CONSUMPTION OF PROCESSED FOOD AND ITS IMPACT ON DIET QUALITY IN CROATIAN SCHOOL-AGED CHILDREN

Ana Ilić[1], Martina Bituh[1], Ivana Rumbak[1], Lucija Marić[1], Tea Karlović[1], Ružica Brečić[2], Irena Colić Barić[1]

[1] Faculty of Food Technology and Biotechnology, University of Zagreb, Pierottijeva 6, 10 000 Zagreb, Croatia
[2] Faculty of Economics and Business, University of Zagreb, Trg J.F. Kennedy 6, 10 000 Zagreb, Croatia

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INTRODUCTION

In countries around the world, a dietary shift is observed in which the consumption of highly processed foods with high content of added sugar, sodium and fat increases over unprocessed or minimally processed foods.[1,2] Such inadequate dietary behaviour in childhood can increase the risk of developing obesity and other non-communicable diseases.[3]

OBJECTIVES

The objectives of this study were to observe the consumption of processed foods in the overall diet of school-aged children and to estimate differences in dietary intake between two dietary fractions.

SUBJECTS AND METHODS

Dietary intake was observed from dietary records for three non-consecutive days of 168 children (50.6% boys) aged 8.3 ± 0.5 years (Zagreb City). All foods and beverages were classified into four groups according to the NOVA Food Classification system based on the type, extent and purpose of industrial food processing.[4] The contribution of each NOVA food group to total energy was calculated and the mean nutrient intake of two dietary fractions (<50% and ≥50% of total energy intake from ultra-processed foods) was compared. Anthropometric measurements were performed according to standard protocols, while z-scores were obtained using AnthroPlus software.[5]

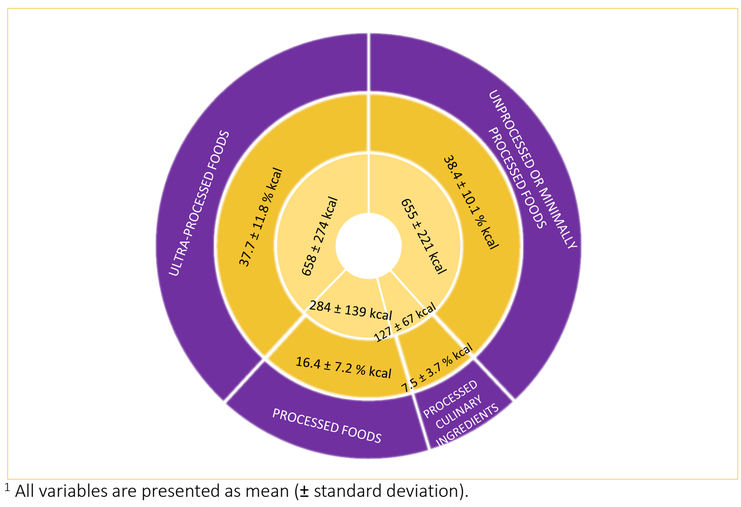
RESULTS

Basic descriptive characteristics of children in sample are presented in Table 1. Results show (Figure 1) that "unprocessed or minimally processed foods" had the highest proportion of dietary intake (38.4% of energy intake), followed by "ultra-processed foods" (37.7%), "processed foods" (16.4%), and "processed culinary ingredients" (7.5%). There was no difference in all four processed food categories intake by gender or BMI (Figure 2 and 3). Children who had ≥50% of their energy intake from "ultra-processed foods" had lower intake of monounsaturated fatty acids (p=0.003), polyunsaturated fatty acids (p=0.004), vitamins and minerals compared with children with <50% (Table 2).

Table 1. Basic characteristics of students in sample[1]

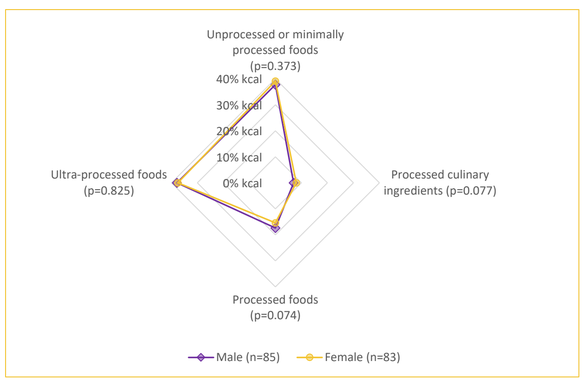
Characteristic	Total of 168 students
Age (yr.)	8.3 ± 0.5
Sex	
Male (%)	50.6
Female (%)	49.4
Body height (cm)	134.9 ± 5.6
z-score body height-for-age	0.84 ± 0.95
Body weight (kg)	30.6 ± 6.0
z-score body weight-for-age	0.68 ± 1.05
Body mass index (kgm^{-2})	16.7 ± 2.5
z-score body mass index-for-age	0.26 ± 1.14
Body mass index categories according to z-score body mass index-for-age	
< - 1 (%)	12.8
- 1 – 1 (%)	65.4
> 1 (%)	21.8

[1] All continuous variables are presented as mean (± standard deviation) and categorical as percentages.



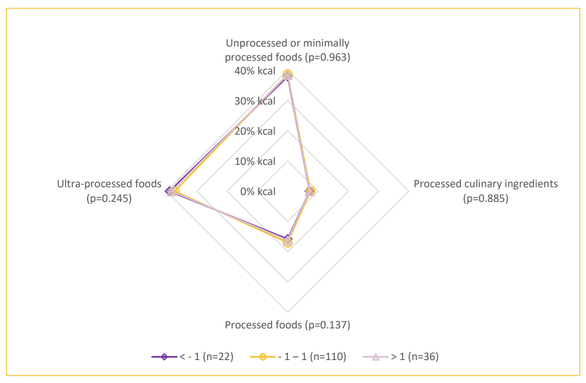
[1] All variables are presented as mean (± standard deviation).

Figure 1. Average absolute and relative daily energy intake according to NOVA food processing groups and subgroups in total sample (n=168)[1]



Differences were tested using an independent Student's T-test (p<0.05)

Figure 2. Differences in relative energy intake according to NOVA food processing groups between sex



Differences were tested using analysis of variance (p<0.05)

Figure 3. Differences in relative energy intake according to NOVA food processing groups between body mass index categoriess

Table 2. Difference in average daily energy and nutrient intake between students whose intake were < 50% and ≥ 50% of total energy intake from "ultra-processed foods" in sample[1]

Dietary parameters	Overall	Non-ultra processed dietary fraction (n=147)	Ultra processed dietary fraction (n=21)	p value*
Energy (kcal)	1706 (1428 – 1920)	1681 (1414 – 1905)	1848 (1526 – 1978)	0.233
Proteins (g)	66.2 (57.1 – 78.0)	67.3 (57.4 – 79.4)	59.5 (56.6 – 67.3)	0.067
Plant protein (g)	22.4 (18.2 – 27.2)	22.5 (18.4 – 27.3)	22.0 (16.5 – 26.4)	0.411
Animal protein (g)	43.1 (36.1 – 52.7)	43.5 (36.9 – 53.1)	37.0 (29.3 – 47.1)	0.055
Carbohydrates (g)	210.0 (172.3 – 246.5)	208.4 (169.1 – 244.4)	235.4 (185.7 – 251.9)	0.282
Monosaccharides (g)	66.8 (49.9 – 85.9)	65.5 (49.0 – 84.9)	71.8 (60.7 – 94.0)	0.147
Polysaccharides (g)	82.9 (64.1 – 106.4)	85.4 (67.7 – 107.5)	55.8 (43.3 – 76.7)	< 0.001
Dietary fibre (g)	15.2 (12.0 – 17.8)	15.5 (12.2 – 18.1)	13.1 (11.6 – 17.1)	0.151
Fat (g)	68.7 (56.3 – 81.2)	66.7 (55.4 – 81.2)	77.7 (67.6 – 80.2)	0.101
Saturated fatty acids (g)	28.1 (22.3 – 33.6)	27.7 (22.0 – 32.9)	30.3 (26.6 – 34.9)	0.056
Monounsaturated fatty acids (g)	16.8 (13.5 – 21.9)	17.4 (14.1 – 22.5)	13.7 (11.0 – 16.4)	0.003
Polyunsaturated fatty acids (g)	11.5 (9.0 – 15.0)	11.8 (9.5 – 15.6)	9.8 (7.4 – 11.0)	0.004
Sodium (mg)	3123.59 (2596.58 – 3823.16)	3142.10 (2603.82 – 3914.23)	3076.03 (2563.14 – 3644.66)	0.459
Potassium (mg)	2067.30 (1603.11 – 2474.98)	2138.31 (1658.52 – 2507.36)	1498.09 (1126.26 – 1868.11)	< 0.001
Calcium (mg)	647.73 (526.52 – 781.28)	662.97 (547.01 – 795.99)	527.63 (355.63 – 734.77)	0.039
Magnesium (mg)	119.84 (97.47 – 147.38)	119.97 (100.13 – 147.64)	94.36 (79.59 – 140.52)	0.138
Phosphorous (mg)	905.99 (744.18 – 1087.91)	944.46 (763.45 – 1114.40)	632.40 (578.07 – 834.74)	< 0.001
Iron (mg)	7.34 (5.92 – 9.12)	7.60 (6.10 – 9.60)	5.82 (5.18 – 6.92)	0.004
Zinc (mg)	2.80 (2.15 – 3.41)	2.85 (2.22 – 3.44)	2.16 (1.67 – 3.13)	0.024
Copper (mg)	2.15 (1.25 – 3.28)	2.14 (1.33 – 3.24)	2.22 (1.16 – 3.27)	0.775
Vitamin A (µg RE)	538.93 (353.19 – 721.49)	552.61 (365.10 – 726.74)	374.86 (204.36 – 577.36)	0.013
Thiamine (mg)	0.77 (0.59 – 1.02)	0.78 (0.63 – 1.02)	0.59 (0.50 – 0.79)	0.020
Riboflavin (mg)	1.08 (0.85 – 1.33)	1.09 (0.88 – 1.32)	0.92 (0.77 – 1.33)	0.418
Niacin (mg)	12.01 (9.31 – 14.29)	12.22 (10.12 – 14.33)	7.74 (6.36 – 11.37)	0.002
Pyridoxine (mg)	1.07 (0.78 – 1.34)	1.08 (0.83 – 1.34)	0.61 (0.49 – 1.13)	0.022
Vitamin C (mg)	75.64 (45.02 – 104.35)	77.45 (47.74 – 106.25)	52.78 (37.35 – 82.70)	0.130

[1] All variables are presented as mean (± standard deviation).
* differences between two dietary fraction were tested using Mann-Whitney U test (p<0.05)

CONCLUSIONS

This study shows that nearly one-third of the energy intake of school-aged children comes from the "ultra-processed foods" group. The study also showed that high energy intake from the "ultra-processed foods" group can contribute to poor overall nutrition which could affect children's growth and development. Further research is needed on the factors that contribute to the consumption of ultra-processed foods in order to reduce the intake of these foods.

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