

# The Increase in Parental Knowledge May Change the Nutritional Knowledge and Consumption of Professional Adolescent Swimmers: A Cross Sectional Study

## Profesyonel Ergen Yüzücülerin Beslenme Bilgi ve Tüketimleri Ebeveyn Bilgisindeki Artış ile Değişebilir: Kesitsel Bir Çalışma

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**ABSTRACT Objective:** Compared to non-athletic adolescents, the nutritional needs of athletes, especially swimmers with intensive training programs, are significantly increased. Therefore, an adequate and balanced diet is important to support their performance and growth. As adolescents are generally supported by their parents in food selection, preparation, and access to food, parents' nutritional knowledge is a factor that influences their diets. **Material and Methods:** This is an interventional study with pre-post measurements to evaluate the effect of sports nutrition education provided to parents on adolescent athletes' nutritional knowledge and dietary habits. Initially, the athletes were administered a demographic information form, food frequency questionnaire and nutrition knowledge questionnaire. After data collection, nutrition education was given to the parents of the athletes. Six weeks after the education, the questionnaires were readministered to the athletes. Sixty volunteer adolescent competitive swimmers and their parents participated in the study. **Results:** There was a statistically significant increase in the consumption of foods such as buttermilk, eggs, pulses, nuts, vegetables, fruit, bread, and water ( $p<0.05$ ). There was also a statistically significant increase in both general and sports nutrition knowledge ( $p<0.05$ ). **Conclusion:** This study showed that parental education has a positive effect on the dietary habits and nutritional knowledge of adolescent athletes.

**Keywords:** Sports nutrition; nutritional knowledge; swimmers; nutrition education

**ÖZET Amaç:** Sporcuların, özellikle de yoğun antrenman programı olan yüzücülerin beslenme ihtiyaçları, sporcu olmayan adölesanlara göre önemli ölçüde artmaktadır. Bu nedenle, performanslarını ve büyümelerini desteklemek için yeterli ve dengeli bir diyet önemlidir. Adölesanlar genellikle yiyecek seçimi, hazırlanması ve yiyeceklere erişim konusunda ebeveynleri tarafından desteklendiğinden, ebeveynlerin beslenme bilgisi diyetlerini etkileyen bir faktördür. **Gereç ve Yöntemler:** Bu çalışma, ebeveynlere verilen sporcu beslenmesi eğitiminin adölesan sporcuların beslenme bilgisi ve beslenme alışkanlıkları üzerindeki etkisini değerlendirmek için ön-test ve son-test ile yapılan girişimsel bir çalışmadır. Başlangıçta sporculara demografik bilgi formu, tüketim sıklığı ve sporculara yönelik beslenme bilgisi ölçme anketi uygulanmıştır. Veriler toplandıktan sonra sporcuların ebeveynlerine beslenme eğitimi verilmiştir. Eğitimden 6 hafta sonra anketler sporculara tekrar uygulanmıştır. Çalışmaya 60 gönüllü adölesan yarışmacı yüzücü ve ebeveynleri katılmıştır. **Bulgular:** Ayran, yumurta, bakliyat, kuru yemiş, sebze, meyve, ekme ve su gibi gıdaların tüketiminde istatistiksel olarak anlamlı bir artış görülmüştür ( $p<0,05$ ). Hem genel hem de sporcu beslenmesi bilgisinde de istatistiksel olarak anlamlı bir artış olmuştur ( $p<0,05$ ). **Sonuç:** Bu çalışma, ebeveyn eğitiminin adölesan sporcuların beslenme alışkanlıkları ve beslenme bilgileri üzerinde olumlu bir etkisi olduğunu göstermiştir.

**Anahtar Kelimeler:** Sporcu beslenmesi; beslenme bilgisi; yüzücüler; beslenme eğitimi

The nutrition of adolescent athletes aims to support their maximum performance by providing all the energy and nutrients required for their age, sex, and level of physical activity and to maintain their tar-

geted growth and development, as with all other young people.<sup>1,2</sup> By following the 3 basic rules of ensuring fluid balance, maintaining energy balance, and promoting recovery in their diets, the risk of disease

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is reduced, weight control is achieved, growth and developmental goals are met, and athletic performance is improved.<sup>1</sup> Otherwise, they may have problems with growth and normal body functioning, reduced performance, weakened immunity, and cognitive problems.<sup>3</sup> Swimming is a sport that requires a high level of training to achieve individual performance goals. Thus, nutritional requirements increase as a result of both growth and development and intensive training programmes. Therefore, the importance of an adequate and balanced diet for adolescent swimmers increases.<sup>4,5</sup>

Reaching out to the family and school, the two most important settings should be essential in interventions aimed at guiding adolescents toward a healthy diet.<sup>6</sup> This is because, compared to adult athletes, young athletes are thought to receive support from their parents in food choices, preparation, and access to food. Parents are, therefore, seen as the target audience for sports nutrition education.<sup>7</sup> Organizations, such as the International Olympic Committee and Australian Athlete Dietitians, emphasize the importance of nutrition education for athletes and their parents.<sup>4,8</sup> Studies conducted to evaluate the effectiveness of parental education show that this intervention positively affects adolescents' food preferences, nutritional knowledge, dietary regulation, and anthropometric measures.<sup>9-12</sup> Additionally, a recent systematic review recommended that researchers focus on connecting with parents and increasing their involvement in any intervention planned in any setting.<sup>6</sup>

Consequently, parents who have a high level of knowledge about sports nutrition encourage their children to apply sports nutrition principles, provide them with access to nutrients, and transfer their knowledge to their children; this will contribute to the athlete's performance, reduce the risk of injury and be an essential preparation for the adult athletic years.<sup>13,14</sup> Thus, the main objective of this study is revealing the importance of parental involvement to athletes professional life in particular their nutritional behaviors. By this objective, this study initially aimed to evaluate the effect of sports nutrition education provided to parents on adolescent athletes' nutritional knowledge and dietary habits. In the long term, it is aimed that the nutritional behavior of athletes will de-

velop positively by enhancing consumption of balance meals regarding macro and micro nutrients especially protein and carbohydrates, importance of hydration and rational use of supplementations, in parallel with the change in their families. Moreover, it is aimed to contribute to the increase in the trend of healthy eating behavior in the long term through the awareness that the work will create among athletes. Although studies evaluating the effectiveness of nutrition education provided to parents are common, such studies are not common in sports nutrition. Therefore, this study will help determine whether parental education is an appropriate intervention to improve adolescent athletes' dietary habits and nutritional knowledge.

## MATERIAL AND METHODS

This study was conducted to evaluate the effect of sports nutrition education given to the parents of swimmers on nutritional knowledge and consumption habits after ethical approval by the Yeditepe University Clinical Researches Ethical Committee with approval number 1190 on April 9, 2020, and all procedures followed the Declaration of Helsinki. Written consent was also obtained from Galatasaray Sports Club. Informed consent was obtained from the athletes and their parents during the data collection, which took place between October and December 2020.

### PARTICIPANTS

The universe of the study was 89 athletes aged 10-14 years who trained in the swimming department of the Galatasaray Sports Club. Participants who had an injury that prevented them from training and had been training regularly for less than 6 months were excluded. Finally, 60 athletes volunteered to participate in the study.

### DATA COLLECTION

A number of questions were asked in the questionnaire form to determine the general characteristics of the athletes, including questions about the duration of their participation in sports and whether they followed a specific dietary plan according to their preferences. Anthropometric measurements were taken

by the researcher, and body mass index (BMI) was calculated by dividing the athletes' body weight in kilograms by the square of their height in meters. The athletes completed the food frequency questionnaire, adapted by the researcher from the sports nutrition literature.

The 20-item, two-part Athletes' Nutrition Knowledge Questionnaire was used to measure athletes' sports nutrition knowledge.<sup>15,16</sup> The first section, consisting of 10 items, assesses general nutrition knowledge with questions about energy needs and macro- and micronutrients. The second section assesses knowledge of sports nutrition with questions relating to athletes' macro-micronutrient needs, fluid requirements, diet, and nutritional timing specific to the training-competition period. As each question was worth 1 point, athletes received a maximum of 10 points from each section. A score of 0-3 points was considered poor, 4-7 points was considered average, and 8-10 points was considered good.<sup>15,16</sup> After the initial data collection, the parents of the adolescent athletes were provided with a healthy eating education for adolescent athletes. Six weeks after the education, the Food Frequency Questionnaire and the Athlete Nutrition Knowledge Questionnaire were administered again to the athletes to assess the effectiveness of the education.

## STATISTICAL ANALYSIS

The statistical evaluation of the data was conducted via SPSS 18.0 statistical package program in Windows (IBM, USA). The suitability of the variables to normal distribution was examined using the Kolmogorov-Smirnov test. Descriptive analyses were displayed using mean±standard deviation for quantitative variables, and nominal variables were given using frequency and percentages. Wilcoxon and chi-square tests were used to reveal the significance of the difference between the two measures conducted pre- and post-education. Statistical significance was accepted  $p < 0.05$ .

## RESULTS

Of those 60 swimmers, 55% (n=33) were men, and 45% (n=27) were women. Only athletes aged 10-14 were included in the study, with a mean age of 11.86

±1.2 years. The athletes' years of participation in the sport varied between 2-10 years, with a mean of 6.46±2.11 years. The BMI of the group ranged from 14.98 to 28.04, and the mean BMI was 19.9±2.53. Moreover, the BMI was evaluated according to the BMI-for-age percentiles specific to Turkish children. Accordingly, 2% (n=1) of the athletes were lean, 85% (n=51) were ideal, 8% (n=5) were overweight, and 5% (n=3) were with obesity.

Of those, 48.3% reported changing their diet in relation to the training and competition cycle, while 51.7% (n=31) did not. Besides, only 20% (n=12) of the athletes used nutritional supplements, and 80% (n=48) were not. Moreover, 65% (n=39) of them stated having information about sports nutrition, and 35% (n=21) indicated that they did not have (Table 1).

The athletes' daily food portions were evaluated concerning their parents' pre and post-education. Parental education significantly increased the athletes' consumption of buttermilk, eggs, legumes, nuts, vegetables, fruit, bread, and water ( $p < 0.05$ ). In comparison, no statistically significant change was observed for other foods ( $p > 0.05$ ) (Table 2).

Table 3 presents the pre and post-education general nutrition scores (GNS) and sports nutrition scores (SNS). The GNS varied between 3-10 points; the mean score was 7.6±1.5 points pre-education, while it significantly increased to 8.4±1.6 points post-education ( $p < 0.05$ ). Similarly, the pre-education SNS varied between 3-9 points, and the mean score was 6.7±1.3 points, while the post-education score significantly increased to 7.7±1.1 points ( $p < 0.05$ ).

Figure 1 shows the distribution of the pre and post-education nutritional knowledge questionnaire scores. Regarding the pre-education scores of the general nutrition part, 1.7% (n=1) of the athletes achieved a low-level score, 43.3% (n=26) an average-level score, and 55% (n=33) a high-level score. After education, none of the athletes had a low-level score, while 25% (n=15) achieved an average-level score, and 75% (n=45) a high-level score. Regarding the sports nutrition pre-education scores, 1.7% (n=1) of the athletes achieved a low-level score, 63.8% (n=41) an average-level score, and 30% (n=18) a

**TABLE 1:** General characteristics of athletes.

Athletes (n=60)		$\bar{X}\pm SD$	Minimum-maximum
Age (years)		11.86 $\pm$ 1.2	10-14
Years of participation in the sport		6.46 $\pm$ 2.11	2-10
BMI (kg/m <sup>2</sup> )		19.9 $\pm$ 2.53	14.98-28.04
		n	%
Percentile distribution of BMI-for-age	Lean	1	2
	Ideal	51	85
	Overweight	5	8
	Obese	3	5
Do you change your diet according to your training and competition cycle?	Yes	29	48.3
	No	31	51.7
Do you use nutritional supplements?	Yes	12	20
	No	48	80
Do you have any information about sports nutrition?	Yes	39	65
	No	21	35

SD: Standard deviation; BMI: Body mass index.

**TABLE 2:** Athletes' daily food consumption portions regarding pre and post-education of their parents.

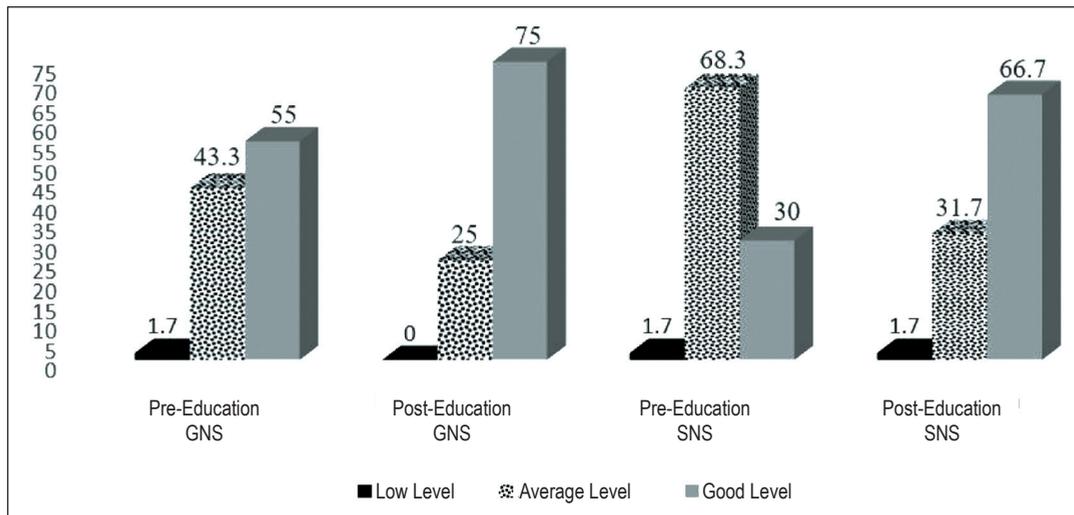
	Pre-education		Post-education		Significance p <sup>a</sup>
	$\bar{X}\pm SD$	Minimum-maximum	$\bar{X}\pm SD$	Minimum-maximum	
Milk	0.93 $\pm$ 0.6	0-2	0.94 $\pm$ 0.6	0-2	0.771
Yogurt	0.58 $\pm$ 0.7	0-4	0.50 $\pm$ 0.5	0-1.6	0.441
Buttermilk	0.16 $\pm$ 0.4	0-1	0.33 $\pm$ 0.6	0-2	0.001*
Kefir	0.036 $\pm$ 0.3	0-2	0.12 $\pm$ 0.5	0-3	0.168
Cheese	0.52 $\pm$ 0.4	0-1	0.54 $\pm$ 0.4	0-2	0.608
Redmeat	0.81 $\pm$ 0.6	0.07-3	0.85 $\pm$ 0.5	0.07-3	0.312
Chicken	0.4 $\pm$ 0.5	0-3	0.42 $\pm$ 0.5	0-3	0.726
Fish	0.25 $\pm$ 0.2	0-1	0.24 $\pm$ 0.2	0-1.6	0.697
Egg	0.53 $\pm$ 0.3	0-1.5	0.60 $\pm$ 0.3	0.07-1.5	0.004*
Legume	0.36 $\pm$ 0.3	0-1	0.42 $\pm$ 0.2	0-1	0.032*
Nut	0.81 $\pm$ 0.8	0-5	1.04 $\pm$ 0.8	0-4	0.002*
Vegetable	0.9 $\pm$ 0.6	0.7-2.36	1.29 $\pm$ 0.8	0.07-3	0.000*
Fruits	1.57 $\pm$ 0.7	0.14-3	1.82 $\pm$ 0.8	0.14-4	0.017*
Bread	1.22 $\pm$ 0.9	0-4	1.45 $\pm$ 0.9	0-4.5	0.001*
Pasta	0.71 $\pm$ 0.3	0-1	0.70 $\pm$ 0.5	0-2	0.729
Rice	0.49 $\pm$ 0.4	0-1	0.45 $\pm$ 0.5	0-2	0.365
Bulgur	0.22 $\pm$ 0.4	0-1	0.21 $\pm$ 0.4	0-2	0.700
Oatmeal	0.01 $\pm$ 0.1	0-0.5	0.003 $\pm$ 0.02	0-0.2	0.357
Cornflakes	0.08 $\pm$ 0.3	0-1	0.07 $\pm$ 0.2	0-1	0.888
Olive oil	3.83 $\pm$ 2.2	0-10	4.23 $\pm$ 3	0-20	0.373
Sunflower oil	0.64 $\pm$ 1.7	0-10	0.81 $\pm$ 1.6	0-6	0.384
Butter	0.48 $\pm$ 0.7	0-3	0.66 $\pm$ 1.2	0-6	0.524
Pastry	0.57 $\pm$ 0.6	0-3.4	0.54 $\pm$ 0.6	0-3.1	0.500
Cake	0.28 $\pm$ 0.6	0-3	0.36 $\pm$ 0.6	0-2.5	0.410
Pudding	0.53 $\pm$ 0.7	0-2.3	0.43 $\pm$ 0.6	0-2.4	0.162
Baklava	0.04 $\pm$ 0.2	0-1	0.04 $\pm$ 0.2	0-1	0.537
Biscuit	0.27 $\pm$ 0.8	0-4	0.22 $\pm$ 0.7	0-3.1	0.602
Chocolate	0.60 $\pm$ 0.6	0-2	0.59 $\pm$ 0.6	0-2	0.731
Chips	0.45 $\pm$ 1.1	0-5	0.26 $\pm$ 0.8	0-3.9	0.169
Protein bar	0.05 $\pm$ 0.2	0-1	0.07 $\pm$ 0.2	0-1	0.534
Carbohydrate gel	0	0	0.001 $\pm$ 0.01	0-0.1	0.317
Sports drink	0.003 $\pm$ 0.01	0-0.1	0.03 $\pm$ 0.1	0-1	0.068
Water (lt)	1.8 $\pm$ 0.8	0.4-3.5	2 $\pm$ 0.9	1-7	0.012*

<sup>a</sup>The p-value calculated via Wilcoxon test; \*p<0.05; SD: Standard deviation.

**TABLE 3:** The athletes' nutritional knowledge questionnaire scores comparison regarding pre and post-education.

	Pre-education		Post-education		Significance	
	$\bar{X}\pm SD$	Minimum-maximum	$\bar{X}\pm SD$	Minimum-maximum	Z	p <sup>a</sup>
GNS	7.6±1.5	3-10	8.4±1.6	4-10	-3.720	0.000*
SNS	6.7±1.3	3-9	7.7±1.1	3-10	-5.043	0.000*

<sup>a</sup>The p-value calculated via Wilcoxon test; \*p<0.001; SD: Standard deviation; GNS: General nutrition score; SNS: Sports nutrition score.



**FIGURE 1:** Distribution of the nutritional knowledge questionnaire scores level. GNS: General nutrition score; SNS: Sports nutrition score.

high-level score. Only 1.7% (n=1) of the athletes achieved a low-level post-education score, while 31.7% (n=19) had an average-level score and 66.7% (n=40) a high-level score.

## DISCUSSION

Adolescent swimmers should provide their bodies with sufficient energy intake and various nutrients to maintain their health, support swimming performance, and keep their growth and development at optimum levels in the long term.<sup>4</sup> But some studies mentioned that the poor dietary habits of adolescents who swim competitively might threaten their optimum athletic performance and place them at risk for future chronic diseases, including osteoporosis.<sup>17,18</sup> Ensuring the ideal growth and development of athletes in adolescence is only possible with the high nutritional knowledge necessary for healthy nutrition of the athlete. In this regard, parents' nutritional knowledge is also important since the nutrition of children

and adolescents is usually the responsibility of their parents.<sup>7,13,14</sup> Thus, this study aimed to evaluate the effect of sports nutrition education given to parents on the nutritional knowledge and consumption habits of adolescent athletes.

In the literature, it was determined that the daily diet of adolescent swimmers was deficient in carbohydrates, vitamins, and minerals, and they consumed too excessive fat and inadequate carbohydrates, and in particular, women swimmers did not meet the recommended dietary allowances for calcium and iron.<sup>17,19</sup> Thus, a strategy that addresses all the factors around it is required in order to regulate adolescents' nutritional behaviors to be healthier. As in this study, many studies have shown that multi-component strategies, which include parental education, have a positive effect on their children's consumption habits.<sup>10,20-24</sup> In particular, parental involvement is essential to achieve the long-term benefits of adolescent nutrition programs.<sup>25</sup> Also, the importance of

parental education is highlighted by international sports organizations such as the International Olympic Committee and Australian Athlete Dietitians.<sup>5,26</sup>

The findings of this study indicated that increased nutritional information as a result of nutrition education given to parents might affect the consumption habits of athletes. There were statistically significant changes in the consumption of some foods such as dairy group, eggs, legumes, nuts, vegetables, fruits, and bread. Since dairy groups, eggs, legumes, nuts, vegetables, and fruits are frequently used nutrients in the diet plans of athletes, their statistical increase in this study was important. It should be highlighted that providing the optimum amount of nutrients in the diets of athletes promotes performance and recovery.<sup>27</sup> Ideal amounts of consumption of nuts and legumes will contribute to athletes' muscle development due to their protein content. As well, those foods are ideal alternatives to animal-based protein.<sup>28</sup> Vegetables and fruits, which are sources of vitamins, minerals, antioxidants, and fiber, are effective in growth and development, cell renewal, tissue repair, skin and eye health, tooth and gum health, blood formation, and resistance to diseases. In addition, due to the feeling of satiety and low energy, they have an important role in preserving and maintaining a healthy weight in children and adolescents and preventing excessive weight gain.<sup>29</sup> Ideal consumption of vegetables and fruits enables the athlete to get enough of most of the micronutrients, maintain their general health, and protect them from injuries. In addition, athletes need to get enough of these nutritious foods, as micronutrient deficiencies can cause severe decreases in performance.<sup>28</sup> The daily water requirement recommended in the guideline was 2000-2400 mL, while water consumption among athletes has reached an adequate level after education.<sup>29</sup>

In line with the literature, the findings of this study indicated a significant increase in adolescents' general and sports nutrition knowledge levels as a result of the education given to their families.<sup>9,30</sup> Studies indicated that parental education has shown to be more efficient when compared to education only given to athletes.<sup>30</sup> Moreover, similar to our findings, another study concluded that nutrition education con-

tributes to both nutritional knowledge and healthy eating habits, as well as increases efficiency with parents' participation in the education process.<sup>9</sup>

## CONCLUSION

In conclusion, in this study, a multi-dimensional evaluation was made by including the athletes' parents, and the multiple-component method's contribution to obtaining more effective results was shown. However, a couple of limitations should be considered in evaluating the results obtained. Firstly, the whole education content was expressed in a single seminar; it might have been more beneficial if the topics had been divided and explained in separate seminars. Secondly, although the athletes were given detailed instructions on portion sizes and completed the questionnaires under the researcher's supervision to maximize accurate reporting when administering the food frequency questionnaire, evaluating this data in conjunction with 24-hour recall would be more accurate.

Despite all these limitations, in addition to the pre-test and post-test application, this study poses an important conclusion that parental involvement is an crucial component in improving the nutritional status of athletes. Moreover, it was determined that nutrition education given to parents had a positive effect on both consumption attitudes and nutritional knowledge regarding consumption of specific foods including buttermilk, eggs, legumes, nuts, vegetables, fruit, bread, and also drinking sufficient amount of water. It should be highlighted that these foods contain advantageous nutrients especially in contributing to the health and performance of athletes. With this awareness-raising education study, an important output was created for diversifying the pre- and post-training meals of athletes prepared by families, as well as planning meals that will contribute to athlete performance. The results of this study emphasize the need for further studies to develop nutrition strategies and education activities that also involve parents to improve the performance of athletes.

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### Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

### Authorship Contributions

**Idea/Concept:** Dilara Serarslan, İrem Kaya Cebioğlu; **Design:** Dilara Serarslan, İrem Kaya Cebioğlu; **Control/Supervision:** İrem Kaya Cebioğlu; **Data Collection and/or Processing:** Dilara Serarslan; **Analysis and/or Interpretation:** Dilara Serarslan, İrem Kaya Cebioğlu; **Literature Review:** Dilara Serarslan; **Writing the Article:** Dilara Serarslan, İrem Kaya Cebioğlu; **Critical Review:** İrem Kaya Cebioğlu; **References and Fundings:** Dilara Serarslan; **Materials:** Dilara Serarslan, İrem Kaya Cebioğlu.

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