

ORIGINAL ARTICLE

The Effect of Parent-Supported Education on Nutritional Knowledge and Eating Behaviors in Primary School Children

İlköğretim Çocuklarında Ebeveyn Destekli Beslenme Eğitiminin Beslenme Bilgisi ve Yeme Davranışı Üzerine Etkisi

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ABSTRACT

Aim: To investigate the effects of parent-supported nutrition education (PSNE) on children's nutritional knowledge and eating behaviors.

Methods: A total of 121 students from the third, fourth, and fifth grades at a private school in Isparta, Türkiye, were selected for the study. The participants were divided into two groups: one receiving PSNE, and the other receiving nutrition education targeted only at the children. A nutrition knowledge test was administered to both groups one week before the intervention and again following the completion of the education program. In order to evaluate changes in the children's eating behaviors, the Children's Eating Behavior Questionnaire was completed by the parents. Data were analyzed using the Wilcoxon Test, Man Mann-Whitney U Test, and the Multiple Linear Regression Analysis.

Results: The increase in nutritional knowledge scores of children supported by their parents compared to before the education was significantly greater than that of children without support. At the end of the education, food enthusiasm, emotional overeating, passion for drinking, and enthusiasm for satiety eating behavior scores reduced, while food selectivity eating behavior scores increased. The increase in higher nutritional information score is estimated to be less enthusiasm for satiety and food selectivity scores, whereas higher enjoying food scores for children in the group supported by parents. However, the changes in eating behaviors were observed to be similar between children with parental support and children without parental support after the education.

Conclusions: PSNE was found to lead to a greater improvement in children's nutritional knowledge compared to education provided without parental involvement. Furthermore, nutrition education was shown to be effective in promoting more positive eating behaviors among children. In particular, parental involvement in nutrition education was found to play a significant role in enhancing the effectiveness of the program, especially among primary school children.

Keywords: Eating behaviors, nutrition education, parent support, primary school children

Öz

Amaç: Ebeveyn destekli beslenme eğitiminin çocukların beslenme bilgisi ve yeme davranışlarına etkisini gözlemlemek çalışmanın amacını oluşturmıştır.

Gereç ve Yöntemler: Çalışmaya, Türkiye'nin Isparta ilindeki bir özel okulun üçüncü, dördüncü ve beşinci sınıflarında öğrenim gören toplam yüz yirmi bir öğrenci dahil edilmiştir. Çocuklar, ebeveyn destekli eğitim verilen grup ve sadece çocuklara eğitim verilen grup olmak üzere iki gruba ayrılmıştır. Her iki gruba da müdahaleden bir hafta önce ve eğitim programının tamamlanmasının ardından beslenme bilgi testi uygulanmıştır. Çocukların yeme davranışlarındaki değişiklikleri değerlendirmek amacıyla, ebeveynler tarafından Çocukların Yeme Davranışları Anketi doldurulmuştur. Veriler Wilcoxon Testi, Mann-Whitney U Testi ve Çoklu Doğrusal Regresyon Analizi ile analiz edilmiştir.

Bulgular: Ebeveyn desteğiyle beslenme eğitimi alan çocukların beslenme bilgi puanlarındaki artış, destek almayanlara göre anlamlı düzeyde daha yüksek bulunmuştur. Eğitim sonunda gıda heveslisi, duygusal aşırı yeme, içme tutkusu ve tokluk heveslisi yeme davranışı puanlarında azalma, seçici yeme davranışı puanlarında ise artış gözlenmiştir. Ebeveyn desteği alan grupta, beslenme bilgisi puanı arttıkça duygusal az yeme ve seçici yeme davranışı puanlarının azalacağı, ancak gıdadan keyif alma yeme davranışı puanlarının ise artacağı belirlenmiştir. Ancak, eğitim sonrası yeme davranışlarındaki değişimlerin, ebeveyn desteği alan ve almayan çocuklar arasında benzer olduğu gözlemlenmiştir.

Sonuçlar: Ebeveyn destekli verilen beslenme eğitiminin ebeveyn desteği olmaksızın verilen beslenme eğitimine göre çocuklarda beslenme bilgisini daha fazla arttırdığı tespit edilmiştir. Ayrıca, beslenme eğitiminin daha olumlu yeme davranışları göstermede etkili olduğu görülmüştür. Özellikle, beslenme eğitimine ebeveyn katılımının, ilkökul çağındaki çocuklar arasında programın etkinliğini artırmada önemli bir rol oynadığı belirlenmiştir.

Anahtar Kelimeler: Beslenme eğitimi, ebeveyn desteği, ilkökul çocukları yeme davranışları

INTRODUCTION

Childhood is a critical period of life during which healthy eating habits can develop, settle down, and be sustained in the following years. In this period, adequate and balanced nutrition is extremely important for the physical and cognitive development of children (1). Lifelong eating habits are shaped by the eating behaviors of preschool children. During this period, children play an important role in the formation of eating behaviors as they are very good at learning and imitating parental behaviors (2). Eating behaviors express persistent predispositions and tendencies towards nutrients that encompass traits such as hunger, satiety, appetite, and response to food cues. These behaviors interact with environmental factors and influence children's food choices and preferences (3). From these environmental factors, parents, caregivers, and siblings mostly influence the eating behavior of children in the preschool period, while the education, teachers, and groups of friends at school play a more effective role in children's eating behaviors with the start of school (4).

The process by which one tries to change human behavior knowingly and willingly is defined as education. The main purpose of education is to change the desired attitude and behavior through learning (5). It has been shown by many studies that nutritional education given in schools can change nutrition information, dietary habits, and behaviors in children in the desired way. In the studies conducted after nutrition education in schools, it was determined that the nutrition information of children increased significantly (6-9). In addition, after nutrition education in schools, positive changes were observed in the attitudes

and behaviors of children, and they preferred healthier foods (10-14). The study aimed to show that engaging both parents and children in nutrition education leads to more effective outcomes compared to interventions targeting only children.

MATERIALS and METHODS

A quasi-experimental pre-test and post-test design was employed. The test, which measures the nutrition information of children before the nutrition education and one week after the completion of the education program, was applied. Also, the test measuring children's eating behaviors was administered to their parents.

Participants and Recruitment

The study was structured as a five-week nutrition education program targeting third, fourth, and fifth-grade students aged 8 to 10 years, attending a private school in the province of Isparta, whose parents provided informed consent for participation. The sample size was determined based on similar studies and calculated using G*Power analysis, indicating that a minimum of 108 participants was required to achieve 95% statistical power at a 0.05 significance level (15). The study started with one hundred and forty-five children and was completed with one hundred and twenty-one students. Children were divided into two groups. In this study, third-grade children were included in parent-supported nutrition education (PSNE), and fourth and fifth-grade children were included in nutrition education (NE). The reason why study groups cannot be selected by a random method is that different applications cannot be applied to children in the same grades.

Measures

The first section of the parent questionnaire assessed the parents' sociodemographic characteristics, including age, self-reported body weight and height, educational level, occupation, income status, and health status. The second section consisted of questions regarding the parents' dietary habits. In the third section, data were collected on children's food consumption through a Food Frequency Questionnaire, a 2-day food intake record covering a weekend using the 24-hour dietary recall method, and the Children's Eating Behavior Questionnaire (CEBQ). The CEBQ was adapted into Turkish and validated for reliability and validity by Yilmaz et al. in 2011 (16). CEBQ examined children's eating behaviors in eight sub-dimensions with thirty-five different questions. From the sub-dimensions; five questions food enthusiast (FE), four questions emotional overeating (EO), five questions enjoying food (EF), three questions passion for drinking (PD), seven questions enthusiasm for satiety (ES), four questions of slow eating (SE), four questions of emotional less eating (ELE), and three questions of food selectivity (FS). 'Never' one point and 'Always' five points, children's eating behaviors were scored on the five Likert-type survey. As the scores obtained from the subscales of the instruments increase, the corresponding behaviors related to those subscales are observed to a greater extent (16, 17).

The child questionnaire was composed of items aimed at evaluating children's dietary habits, attitudes toward nutrition, eating behaviors, as well as their nutritional knowledge. In determining the nutritional information of children by the researcher, seventeen multiple-choice questions were prepared to cover the five-week nutritional education program, and eight matching

content total of twenty-five questions. Each question has a single correct answer, and the wrong answers have not negatively affected the score. Each correct answer is rated at + one point.

Procedure

Patients were evaluated after approval was obtained Ethics Committee (Decision No: 197-Ankara University-2022). The study was conducted under the principles of the Declaration of Helsinki. Each session was reinforced through classroom activities and supported by computer-based homework assignments. First week 'I know the nutrients', second week 'I know the food groups', third week 'The meal layout and the importance of breakfast', fourth week 'The importance of water and physical activity' and fifth weeks 'The results of healthy food selection-unhealthy diet' subject nutrition trainings were given by the group of researchers at the school. In addition, the parents of PSNE children were given a two-session online education during this program. Researchers emphasized that parents should support their children during this educational process and do the activities together. During the preparation of the education program, the materials to be used in the program and activities to be applied by specialist school psychological counselors, classroom teachers, physical education teachers, dietitians, and an expert professor in Nutrition and Dietetics were prepared.

Data Analysis

Data analysis was done in the Statistical Package for the Social Sciences 22 package program. The normal distribution of continuous quantitative data is controlled by the Kolmogorov-Smirnov Test. Wilcoxon, Mann-Whitney U, and Multiple Linear Regression analyses were employed to

Table 1. Weekly structure of the Nutrition Education Program for primary school children

Week	Contents	Learning Objectives	Instructional Activities	Reinforcement Task
1	Getting to Know Nutrients	Recognize different nutrients, their functions, and the consequences of deficiencies	Played "Taboo" with cards depicting foods and nutrients	Interactive quiz game via Quizizz
2	Eating a Balanced and Adequate Diet	Classify foods and learn how to maintain a balanced diet	"Healthy Eating Plate" activity	Computer game on Wordwall
3	Starting My Day with Breakfast	Understand the importance of breakfast and meal planning	Story reading and completion activity	Quizizz game
4	Importance of Water and Physical Activity	Define physical activity, warm-up/cool-down, and hydration importance	Traditional outdoor games with warm-up, water break, and cool-down	Water intake coloring activity and home family game
5	Choosing Healthy Foods	Differentiate healthy and unhealthy foods and understand their effects	Classification of food pictures on "Healthy" and "Unhealthy" posters	Wordwall computer game

evaluate the research data. Data were evaluated at the 95% confidence level, with $p < .05$ indicating statistical significance.

RESULTS

The majority of PSNE (96.8%) and NE (96.6%) parents are married. 64.5% of PSNE

mothers and 93.2% of NE mothers are college graduates. 90.3% of PSNE fathers and 94.9% of NE fathers graduated from college. While the average number of children of PSNE parents is 1.85 ± 0.86 , that of NE parents is 1.66 ± 0.76 (Table 2). PSNE

Table 2. Parents' demographic characteristics (n=121)

		PSNE (n=62)		NE (n=59)	
		n	%	n	%
Marital Status	Married	60	96.8	57	96.6
	Single	2	3.2	2	3.4
Maternal Educational Background	Elementary	-	-	-	-
	Secondary	2	3.2	-	-
	Highschool	20	32.3	4	6.8
	College	40	64.5	55	93.2
Paternal Educational Background	Elementary	1	1.6	-	-
	Secondary	-	-	1	1.7
	Highschool	5	8.1	2	3.4
	College	56	90.3	56	94.9
Mothers' Professional Status	Housewife	25	40.3	9	15.2
	Officer	19	30.7	46	78.0
	Employee	-	-	3	5.1
	Artisan/Employer	18	29.0	1	1.7
Fathers' Professional Status	Officer	52	83.9	52	88.1
	Employee	1	1.6	1	1.7
	Artisan/employer	9	14.5	5	8.5
	Retired	-	-	1	1.7
Total Number of Children in the Family	1	28	45.2	30	50.8
	2	15	24.2	19	32.2
	≥3	19	30.6	10	17.0

PSNE: Parent-supported nutrition education, NE: Nutrition education.

children's nutritional information scores before education were found to have a median value of 12.0 (7.7–16.0), while at the end of education, they were up to a score of 20.0 (17.0–22.0). NE children's pre-education nutritional information scores were found to have a median value of 18.0 (16.0–20.0), while post-education scores were found to have increased to 20.0 (18.0–21.0) ($p < 0.05$). There was no significant difference between PSNE and NE children's final test scores ($p > 0.05$) (Table 3).

The changes in children's post-education eating behavior scores are given in Table 4. PSNE children have been found to have reduced FE, EO, PD, and ES eating behavior scores at the end of education, while FS eating behavior scores have been found to have increased. NE children have reduced FE, EO, PD, and ES eating behavior scores at the end of education, while SE and FS eating behavior scores have increased ($p < 0.05$). In addition, the eating behavior scores of both groups after nutrition

Table 3. Evaluation of children's nutritional information scores (n=121)

Nutrition Information Scores	Pre-Education		Post-Education		P
	Median (Q1-Q3)	Min-Max	Median (Q1-Q3)	Min-Max	
PSNE ^a	12.0(7.7-16.0)	4.0-21.0	20.0(17.0-22.0)	11.0-24.0	<0.001
NE ^a	18.0(16.0-20.0)	8.0-24.0	20.0(18.0-21.0)	4.0-23.0	0.002
	PSNE (n=62)		NE (n=59)		
	X±S/ Median (Q1-Q3)		X±S/ Median (Q1-Q3)		P
Score difference ^b	7.16±4.22		1.12±2.33		<0.001
Latest Test Scores ^b	20.0(17.0-22.0)		20.0(18.0-21.0)		0.929

^aWilcoxon Test; ^bMann-Whitney U Test. PSNE: Parent-supported nutrition education, NE: Nutrition education.

education are compared in Table 5. It was observed that the FS scores of NE children were significantly higher than those of PSNE

children ($p < 0.05$). The difference between the other eating behaviors scores was not significant ($p > 0.05$).

Table 4. Assessment of children's eating behavior scores (n= 121)

Eating Behavior Scores	PSNE (n=62)			NE (n=59)		
	Pre-Education Median (Q1-Q3)	Post-Education Median (Q1-Q3)	P	Pre-Education Median (Q1-Q3)	Post-Education Median (Q1-Q3)	P
FE	2.4(1.8-2.8)	1.8(1.6-2.4)	<0.001	2.4(1.8-2.6)	1.8(1.6-1.8)	<0.001
EO	2.2(1.7-2.7)	1.5(1.2-1.8)	<0.001	2.2(1.7-2.2)	1.5(1.2-1.5)	<0.001
EF	3.4(2.0-3.8)	3.2(3.0-3.8)	0.131	3.4(3.2-3.8)	3.2(3.0-3.8)	0.699
PD	2.3(2.3-2.3)	2.0(1.7-2.0)	<0.001	2.3(2.3-2.3)	2.0(1.7-2.0)	<0.001
ES	3.0(2.9-4.3)	2.6(2.0-2.7)	<0.001	2.9(2.9-3.0)	2.6(2.0-2.6)	<0.001
SE	2.7(2.2-4.2)	3.0(2.5-3.2)	0.613	3.0(2.7-3.0)	3.0(3.0-3.2)	<0.001
ELE	3.5(2.9-3.7)	3.2(3.0-3.5)	0.474	3.2(3.0-3.2)	3.0(3.0-3.2)	0.384
FS	3.0(1.7-4.0)	4.0(3.7-4.3)	<0.001	4.0(4.0-4.0)	4.3(4.0-4.3)	<0.001

Wilcoxon Test. PSNE: Parent-supported nutrition education, NE: Nutrition education, FE: Food enthusiast, EO: Emotional overeating, EF: Enjoying food, PD: Passion for drinking, ES: Enthusiasm for satiety, SE: Slow eating, ELE: Emotional less eating, FS: Food selectivity.

Table 5. Comparison of eating behavior scores between groups after education (n=121)

Eating Behavior Scores)	PSNE (Median)	NE (Median)	p
FE	1.8(1.6-2.4)	1.8(1.6-1.8)	0.667
EO	1.5(1.2-1.8)	1.5(1.2-1.5)	0.766
EF	3.2(3.0-3.8)	3.2(3.0-3.8)	0.249
PD	2.0(1.7-2.0)	2.0(1.7-2.0)	0.569
ES	2.6(2.0-2.7)	2.6(2.0-2.6)	0.683
SE	3.0(2.5-3.2)	3.0(3.0-3.2)	0.167
ELE	3.2(3.0-3.5)	3.0(3.0-3.2)	0.113
FS	4.0(3.7-4.3)	4.3(4.0-4.3)	0.023

Mann-Whitney U Test. FE: Food enthusiast, EO: Emotional overeating, EF: Enjoying food, PD: Passion for drinking, ES: Enthusiasm for satiety, SE: Slow eating, ELE: Emotional less eating, FS: Food selectivity, PSNE: Parent-supported nutrition education, NE: Nutrition education.

The increase in higher nutritional information score is estimated to be lower FE, ES, and FS scores, whereas higher EF and ELE scores are for all children. Higher nutritional information scores are estimated to have fewer ES and FS scores, whereas higher EF scores are for

PSNE children. In addition, the increase in higher nutritional information scores was associated with NE children with higher ELE scores ($p<0.05$) (Table 6).

Table 6. The relationship of children's eating behavior scores with the difference in nutritional information scores (n= 121)

Variables	PSNE (n=62)			NE (n=59)		
	β	%95 CI	p	β	%95 CI	p
FE	-0.651	-9.15/0.48	0.076	-0.268	-4.53/1.14	0.236
EF	0.727	1.10/11.89	0.019	-0.206	-3.67/1.80	0.494
PD	0.398	-2.46/9.52	0.243	-0.413	-6.53/1.05	0.152
ES	-0.836	-10.71/-1.65	0.008	0.605	-1.01/7.22	0.136
SE	0.055	-2.50/3.35	0.771	-0.215	-3.90/1.07	0.258
ELE	0.777	-1.07/19.49	0.078	0.468	0.60/5.42	0.016
FS	-0.983	-9.06/1.77	0.004	0.692	-0.34/6.90	0.074

Multiple Linear Regression Analysis. PSNE: Parent-supported nutrition education, NE: Nutrition education, FE: Food enthusiast, EF: Enjoying food, PD: Passion for drinking, ES: Enthusiasm for satiety, SE: Slow eating, ELE: Emotional less eating, FS: Food selectivity.

DISCUSSION

Children's development, habits, and behaviors are shaped within the family environment from the early years of life. Therefore, involving parents in school-based nutrition education programs is believed to increase their effectiveness in promoting healthy eating habits and

behaviors among children (18). One distinguishing aspect of this study is that it was conducted in a private school setting. However, the availability of a school meal service posed a challenge in observing individual changes in children's eating behaviors. Additionally, the inability to apply different interventions within the same

grade levels due to school regulations constituted another limitation of the study.

The findings revealed a statistically significant increase in nutrition knowledge scores among all participants following the nutrition education intervention ($p < 0.05$). Moreover, when comparing the two intervention groups, children in the Parent-Supported Nutrition Education (PSNE) group demonstrated a greater improvement in their nutrition knowledge scores than those in the Nutrition Education (NE) group. This difference was also statistically significant ($p < 0.05$), indicating that parental involvement contributed to enhanced learning outcomes in nutritional knowledge. In the pre-education nutrition information scores of second-third and fourth-fifth grade children in the second-third grade children in the parent-supported nutrition education study, 54.2 ± 17.8 , while, at the end of education, 61.3 ± 18.4 'e increased ($p < 0.001$); while fourth-fifth grade children had pre-education information scores of 46.4 ± 13.9 , while at the end of education, 54.2 ± 18.8 'ze increased ($p < 0.01$) (6). In another study, children aged three-six years who were given parent-supported nutrition education had 4.24 ± 3.94 pre-educational nutrition information scores, while at the end of education was 4.47 ± 4.13 ; children who were educated in kindergarten alone had a pre-education nutrition information score of 3.50 ± 4.11 , while at the end of education it was found to be 4.46 ± 3.99 ($p < 0.05$) (19). In another study, the nutrition information score of the group receiving education at the end of the nutrition education given to the parents aged six to 12 years was 8.8 ± 2.0 , the nutrition information score of the control group children was 5.9 ± 2.1 ($p < 0.001$) (8). In many studies, it has been observed that the

nutritional information scores of primary school children who receive nutrition education have increased (20-24). The support of primary school children with high learning perceptions is also provided by the effectiveness of nutritional education given to children. Especially in this period, it is thought that the nutrition trainings applied with the participation of parents increase the nutritional information of children and the activities of children at home with their parents, preparing healthy foods and consuming them together, reinforcing the education given. Also in our study, although the nutritional information scores of PSNE children before education are lower than NE children, NE children are composed of fourth and fifth-grade children, and the difference may have been since there is a unit entitled 'Nutrition' subject in the Science course in the fourth grade.

Eating behavior is complex and can be influenced by many factors. Eating behaviors in children are primarily shaped in the family, and this process continues in the school environment (25). In this study, PSNE children have reduced FE, EO, PD, and ES eating behavior scores at the end of education, while FS eating behavior scores have increased; NE children have reduced FE, EO, PD, and ES eating behavior scores at the end of education, while SE and FS eating behavior scores increased. Furthermore, this study found a significant difference only in FS scores between PSNE and NE children after nutrition education ($p < 0.05$). In one study, children aged eight to nine years were given nutrition training for one month in the education group, as well as nutrition awareness training and three-session nutrition education in the control group. At the end of the training, it was found that

both ES and food and beverage enthusiast scores increased for both groups (26). In a study conducted by Pierson and others (2019), it was observed that after nutrition education, children showed less cravings for food and nutrients, and their emotional eating scores decreased ($p<0.05$) (27). A study by Magarey and others (2016) found that children who received education showed lower food sensitivity and higher satiety sensitivity than those who did not ($p<0.05$) (28). A study of Brantley and others (2023) found that parent-supported eating practices reduced emotional eating behaviors in children ($p<0.05$) (29). In addition, many studies have shown that FS and nutrient neophobia behavior decrease in children after nutrition education (30–32). As seen in many studies, it can be said that parent-supported nutrition education in young age group children has a positive effect on the eating behavior of children. In addition, in our study, the change in eating behavior of PSNE children and NE children is similar because there is no significant difference between post-education nutrition information scores, and NE children have previous nutrition topic lessons based on the curriculum, which may have consolidated the training provided.

Nutritional education is critical to the development of positive eating behaviors by developing the knowledge and skills children need to make healthy food choices (33). In this study, it is estimated that the 1-point increase in PSNE children's nutritional information score will be a 0.73-point increase in EF; a 0.84-point decrease in ES, and a 0.98-point decrease in FS were expected. In addition, NE children are expected to increase 1 point in nutritional information score by 0.47

points in ELE ($p<0.05$). A study concluded that after a nutrition education program, positive eating behaviors would increase by 1 point for every 0.35 points in children's nutrition information (34). Another study found that after nutritional education given to children aged eight–fifteen years, there were significant increases in nutritional information and behavior scores of children (35). In many studies, it has been seen that there is a significant positive relationship between the change in nutrition information score of children after nutritional education in elementary school and their nutrition attitude and eating behavior scores ($p<0.05$) (36–39). However, in some studies, it was found that school children who were enrolled in a nutrition education program did not have a significant relationship between the increase in nutritional information scores and their eating behavior scores ($p>0.05$) (40, 41). As can be seen from the studies, the increase in nutrition information scores of school-age children has been shown to provide improvements in eating behaviors. Considering that the periods when eating behaviors begin to take shape are preschool periods, it is thought that including parents in the nutrition education given to primary school children can increase the effectiveness of education.

CONCLUSION

The increase in nutrition information scores of PSNE children was significantly higher than the increase in NE children. In contrast, it was observed that the changes in eating behavior scores of the two groups of students were similar. However, according to the increase in nutritional information scores, the increase in EF scores in PSNE

children, decreased ES and FS scores, and increased ELE scores in NE children were found. In conclusion, although children who received parent-supported nutrition education demonstrated a greater increase in nutrition knowledge scores compared to those who received nutrition education without parental involvement, the changes in eating behavior scores were observed to be similar between the two groups. This shows us the importance of parental support in learning, especially in young children.

Positive eating behaviors to be introduced to children will ensure that both children's growth and development are adequate and that their eating habits are shaped during adulthood, thus protecting them from nutrition-induced obesity and many chronic diseases. This means the emergence of healthy and productive generations for states. Thus, fewer resources will be allocated to health expenses, resulting in a reduction of a significant expense item. Considering that children are the parents of the first role models, the nutrition education modules to be developed in schools need to be planned in a way that includes parent participation, and in the process, it will have positive effects to make the whole environment of children a part of the education considered.

Conflict of interest

The authors declare that they have no conflict of interest.

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