Effects of Educational Materials Designed with a Healthy Nutrition Theme on Nutritional Status of 4-6 Years Old Children*

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Abstract

Aim: This study aims to evaluate the effect of nutrition education during the preschool period on children's food consumption habits.

Method: The study was designed in a quasi-experimental and descriptive model. Forty-five children aged 4-6 years were included in the study. The intervention involved providing nutrition education aimed at improving healthy eating habits, with the use of visual materials to increase nutrition awareness. The primary dependent variables included the frequency of consumption of various foods. Independent variables included gender and the pre- and post-intervention assessments. Data analysis was performed using IBM SPSS 23.0 programme. A significance level of $p<0.05$ was used to determine statistical significance.

Results: The majority of the children consumed breakfast, lunch, and dinner regularly before the intervention. After the intervention there was a significant decrease in the consumption of unhealthy foods such as white bread, instant fruit juices, butter, chocolate, etc. Healthy food consumption, although not statistically significant, showed an increase in the consumption of milk, yogurt, cheese, fish, green vegetables, etc.

Conclusion: Nutrition education during the preschool period contributes to the development of healthy eating habits in children.

Keywords: Preschool, nutrition, education.

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Sağlıklı Beslenme Temalı Tasarlanan Eğitsel Materyallerin 4-6 Yaş Çocuklarda Beslenme Durumuna Etkisi

Öz

Amaç: Bu çalışma, okul öncesi dönemde verilen beslenme eğitiminin çocukların besin tüketim alışkanlıkları üzerindeki etkisini değerlendirmeyi amaçlamaktadır.

Yöntem: Çalışma, yarı deneysel ve tanımlayıcı bir modelde tasarlanmıştır. Çalışmaya 4-6 yaş arası 45 çocuk dahil edilmiştir. Müdahale, görsel materyaller kullanılarak sağlıklı beslenme alışkanlıklarını iyileştirmeyi amaçlayan beslenme eğitimi vermeyi içermektedir. Birincil bağımlı değişkenler, çeşitli besinlerin tüketim sıklığıdır. Bağımsız değişkenler ise cinsiyet ve müdahale öncesi ve sonrası değerlendirmelerdir. Veri analizi IBM SPSS 23.0 programı kullanılarak gerçekleştirilmiştir. İstatistiksel anlamlılığı belirlemek için $p<0,05$ anlamlılık düzeyi kullanılmıştır.

Bulgular: Çocukların çoğunluğu müdahaleden önce düzenli olarak kahvaltı, öğle yemeği ve akşam yemeği tüketmektedir. Müdahale sonrasında beyaz ekmek, hazır meyve suları, tereyağı, çikolata vb. gibi sağlıksız gıdaların tüketiminde önemli bir azalma görülmüştür. Sağlıklı gıda tüketimi, istatistiksel olarak anlamlı olmasa da süt, yoğurt, peynir, balık, yeşil sebzeler vb. tüketiminde artış göstermiştir.

Sonuç: Okul öncesi dönemde beslenme eğitimi, çocuklarda sağlıklı beslenme alışkanlıklarının geliştirilmesine katkıda bulunmaktadır.

Anahtar Sözcükler: Okul öncesi, beslenme, eğitim.

Introduction

Children aged 4 to 5 years is a critical stage in which the child's physical, cognitive and emotional development is rapidly shaped[1]. Nutritional habits acquired during this period play a decisive role in children's lifelong health. Healthy nutrition not only supports the growth and development of children but also has long-term effects on mental performance, academic success and future health[2]. The eating habits of children aged 4 to 5 are largely based on the guidance they receive from their families, carers and educational institutions[3,4]. For this reason, nutrition education in children aged 4 to 5 years enables laying the foundations of a healthy lifestyle and contributes to the prevention of health problems in the following years[5].

Nutrition education in the 4–5-year age increases the effectiveness of the strategies used to ensure that children acquire healthy eating habits. In the study examining the effectiveness of nutrition education tools in children aged 4 to 5 years, the importance of educational materials and guidance to improve children's eating habits is emphasised. This study reveals that the creation of nutritional awareness in children aged 4 to 5 years provides positive effects not only on physical health but also on social and cognitive development. Nutrition education in children aged 4 to 5 years offers an important opportunity to contribute to children growing up as healthier individuals in the long term[5,6].

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Children's eating habits should be shaped according to their individual needs and a balanced diet with the right variety of foods should be provided. However, picky eating behaviour and unbalanced eating habits are among the common nutritional problems encountered in children aged 4 to 5 years[1]. Picky eating behaviour is manifested by children's preference for a diet limited to only a few foods, which may lead to deficiency of some nutrients and negatively affect the development of the child[5]. It is known that nutrition education given at an early age helps to develop healthy eating habits in children. It is stated that education in the 4–5-year age years contributes to children's awareness of healthy habits[6].

Many studies have supported that nutrition education in children aged 4 to 5 helps children make informed food choices[7]. It is recognised that such education plays a critical role in children's adoption of healthy eating habits and is an important factor affecting their long-term health development[5-7].

Childhood period is important in terms of creating nutritional awareness because it is the period when habits are acquired. Healthier societies will be formed thanks to children with healthy nutrition awareness. This study is aimed to increase the healthy nutrition awareness of children aged 4 to 5 years in order to create healthier societies. It is also revealed to examine the effectiveness of nutrition education strategies for children aged 4 to 5 years and to evaluate the long-term effects of these strategies on children's eating habits. In addition, developing practical suggestions for increasing nutrition awareness is another objective of this study.

Material and Methods

Study Type

The study was designed in a quasi-experimental and descriptive model.

Population and Sampling

The study was conducted on 4–6 year old children studying at kindergarten. All eligible students (n=45) were included in the study. The study was finalised with a total of 45 participants. Children were classified according to their chronological age at the time of data collection. Age was recorded in half-year intervals and categorized as 4.0, 4.5, 5.0, 5.5, and 6.0 years. This classification was used to reflect developmental differences within the preschool period and to allow a more precise evaluation of age-related nutritional behaviors.

Data Collection Tools

The Food Consumption Frequency Questionnaire is a questionnaire that determines the frequency of consumption of food groups (milk and dairy products, meat-egg-legume group, fresh vegetables and fruits, cereal group, beverages, fatty-sugary foods group) in

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the last month in order to evaluate the nutritional status of the child. In addition, a General Information Form was used to collect demographic data.

Data Collection

During the data collection process, voluntary consent forms were obtained at the information meeting held with the parents, and then the Food Consumption Frequency Questionnaire and General Information Form were filled out to evaluate the nutritional status of the children in the last month. In the study, in order to increase children's nutritional awareness, a three-dimensional plate and food samples from food groups were prepared based on the 'Healthy Plate Model'[8]. These materials were designed from felt, plastic sheeting, and cardboard.

For the 'Healthy Human and Obese Human Material', two 3-dimensional human figures were designed as normal (representing the ideal weight body mass index range of 18–25 kilograms/square metre) healthy human figure and obese human figure (representing body mass index >30 kg/m^2). In addition, 8 healthy food materials (cereal bread, milk, cheese, eggs, fish, apples, carrots, walnuts) and 8 French fries, sausage bread, confectionery, solid fat, ice cream, acidic drinks, salt, packaged chips materials were designed in 3D using fibre, felt, and fabric. The prepared food materials were mixed in a box.

After the children were told what healthy and other foods are, they were instructed to take turns choosing a random food from the box and stick it to the figure of a healthy person with ideal body weight if the food was healthy, or to the figure of an obese person if the food was unhealthy. These activities were organised for 4 weeks and 2 hours per week. Each student completed each activity a minimum of two times. Pre-test and post-test were applied to the participants before and after the intervention in order to evaluate the change in nutritional awareness.

Figure 1. Application of healthy nutrition-themed educational materials in children

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Figure 2. Application of healthy nutrition-themed educational materials

Figure 3. Presentation of healthy nutrition-themed materials to children

Ethical Statement

This study was carried out with the approval of the Ethics Committee of Kırşehir Ahi Evran University, dated 16/11/2023 and numbered 2023/10/31. A signed subject consent form in accordance with the Declaration of Helsinki was obtained from each participant. As the study was conducted on children, written informed consent was obtained from the parents/legal guardians of all participating students.

Data Analysis

Data analysis was performed using IBM SPSS 23.0 programme. The conformity of continuous variables to normal distribution was evaluated by Skewness and Kurtosis tests. Skewness and kurtosis values for the Food Consumption Frequency Questionnaire were observed to be between +2.0 and -2.0, and according to Tabachnick and Fidell (2013)[9], parametric tests can be applied when they are between +1.5 and -1.5. According to George and Mallery (2010)[10], when these values are between +2 and -2, the use of parametric tests is supported. Accordingly, the normality assumption was met for variables other than margarine and parametric analyses were applied. Firstly, the difference tests were examined according to the gender of children aged 4 to 5 years, and then analyses were performed for the values before and after the intervention training. An independent sample t-test was used to evaluate the differences in food consumption frequency depending on the gender variable. Within the scope of descriptive statistics,

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the means and standard deviations of the groups were calculated and presented. Mann-Whitney U, Kruskal-Wallis and Spearman correlation tests were applied for nonparametric distributions, and One-Way ANOVA test was applied for parametric distributions. Chi-square analysis was used to evaluate the relationships between categorical variables and the statistical significance level was accepted as $p<0.05$.

Results

According to Table 1, 58% of the children participating in the study were females; 84% did not have any disease; 51% rarely got sick; 89% ate breakfast, 73% ate lunch and 98% always ate dinner.

Table 1. Distribution according to demographic variables

Variable	Group	Number (n)	Percentage (%)
Gender	**Boy**	19	42,2
	Girl	26	57,8
Age	**4**	14	31,1
	4,5	7	15,6
	5	14	31,1
	5,5	4	8,9
	6	6	13,3
Presence of disease	**Yes**	7	15,6
	No	38	84,4
Frequency of Illness	**Less**	4	8,9
	Rare	23	51,1
	Frequently	18	40,0
Breakfast	**Yes**	40	88,9
	No	1	2,2
	Sometimes	4	8,9
Lunch	**Yes**	33	73,3
	Sometimes	12	26,7
Dinner in the evening	**Yes**	44	97,8
	Sometimes	1	2,2
	Total	45	100,0

The independent sample t test was used to reveal the differences between the pre-test and post-test attitudes according to the frequency of food consumption of the participants. As a result of the analysis, a statistically significant difference was found in the variables of white bread, instant fruit juices, other vegetable oil, butter, candy, Turkish Delight, jelly candies, chocolate, cake, cake, biscuit, cracker, french fries, lahmacun, pita, döner, junk food and packaged food. Accordingly, while the values of white bread, instant fruit juices, other vegetable oil, butter, candy, Turkish Delight, jelly candies, chocolate, cake pastry, biscuit crackers, french fries, lahmacun pita, doner kebab, junk food and packaged food variables were high before the intervention training. It was observed that these values tended to decrease after the intervention training.

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In other words, it can be said that sensitivity to white bread, instant fruit juices, other vegetable oil, butter, candy, Turkish Delight, jelly candies, chocolate, cake, biscuit crackers, french fries, lahmacun pita, doner kebab, junk food and packaged foods developed in children aged 4 to 5 years at the end of the training. In addition, although no statistical difference was found, it was observed that the frequency of milk, yoghurt, buttermilk, cheese, fish, dried legumes, green vegetables, dried fruits and olive oil increased after the intervention training in children aged 4 to 5 years.

Table 2. Comparison of scales according to pre-test post-test variables

	Pre-test-Post-test	N	Average	S.S.	t	df	p
Milk	**Pre-test**	45	5.1556	2.09930	-.361	88	.719
	Post-test	45	5.3111	1.98657			
Yoghurt	**Pre-test**	45	5.3111	1.80683	-.938	88	.351
	Post-test	45	5.6444	1.55440			
Buttermilk	**Pre-test**	45	4.5778	1.61652	-.882	88	.380
	Post-test	45	4.8667	1.48630			
Cheese	**Pre-test**	45	4.0444	2.63676	-.450	88	.654
	Post-test	45	4.2889	2.51018			
Red meat	**Pre-test**	45	4.4889	1.27247	.175	88	.862
	Post test	45	4.4444	1.13929			
Chicken	**Pre-test**	45	4.3333	1.27920	.266	88	.791
	Post-test	45	4.2667	1.09545			
Fish	**Pre-test**	45	3.4667	1.56089	-.071	88	.944
	Post-test	45	3.4889	1.40813			
Egg	**Pre-test**	45	5.4444	1.69967	.062	88	.950
	Post-test	45	5.4222	1.68535			
Dried Legumes	**Pre-test**	45	3.9556	1.22392	-.597	88	.552
	Post-test	45	4.1111	1.24722			
Oilseed	**Pre-test**	45	5.5556	1.57474	1.262	88	.210
	Post-test	45	5.1556	1.42949			
Dark green leafy vegetables	**Pre-test**	45	3.7111	2.14923	-.607	88	.545
	Post-test	45	3.9778	2.01685			
Potato	**Pre-test**	45	5.1333	.94388	.773	88	.442
	Post-test	45	4.9778	.96505			
Tomato	**Pre-test**	45	3.9556	2.26591	.094	88	.925
	Post-test	45	3.9111	2.21382			
Other vegetables	**Pre-test**	45	2.5111	1.59006	-.697	88	.488
	Post-test	45	2.7556	1.73409			
Citrus fruits	**Pre-test**	45	5.9333	1.48324	.216	88	.829
	Sontest	45	5.8667	1.43970			
Other fruits	**Pre-test**	45	5.8889	1.62680	.131	88	.896
	Post-test	45	5.8444	1.59481			
Dried fruits	**Pre-test**	45	3.9333	2.03827	-.970	88	.335
	Post-test	45	4.3333	1.87083			
White bread	**Pre-test**	45	6.2667	1.38826	3.238	88	*.002**
	Post-test	45	5.3111	1.41135			
Whole grain bread	**Pre-test**	45	2.4444	2.06217	.293	80.169	.770
	Post-test	45	2.3333	1.49241			
Rice	**Pre-test**	45	4.3778	1.38644	1.243	88	.217
	Post-test	45	4.0444	1.14724			
Pasta	**Pre-test**	45	4.5778	1.03328	1.901	88	.061
	Post-test	45	4.2000	.84208			
Bulgur	**Pre-test**	45	4.1111	1.35214	.597	88	.552
	Post-test	45	3.9556	1.10691			

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Breakfast cereal	**Pre-test**	45	1.8667	1.42382	1.213	77.452	.229
	Post-test	45	1.5556	.96661			
Instant fruit juices	**Pre-test**	45	3.5778	1.86461	3.080	75.710	*.003**
	Post-test	45	2.5556	1.21647			
Fizzy drink	**Pre-test**	45	2.3556	1.56895	1.733	77.136	.087
	Post-test	45	1.8667	1.05744			
Tea-Coffee-Herb tea	**Pre-test**	45	3.0222	2.24103	1.498	81.038	.138
	Post-test	45	2.4000	1.65694			
Olive oil	**Pre-test**	45	5.6444	2.24778	-.619	88	.538
	Post-test	45	5.9111	1.81937			
Other oil	**Pre-test**	45	4.9778	2.15838	2.174	88	*.032**
	Post-test	45	4.0444	1.90640			
Margarine	**Pre-test**	45	1.7111	1.29021	1.741	66.362	.086
	Post-test	45	1.3333	.67420			
Butter I	**Pre-test**	45	5.8222	1.38644	3.595	88	*.001**
	Post-test	45	4.8444	1.18620			
Sugar	**Pre-test**	45	5.1333	1.80404	1.848	88	.068
	Post-test	45	4.5111	1.35885			
Honey-Cherry-Molasses	**Pre-test**	45	4.3111	2.30437	1.207	79.970	.231
	Post-test	45	3.8000	1.65968			
Dumplings	**Pre-test**	45	2.8667	1.47093	.494	79.723	.622
	Post-test	45	2.7333	1.05313			
Milk desserts	**Pre-test**	45	3.6222	1.19257	1.920	88	.058
	Post-test	45	3.2000	.86865			
Candy, Turkish Delight, Jelly candies	**Pre-test**	45	4.0889	1.72972	2.704	88	*.008**
	Post-test	45	3.2222	1.27723			
Chocolate	**Pre-test**	45	5.5333	1.61808	4.393	88	*.000**
	Post-test	45	4.2000	1.23583			
Cake-Pastry	**Pre-test**	45	4.2889	1.45574	2.481	76.053	*.015**
	Post-test	45	3.6444	.95716			
Biscuits and Crackers	**Pre-test**	45	4.4444	1.79083	2.698	72.883	*.009**
	Post-test	45	3.6000	1.09545			
Chips	**Pre-test**	45	3.6000	1.67060	1.819	79.375	.073
	Post-test	45	3.0444	1.18620			
French fries	**Pre-test**	45	4.0222	.96505	2.331	88	*.022**
	Post-test	45	3.5778	.83907			
Lahmacun-Pide	**Pre-test**	45	3.1333	1.09959	2.676	88	*.009**
	Post-test	45	2.5556	.94281			
Instant hamburger	**Pre-test**	45	2.3111	1.16428	1.808	76.899	.075
	Post-test	45	1.9333	.78044			
Instant pizza	**Pre-test**	45	2.1556	1.16688	1.494	88	.139
	Post-test	45	1.8444	.76739			
Rotary	**Pre-test**	45	2.7333	1.32116	2.142	70.981	*.036**
	Post-test	45	2.2444	.77329			
Junk food	**Pre-test**	45	4.6000	1.81409	4.242	71.489	*.000**
	Post-test	45	3.2667	1.07450			
Packaged food	**Pre-test**	45	3.7778	2.07681	2.831	72.043	*.006**
	Post-test	45	2.7556	1.24600			

*p<.05, Independent Samples t-test

Discussion

Children aged 4 to 5 years is an important stage in which the foundation of the child's physical, mental and emotional development is laid[1]. The nutritional habits acquired in this process directly shape the health of children in the following years. In addition to supporting growth and development, balanced and healthy nutrition also plays a decisive role in cognitive abilities and academic success[2]. In this context, the acquisition of

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healthy eating habits in the 4–5-year age plays a decisive role in the lifelong health of children.

The main aim of nutrition in the 4–5-year age years is to ensure optimal growth and development with adequate nutritional diversity[3]. In this process, parents' nutrition attitudes are one of the main factors that shape children's food preferences, eating motivations and long-term eating habits. Adopting mindful nutrition approaches by parents plays a critical role in protecting both physical and metabolic health of children[11].

In this study, 45 children aged 4-6 years studying at XXXXX Kindergarten took part. It was found that 89 % of the participants ate breakfast every day, 73% ate lunch, and 98 % always ate dinner. These findings are similar to the results of the study conducted by Lattanzi et al. (2023)[5]. In this study, it was reported that 90% of 108 children had breakfast at home, consumed lunch in the school canteen on weekdays, and all children ate dinner at home.

The findings of our study show that regular eating habits are common in children aged 4 to 5 years and children develop consistent behaviours regarding meal patterns. In the process of gaining healthy eating habits, it was observed that children's individual development was positively affected and parents were effective in gaining healthy habits by modelling their behaviours. These findings are consistent with the literature showing that visual guides and training are effective in the process of developing children's nutritional behaviours[12].

The relationship between dietary habits and gender was also analysed in the present study. Before the intervention, it was determined that only males' egg consumption frequency was significantly higher than that of females. However, no significant difference was observed between the genders in the post-tests conducted after the intervention. This finding suggests that healthy eating habits have similar effects on children of all ages and that education can play an important role in eliminating gender differences.

Pre-test and post-test comparisons of unhealthy dietary habits showed that there was a significant decrease in the consumption of white bread, ready-made fruit juices, oils, butter, confectionery, chocolate, cakes, cakes, biscuits and junk food. This finding is in line with the literature showing that visual guides such as "Nutripiatto" are an effective tool in portion control and acquisition of healthy eating habits among children[5]. Similarly, Kostecka (2022)[13] found that activities such as puzzles, games, label charts and cooking workshops implemented within the scope of the "Colourful Nutrition is Healthy Nutrition" programme, when designed in accordance with children's developmental levels, reduced the consumption of sweetened beverages. It was also reported that the programme increased water intake and reduced the consumption of sweets[13].

Visual materials used in the present study were found to be an effective tool in teaching children healthy eating habits and ensuring that children consume the correct portions of food. It was observed that the training has the potential to transform eating habits and

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encourage healthy food consumption. In addition, it was observed that the training was equally effective on children of all ages by eliminating gender differences. Recent evidence from post-2023 intervention research highlights the effectiveness of structured nutrition education programs in enhancing dietary knowledge and healthy food choices among preschool children. A study examining a MyPlate-based nutrition education intervention found significant improvements in preschoolers' ability to identify food groups and distinguish between healthy and unhealthy foods following the program, emphasizing the value of visual materials and age-appropriate content in shaping dietary behavior in early childhood[14,15]. Additionally, data from the UPBEAT trial indicate that maternal diet quality and family eating habits are strongly associated with preschool children's dietary patterns, underscoring the influence of home environment and parental modeling on children's eating behaviors and suggesting that educational interventions may be more effective when family dynamics are considered alongside child-focused strategies[16].

In conclusion, the acquisition of healthy eating habits in the children aged 4 to 5 years is a critical step that will positively affect children's lifelong health. It is thought that training in children aged 4 to 5 years in order to gain healthy eating habits will positively affect the lifelong health of children[14].

Conclusion

In our study, it was shown that visual materials can be used as an effective tool to reinforce healthy eating habits and reduce harmful food habits. These findings reveal how effective healthy nutrition education is in children aged 4 to 5 years and that such education will support healthy life behaviours of children in their later ages. This study evaluated the effect of nutrition education on children's eating habits in children aged 4 to 5 years. The findings show that consumption of white bread, instant fruit juices, butter, confectionery, chocolate, cakes, biscuits, junk food and packaged foods decreased, while consumption of milk, yoghurt, cheese, fish, dried legumes, vegetables and olive oil increased. However, this increase in healthy food consumption was not statistically significant. While it was found that the frequency of egg consumption of males was higher than that of females before the education, no significant difference was observed between genders after the education. These results suggest that nutrition education can create positive changes in children's dietary preferences and balance gender differences. In addition, visual materials and guides were found to be effective in increasing healthy eating awareness in children. In conclusion, the acquisition of healthy eating habits in the children aged 4 to 5 years may contribute to the adoption of a healthier lifestyle in later ages. Therefore, it is recommended that nutrition education at an early age should be popularised and supported with effective teaching methods.

Ethical Committee Approval

Approval was obtained from The Ethics Committee of Kırşehir Ahi Evran University. The procedures used in this study adhere to the tenets of the Declaration of Helsinki (Decision no:2023/10/31; Decision date: 16/11/2023). As the study was conducted on

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children, written informed consent was obtained from the parents/legal guardians of all participating students.

Conflict of Interest

The authors declare that they have no conflict of interest.

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