differences between eating and accurately feeding; b) the relationship between eating and health; c) food deficit and food excess and related illnesses; d) food groups; e) the nutritional pyramid chart; f) specific feeding needs according to age, sex and activity; g) seasonal foods; h) natural and manufactured foods; i) food hygiene; j) feeding and culture; k) erroneous beliefs about foods, and l) mass media and consumption habits. The specific characteristics of each program are as follows:

#### *Non-instrumental*

The researcher presented each theme as a conference with the scholars. The workbook contained the same information, and the activities required that children must read the text, and after the reading, they would repeat the information completely or at least partially. After that, they would be able to identify some components of the information with figures contained in the book to color and/or mark.

#### *Instrumental*

The researcher presented the theme on a conference. There were exercises that demanded scholars' active participation as follows: comparing, selecting, classifying and ordering the elements provided in the learning

situation. For example, students would classify a series of alimentary products according to group, and relating portions of diverse food groups for different people characteristics (age, sex and activity).

#### *Extra-situational*

This program was similar to the instrumental program; the program features were selecting, ordering or comparing criteria in some examples. Additionally, in this condition, scholars had to relate his (her) personal experiences or others' experiences to evaluate the previously established behavior criteria. For example, to write down the meals they consumed the day before and comparing his(her) intake with dietary recommendations, indicating if he(he) had eaten in a healthier manner. Also, if he (she) exceeded or stayed under the consumption limit of a particular group, or have linked personal or familiar health problems with the incorporation of a suitable or incorrect diet.

#### *Trans-situational*

This program was organized in a distinct manner from the three previous ones. None of the theme was start by researcher. The activities were oriented to promote the abstraction of the criteria and the adequate eating conditions for a healthy balanced diet using exercises derived from deductive strands pertaining to the logic said of classes or set theory. These includes the identification of a concept relative to the subject through positive and negative models of a particular instance, or through the relating of conditional tags like, *if or then*, among other strategies. For example, on the subject relative to the food groups, each nutritional value was show by way of what they do for our bodies; after this, examples of foods were given that contained said nutritional values and finally it was asked the child who had mentioned various products belonging to a food group in order to fulfill a specific necessity. They worked on applying said criteria to their personal experience and later they reviewed the knowledge acquired where the children elaborated in the form of a summary.

### Results

The nutritional status of the students was evaluated using weight, height and age indicators, using as reference the NCHS charts (National Health Statistics Center), the same reference criteria employed by the *Encuesta Nacional de Salud y Nutrición 2006* (Olaz-Fernández, et al., 2006).

The basic statistics were calculated. To evaluate the intervention effects on the change of meal preferences and food choice, intra-group comparisons were made. To evaluate the general effect of the intervention, Student *t* test for related samples was used; however, the specific effects of the intervention were tested using Wilcoxon Ranks test because when the analysis was made by group or/and program, the number of observations is lesser than the required on parametric statistics.

To evaluated individual effects of strategy and interactive effects of the program, the academic level, and the nutritional status of the children, a multi-way ANOVA with a factorial model of the main effects and interaction between variables was employed. SPSS (version 10) was

1. The hierarchical analysis was not a concern of this study

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use to analyze the data. The level for the hypothesis testing was set at 0.05.

### Nutritional status

A little more than half of the sample (59, 8%) are at a normal nutritional status; 23, 2% are overweight, and

15,2% were at risk of overweight. A small percentage, 1, 8%, is underweight. Table 2 shows the percentage distribution per program.

Table 2  
*Distribution in percentage of the nutritional status according to the assigned program*

Program	Nutritional State				Total
	Low weight	Normal weight	Overweight risk	Overweight	
Situational non-instrumental	0	20.5	1.8	2.7	25
Situational	0	15.2	0.9	4.5	20.5
Extra-situational	0.9	16.1	8	3.6	28.6
Trans-situational	0.9	8.0	4.5	12.5	25.9
Total	1.8	59.8	15.2	23.2	100

Table 3  
*Descriptive values preference and choice index by program and grade*

Grade		Program							
		Situational non instrumental		Situational instrumental		Extra-situational		Trans-situational	
		Average	SD	Average	SD	Average	SD	Average	SD
<i>Second</i>									
Preference	Pre	1.00	0.57	0.00	0.00	1.55	1.33	2.77	1.92
	Post	1.71	2.36	0.75	1.50	2.11	1.96	1.88	1.90
Choice	Pre	0.42	0.78	0.25	0.50	0.55	0.53	0.88	0.92
	Post	0.42	0.53	0.25	0.50	0.88	0.60	0.44	0.72
<i>Fourth</i>									
Preference	Pre	1.70	2.16	2.77	2.22	2.50	2.29	1.35	1.70
	Post	2.00	2.25	3.44	2.18	2.78	2.26	2.50	2.4
Choice	Pre	0.90	1.28	1.66	1.22	0.64	1.00	0.35	0.74
	Post	0.80	1.31	1.88	2.02	0.71	1.34	1.28	1.38
<i>Sixth</i>									
Preference	Pre	2.00	2.28	2.00	2.31	1.36	2.01	2.77	2.10
	Post	1.09	1.64	1.90	2.33	4.00	1.84	4.11	1.6
Choice	Pre	0.54	0.93	0.80	1.03	0.90	1.04	1.88	1.69
	Post	0.54	0.82	0.40	0.96	1.90	1.64	2.55	1.74

### Preference/ Choice

Preference and choice scores for natural foods were obtained by assigning values according to the number of occasions in which a natural product was preferred or selected. It was therefore established that the desirable values of the dependent variable were those closer to five points because they indicated that the preference/choice behavior was oriented toward natural foods. ,

Regarding preference and food choice scores obtained in the pre-evaluation in all the school grades, the mean was less than 3 ( $M = 1.91, SD = 1.99$  for preference, and  $M = 0.82, SD = 1,08$  for choice), values that point preference and choice toward processed foods. It can be notice that this tendency is greater in food selection.

notice that this tendency is greater in food selection.

Scholars select more processed foods although they proclaim to prefer them to a lesser extent; this discrepancy between preference and choice was statistically significant, ( $t_{(115)} = 6.77, p < 0.01$ ). Table 3 shows that after applying the intervention programs, there were modest changes in the scores distribution, mainly in the fourth and sixth grades.

Wilcoxon test was used to compare the intervention's effect in each program; the extra situational generated significant changes in preference ( $z = -2.29, p = 0.01$ ) and in natural products choice ( $z = -2.23, p < 0.05$ ) in the way we wanted, mainly in sixth grade (preference:  $z = -2.41, p <$



Table 4  
Principal and interactive effects program, grade and nutritional status in pre & post intervention tests

Factor	Preference				Choice			
	Pre		Post		Pre		Post	
	df	F	df	F	df	F	df	F
Program	3	1.47	3	3.20*	3	1.37	3	3.50*
Grade	2	1.74	2	3.04*	2	1.94	2	4.91**
Nutritional Status	3	0.78	3	0.18	3	0.69	3	1.87
Program*Grade	6	2.08	6	0.86	6	1.94	6	1.51
Program* Nutritional Status	7	1.83	7	1.27	7	1.81	7	1.29
Grade* Nutritional Status	4	1.41	4	0.95	4	1.03	4	0.82
Program*Grade* Nutritional Status	5	2.65	5	7.04	5	0.93	5	3.25

\*  $p < .1$  \*\* $p < .05$

0.05; choice:  $z = -2.23$ ,  $p < 0.05$ ). In the trans situational program, changes were marginally significant in preference ( $z = -1.77$ ,  $p < 0.1$ ) and choice ( $z = -1.76$ ,  $p < 0.1$ ), the effect was more intense in the fourth grade (preference:  $z = -2.43$ ,  $p = 0.01$ ; choice:  $z = -2.40$ ,  $p < 0.05$ ). Both situational programs did not produce any significant changes.

The analysis of pre and post intervention children's choices was made in each academic level, it was observed that despite the average increase in the preference index in second grade after the intervention with the situational and extra-situational programs, none of them reached the significance level. In fourth and sixth grades, only preference is affected by intervention ( $z = -1.91$ ,  $p = 0.05$  respectively).

Nutritional status was analyzed conjointly to school grade and the intervention program, due to the lack of equivalence between groups. ANOVA allowed us to appreciate that the differences between groups in the preference and choice responses before the intervention are not explain by the described factors. Nevertheless, the test showed that after the intervention, an effect remains about the preference and selection of products as much from the treatment as of school grade, whereas the nutrition status does not show significant effects on the post intervention differences between groups. Non-significant effects of the interaction between factors were observed (Table 4).

#### Discussion

The results obtained in this investigation justified the objective to design and test a nutritional education strategy based on different behavioral levels of complexity. The main aspect that stands out of the data concurs with the report of López, Alarcón and Gómez (1994) in other scholars' population; there are differences between preference and choice; children reported a preference for natural products but they selected processed products for consumption.

In addition, since programs affected preference more than choice, it is probable that interventions modify this behavior first and selection will be modify later, according to the development level. This assumption derives from

the observed pattern of changes in both dimensions, when the intervention effect is analyze conjointly with school grade. Second grade children only showed changes in preference, and they were non significant; on the contrary, we observed statistically significant changes in preference as we expected in fourth and sixth grade children, but not in the food selection.

Regarding programs, the extra-situational and trans-situational programs clearly showed the modifications experienced in preference and in food choice in the scholars of fourth and sixth grades. The behavioral intervention in nutritional education developed under the behavioral complexity levels proposed by Ribes (1990) demonstrated better results when there is a correspondence between children's competencies developed through their academic development, and the interventions that incorporate more complex criteria, as we could demonstrate with the scholars of fourth and sixth grades. This may be explained because, in these functional levels, the intervention allows the integration of the trained competencies with others previously developed, so children may respond using general criteria in diverse circumstances. In the same respect, there is a previous research in the field of reading, which indicates that situational training in students is only effective when the assessment method is structured in the same way as the ones employed during training. On the other hand, training that involves linguistic substitutions allows children to transfer trained competencies toward other circumstances, (Mares, Rueda, Plancarte & Guevara, 1997). In this study, the scholars undergoing extra-situational as well as trans-situational programs, had the opportunity to relate the criteria that regulates healthy eating with diverse situations they have experienced in other contexts, either in or out of school and maybe this fact allow them to regulate his(her) behavior in preference and choice tests.

The preceding results would not be found if the program was structured with simpler levels, as shown with the non-instrumental and instrumental programs results applied to the fourth and sixth grade children, despite the less achievement levels. This would explain the meager

success rate these programs have on nutritional education based on the concept repetition (Aldrete, et al, 2002).

Despite we found favorable statistically significant and changes in meal choice, these did not reach the desired values that indicated greater inclination for natural products, instead of the processed ones, except in two groups. Although it is important to remember: small changes obtained in a preventive program at population level may represent a great benefit to ameliorate the influence of risk factors for some chronic diseases, because the sum of individual behavior changes may shift the risk distribution by modifying the accepted practices of the community (Rose, 2001; Sorensen, Emmons, Hunt & Johnston, 1998). Change levels obtained in the extra and trans situational programs in the fourth and sixth grades allow us to contemplate the viability of their application at population level in a preventive way, once the findings have been randomly replicated.

This study comprises empirical evidence on the possibility of affecting preference and food choice behavior of scholars populations; besides, the study showed that it is possible to evaluate if a nutritionally orientated program affects individual's behavior through simple indicators, as the preference index.

School-aged children comprise a high-priority group that should be nutritionally educated in an effective manner. School education about proper nourishment will allow to effectively reach highly populated sectors, including teachers, families and the community as a whole (WHO, 1998).

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