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Evaluation of Added Sugar and Sugar-Sweetened Beverage Consumption by University Students

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Abstract

Today, increased intake of sugar and sugar-sweetened beverages is seen as an important factor in the growing prevalence of chronic diseases, such as obesity, obesity-related diabetes, and coronary heart diseases. This study involved 214 Ankara University students from the Department of Nutrition and Dietetics, which was intended to evaluate the consumption of sugar and sugar-sweetened beverages. The frequency of student consumption of beverages and the quantities and amounts of sugar taken with beverages were questioned. The average total amount of sugar added to drinks by the students was 4.69 ± 6.35 gram, while the average total amount of sugar taken with sugar-sweetened beverages was 11.34 ± 15.32 gram. Female students relative to male students, students in grade 4 compared to grades 2 and 3, and students who had daily breakfast compared to those who did not had lower average sugar consumption (p -value < 0.05). As class grades increase, the amount of sugar added to beverages and fruit juice and sweetened soft drinks and carbonated beverages decreased (p -value < 0.05). The consumption of herbal teas and dietary beverages increased and the eating habits of students generally changed positively (p -value > 0.05). It is important to educate university students about the reduction in sugar intake and sugar-containing food in order to avoid many chronic diseases that may be seen in older ages.

Keywords: sugar, sugar-sweetened beverages, university students

Introduction

Obesity is a significant health concern in both developed and developing countries today. There have been several factors in the etiology of obesity, but the association between increased obesity prevalence and high sugar consumption has gained attention recently.¹ Moreover, the relationship between high sugar consumption and health problems such as obesity, diabetes, cardiovascular diseases, dental caries, and hyperactivity is discussed.²⁻⁵

Experimental and observational studies have shown that the amount of sugar added to beverages or taken by sweetened beverages induces weight gain in children and adults. It is also strongly emphasized that this situation is closely linked to diseases such as oral and dental health, cardiovascular diseases, diabetes, and metabolic syndrome.⁶⁻⁹ Studies in Turkey indicate that 68.8% of young people consumed sugar added tea and coffee, 33.2% consumed cola drinks, 46.4% consumed fruit juice, and 49.2% consumed foods such as sugar and chocolate;¹⁰ 30% preferred milk and fruit juice as a drink

at breakfast;¹¹ 10.6% of students consumed cola, and 19.9% consumed fruit juice.¹² Other studies stated that most young people prefer cola drinks between meals.^{11,13} Another study conducted in Turkey found that 11.5% of young people consumed sweetened carbonated beverages or cola drinks every day.¹⁴

Nowadays, sugar added or sugar-sweetened fruit juices, soft drinks, and carbonated beverages take place in nutritious drinks such as milk and ayran.¹⁵ Little is known about factors that determine the preferences of beverages as well as the influence of university students on the consumption of sweetened beverages by many factors. In order to better understand these factors, there is a need for the planning and implementation of dietary habits, particularly for the consumption of sweetened beverages by young people. It is considered that this aspect should be taken into account when evaluating the risk of chronic diseases associated with nutrition and health-promoting and protective practices.

For that reason, this study was organized and conducted to determine the amount of sugar added to beverages

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ages or taken by sweetened beverages and the number of beverages consumed by 2nd-, 3rd-, and 4th-year students studying at the Faculty of Health Sciences, Department of Nutrition and Dietetics of Ankara University, Turkey.

Method

This study was conducted between November and December 2016 in a total of 214 students in the 2nd, 3rd, and 4th years of the Faculty of Health Sciences, Department of Nutrition and Dietetics of Ankara University, Turkey. This study involved all students (214 students) studying at the Department of Nutrition and Dietetics (the second, third, and fourth years).

Data from the survey were obtained by applying a face-to-face questionnaire, which consists of two parts. The first part contains some demographic information on students and some nutritional habits, such as having breakfast daily and eating outside the house. The second part includes information on students' beverage consumption (daily water consumption; frequency of tea, herbal teas, Nescafe, milk, etc.; addition of sugar to some beverages; preference of sweetened beverages; etc.).

Beverage consumption by university students was determined by frequency and quantity. Moreover, it was questioned how much and how often students consumed drinks such as milk, ayran, fruit juice, cola or diet drinks, Nescafe, Turkish coffee, energy drinks, and alcohol (e.g., one cup a day, one cup of water at a time). University students were asked to complete the surveys, taking into account the frequency of beverage consumption in the last three months. Beverage frequency consumption of each item was evaluated using seven categories: never, once a week, two to three times per week, four to six times per week, once a day, two to three times per day, and four to eight times per day. Later, beverage consumption coefficients were multiplied by the number of drinks consumed at one time. The amount of beverage consumed by university students per day was calculated in mL.

Daily beverage intake was determined using the following formula: frequency of intake (the conversion factor) × serving size × total number of servings × mL of beverage in one serving.¹⁶ Water consumption of university students questioned in the form of water glass. Students who added sugar to beverages were asked to write down the amount of sugar they added as a teaspoon, depending on the amount they consumed (one teaspoon, one cup, etc.), and the amount of sugar added to beverages is calculated in grams, taking into account the amount of beverage consumed. In this study, one teaspoon of sugar was accepted as 5 grams.¹⁷ In addition, sugar fractions used in sweetened beverages are taken from the official websites of the related beverage companies and the amount of sugar taken from sweetened bev-

erages, and finally, the total amount of sugar is calculated.¹⁸⁻²¹

Statistical evaluation was assessed using the Statistical Package for the Social Sciences (SPSS) version 24 (IBM SPSS Advanced Statistics 24.0, Program Number: 5725-A54). Charts showing mean and percent values were prepared when the frequency of beverages was evaluated. One-way ANOVA was used to assess sugar consumed in sweetened beverages and the amount of daily consumption of some beverages and drinks. Further, independent samples of t-tests were used to assess sugar consumption among groups where demographic information and nutrition habits are considered. Additionally, the significance level was accepted as p-value < 0.05 in all statistical analyses. The study was approved by the Ethics Committee of Ankara University (Approval ID: 06-258-16).

Results

A total of 214 university students (21 males, 193 females) participated in the study, with a mean age of 20.57 ± 1.10 years and a mean number of siblings of 3.04 ± 1.52 . According to Table 1, 18.7% of university students say they drink milk once a day, 39.3% drink ayran two to three times a week, 38.9% drink tea two to three times a day, and 35.0% drink Turkish coffee once a week. In addition, 98.6% of students did not consume energy drinks, 93.9% turnip, 89.7% alcoholic beverages, 82.7% diet drinks, 65.4% mineral water, 64.5% of pure fruit juices, and 56.5% carbonated drinks.

University students' consumption of carbonated beverages, fruit juice, sweetened tea, and sweetened soft drinks (mL/day) were lower as the class level increased, whereas consumption of herbal tea and diet beverages increased (Table 2). The average daily water consumption of university students was 1228.04 ± 533.5 mL/day.

Table 3 indicates the amount of sugar (gram) added to beverages by university students and the amount of sugar taken with sweetened beverages by grade level (2, 3, 4). Accordingly, as the grade level increases, the amount of sugar added to beverages and the amount of sugar taken with sweetened beverages are reduced. The average amounts of sugar added to all beverages are 7.21 ± 7.43 g, 3.64 ± 5.39 g, and 2.15 ± 3.95 g in grades 2, 3, and 4, respectively. The total amounts of sugar taken with sweetened beverages for 2nd, 3rd, and 4th grades, respectively, are 17.09 ± 21.62 g, 8.56 ± 14.53 g, and 7.08 ± 8.57 g.

When the amount of sugar consumed by students is considered in line with some nutritional habits; students who have obese individuals in their families, who have daily breakfast regularly, and who have not consumed anything before sleeping had significantly lower sugar consumption. However, students who added salt without

Table 1. Frequency of Some Beverages Consumption by University Students in Ankara City, Turkey (N = 214)

Beverage	Per Day						Per Week						Never	
	Four to Eight Times		Two to Three Times		One Time		Four to Six Times		Two to Three Times		One Time		n	%
	n	%	n	%	n	%	n	%	n	%	n	%		
Milk	-	-	11	5.1	40	18.7	33	15.4	67	31.3	49	22.9	14	6.5
Ayran	-	-	2	0.9	9	4.2	26	12.1	84	39.3	77	36.0	16	7.5
Pure fruit juice	-	-	-	-	-	-	2	0.9	16	7.5	58	27.1	138	64.5
Fruit juice	-	-	-	-	3	1.4	9	4.2	35	16.4	57	26.6	110	51.4
Carbonated drinks	-	-	-	-	-	-	5	2.3	24	11.2	64	29.9	121	56.5
Diet drinks (zero, light, etc.)	-	-	-	-	-	-	1	0.5	10	4.7	26	12.1	177	82.7
Black tea	20	9.3	83	38.9	55	25.7	17	7.9	22	10.3	9	4.2	8	3.7
Sweetened tea (ice tea, etc.)	-	-	1	0.5	3	1.4	8	3.7	13	6.1	52	24.3	137	64.0
Herbal teas	1	0.5	5	2.3	12	5.6	15	7.0	46	21.5	59	27.6	76	35.5
Nescafe	3	1.4	16	7.5	25	11.7	24	11.2	54	25.2	51	23.8	41	19.2
Turkish coffee	-	-	3	1.4	11	5.1	13	6.1	33	15.4	75	35.0	79	36.9
Mineral water	-	-	-	-	3	1.4	7	3.3	15	7.0	49	22.9	140	65.4
Sweetened soft drinks	-	-	-	-	-	-	2	0.9	12	5.6	63	29.4	137	64.0
Oralet	-	-	-	-	-	-	1	0.5	2	0.9	10	4.7	201	93.9
Turnip	-	-	-	-	-	-	1	0.5	2	0.9	10	4.7	201	93.9
Energy drinks	-	-	-	-	-	-	-	-	-	-	3	1.4	211	98.6
Alcoholic beverages	-	-	-	-	-	-	-	-	5	2.3	17	7.9	192	89.7

Table 2. Consumption Amounts of Some Beverages Consumed by University Students (N = 214) (mL/day)

Beverage	Amount of Consumed Beverage (mL/day)				F	p-value
	2 nd Grade (N = 84)	3 rd Grade (N = 79)	4 th Grade (N = 51)	Total (N = 214)		
	$\bar{x} \pm SD$	$\bar{x} \pm SD$	$\bar{x} \pm SD$	$\bar{x} \pm SD$		
Milk	195.23 ± 77.46	193.03 ± 55.31	184.31 ± 67.44	191.82 ± 67.42	0.435	0.64
Ayran	210.71 ± 85.61	205.82 ± 73.91	186.27 ± 80.04	203.08 ± 79.51	1.582	0.20
Pure fruit juice	106.07 ± 106.14	62.40 ± 96.15	35.29 ± 77.00	73.08 ± 99.90	9.359	0.00 ^a 0.01 ^b
Fruit juice	175.00 ± 176.59	110.12 ± 145.48	69.21 ± 108.12	125.84 ± 156.39	8.442	0.00 ^a 0.01 ^b
Carbonated drinks	136.30 ± 140.68	98.35 ± 143.93	90.98 ± 121.41	111.49 ± 138.44	2.293	0.10
Diet drinks	25.35 ± 70.70	43.67 ± 98.30	59.21 ± 108.32	40.18 ± 91.75	2.278	0.10
Black tea	192.85 ± 131.52	185.44 ± 159.35	205.00 ± 151.27	193.01 ± 146.51	0.274	0.76
Sweetened tea	102.26 ± 132.04	97.97 ± 151.81	90.98 ± 159.81	97.99 ± 145.77	0.094	0.91
Herbal teas	98.80 ± 91.16	115.08 ± 92.64	117.68 ± 96.17	109.57 ± 92.88	0.932	0.39
Nescafe	144.04 ± 79.68	134.17 ± 90.42	174.50 ± 121.80	147.66 ± 95.89	2.890	0.58
Turkish coffee	76.19 ± 63.28	70.88 ± 55.81	67.64 ± 70.58	72.19 ± 62.31	0.324	0.72
Mineral water	91.66 ± 124.38	52.27 ± 91.49	63.72 ± 92.23	70.46 ± 106.78	2.956	0.054
Sweetened soft drinks	102.73 ± 102.51	56.32 ± 91.41	46.07 ± 84.16	72.10 ± 97.17	7.472	0.02 ^a 0.00 ^b

Notes: p-value < 0.05^a = the level of significance between the 2nd and 4th grades; p-value < 0.05^b = the level of significance between the 2nd and 3rd grades; SD = Standar Deviation

tasting their meals were found to have significantly higher average sugar consumption than those who did not (p-value < 0.05) (Table 4).

Discussion

The mean age of 214 university students involved in the study was 20.57 ± 1.10 years. Furthermore, 38.9% of university students consumed tea two to three times a day, and 35.0% consumed Turkish coffee once a week. In addition, 51.4% of students did not consume fruit juice, 56.5% carbonated drinks, 35.5% herbal tea,

65.4% mineral water, and 89.7% alcoholic beverages.

The mean age of 214 university students involved in the study was 20.57 ± 1.10 years. Furthermore, 38.9% of university students consumed tea two to three times a day, and 35.0% consumed Turkish coffee once a week. In addition, 51.4% of students did not consume fruit juice, 56.5% carbonated drinks, 35.5% herbal tea, 65.4% mineral water, and 89.7% alcoholic beverages. According to Türkiye Beslenme ve Sağlık Araştırması (TBSA)/Turkey Nutrition and Health Research data,²² when the frequency of consumption of

Table 3. Evaluation of the Amount of Sugar Added to 100 mL of Some Beverages According to Grades of University Students (g)

	Amount of Sugar Added (g)				F	p-value
	2 nd Grade (N = 84)	3 rd Grade (N = 79)	4 th Grade (N = 51)	Total (N = 214)		
	$\bar{x} \pm SD$	$\bar{x} \pm SD$	$\bar{x} \pm SD$	$\bar{x} \pm SD$		
Sugar added to tea	2.26 ± 2.33	1.11 ± 1.65	0.82 ± 1.60	1.49 ± 2.03	11.09	0.001 ^a 0.000 ^b
Sugar added to herbal tea	1.85 ± 2.33	0.86 ± 1.93	0.35 ± 0.95	1.13 ± 2.02	10.76	0.003 ^a 0.000 ^b
Sugar added to Nescafe	2.00 ± 2.59	1.24 ± 1.90	0.82 ± 1.55	1.43 ± 2.18	5.34	0.006 ^b
Sugar added to milk	1.09 ± 2.11	0.43 ± 1.34	0.15 ± 0.67	0.62 ± 1.63	6.45	0.023 ^a 0.003 ^b
Total sugar added to beverages	7.21 ± 7.43	3.64 ± 5.39	2.15 ± 3.95	4.69 ± 6.35	13.09	0.001 ^a 0.000 ^b
Sugar taken with fruit juice	8.26 ± 14.50	3.18 ± 5.32	2.44 ± 4.90	5.00 ± 10.24	7.52	0.004 ^a 0.003 ^b
Sugar taken with carbonated drinks	3.98 ± 6.95	2.71 ± 6.24	1.95 ± 2.96	3.03 ± 5.95	2.03	0.15
Sugar taken with sweetened tea	2.97 ± 8.89	1.76 ± 4.34	1.94 ± 4.10	2.28 ± 6.48	0.80	0.44
Sugar taken with sweetened soft drinks	1.85 ± 2.38	0.90 ± 1.88	0.74 ± 1.53	1.23 ± 2.07	6.50	0.008 ^a 0.006 ^b
Total sugar taken with sweetened beverages	17.09 ± 21.62	8.56 ± 14.53	7.08 ± 8.57	11.34 ± 15.32	7.68	0.004 ^a 0.003 ^b
Total	24.30 ± 2.58	12.21 ± 2.03	9.24 ± 1.47	16.25 ± 20.19	12.56	0.000 ^a 0.000 ^b

Notes: p-value < 0.05^a = the level of significance between the 2nd and 4th grades; p-value < 0.05^b = the level of significance between the 2nd and 3rd grades; SD = Standard Deviation

Table 4. Examination of the Total Amount of Sugar Consumed by University Students per Day (Total Sugar From Sweetened Beverages and Total Sugar Added to Beverages) According to Some Variables (N = 214)

Variable	Category	Total Sugar Consumption (g)		
		n (%)	$\bar{x} \pm SD$	p-value
Gender	Male	21 (9.8)	32.06 ± 32.52	0.024*
	Female	193 (90.2)	14.53 ± 17.65	
Obese individuals in the family	Yes	119 (55.6)	12.61 ± 13.04	0.006*
	No	95 (44.4)	20.80 ± 25.93	
Regular breakfast	Yes	142 (66.4)	13.82 ± 14.88	0.039*
	No	72 (33.6)	21.04 ± 27.35	
Eating before sleeping	Yes	127 (59.3)	19.28 ± 23.33	0.003*
	No	87 (40.7)	11.82 ± 13.36	
Eating outside	Yes	131 (61.2)	16.74 ± 21.94	0.652
	No	83 (38.8)	15.46 ± 17.16	
Adding salt to meals	Yes	34 (15.9)	24.99 ± 27.60	0.041*
	No	180 (84.1)	14.60 ± 18.09	
Adequate and balanced nutrition according to students	Yes	87 (40.7)	12.69 ± 14.54	0.021*
	No	127 (59.3)	18.68 ± 23.02	

Note: SD = Standard Deviation

20-year-olds and over in the last 1-month beverage is evaluated, blacktea was the most commonly consumed in both gender; it is drunk every day, 92.3% in urban and 94.5% in rural areas.

The effects of caffeine in tea on health should not be overlooked. Coffee, tea, cola drinks, cocoa, and chocolate contain caffeine. About 100–120 mg of caffeine is in a cup of brine (200–250 mL), 40–50 mg infused in a cup of tea for 5 minutes, and 35–36 mg is in 100 mL of cola. If taken more than 5 grams per day, congestion, coma, respiration, and heart failure can occur.²³⁻²⁵

According to data from TBSA,²² the consumption frequency of herbal teas was generally low, with a total un-consumed rate of 71.2%. The university students included in this study had a higher consumption frequency of herbal teas than the TBSA data. It is thought that university students are preferred because of the easy consumption of packaged herbal teas, and this situation contributes to an increase in the consumption of herbal tea.

Additionally, according to TBSA data,²² while 21.3% of people drink coffee or Nescafe every day. In this study, 20.6% of students declared that Nescafe was drunk at

least once a day; similar results were obtained in both studies. In the same study, the rate of fruit juice consumption one to two times a week was 22.0%, and the rate of consumption three to four times a week was 11.2%. In this study, both rates were found to be 26.6% and 16.4%, respectively. According to TBSA data,²² the rate of people consuming carbonated drinks daily was 11.7%. At the same time, all of the students who participated in the study reported that they did not consume carbonated drinks every day. This outcome is incredibly rewarding because students in the Department of Nutrition and Dietetics have turned vocational education into a lifestyle. In the same study, the rate of people who did not consume alcoholic beverages was 84.9%, compared to 89.7% in this study. Due to the drunkenness of alcohol in the Islamic world, it is thought that alcohol consumption is not considered legitimate.

Water is the essential component of nutrition. Every body function is supplied with fluid, and losing 10% of water causes serious problems in the body. Water and other beverages are important for the preservation of body fluid balance. An average of 2–2.5 liters (8–10 cups) of water per day is recommended to dispose of toxic substances through food consumption in the body and for the body's heat balance.^{26,27} The average amount of water consumed by university students is 1228.04 ± 533.5 mL/day (6.15 ± 3.41 cups) in this study, lower than recommended.

This study determined that university students' consumption of carbonated drinks, fruit juice, and sweetened soft drinks (mL/day) by university students decreased as the grade level increased (Table 2). In this result, vocational consciousness, abilities transforming knowledge to behavior and active course contents in students of the Department of Nutrition and Dietetics are considered to play an important role. The total amount of sugar added to drinks and the total amount of sugar taken in sweetened beverages were 4.69 ± 6.35 g/day and 11.34 ± 15.32 g/day, respectively, for students of the Department of Nutrition and Dietetics (Table 3). The total sugar added and sugar of sweetened beverages is approximately 44 kcal, equivalent to around 2.75% of the 2,000 kcal diet. The energy given by the amount of sugar added to beverages or taken by sweetened beverages constitutes between 13% and 16% of the daily energy intake of adults and adolescents in the United States (US).²⁸

In a study of 253 university students, West, *et al.*,²⁹ found that male and female students had 620 ± 671 kcal/day (~155–168 g) and 505 ± 670 kcal/day (~126–168 g), respectively, (~135 g) of energy when both groups were included, but this difference was not statistically significant. Murad,³⁰ found that students studying at a university in the US, between 18 and 24 years of age, with 203 university students, had lower consumption of

sugar added to beverages or taken by sweetened beverages as grade increases. According to Huffman and West,³¹ 201 college students in the college preparatory period had a significantly higher rate of sugar consumption (p-value < 0.01) than those who continue to study at university (p-value < 0.01). Additionally, the average daily amounts of consumed sweetened beverages were 12.6 ± 4.8 and 7.6 ± 5.0 , respectively. The findings of this study were similar to those of Murad,³⁰ and Huffman and West,³¹; the students' daily sugar consumption was found to be lower than the study conducted by West, *et al.*²⁹ The main difference is thought to be that the students of the Department of Nutrition and Dietetics have turned the course content and nutritional education gained in this direction into a lifestyle.

In this study, students who have daily breakfasts compared to those who do not have, and students who think they are well fed and balanced compared those who do not had significantly lower (p-value < 0.05) total sugar consumption (Table 4). Welsh, *et al.*,³² Collison, *et al.*,³³ and Gao, *et al.*,³⁴ found that the amount of sugar from sweetened beverages was significantly higher in men than in women (p-value < 0.005); Huffman and West,³¹ found no relationship between consumption of sweetened beverages and gender.

The Institute of Medicine,³⁵ recommends that energy received by added or free sugar consumption should be less than 25% of daily energy. Further, the World Health Organization (WHO),³⁶ also recommends less than 10% of the energy consumed. The American Heart Association,³⁷ reports that energy taken from free sugars should be less than 150 kcal (37.5 g) and 100 kcal (25 g) for men and women, respectively. The United States Department of Agriculture,³⁸ recommends that energy obtained with solid fats and sugar should account for 5–15% of daily energy. The WHO,³⁹ on the other hand, points out that sugar energy is less than 5% of the daily energy requirement. Although international sugar consumption recommendations vary from country to country, it is suggested for our country that a maximum of 9–10% of energy (40 g/day for men, 30 g/day for women) should be consumed from sugar.^{39,40} Even though a maximum of 15% of the 2,000 kcal diet (average 75 g) was considered to be met by sugar, the results of this study indicate that university students have low sugar consumption. In this study, the amount of sugar taken from foods such as sweets and chocolate (one serving containing about 40–50 g of sugar) was not calculated. The only amount of sugar added to beverages or taken from sweetened beverages was determined.

In adolescence or adulthood, skipping breakfast is a serious problem, and this rate is close to 30% for young people in the US and European countries. Studies in the literature indicate that individuals who have a habit of

having regular breakfast typically eat sufficiently and balanced.⁴¹⁻⁴³ Although some studies,^{44,45} show that individuals who have regular breakfast have lower daily sugar consumption than those who do not, studies claiming the opposite of this situation,⁴⁶⁻⁴⁸ are available.

Conclusion

As the grades of Nutrition and Dietetics students increase, their sugary beverage consumption decreases. The eating habits of students usually shift positively. It should be evaluated to reduce the consumption of sugar and sugary foods and beverages in young people and develop recommendations for this, particularly regarding the prevention of chronic diseases in adults. In order to better understand these factors, it is important to plan and practice dietary habits, particularly in children and young adults, with regard to the consumption of soft drinks. Nutritional education, which is widely and efficiently provided, is essential to public health.

Abbreviations

SPSS: Statistical Package for the Social Sciences; TBSA: Türkiye Beslenme ve Sağlık Araştırması/Turkey Nutrition and Health Research US: United States; WHO: World Health Organization.

Ethics Approval and Consent to Participate

The study was approved by the Ethics Committee of Ankara University (Approval ID: 06-258-16).

Competing Interest

The author declares that there are no significant competing financial, professional, or personal interests that might have affected the performance or presentation of the work described in this manuscript.

Availability of Data and Materials

The data are not publicly available as it contains information that could compromise the privacy of research participants.

Authors' Contribution

ÇSM, NYA, and HÖY were involved in the design and conceptualization of the study, ÇSM and HÖY in data collection, ÇSM, NYA, and HÖY in data analysis, discussing the final results and contributing to the final manuscript.

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