

# The application of an occupational therapy nutrition education programme for children who are obese

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**ABSTRACT:** *The aim of this study was to evaluate an occupational therapy nutrition education programme for children who are obese with the use of two interactive games. A quasi-experimental study was carried out at a municipal school in Fortaleza, Brazil. A convenient sample of 200 children ages 8–10 years old participated in the study. Data collection comprised a semi-structured interview, direct and structured observation, and focus group, comparing two interactive games based on the food pyramid (video game and board game) used individually and then combined. Both play activities were efficient in the mediation of nutritional concepts, with a preference for the board game. In the learning strategies, intrinsic motivation and metacognition were analysed. The attention strategy was most applied at the video game. We concluded that both games promoted the learning of nutritional concepts. We confirmed the effectiveness of the simultaneous application of interactive games in an interdisciplinary health environment. It is recommended that a larger sample should be used in evaluating the effectiveness of play and video games in teaching healthy nutrition to children in a school setting. Copyright © 2008 John Wiley & Sons, Ltd.*

**Key words:** childhood obesity, nutrition education, paediatric occupational therapy, therapeutic play

## Introduction

Nutritional health education is a strategy for promoting health through learning about nutritious foods (Triches and Giugliani, 2005) and adopting healthy food habits (Brasil Ministério da Saúde, Secretaria de Políticas de Saúde, 2002; Boog, 2004).

Bundy (2000) proposed that intrinsic motivation and the capacity of abstracting from the reality can be achieved through play. To Lautamo et al. (2005) and Lawlor (2003), the act of play consist is a social and cultural occupation that can be adapted for teaching good nutrition.

One of the assumptions underlying this study is that occupational therapists can adapt play to optimize children's learning of nutritional concepts, and by doing so prevent childhood obesity. The prevalence of child obesity is increasing rapidly. In Brazil, 'the National Institute of Food and Nutrition INAN (National Institute of Food and Nutrition) indicates that childhood obesity in Brazil affects 16% of children' (Giugliano and Melo, 2004, p. 129).

'The increase in childhood obesity and prevalence of chronic disease risk factors demonstrate the importance of creating healthy school environments' (Staten et al., 2005, p. 1).

Since the school is where most learning is planned and executed, it is the ideal place to practice nutritional education and to acquire good eating habits (Organización Panamericana de la Salud, 1999). Intermediated learning occurs there through social relations. The elements of intermediation are the signs, tools, language and culture that are within the subjects and their activities. It facilitates learning by enabling the child to form a relation with the world and with others (Facci, 2004).

Intermediation occurs in the zone of proximal development (ZPD), which is the difference between the level of attitudes that can be developed with the guidance and help of others and the level of attitudes achieved independently (Vigotski, 2003). In this zone, levels of help are offered gradually, according to the child's needs. This study considers the following help levels: first – offer specific instructions; second – demonstrate learning; third – offer strategies to learn; and fourth – perform the task jointly with the child (Munguba, 2002).

This dynamic is strengthened by learning strategies – conscious and intentional decision-making processes in which children organize and recover information and apply it to different situations. These strategies, essential for planning and organizing learning, are classified into processing, affective and metacognition approaches, leading children to autonomy in learning – learning to learn (Valdés, 2002).

Given the link between culture and children through a repertory of games (Gomes and Boruchovitch, 2004), autonomy in the learning of culturally contextualized nutritional concepts is essential for the child. The purpose of this study was to compare educational–nutritional play activities implemented by

occupational therapists applying interdisciplinary approaches, with the goal of preventing childhood obesity.

## Methods

### *Type of study*

This study is interdisciplinary (Rodrigues, 2006), using quantitative and qualitative methods to compare two new nutritional education technologies developed by the authors – a video game and a board game. An analytical, applied and quasi-experimental research design, with triangulation, was applied (Minayo, 2005).

### *Study area and period*

The study was carried out at a municipal public school in Fortaleza, Brazil in 2004.

### *Universe, sample and selection criterion*

We used a convenience sample consisting of 200 children. The study group comprised 95 (47.5%) boys and 105 (52.5%) girls. The children were from 8 to 10 years of age. The study team consisted of a main group that comprised an occupational therapist, a nutritionist, a physician and 23 undergraduate students in occupational therapy (12), nutrition (10) and social communication (1). They were previously qualified in learning strategies, intermediation and nutritional education. This interprofessional group was concern based on researches of Mu and Royeen (2004) that proposed that occupational therapists in school-based settings are interacting with other professionals.

### *Techniques and data collection instruments*

A semi-structured interview and direct and structured observation were used. At the end of the investigation, we applied a focus group technique to collect data about the children's perception of learning nutritional concepts.

### *Comparison variables*

Preference, experience and attitudes

In the comparative study of the two games, we used objective criteria such as: (1) individual preference for the activity; (2) previous experience with the type of activity; and (3) attitudes triggered by the game, including strategic planning, the possibility of competition between children and amusement itself.

### Attitudes observed during the game

We used the following comparison criteria: (1) analysis of the learning strategies applied (metacognition, intrinsic motivation and attention); and (2) analysis of the intermediation used.

### *Comparison categories*

From participatory observation and focus group techniques and the content analysis of the children's discourse, we obtained the attitudes of these children with respect to: (1) the possibility of learning while playing; (2) fantasy during the learning process; (3) learning the concepts of nutritional education; and (4) the need for help in learning (intermediation).

### *Educational–nutritional play activities*

The educational–nutritional play activities, which comprised a board game and a video game, were manufactured in an interconnected way in relation to theme, character and foods, considering the adaptation of the style, traits and colours of the drawings to the age group in question, and were based on the food pyramid adapted to the Brazilian reality (Sizer and Whitney, 2006). A work team was formed consisting of a nutritionist, occupational therapist, pedagogue, psycho-pedagogue, nurse, doctor and computer technician. Each child took part in the games at weekly 30-minute sessions over a 4-month period.

### Video game

The video game encourages individuals to organize their daily diet, emphasizing the consumption of six meals. At the start of the game, weight and height are entered to trigger responses directed towards the user. The child is encouraged to organize a diet of a day. The game was presented in six stages, corresponding to each nutrition of that day. As the foods appear, the child selects the specific diet for his or her own meal. The selection of foods awards a score based on the calories ingested (Brasil IBGE, 1999; Pontes and Magalhães, 2003) and culminates in changes to the character's body, according to the calories of the foods chosen by the player. The child wins the game if he or she builds the correct diet according to his or her weight and height.

### Board game

The board game was developed by the same work group. As with the video game, the board game emphasizes the construction of six daily meals. The children must make decisions about the best form of establishing a healthy diet (Brasil IBGE, 1999; Pontes and Magalhães, 2003). The game stimulates

competition between children and is aimed at obtaining the most suitable number of points (calories). The child who formulates the healthiest diet, according to the criteria established by the food pyramid adapted to the Brazilian reality (Brasil IBGE, 1999) is declared the winner. The game is set up with six pawns with different calories, one die and 258 cards (216 of which are food cards, 18 are orientation cards to build the meal and 24 are trump cards made up of 12 exchangeable cards that can be traded with the opponents). The winner is the child that can build the diet according to the orientation cards and with the least number of points (calories).

#### *Data analysis procedure*

The results were analysed using quantitative and qualitative approaches. The quantitative data were organized in a matrix report and analysed by the SPHINX 2000 software (UFRGS Instituto de Informática, 2005). Chi-square test was used in comparisons between frequencies. The level of probability was set at  $p < 0.05$ . The children's attitudes observed when applying the learning strategies occurred most of the time simultaneously (Sphinks Brasil, Canoas, Rio Grande de Sul, Brazil).

For the qualitative analysis, we adopted Bardin's (1991) content analysis as reference. After performing content analysis, we organized the qualitative data into categories, considering the occupational context in which the play activities occurred and emphasizing the subjective aspects of the child's discourse. Franco (2005) points out that 'the categories are not defined *a priori*. The words of the discourse and the content of the responses emerge, which implies the constant back and forth between the analysis material and the theory' (p. 59).

The project was in conformity with the Declaration of Helsinki (Human and Fluss, 2001) was assessed and approved by the Ethics Committee for Research in Human Beings of the Universidade de Fortaleza, process number 04-033, on 29 March 2004.

## **Results**

### *Comparison variables*

Preference, experience and attitudes

#### *Preference*

Of the 200 children studied, 27% (54) preferred the video game, while 6% (12) preferred the board game; this difference was statistically significant ( $p < 0.005$ ).

#### *Previous experience*

The children reported more experience with video games (161 = 80.5%) than they did with board games.

### Attitudes triggered by the games

The children's attitudes, an important criterion in their choice of games, differed significantly between the two games. In the video game, attitudes of winning, planning and amusement were the most recorded, whereas competition is more prevalent in the board game (Figure 1).

### Attitudes observed during the games

#### Analysis of the learning strategies applied

*Metacognition strategy.* Metacognitive attitudes such as the learning strategies adopted and their effectiveness, attention paid to verbal hints and assessment of the results were considered significant. Using the hints was a common attitude in both games, suggesting that intermediation from friends was put into practice. Planning and establishing goals was rarely used (Table 1).

*Intrinsic motivation strategy.* A level of significance was obtained in the attitude 'demonstrates happiness when succeeds' in the comparison established between the video game and the board game. We underscore the playfulness of the activities involved. There was a predominance of the attitude 'is attentive to the challenges of the game'; in both activities it was greater than 50%, suggesting that the level of the games was suitable for the age group (Table 2).

*Attention strategy.* The attitude of not being distracted by ambient noise showed no significant difference between the two games. The level of attention when

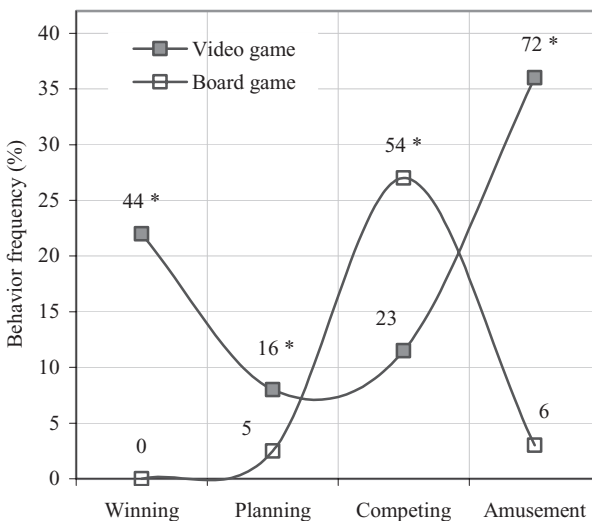


FIGURE 1: Preferred attitudes of research subjects at the start of the study ( $n = 200$ ). Fortaleza, Brazil, 2004. \* $p < 0.05$ .

TABLE 1: Distribution of the metacognitive attitudes and behaviours demonstrated during educational–nutritional play activities (n = 200). Fortaleza, Brazil, 2004

Metacognition	Video game		Board game		Significance
	n	%	n	%	
Analyses the strategies adopted and their effectiveness	36	18.00	70	35.00	*
Discusses strategies	57	28.50	79	39.50	NS
Plans and establishes goals	37	18.50	42	21.00	NS
Attentive to verbal hints	116	58.00	152	76.00	*
Uses the hints	128	64.00	105	52.50	NS
Assesses the results	30	15.00	63	31.50	*

NS = not significant. \*  $p < 0.05$ .

TABLE 2: Distribution of intrinsic motivation attitudes and behaviours during the educational–nutritional play activities (n = 200). Fortaleza, Brazil, 2004

Intrinsic motivation	Video game		Board game		Significance
	n	%	n	%	
Attentive to the challenges of the game	113	56.50	133	66.50	NS
Tries new strategies after ‘failing’	47	23.50	39	19.50	NS
Becomes irritated after ‘failing’	43	21.50	52	26.00	NS
Shows happiness after ‘succeeding’	89	44.50	118	59.00	*
Becomes irritated when the session finishes	32	16.00	48	24.00	NS

NS = not significant.

playing both the video game (70.5%) and the board game (63%) was high, as shown in Table 3.

#### *Analysis of the intermediation used*

Intermediation occurred with the application of help levels. The first level (offering instructions) was the most used in the video game (53.5%) and in the board game (41.5%). The third level of help (offering hints) was significant for the board game. This shows that the skills to perform the two play activities were found in the ZPD. The non-application of help levels refers to activities performed independently (Table 4).

TABLE 3: Distribution of attention strategy attitudes and behaviours during the educational–nutritional play activities (n = 200). Fortaleza, Brazil, 2004

Attention	Video game		Board game		Significance
	n	%	n	%	
Distracted by ambient noise	23	11.50	40	20.00	*
Not distracted by ambient noise	141	70.50	126	63.00	NS
Observes companion playing during the game	52	26.00	137	68.50	*
Does not observe companion playing during the game	56	28.00	21	10.50	*
Distracted by the comments of others	14	7.00	53	26.50	*

NS = not significant.

TABLE 4: Distribution of the help levels applied by the occupational therapy researchers during the educational–nutritional play activities (n = 200). Fortaleza, Brazil, 2004

Help levels	Video game		Board game		Significance
	n	%	n	%	
Non-application of help levels	31	15.50	23	11.50	NS
First level: offering instructions	107	53.50	83	41.50	NS
Second level: demonstrating	46	23.00	33	16.50	NS
Third level: offering hints	5	2.50	41	20.50	*
Fourth level: performing the task jointly	11	5.50	20	10.00	NS

NS = not significant.

### Comparison categories

#### Possibility of learning while playing

When the children were asked about the possibility of learning while playing, 65% (154) responded affirmatively. During the activities, they stated that they were learning to eat right and were not tired.

#### Fantasy during the learning process

While they were playing the two games, the children assumed the role of the character. The decisions and strategies adopted were referred to in the first person, such as 'I haven't eaten fruit today yet' or 'I need to eat vegetables for dinner because I didn't eat any at lunch'.



### Learning the concepts of nutritional education

During the focus group, the children demonstrated that they had learned to select foods: *'When I go to the grocery store, I still buy pastry, but I know that a banana is better'*; however, eating habits persist. They showed that they had learned to use the available foods: *'At the grocery store there's a little of everything and we can eat well with little money'*. They expressed how they had learned about the food groups and their functions and how to organize their diet: *'I learned that we have to eat a little of each kind of food'*; *'I can't eat only pasta and proteins. I have to eat fruits and vegetables'*; *'If I've already put cheese, why put margarine? They're from the same group!'*

### The need for help in learning (intermediation)

In the same focus group, the observers recorded: *'It's so good to learn with our friends, to organize our diet!'*; *'I don't know what to include in my lunch! Can you help me?'*; *'The therapist helped me and I learned how to choose foods in the games and at home too'*. Intermediation from the therapist and from other children was accepted and even requested; however, the children that do not need intermediation affirmed that they knew how to choose foods and did not need help since they had already learned to organize their diets.

## Discussion

We chose the 8- to 10-year age group for the sample since it is a phase in which children have increasing autonomy in food selection. This is the period when unhealthy eating habits may form or be reinforced, resulting in children being overweight or obese.

We conducted the study at school, an ideal location to implement educational health measures because we could associate nutritional education to the subjects talked about in the classroom and extend it to informal discussions (Pinheiro et al., 2004).

### *Comparison variables*

#### Preference, experience and attitudes

Games are still played, but with different objects, including video games (Kishimoto, 2007). Occupational therapists who work with children perceive that it is essential to observe playful behaviour in children, and it is indeed the role of this professional to do so when they are treating them (Stagnitti, 2004).

At the start of the study, when referring to more experience with video games, the children demonstrated the influence of this process on cultural change. These children have more access to video games than to board games.

At the end of the study, we observed a preference for the board game, owing to competition and to intermediation. It should be pointed out that the video game was not on a network, making the competition exclusively against the computer.

### Attitudes observed during the games

#### *Analysis of learning strategies*

*Metacognition strategy.* To investigate the application of metacognition by the children, we observed the following attitudes: attention to verbal instructions; analysis of strategies with a companion or a researcher; discussion of strategies; and assessment of results. The incidence of the last two is low, indicating a reduced level of managing the learning process in both games. Paying attention to hints was an attitude adopted by most of the children in both games, illustrating the relevance of intermediation in learning while playing.

Monereo and Gisbert (2002), Ribeiro (2003) and Guimarães and Boruchovitch (2004) argue that metaknowledge is essential for planning, assessing and monitoring the application of a strategy. The following discourses were recorded: *'It's amazing how I understand, how I learn better'*; *'This way, I eat better and I won't lose the game'*; *'My teacher noticed that I'm more organized and learning better'*. We observed that metacognition influenced the learning of nutritional concepts and was transferred to formal pedagogic situations.

*Intrinsic motivation strategy.* Intrinsic motivation is an affective learning strategy related to involvement and motivation that favours higher self-esteem and determines the quality of the learning process (Guimarães and Boruchovitch, 2004).

Intrinsic motivation was demonstrated in both games; however, there was a significant difference in expressing pleasure when succeeding at the board game strategy. There were no significant differences in the level of intrinsic motivation. The following was reported: *'I wait all week for Friday to play and learn how to eat right'*; *'I'm learning to try new strategies to win the game and learn more'*.

*Attention strategy.* The attention strategy is fundamental for learning. Through it, children choose the stimulus to focus on, to the detriment of the others. According to Vasta et al. (1999), 'attention has a fundamental role in relation to which information the brain seizes on and stores. In children, attention, along with intentions, objectives and inclinations, also influences the way in which the world is perceived' (p. 272).

In our study, we observed that this strategy was more applied in the video game than in the board game. Munguba et al. (2003) state that '[...] video games develop attention levels associated to motivation and to the challenges posed by the game [...]' (p. 46). This assertion points to the relevance of developing contextualized games aimed at nutritional education.

### *Intermediation analysis*

For intermediation in the learning of nutritional concepts, we applied the help levels. It is assumed that the adult knows the child's needs and skills that are maturing in the ZPD (Munguba, 2002). The high number of instances of applying the first level is relevant, demonstrating that the skills are in the ZPD and that they are indispensable to intermediation.

If in most children these skills are found in Vigotski's (2003) ZPD, such as the ability to establish strategies to win the game and the capacity to identify the more suitable foods for each meal, they may be related to the child's experience, associated with a commonsensical awareness of nutritional concepts. In this case, the children will perform with autonomy the activities proposed by the game. The following discourses were reported: 'You don't have to teach me because I've already played a similar game'; 'Show me what you do not to get fat'. The researchers demonstrated that the children's skills are in the ZPD.

It was shown that higher help levels were needed in the board game than in the video game. This finding may establish a relation with little prior experience with the board game.

All the researchers recognized the importance of applying help levels. Gomes (2005) points out that '[...] more important than the game itself, or than the simple act of playing, is the interactional context that is established and the strategic intervention of the investigator' (p. 325).

In general, the children's lack of knowledge about nutrition and healthy eating habits is caused by the powerful messages transmitted by the media, the school and the family (Triches and Giugliani, 2005). The contextualized video game and board game are proposed as educational technologies in this area. When comparing the two games, we observed that learning occurred through intermediating nutritional concepts and by applying the learning strategies of metacognition, intrinsic motivation and attention.

In metacognition, the board game was more efficient in developing the child's autonomy for learning nutritional concepts. In intrinsic motivation, the board game showed a significant difference from the video game. This result was unexpected because the video game was initially preferred by most of the sample. Autonomy and the application of metacognition, intrinsic motivation and attention strategies were observed in formal pedagogic situations.

### *Comparison categories*

#### *Possibility of learning while playing*

The contextual perspective of human development considers social and cultural interactions as inseparable items for producing changes in the personal involvement of individuals with their occupations (Humphry and Wakeford, 2006; Watson, 2006). This context must be considered when one studies child development, for it occurs in stages, in which each one is governed by one main

activity. Over the course of their schooling, children occupy themselves with activities that generate a sense of responsibility (Leontiev, 2001).

Games as an occupation takes on a different connotation, involving the playful being and the pleasure of learning with limits different from those established in pedagogic activities. Ferland (2003) underscores that in this area, the specific contribution of occupational therapists in an interdisciplinary setting that occurs through the act of playing. This activity develops skills in the child, as well as positive attitudes that aid in the development of healthy food habits.

Pereira (2003), Schwartz and Puhl (2003), and Costa et al. (2001) emphasize the cultural and symbolic aspects of nutrition, which involve the conception formulated by individuals and their social group about nutrition and food choices. This attitude favours the effectiveness of health education proposals aimed at changing eating habits.

### Fantasy-based learning

Because of new technologies, the playful imagination of children has taken on a new significance (Munguba, 2002; Brougère, 2003), but make-believe endures. Games are still played with a variety of objects, including video games (Kishimoto, 2007). When engaging in both play activities, the children assumed the role of the 'character'; the following discourses were recorded: *'Look how I got skinny. I have to eat more pasta so I won't be malnourished!'; 'I didn't lose or gain weight. I think I'm eating right'*. Therefore, the two activities are efficient in inter-mediating the learning of nutritional concepts. The games provided the main characteristics of playful activities – imagination, associated to involvement, rules, decision making, uncertain results and pleasure (Brougère, 2003) – all directed to learning nutritional concepts.

### Conclusions

The results point to the need for more research in health education that emphasize the autonomy of children in learning nutritional concepts through the use of play. The results of the study indicated that occupational therapists applying play activities can be effective in a nutritional education programme. A limitation to generalizing the results of this study was the small sample size. We believe, however, that this did not compromise the objectives of the investigation. Thus, the study could be replicated to increase external validity. The impact of the family on learning nutrition is an additional topic for further research. It is concluded that educational–nutritional play activities promoted the learning of nutritional concepts with children who are obese, through the application of effective strategies by occupational therapists using interactive games.

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