

Research Report

Nutrition in the comprehensive approach of Health Promoting Schools: Survey on attitudes, knowledge and experiences in a sample of European teachers

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Abstract.

BACKGROUND: A healthy diet is a major factor in childhood for proper mental and physical development, and schools are valuable settings for promoting nutritional health. Teachers have a key role as educators and as a link between children, families, and institutions.

OBJECTIVES: The study aims at describing the teachers' profile and to evaluate the level of adherence of their schools to the recommendations by Health Promoting Schools concerning nutritional issues.

METHODS: A cross-sectional study was conducted on a sample of 131 Spanish and Italian teachers from kindergartens and primary schools.

RESULTS: The lack of a structured approach to school food emerged, as well as a low quality level of food consumption at school. Among the positive aspects, there is the compliance with the dietary reference values for the intake of nutrients and energy of meals supplied by cafeterias and the collaboration with nutritionists in health services, but other desirable circumstances are neglected (e.g. training courses for staff, the involvement of students, supply of water and vegetables such as healthy drinks and snacks).

CONCLUSION: The study confirmed the need to train teachers and to strengthen school action plans, particularly the agenda around the sustainability of the school food and nutrition environment.

Keywords: Nutrition, Health Promoting School, teachers, dietary habits, role modelling, recommendation adherence

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26 1. Introduction

27 A balanced diet is a major determinant of health from an early age and it is preeminent for proper mental
28 and physical child development [1]. In addition to avoiding malnutrition and growth retardation, healthy eating
29 practices acquired during childhood help prevent the development of overweight, obesity, dyslipidemia and
30 hypertension, which are major drivers of chronic degenerative diseases in adulthood, such as cardiovascular
31 diseases, cancers and type 2 diabetes [2, 3]. Therefore, early eating habits might have either positive or negative
32 implications for health, not only in childhood but also later in life, as protective/risk determinants of disease, with
33 a significant impact on the epidemiology and public health expenditure [4]. In the context of the Global Burden
34 of Disease Study (GBD), in 2017, a burden of 11 million deaths (22% of all deaths) and 255 million DALYs
35 (15% of all DALYs) were estimated as the impact on NCDs mortality and morbidity attributable to diet and
36 nutrition, in 195 countries over the world. The leading dietary risk factors have been recognized in a suboptimal
37 healthy food consumption (low intake of whole grains and fruits) and an exceeding daily intake of unhealthy
38 foods and nutrients (high sodium intake and high consumption of sugar-sweetened beverages and processed
39 meat) [5]. Therefore, it is necessary that early childhood nutrition policies and interventions are implemented
40 [4], and schools are fundamental settings to promote nutritional health programs [6, 7]. Public health concerns,
41 particularly those related to the increased prevalence of overweight, obesity, and diabetes, call for schools to
42 become proactive in the promotion of healthy and physically active lifestyles [8]. Furthermore, the nutritional
43 status of school children affects their academic performance [9–11], and early childhood nutrition outcomes
44 persist over time, so such successful early childhood nutrition interventions can lead to improved education
45 attainments for adolescents [12].

46 Therefore, the school setting is ideal for preventive activities because the continual contact by teachers,
47 administrators, and staff maintained with students provides the opportunity to support healthy food choices [13].

48 In particular, teachers appear to have a key role as they are an important link between children, families and
49 institutions. Indeed, as significant adults, teachers can influence their students through role modelling on healthy
50 behavior. Therefore, teachers may be change agents in the improvement of the nutrition patterns of their students
51 [13].

52 This work aims to explore knowledge, attitudes and experiences of both Italian and Spanish kindergarten and
53 primary school teachers and the level of adherence of their schools to the global recommendations regarding the
54 different aspects of the Health Promoting School initiative in the area of diet and nutrition.

55 2. Methods

56 2.1. Study design and data collection

57 Between May–June 2018, a cross-sectional survey was conducted on a non-probabilistic sample of Spanish and
58 Italian primary school and kindergarten teachers from Madrid Capital area (Spain) and Abruzzo Region (Italy).
59 The recruitment of participants was carried out through a letter of invitation to the school administrators, following
60 an official visit to the educational institutions, posting on appropriate social networks and by personal contacts.
61 Data collection was based on online, anonymous self-report questionnaires. Informed consent to participation
62 and data treatment was obtained electronically.

63 2.2. The questionnaire

64 On the basis of institutional documents and research literature, an original questionnaire was developed and
65 cross-culturally adapted into Spanish and Italian to determine the knowledge, attitudes and experiences of teachers
66 on nutrition topics and their rating of the school adherence to the recommendations of the Health Promoting

Schools initiative. Overall, the questionnaire consists of 94 questions divided into the following 5 sections: 1) *Teacher's general data and health status* (Questions #1 – #17), socio-demographic characteristics, school location, teaching career, self-reported anthropometric measures, dietary regimen and physical activity levels; 2) *School policies* (Questions #18 – #26), presence of written Policies and a structured School Working Group on health and nutrition; Partnerships with external subjects; Other initiatives (e.g. school gardens, food marketing, food waste); 3) *Food and beverage consumption at school* (Questions #27 – #61), student's eating habits in the school setting (e.g. canteen, vending machines, cafeteria, active supply of water and fruit and vegetables, other circumstances) and the teachers' role modelling regarding eating behaviour; 4) *Health literacy* (Questions #62 – #75), strengthening of pupils' skills regarding healthy nutrition (e.g. curricular health education, cooking workshops, offering healthy alternatives, teaching activities about local food traditions, homework tasks, surveys on anthropometric data and eating habits); 5) *Teachers' knowledge and opinions*, (Questions #76 – #94), real experiences, attitudes variables and scientific information. The questionnaire included multiple-choice closed-ended questions, open-ended questions with short responses, and Likert-type scales (see following Statistical analysis section for data management) for the psychometric assessment of the attitudinal variables. Self-report questionnaires were filled-in anonymously by using an online data collection tool (Google Forms) which allowed access without requiring the participant's authentication via an account; furthermore, personal data such as name and surname are omitted. Twenty minutes was the estimated time taken to complete the questionnaire.

2.3. Statistical analysis

Psychometric variables were subjected to a scoring system by means of raw scores and linear transformations to obtain homogeneous scale values (from 0 to 10) to facilitate the comparison of the different dimensions and constructs assessed by the questionnaire. For descriptive statistical analysis, central tendency (mean) and variability (standard deviation) measures were calculated in addition to the frequencies in the case of categorical variables. Tests were used to evaluate the association between categorical variables (Chi-square test with Fisher's correction, tests on the equality of proportions) and to measure quantitative / ordinal variables (Student's test and Wilcoxon – Mann- Witney rank-sum test).

Software STATA IC/15.1 was used for statistical analysis.

3. Results

3.1. Participants

The sample consisted of 51 Spanish and 80 Italian teachers (131 in total). The Spanish sub-sample was younger than the Italian sub-sample (42.5 ± 7.9 yr. vs 49.2 ± 8.8 yr. respectively $p < 0.001$), with a higher proportion of males (15.7% vs 6.3% respectively, n.s.) and a lower proportion of non-graduates (2.0% vs 52.5% respectively, $p < 0.001$). Two-thirds of the participants were from primary schools (68.7% in total), with a homogeneous distribution between the two subsamples (Table 1).

Overall, 80% of the sample had followed at least one training/professional development course in health education, with a significant difference between the two sub-samples: in fact, the proportion of participants who had followed training courses in food, nutrition, and physical activity was significantly higher among the Spanish teachers than the Italian teachers (87.5% vs 35.0%, $p < 0.001$ and 34.4% vs 12.5% respectively, $p < 0.01$). Only 6.3% of the total sample had attended training courses in health promotion principles and methodology.

3.2. School policies

Overall, 38.2% of the teachers ($n = 50$) reported that their schools adopted specific written policies on food and nutrition. In kindergarten, this proportion resulted to be equal to 41.2% and 45.8% in the Spanish and Italian

Table 1
Demographic, education and occupational characteristics of participants

	Spain (51)	Italy (80)	Total (131)
Females	43 (84,3%)	75 (93,8)	118 (90,1%)
Males	8 (15,7%)	5 (6,3%)	13 (9,9%)
Age (years)			
means \pm st.dev	42,5 \pm 7,9	49,2 \pm 8,8	
range	29,1–60,7	33,1–74,7	
Education			
High School	1 (2,0%)	42 (52,5%)	43 (32,8%)
Graduated	38 (74,5%)	28 (35,0%)	66 (50,4%)
Post-graduated	12 (23,5%)	10 (12,5%)	22 (16,8%)
Teaching cycle			
Kindergarten	17 (33,3%)	24 (30,0%)	41 (31,3%)
Primary school	34 (66,7%)	56 (70,0%)	90 (68,7%)

Table 2

Dimensions relating to 'School Policies on Food and Nutrition': teachers' rating stratified by country and school stage (average values and standard deviations of raw and transformed scores)

Items	Kindergarten				Primary School			
	Spain (16)		Italy (24)		Spain (34)		Italy (56)	
	average	st.dev	average	st.dev	average	st.dev	average	st.dev
Written Polices on food and nutrition (-1 to +1)	0.19	0.98	0.21	0.83	0.35	0.92	-0.34	0.77
School working group on food and nutrition (-1 to +1)	-0.63	0.81	-0.25	0.90	0.00	0.97	-0.64	0.67
Training courses for school staff on nutrition and food safety (-1 to +2)	-0.31	1.08	0.00	1.06	-0.19	1.01	0.02	1.15
Partnership with families and communities on food and nutrition (-1 to +3)	0.80	0.86	0.54	1.06	1.03	1.05	0.50	1.06
Partnership with local producers on food and nutrition (-1 to +2)	-0.25	1.18	-0.08	1.14	-0.32	0.91	0.02	1.10
School gardening (-1 to +1)	0.75	0.68	-0.33	0.92	0.24	0.99	-0.14	0.96
Unhealthy food marketing control strategies (-1 to +1)	0.13	0.96	-0.46	0.78	0.27	0.91	-0.49	0.74
Activities on food waste (-1 to +1)	-0.38	0.96	-0.08	0.93	0.03	0.90	0.09	0.93
TOTAL – School POLICIES								
Raw Score (-8 to +12)	-0.63	3.79	-0.46	4.94	1.17	4.57	-0.95	4.37
Transformed score (0 to +10)	3.69	1.90	3.77	2.47	4.59*	2.28	3.53*	2.19

* $p < 0.05$ statistically significant difference in the Wilcoxon test of the rank sum (Mann – Withney).

108 samples respectively (no statistically significant difference \hat{u} , n.s.) while, in primary school, the proportion was
 109 equal to 64.7% and 17.9% respectively, resulting in a higher adherence level in the Spanish schools vs Italian
 110 schools ($p < 0.001$). The presence of a working group on nutrition was reported by 24.4% of the overall sample
 111 ($n = 32$), with more homogeneous proportions between the two countries in kindergartens (23.5% among the
 112 Spanish teachers and 29.2% among the Italian teachers, n.s.) compared to primary school (45.5% and 10.7%
 113 respectively, $p < 0.001$).

114 Eight items were submitted to assess the School Policies construct (Table 2). Negative ratings resulted more
 115 frequent among kindergarten teachers (five dimensions out of eight, even if differently distributed in the two

Table 3

Dimensions relating to 'Food consumption at school': teachers' rating stratified by country and school stage (average values and standard deviations of raw and transformed scores)

Items (score 0 to 10)	Kindergarten				Primary School			
	Spain (16)		Italy (24)		Spain (34)		Italy (56)	
	average	st.dev	average	st.dev	average	st.dev	average	st.dev
Guaranteed standards in the management of the cafeteria service (a)	2.06	1.72	1.81	1.38	3.04	1.62	1.71	1.14
Characteristics of the environment where the cafeteria service takes place (a)	5.78*	2.40	3.96*	2.73	5.39*	2.00	4.01*	2.26
Vending machines (b)	–	–	2.68	1.12	–	–	2.92	1.41
Availability of free water, fruit and vegetables	3.65	3.41	2.67	3.47	4.76***	2.74	2.43***	2.18
Cafeteria (c)	7.78	2.55	3.75	2.10	4.29	3.31	3.33	1.36
Other circumstances related to food intake at school	5.42	1.75	5.37	1.59	6.05	1.73	5.71	1.58

(a) referring to a subset of 112 records; (b) referring to a sub-group of 37 records only in the Italian subsample; (c) referring to a subset of 18 records. * $p < 0.05$, *** $p < 0.001$ statistically significant difference on the Wilcoxon test of the rank sum (Mann – Withney).

116 countries): the worst score in the Spanish sample regarded the presence of a 'School working group on food and
 117 nutrition' (-0.63 ± 0.81), while in the Italian sample the worst score was related to the 'Control strategies on
 118 marketing of unhealthy food' (-0.46 ± 0.78). In primary schools, the rating of the Spanish respondents resulted to
 119 be more positive than among the Italian respondents: only two dimensions reported a negative score in the Spanish
 120 group, the worst being 'Partnership with local producers' (-0.32 ± 0.91), while the lowest score in the Italian
 121 group was the presence of a 'School working group on food and nutrition' (-0.64 ± 0.67). In both the Italian
 122 and Spanish subsamples, the highest score was reported for the 'Partnerships with families and communities on
 123 food and nutrition issues' both in the kindergarten (0.80 ± 0.86 among the Spanish and 0.54 ± 1.06 among the
 124 Italian) and primary school teachers (1.03 ± 1.05 and 0.50 ± 1.06 , respectively). The overall score referred to
 125 the 'School Policies' in kindergarten (transformed values, range 0 to 10) was worse among the Spanish teachers
 126 than the Italian teachers (3.69 ± 1.90 vs 3.77 ± 2.47 , n.s. to the Wilcoxon rank-sum test), while in the primary
 127 school it was significantly better in the Spanish subsample (4.59 ± 2.28 vs 3.53 ± 2.19 , $p < 0.001$).

128 3.3. Consumption of food at school

129 The school food service was provided in all the schools where the Spanish teachers worked (kindergartens and
 130 primary schools), whereas the Italian teachers reported the provision of school lunches in 76.3% of the schools,
 131 specifically in all the kindergarten schools and in two thirds of primary schools (66.1%, 61 teachers out of 80).

132 Thirty-seven teachers (28.2%) of the overall sample reported that their schools also served breakfast. However,
 133 the provision of the school breakfast was significantly more frequent in Spain than in Italy, and in kindergartens
 134 vs. primary schools: in particular, it was accounted for by 58.8% of the Spanish kindergarten teachers vs. 20.8%
 135 of the Italian teachers ($p < 0.05$); in primary schools, it accounted for 47.1% of the Spanish teachers vs. 10.7%
 136 of the Italian teachers ($p < 0.001$).

137 Six items were submitted to assess the overall health promotion programs regarding 'Food consumption at
 138 school' (Table 3). Overall, low scores were observed, in particular among the Italian respondents whose average
 139 ratings resulted to be always worse than the Spanish respondents, and below the central value of the 0 to 10 scale
 140 (i.e. 5.00) except in one item. In both kindergartens and primary schools, the dimensions with the highest scores
 141 were: 'Characteristics of the environment where the school cafeteria service is held' (5.78 ± 2.40 among the
 142 Spanish and 3.96 ± 2.73 among the Italian teachers in kindergarten, $p < 0.05$; and 5.39 ± 2.00 and 4.01 ± 2.26

143 in primary school cycle respectively, $p < 0.05$); ‘Other circumstances referring to the intake of food at school’
144 (5.42 ± 1.75 among the Spanish and 5.37 ± 1.58 among the Italian teachers in kindergarten, n.s.; 6.05 ± 1.73
145 and 5.71 ± 1.58 in primary school respectively, n.s.).

146 With regard to the other dimensions, the scores resulted to be lower than the central threshold value:
147 ‘Guaranteed standards in the management of the school cafeteria service’ (2.06 ± 1.72 among the Spanish
148 educators and 1.81 ± 1.38 among the Italian teachers in kindergarten, n.s.; 3.04 ± 1.62 and 1.71 ± 1.14 in
149 primary school, $p < 0.001$); ‘Vending machines’ (assessed only in the kindergarten sub-sample of the Italian teachers
150 2.68 ± 1.12 and 2.92 ± 1.41 in primary school); ‘Availability of free water, fruit and vegetables’ (3.65 ± 3.41
151 among the Spanish teachers and 2.67 ± 3.47 among the Italian teachers in kindergarten, n.s.; 4.76 ± 2.74 and
152 $+2.43 \pm 2.18$ respectively, in the primary school, $p < 0.001$); ‘Cafeteria’ (7.78 ± 2.25 among the Spanish teachers
153 and 3.75 ± 2.10 among the Italian teachers in kindergarten; 4.29 ± 3.31 and 3.33 ± 1.36 respectively, in primary
154 school, n.s.).

155 The overall *School Policies on Food and Nutrition* score (transformed) resulted to be always below the central
156 value of the 0 to 10 interval scale (i.e. 5.00), lower for the kindergarten Spanish teachers vs the Italian educators
157 (3.69 vs 3.77 respectively, n.s.), while it was higher in primary school (4.59 vs 3.53 respectively, $p < 0.05$.) as
158 Table 2 shows.

159 3.4. Role modelling

160 The questionnaire examined the teachers’ capacity to model positive eating behavior among their students, by
161 assessing the food and beverages consumed by the educators in the classroom.

162 Almost two thirds of the teachers (63.4%) reported consuming drinks or food at school ‘regularly’ and 26.0%
163 ‘occasionally’, while 9.2% reported ‘never’ or ‘hardly ever’, eating food at school with significant differences
164 between the two countries: ‘regular’ consumption among the Spanish teachers was more frequent than among
165 the Italian educators (80.4% vs 52.5% respectively, $p < 0.01$ in the proportions’ difference test), and ‘occasional’
166 consumption was less frequent (9.8% vs 36.3% respectively, $p < 0.001$). The most frequently reported item
167 was ‘water’ (accounting for 86.3% of the Spanish teachers vs 73.8% of the Italian teachers, n.s.), followed by
168 ‘fresh fruit/vegetables’ (80.4% vs 25.0% respectively, $p < 0.001$), ‘meal at the school cafeteria service’ (60.8% vs
169 35.0% respectively, $p < 0.01$) and ‘hot drinks’ (58.8% vs 70.0% respectively, n.s.). ‘Salty snacks’ were the least
170 frequently consumed food (by none of the Spanish vs 6.3% of the Italian teachers, n.s.). Moreover, with regard
171 to the reported time during which the teachers consume food during the school day, the two samples appeared
172 significantly different. Spanish teachers consumed meals mainly at lunchtime (68.6% vs 30.0% of the Italian
173 subsample, $p < 0.001$) and less frequently during school break time (54.9% vs 76.3% respectively, $p < 0.05$); the
174 proportion of teachers who consumed food or drinks before or after school hours was homogeneous, equal to
175 10.0%.

176 The two major ways of supplying food/drinks consumed at school were the ‘school cafeteria service’ (indicated
177 by 66.7% of Spanish educators vs 35.0% of the Italian teachers, $p < 0.01$) and the ‘lunch brought from home’
178 (47.1% vs 58.8% respectively, n.s.). One quarter of the teachers (both Italian and Spanish) reported consuming
179 food regularly together with schoolchildren and as many reported eating ‘sometimes’ together with pupils.

180 3.5. Health literacy

181 Fourteen items in the questionnaire asked teachers about activities specifically targeted to improve health
182 literacy around nutrition and diet (Table 4). Different approaches that may have been adopted were explored, such
183 as educational (curricular, laboratory, multimedia) and practical (e.g., surveys on nutritional status, experiences
during the meal – cafeteria).

Table 4

Dimensions relating to 'Health literacy': teachers' rating stratified by country and school stage (average values and standard deviations of raw and transformed scores)

Items	Kindergarten				Primary School			
	Spain (17)		Italy (24)		Spain (34)		Italy (37)	
	Average	Std. Dev	Average	Std. Dev	Average	Std. Dev	Average	Std. Dev
Educational activities to make healthy choices	-0.35	0.93	0.00	0.93	0.32*	0.91	0.54*	0.81
Cooking workshops at school with teachers and cafeteria staff	-1.00	0.00	-0.88	0.34	-0.94	0.24	-0.98	0.13
Attractive alternatives	-0.24	0.83	-0.46	0.66	-0.29	0.80	-0.41	0.73
Information materials in the places where you eat	-0.65	0.61	-0.54	0.78	0.00***	0.89	-0.73***	0.52
Food education in the school curriculum	0.47	0.8	0.42	0.72	0.47	0.83	0.38	0.86
Educational activities on local traditions	0.47	0.87	0.33	0.82	0.65	0.69	0.55	0.71
Homework on the topic of nutrition	0.12**	0.99	-0.38**	0.82	0.41*	0.86	0.04*	0.87
Surveys on eating habits	-0.47	0.87	-0.13	0.90	-0.12*	0.88	0.14*	0.88
Anthropometric surveys	-0.47	0.87	-0.50	0.78	-0.15*	0.86	0.13*	0.92
Artistic activities on the theme of nutrition	-0.18	0.95	-0.08	0.93	-0.24*	0.89	0.04*	0.85
Information materials on the website	-0.59	0.80	-0.38	0.71	-0.47	0.83	-0.55	0.69
Nutritional counselling at school	-0.82	0.53	-0.63	0.65	-0.76	0.5	-0.86	0.35
Actions to combat food marketing	-0.53	0.80	-0.54	0.72	-0.21*	0.91	0.05*	0.90
School meal as an opportunity for health education	-0.12	0.93	-0.08	0.88	0.06**	0.92	-0.43**	0.78
TOTAL – Health Literacy								
Raw Score (-14 to +14)	-4.35	6.44	-3.83	4.82	-1.26	5.06	-2.11	5.12
Transformed score (0 to +10)	3.45	2.30	3.63	1.72	4.55	1.81	4.25	1.82

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ statistically significant difference in the Wilcoxon test of the rank sum (Mann – Withney).

In both kindergartens and primary schools, the items with the highest scores were:

- 'Food education in the school curriculum' (+0.47 among the Spanish teachers vs +0.42 among the Italian educators in kindergarten, n.s.; and +0.47 vs 0.38 respectively in primary school, n.s.);
- 'Educational activities on local traditions' (+0.47 among the Spanish teachers vs +0.33 among the Italian teachers in kindergarten, n.s.; and +0.65 vs +0.55 respectively in primary school, n.s.);
- 'Homework on the topic of nutrition' (+0.12 among the Spanish teachers vs -0.38 among the Italian educators in kindergarten, $p < 0.01$; and +0.41 vs +0.04 respectively in primary school, $p < 0.05$);
- 'Educational activities to make healthy choices' only in the primary school (+0.32 among the Spanish teachers vs +0.54 among the Italian teachers, $p < 0.05$).

The items with the lowest scores were:

- 'Cooking workshops at school with teachers and cafeteria staff' (-1.00 among the Spanish teachers vs -0.88 among the Italian group in kindergartens, n.s.; and, -0.94 vs -0.98 respectively in primary school, n.s.);
- 'Nutritional counselling at school' (-0.82 among the Spanish teachers vs -0.63 among the Italian educators in kindergarten, n.s.; and equal to -0.76 and -0.86 respectively in primary school, n.s.);
- 'Information materials in the places where you eat' (-0.65 among the Spanish teachers vs -0.54 among the Italian teachers in kindergarten, n.s.; and 0.00 vs -0.73 respectively in primary school, $p < 0.001$).

The remaining items for Health Literacy assessment ('Attractive alternatives', 'Surveys on eating habits', 'Anthropometric surveys', 'Nutrition Arts and Crafts', 'Information materials on the Internet', 'Actions to fight

Table 5

Dimensions relating to 'Knowledge of teachers on food and nutrition': teachers' rating stratified by country and school stage (average values and standard deviations of 0 to 10 transformed scores)

Items	Kindergarten				Primary School			
	Spain (17)		Italy (24)		Spain (34)		Italy (56)	
	Average	Std. Dev	Average	Std. Dev	Average	Std. Dev	Average	Std. Dev
Proper identification of nutrients and foods	6.27*	2.59	4.44*	2.33	6.74**	2.77	4.82**	2.34
Nutritional role of different macro and micronutrients	7.24	1.39	6.54	1.18	7.1	1.27	7.17	1.13
Daily dietary recommendations for childhood	8.14	1.25	7.76	1.47	8.08	1.41	7.74	1.79
Food groups characteristics	7.57	0.83	7.08	1.49	7.47	1.23	7.43	0.93
Malnutrition and associated risks for chronic diseases	5.38*	0.71	4.86*	0.89	5.22	0.93	4.99	0.99

* $p < 0.05$, ** $p < 0.001$ Wilcoxon rank sum test (Mann – Withney).

junk food marketing', 'School meal as an opportunity for health education') were rated negatively by the kindergarten teachers of both countries. Conversely, the same items received different ratings (positive or negative) among primary school teachers, with significant differences between the Spanish and Italian sample (Table 4).

The total Health Literacy score (transformed) was always below the central value of the interval scale (<5.00), lower for the kindergarten Spanish teachers vs the Italian group (3.45 vs 3.63 respectively, n.s.), while it was higher among primary school teachers (4.55 vs 4.25 respectively, n.s.) as Table 4 shows.

3.6. Teacher's opinion and knowledge

Teachers' training experiences, attitudes and scientific knowledge have been assessed to evaluate their capacity to be health educators and their key role in promoting healthy nutrition at school.

Only 9.2% of the total sample considered to follow training courses on food and nutrition 'Not so necessary' (5.9% of Spanish teachers and 11.3% of Italian teachers, n.s. in the proportions' difference test), 45.0% deemed it 'necessary' and 45.0% 'very necessary' (proportions were completely homogeneous with respect to the country of origin).

More than half of the overall sample believed was 'absolutely necessary' to promote food and nutrition education in the school setting (55.0% both among the Spanish and Italian teachers), and the remaining sample deemed it 'necessary'.

Less than 50% believed that there was an overweight / obesity problem among the students in the school where they worked (this proportion is lower among the Spanish teachers than the Italian sub-group: 25.5% vs 55.1 respectively, $p < 0.001$). Findings identified a gap in knowledge related to the prevalence levels of the children obesity/overweight condition: in fact, 52.9% of the Spanish teachers and 71.2% of the Italian teachers ($p < 0.05$) stated that this index was equal to 10% or 5%, which are prevalence values far lower than those found in national surveillance studies [14, 15].

More than a third of the total sample believed that the condition of overweight / obesity is associated with academic performance (precisely 40.0% of Spanish teachers and 35.1% of Italian teachers, n.s.).

The level of scientific knowledge of teachers on nutrition topics was assessed through ten questions (for a total of 70 items) assessing five dimensions: proper identification of nutrients and foods; nutritional role of different macro and micronutrients; food groups; daily dietary recommendations for childhood; malnutrition and associated risks for chronic diseases (Table 5).

Overall, the level of knowledge was above the central value of the 0 to 10 interval scale (i.e., 5.00), except four cases out of twenty (all referred to the Italian sub-group).

232 The dimensions that achieved the highest scores were (Table 5):

- 233 – ‘Daily dietary recommendations for childhood’ (+8.14 among the Spanish teachers vs +7.76 among the
234 Italian teachers in kindergarten; and, +8.08 vs +7.74 respectively in primary school, n.s.);
- 235 – ‘Food group characteristics’ (+7.57 among the Spanish teachers vs +7.08 among the Italian educators in
236 kindergarten, n.s.; and +7.47 vs +7.43 respectively in primary school, n.s.);
- 237 – ‘Nutritional role of different macro and micronutrients’ (+7.24 among the Spanish teachers vs +6.54 among
238 the Italian teachers in kindergarten; and +7.10 vs +7.17 respectively in primary school, n.s.)

239 The dimensions with lower scores were (Table 5):

- 240 – ‘Malnutrition and associated risks for chronic diseases’ (+5.38 among the kindergarten Spanish teachers
241 vs +4.86 among the Italian teachers, $p < 0.05$; and +5.22 vs +4.99 respectively in primary school, n.s.);
- 242 – ‘Proper identification of nutrients and foods’ (+6.27 among the Spanish teachers vs +4.44 among the Italian
243 respondents in kindergarten, $p < 0.05$; and +6.74 vs +4.82 respectively in primary school, $p < 0.01$)

244 In general, the level of knowledge of the Spanish teacher subgroup was higher vs the Italian subgroup, but this
245 difference was statistically significant only in two dimensions (‘Proper identification of nutrients and foods’ and
246 ‘Malnutrition and associated risks for chronic diseases’).

247 4. Discussion

248 According to the Comprehensive Approach of Health Promoting School initiative, good schools are part of a
249 complex system of interactive forces, individuals, institutions, and organizations linked together to forge and to
250 promote students’ social, emotional, physical, and intellectual development [16].

251 The final objective is to produce a learner who will be confident in their individual capacities and positively
252 disposed to discover and master ways to establish a life-long healthy lifestyle [17]. Early healthy eating habits
253 could lead to short-term metabolic improvements or longer-term health gains that might, in turn, contribute to
254 better cognitive outcomes and academic success [18].

255 However, consistent with the literature [19], the results of the study demonstrate that there are constraints in
256 achieving significant progress, including poorly trained class teachers; insufficient time dedicated to nutrition
257 education incorporated into the school curriculum; the complexity of health issues involving obesity, nutrition
258 and physical activity; and the absence of an adequate knowledge for designing programs that will influence
259 healthy lifestyles throughout life.

260 In fact, the first result that emerges is the lack of a structured approach to school food and to the implementation
261 of written nutrition policies (reported by less than 40% of the sample) and the creation of a school working group
262 (reported by less than 30%). The overall score allowed to detect a level of implementation of the aspect of school
263 policies about nutrition, which was lower than the central value, particularly for Italian primary schools.

264 Regarding the consumption of food at school, a low quality level emerges compared to the criteria of the
265 international guidelines [20]. Among the positive aspects of the cafeteria service are the compliance with the
266 dietary reference values for the intake of nutrients and energy (DRVs) and the collaboration with nutritionists in
267 health services. However, there are other desirable circumstances which are neglected and which could guarantee
268 higher standards: the variety in the food and drinks offered, training courses for staff, and the involvement of
269 students. [21, 22].

270 The performances regarding the environment and the conditions in which the cafeteria meal is delivered
271 resulted as the best. When present, vending machines sell food of poor nutritional value, both for the nature
272 of the food and drink proposals (almost exclusively unhealthy snacks and drinks) and for the conditions of use
273 (access time, agreements with suppliers). The same applies to the cafeterias inside the schools (present in few
274 schools).

275 The active supply of water and vegetables, such as healthy drinks and snacks, is poorly implemented and,
276 when provided, the teachers' ratings revealed a suboptimal level of their appeal to and regular consumption
277 by schoolchildren. The lowest reported score was for the dimensions related to the consumption of food at
278 school and the offer of healthy proposals, thus revealing an important limit of the schools. Therefore, the
279 involvement of teachers, students, parents, and other stakeholders in the school meal planning will facilitate the
280 education of participants on the nutritional content of menus. Moreover, this could allow a better assessment
281 of menu items offered [23]. In fact, evidence showed that school feeding experience has a significant impact
282 on children's behavior [24]. For this reason, standardized and sustainable projects have gained considerable
283 importance throughout the years, such as the one implemented in Italy on the initiative of the Ministry of Health
284 called 'Fruits and Vegetables in Schools' as part of an European Plan named 'EU school fruit, vegetables and
285 milk scheme' [25, 26].

286 Systematic reviews evaluated the effects of feeding, particularly breakfast, for improving the physical and
287 psychosocial health of students [27, 28]. The role of breakfast in well-nourished children and nutritionally
288 at-risk or stunted children was considered, since breakfast is widely promoted to improve cognitive function
289 and academic performance, leading to the provision of breakfast initiatives by public health bodies. The results
290 suggested that breakfast consumption has generally positive effects on cognitive performance in comparison with
291 breakfast omission. This effect appears to be pervasive in both acute studies and longer-term school breakfast
292 programmes. However, the apparent beneficial effects of school breakfast programmes could probably be due to
293 more regular school attendance rather than an improvement of the nutritional status [29]. Another review found
294 that school breakfast schedules have a direct positive effect on children's nutritional status, as well as on school
295 attendance and dropout rates [30].

296 A healthy eating behavior seems to emerge from the role modeling section, in particular regarding the quality
297 of the food and beverages that teachers consume at school, either from the cafeteria meals or from lunch boxes.

298 Personnel working with preschool-aged children play a vital role in shaping children's current and future health
299 [31]. School professionals at all levels must recognize that they play roles in forming the life-long nutritional
300 habits of children, and meals consumed in schools not only provide the nutritional needs of these young children
301 but also provide opportunities for these students to acquire a healthful eating behaviors in a supportive pleasant
302 environment [32].

303 These circumstances could promote activities aimed at strengthening health literacy of pupils through cooking
304 workshops at school with teachers and staff, or by engaging children in the discussion of nutrition information
305 material (e.g. food labels, leaflets) which, based on our findings, appears to be the most overlooked activity.

306 From the nutritional point of view, health literacy has been defined as "the degree to which individuals
307 have the capacity to obtain, process, and understand basic nutrition information needed to make appropriate
308 dietary decisions" [33]. Thus, health literacy may have direct relevance in the context of the school environment,
309 especially among staff who make daily decisions regarding the provision of food for young children [34].

310 Findings highlight a gap in the awareness of teachers on overweight and obesity, with respect both to the
311 spread of the phenomenon and to all possible consequences. For example, only a third of the sample was aware
312 of the negative effect on academic performance. Almost all teachers recognize the need for training on nutrition
313 issues. The level of knowledge regarding the role of nutrients, the characteristic constituents of the different food
314 groups and the recommended servings appears to be good. In contrast, knowledge in relation to the pathological
315 conditions attributable to the food factor is limited. School staff play a critical role in the implementation of
316 many school-based health promotion interventions. Several reviews mention the importance of adequate staff
317 training and many of the primary studies included teacher training conducted alongside other activities. Many
318 studies reported significant improvements as a result of the implementation strategy compared to usual practice.
319 Nevertheless, insufficient evidence is available to draw conclusions regarding their effectiveness at improving
320 staff knowledge, attitudes and skills [35].

321 The present study has several limitations, first of all the small sample size and the absence of randomization
322 in the teachers' enrolment, thus determining a selection bias: the teachers who chose to respond to the survey

323 are probably more sensitive to the problem and, therefore, could have better levels of preparation and with
324 previous experience of preventive interventions. Furthermore, the enrolled teachers, and their schools, belong
325 to very different settings, from an urban, demographic and socio-cultural point of view, which poses a serious
326 comparison problem between the results of the Spanish subgroup (exclusively metropolitan) compared to the
327 Italian subgroup (coming from small or medium-sized municipalities). Lastly, the collection of information, in
328 which the observation unit was the teacher whereas many of the observed dimensions refer to the educational
329 institution in its entirety. For this reason, there may be over-represented ratings, when more than one teacher
330 belongs to the same school.

331 5. Conclusions

332 In conclusion, the results suggest the necessity of a support team for the implementation, management and
333 evaluation of the Health Promoting School guidelines. Teacher training can lead to the sustainability of programs
334 and, therefore, to a healthier school environment [36]. Plans should be outlined providing specific enforcement
335 responsibilities. Enforcement of the policy should be evaluated on a regular basis [37, 38, 39]. If not addressed
336 in the policy itself, these plans, responsibilities, and evaluation strategies should be detailed in the procedures or
337 guidelines related to the policy [40].

338 In a future research perspective, a larger study, involving representative samples from a number of European
339 countries and with a well-designed randomized approach, should be carried out, in order to confirm our results
340 and to highlight regional differences, particularly in the Mediterranean area.

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