



Trabajo Original

Nutritional education knowledge of teachers and nutritionists in four European countries

Conocimientos sobre educación nutricional de profesores y nutricionistas de cuatro países europeos

Alejandro Domínguez-Rodríguez^{1,2}, Ausiàs Cebolla², Jessica Navarro², Rosa Baños^{2,3}

¹Health Sciences Area. Universidad Internacional de Valencia. Valencia, Spain. ²Department of Personality, Evaluation and Psychological Treatment. Universidad de Valencia. Valencia, Spain. ³CIBER Fisiopatología Obesidad y Nutrición (CIBEROBN). Instituto Carlos III. Madrid, Spain

Abstract

Objective: the aim of this study was to examine the perception of professionals from four European countries in charge of teaching Nutrition Education (NE) to children in primary schools or hospitals.

Methods: this was achieved through an exploratory study that initiated with two focus groups, one with 5 elementary school teachers and another with 14 nutritionists. From the results of it an online survey was designed and distributed internationally to elementary schools and professional clinics in Spain, Italy, Norway, and Austria. The participants were 75 elementary school teachers and 98 nutritionists. It was measured the level of knowledge of teachers and nutritionists to teach NE, and the level of nutritional knowledge of the children in their respective country. Descriptive statistics were conducted, one-factor ANOVAs to analyze the effect of nationality, and when a significant interaction was found, a post-hoc analysis using Bonferroni adjustment was applied.

Results: the results indicated that forty-one percent of the participants considered they have "adequate" theoretical knowledge to teach NE. Only 27 % considered they had "adequate" pedagogical training. A significant effect was found: $F(3,168) = 17.37, p < 0.001, \eta^2_p = 0.24$. Regarding the levels of NE knowledge of children, from lowest to highest, there were Spain, Italy, Austria, and Norway. Also, it was observed that professionals and children from Spain and Italy were more affected with less knowledge and training regarding NE.

Conclusions: these results could help governments and educational organizations of the affected countries to take decisions to tackle this problematic.

Keywords:

Nutrition education.
Survey. School teachers.
Nutritionists. Europe.

Received: 14/03/2022 • Accepted: 07/10/2022

Conflicts of interest: the authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Acknowledgments: MEAL ("Modifying eating attitudes and actions through learning") European Transversal Program LLP - PROGRAM KA3 (nº-LLP-1-2013-1-ES-KA3KA3MP). CIBERObn is an initiative of the ISCIII.

Domínguez-Rodríguez A, Cebolla A, Navarro J, Baños R. Nutritional education knowledge of teachers and nutritionists in four European countries. *Nutr Hosp* 2023;40(1):136-143

DOI: <http://dx.doi.org/10.20960/nh.03930>

Correspondence:

Alejandro Domínguez-Rodríguez. Health Sciences Area.
Valencian International University. Calle Pintor
Sorolla, 21. 46002 Valencia, Spain
e-mail: alejandrodominguez.r@campusviu.es

Resumen

Objetivo: el objetivo de este estudio fue examinar la percepción de los profesionales de cuatro países europeos encargados de enseñar educación nutricional (EN) a niños de escuelas primarias u hospitales.

Métodos: esto se logró a través de un estudio exploratorio que se inició con dos grupos focales, uno con 5 maestros de primaria y otro con 14 nutricionistas. A partir de los resultados del mismo se diseñó una encuesta en línea y se distribuyó internacionalmente a escuelas primarias y clínicas de profesionales en España, Italia, Noruega, y Austria. Los participantes fueron 75 maestros de primaria y 98 nutricionistas. Se midió el nivel de conocimientos de los maestros y nutricionistas para enseñar EN, y el nivel de conocimientos nutricionales de los niños de su respectivo país. Se hicieron análisis descriptivos, ANOVA de un factor para analizar el efecto de la nacionalidad, y cuando se encontró una interacción significativa se aplicó un análisis *post-hoc* mediante ajuste de Bonferroni.

Resultados: los resultados indicaron que el cuarenta y uno por ciento de los participantes consideró tener conocimientos teóricos “adecuados” para enseñar NE. Solo el 27 % consideró tener una formación pedagógica “adecuada”. Se encontró un efecto significativo: $F(3,168) = 17.37$, $p < 0,001$, $\eta^2_p = 0,24$. Con respecto a los niveles de conocimiento de NE de los niños en los distintos países, de menor a mayor se clasificaron España, Italia, Austria y Noruega. Asimismo, se observó que los profesionales y los niños de España e Italia se vieron más afectados con menos conocimiento y formación en EN.

Conclusiones: estos resultados podrían ayudar a los gobiernos y organizaciones educativas de los países afectados a tomar decisiones para abordar esta problemática.

Palabras clave:

Educación nutricional.
Encuesta. Profesores de escuela. Nutricionistas.
Europa.

INTRODUCTION

Childhood obesity is considered one of the most serious public health challenges (1). In 2016 the number of overweight children with an age below five was estimated to be 41 million (2). Nutrition Education (NE) plays an important role in combating this pandemic. NE has been defined as “any combination of educational strategies, accompanied by environmental supports, designed to facilitate voluntary adoption of food choices and other food and nutrition-related behaviors conducive to health and well-being; NE is delivered through multiple venues and involves activities at the individual, community, and policy levels” (p. 176-177) (3). NE has been identified as a key element to increase healthy eating habits, as is a higher intake of fruits and vegetables (4), lower consumption of high caloric food (5), prevention of overweight and obesity (6), and higher chances of developing a change towards healthier eating habits that will continue through adolescence and adult life (7).

The formal teaching of NE is usually implemented in elementary schools (8-9). Elementary school teachers oversee this task (10-11). Other space where children learn about NE is in nutritional clinics or hospitals (12). However, there is evidence that nutritionists and teachers do not have access to sufficient resources or training to perform this task. Katsagani et al. identified that teachers had a lack of knowledge about NE and more than 60 % did not know the components of the Mediterranean diet (13). A study conducted in Brazil with teaching technicians, elementary school teachers and dieticians concluded that dieticians had training on NE during college but the real knowledge on how to teach was acquired during their practice (14). Despite the relevance of NE, and the studies made in other countries to know the level of knowledge of NE on their elementary school teachers and nutritionists, the level of training and materials of teachers and nutritionists in Europe remains mainly unknown.

It has been observed a constant increase in the use of Information and Communication Technologies (ICT's) as a frequently mean to transfer NE to children. A recent systematic

review concluded that all studies supported by ICT's reported positive results suggesting that programs based in ICT's could be useful to provide NE and promote dietary changes perceiving these programs more attractive and enjoyable compared to traditional methods (15).

The aim of this study was to explore the experience implementing NE programs in a sample of nutritionists and elementary school teachers (professionals of NE) in four European countries: Spain, Italy, Austria, and Norway. In addition, this study was intended to know about materials, components, perceived effectiveness of NE programs. Furthermore, main barriers and perception on the use of the ICT's directed to implement a program, and lastly what is the level of nutritional knowledge perceived by these professionals in children of their respective country.

METHODS

PARTICIPANTS

A total of 75 elementary school teachers and 98 nutritionists participated in this survey. Of these, 67 participants responded in Spain, 17 in Italy, 45 in Norway and 44 in Austria. Most of the participants were female (75 %). The age of the participants was between 18 and 65 ($M = 32.33$, $SD = 11.62$). Regarding the years of experience in the profession, the minimum was 1 year and 36 the maximum ($M = 10.45$, $SD = 9.59$). Regarding the working population, 69 of them worked with patients of all ages, followed by 43 professionals that worked with children from pre-school, 26 with adults, 21 worked with teenagers and 14 with children in elementary school. The workplace of 60 of them was in high schools, 55 worked in universities, 24 in hospitals or health services, 29 defined as “other” and five in private clinics. The sociodemographic data of the participants can be found on table I. The project received approval from the ethics committee of the University of Valencia, Spain.

Table I. Sociodemographic data of nutritionists (n = 98) and elementary school teachers (n = 75)

Age range	n	Gender	Profession	Nationality
18-25	65	F = 56, M = 9	T = 13, N = 52	A = 5, S = 41, N = 19
26-30	25	F = 16, M = 9	T = 11, N = 14	A = 7, S = 7, N = 11
31-40	45	F = 32, M = 13	T = 28, N = 17	A = 21, S = 15, I = 5, N = 4
41-50	22	F = 17, M = 5	T = 13, N = 9	A = 9, S = 1, I = 8, N = 4
51 +	16	F = 9, M = 7	T = 10, N = 6	A = 2, S = 3, I = 4, N = 7

M: male; F: female; N: nutritionist; T: elementary school teacher; A: Austria; S: Spain; N: Norway; I: Italy.

PROCEDURE

The participants were invited to this study by the project partners of the MEAL (16) Project. In Spain was done by the researchers of the University of Valencia, in Italy by FVA New Media Research, in Austria by BEST *Institut für berufsbezogene Weiterbildung und Personal training GmbH*, and in Norway by Rogaland School and Business Development Foundation Posts. The participants received an email with the invitation, the informed consent, and the link to the online survey. The participants were not rewarded with any monetary compensation, besides the appreciation for collaborating in this study.

INSTRUMENT

A survey for teachers and nutritionists about the status of NE knowledge and materials available to teach it in schools and nutrition clinics.

In order to start to explore the knowledge about NE that primary school teachers and nutritionists have, two focus groups were conducted: 1) with elementary school teachers and 2) with nutritionists. These focus groups were conducted in Valencia, Spain. To collect the sample of nutritionists it was contacted the Official Association of Dietitians and Nutritionists of the Valencian Community (CODINuCoVa). All the nutritionists who were part of CODINuCoVa and who were working with children were invited to the Focus Group. The focus group of nutritionists was composed of 14 professionals.

To collect the sample of primary school teachers, the School 2 teaching cooperative of the Valencian Community (*Escuela 2 Cooperativa Valenciana*) was contacted. The focus group of elementary school teachers was composed of 5 professionals.

There were 3 moderators to conduct and organize the focus groups; of these moderators one directed the interview, and two of them observed and recorded the comments and opinions of the interviewees. The Focus Groups sessions lasted between one to one and a half hour.

A third focus group was conducted with children from 9 to 12 years old, however for the purpose of this article this data will

not be presented but it can be found on Domínguez-Rodríguez, Baños and Cebolla (17).

Among the main objectives of these focus groups was to: a) analyze the level or training regarding nutritional knowledge that the professionals considered they had; b) collect feedback on how participants perceived the importance of NE in general; c) analyze the level of NE materials which professionals had; and d) analyze the perception of the importance of using ICTs to transmit NE. More details can be found in Domínguez-Rodríguez, Baños and Cebolla (17).

From the results of these focus group a survey was built in order to explore this data from a broader sample of these professionals in Spain, Italy, Norway and Austria. The survey was composed by 42 items divided in four sections: a) sociodemographic data (10 items); b) experience and opinion regarding NE programs (11 items and six open questions); c) observed efficacy of previous experience of implemented NE program in children between 9-12 years old (six items), and d) proposals for the improvement of NE programs in children, specifically the use of ICTs (nine items). A last item was added to assess the main barriers to utilize educative digital platforms to teach NE supported by ICTs. The survey was translated to Spanish, Italian, German, and Norwegian by the members of each research group in the four cities that composed this project.

STATISTICAL ANALYSIS

Descriptive statistics were analyzed for each group of professionals on the questionnaire items, and one-factor ANOVAs were performed to analyze the effect of nationality in the perception level of knowledge of professionals to teach NE, the perception of elements to teach NE, the perceived effectiveness of NE programs, the barriers that they encounter more often to teach NE, the main components that a NE program should contain, and lastly the perceived level of nutritional knowledge of children per country. When a significant interaction was found, post-hoc analyses using Bonferroni adjustment were conducted. The analysis was performed using the Statistical Package for the Social Sciences (SPSS), version 20.0 (SPSS, 2011).

RESULTS

KNOWLEDGE AND PERCEPTION OF THE CAPACITY OF PROFESSIONALS TO TEACH NUTRITION EDUCATION

Perceived nutrition education training (theoretical knowledge)

Most of the participants considered that they had “adequate” training regarding NE (41 %), followed by 27.2 % who considered that they “did not have enough training”. The percentage of professionals that considered to have “very good” training was 22.5 %, and only 7.5 % considered they had “little” training, and 1.7 % considered they “had no training at all”. Most of the elementary school teachers (40.5 %) answered that they “did not have enough training”, 33.8 % that they had “adequate” training, 12.2 % that they had “very good” training, 9.5 % that they had “little” training, and 4.1 % perceived that they “had no training at all”. In all, 45.9 % of nutritionists indicated they had “adequate training”, 30.6 % “very good training”, 17.3 % “not enough training”, and 6.1 % perceived they had “little training”.

Perceived ability to transfer nutrition education knowledge (pedagogical skills)

Regarding the perception of these professionals to transfer their knowledge to children, the results indicated that 27.7 %

considered they had “adequate” training to transfer this knowledge, 18.5 % considered they had “little” training, 14.5 % considered they had “very good” training, and 6.4 % considered they “had no training at all”. Separated by professions it can be observed that 36.5 % of elementary school teachers perceived they had “little” training to transfer NE to children, 28.4 % that they had “very good” training, 21.6 % that they had “adequate” training, 10.8 % that they had “little” training, and 2.7 % perceived that they “had no training at all”. For the nutritionist the results were: 32.7 % had “adequate” training, 30.6 % “did not have enough training”, 24.5 % had “little” training, 9.2 % “had no training at all”, and only 3.1 % perceived they had “very good” training. The details of the theoretical and didactical knowledge of these professionals by country can be found in figure 1.

AVAILABLE MATERIALS TO TEACH NUTRITION EDUCATION

In a majority of cases (44 %) nutritionists considered that they did not have the necessary materials to teach NE to children, 14 % indicated that they had to develop these materials by themselves, and only 17 % indicated that they considered that they had the guides and materials necessary to carry out the task of teaching NE.

Furthermore, in the case of teachers, 71 % indicated that it was not part of the current academic curriculum, but it was offered

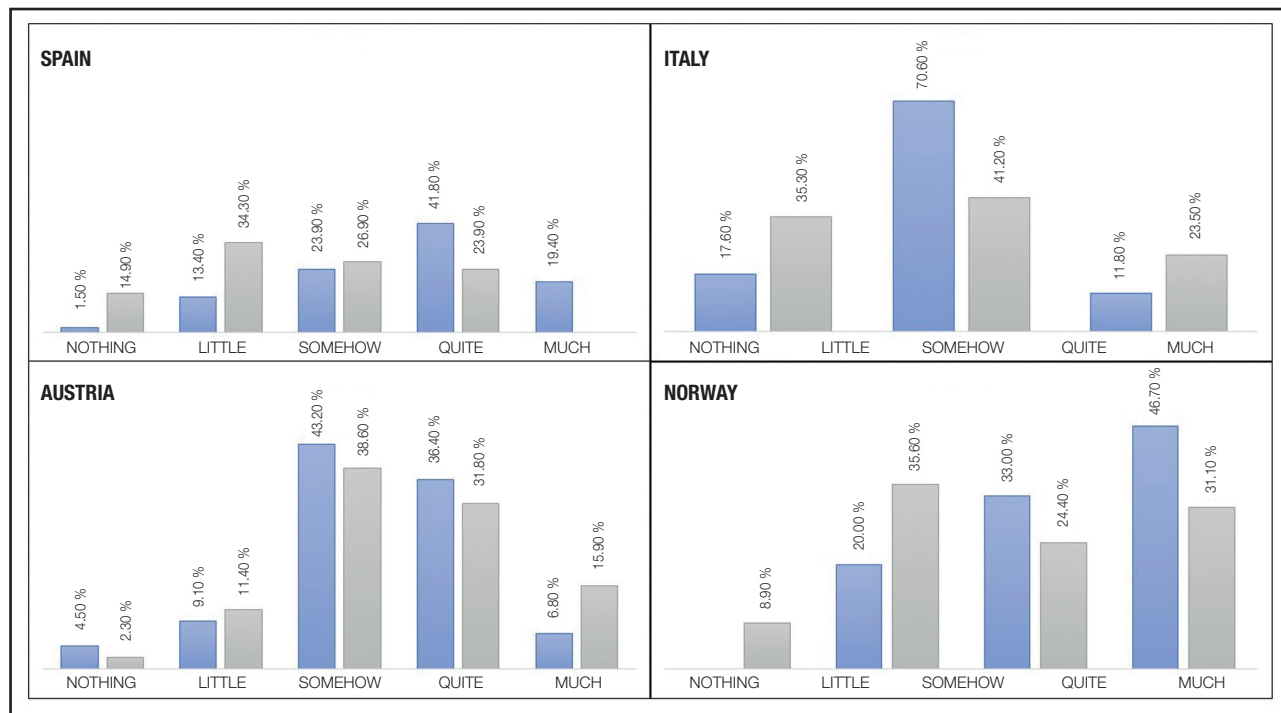


Figure 1.

Perception of theoretical (in blue) and didactical (gray) knowledge of elementary school teachers and dietitians to teach NE by country (n = 173).

as an extracurricular activity. Concerning the amount of materials available for them, unlike nutritionists, 50 % felt that they had the necessary materials, but the other 50 % reported that they had to develop such materials to teach these contents.

MAIN CONTENTS THAT SHOULD BE INCLUDED IN PROGRAMS OF NUTRITION EDUCATION FOR CHILDREN

As to the main contents that the professionals considered that should be taught to children, an agreement was found between nutritionists and teachers concluding the following: 1) knowledge about calories and the developmental stage of the children (43 of 98 nutritionists, and 51 of 75 teachers), and 2) knowledge about the nutrition pyramid and its distribution (67 nutritionists and 44 teachers). The detail of each content and the distribution of the professionals that indicated these contents as fundamental can be found in table II.

PERCEPTION OF EFFECTIVENESS OF NUTRITION EDUCATION PROGRAMS

The results indicated that most of the participants evaluated the current NE programs from "little to somehow" effective (30.80 % and 45.90 %, respectively), and only 1.20 % considered that the current NE programs are "very effective". By separating the results of these professionals, it can be observed that the majority of teachers (43.8 %) evaluated the current NE programs as "somehow" effective, followed by 26 % who evaluated them as "little" effective; 17.8 % considered they were "pretty" effective, 9.6 % "not effective at all" and just 2.7 % considered they were "very effective". Con-

cerning the results of nutritionists these were the following: 48.0 % considered they were "somehow" effective, 33.7 % "little" effective, 12.2 % "pretty" effective, and 6.1 % "not effective at all". None of the nutritionist indicated that they considered NE to be "very effective".

BARRIERS TO TEACH NUTRITION EDUCATION TO CHILDREN

Among the main barriers identified by the professionals related to their performance to share nutritional knowledge with children, 50 % of the nutritionists who answered this item found that it was "somehow" difficult to have enough time to implement NE programs. For elementary school teachers, 44.8 % found that it was "quite" difficult to overcome this barrier. Fifty percent of the nutritionists considered that they had "some" lack of didactical skills to teach NE, and 40.9 % that they lacked this skill "very much".

Regarding the barriers identified as related to children, 50 % of the nutritionists identified that lack of interest to learn NE was "some" difficulty to implement programs, and 37.8 % of the elementary school teachers identified this barrier as "quite" relevant. On the other hand, 37.5 % of the nutritionists identified teaching NE to children as "somewhat" difficult due the fact that children find it boring, and this barrier was observed by 35.8 % of the elementary school teachers as "pretty" difficult to overcome. Lastly, 50 % of the nutritionists considered "somehow" problematic the low interest of parents in this program, therefore affecting its implementation, and this barrier was noted as "somehow" difficult to overcome by 35.4 % of the elementary school teachers. The main barriers identified and the number of professionals that indicated these barriers are detailed in the table III.

Table II. Main contents identified by nutritionists (n = 98) and elementary school teachers (n = 75) to be included in a NE program for children

Content	Nutritionists (n = 98)	Teachers (n = 75)
Knowledge about the number of calories and time of development (evolutionary of children)	43 (43.87 %)	51 (68 %)
Knowledge of the food pyramid and its distribution	67 (68.36 %)	44 (58.66 %)
Knowledge about food composition	52 (53.06 %)	42 (56 %)
Functions of nutrients in the body	63 (64.28 %)	42 (56 %)
Impact of the diet on health	53 (54.08 %)	28 (37.33 %)
Moments of intake and organization of food	39 (39.79 %)	33 (44 %)

Table III. Main barriers identified by nutritionists (n = 98) and elementary school teachers (n = 75) to the implementation of NE programs for children

Identified barrier	Barrier responsible	Amount and percentage of professionals that identified this barrier
Lack of time for planification	Professionals	n = 127 (73.41 %)
Lack of planification	Professionals	n = 124 (71.61 %)
Lack of interest	Children	n = 121 (69.94 %)
Lack of time for implementation	Professionals	n = 119 (68.78 %)
Low perception about the benefits of this type of programs	Parents	n = 118 (68.20 %)
Lack of knowledge about NE	Professionals	n = 117 (67.63 %)
Lack of teaching skills	Professionals	n = 115 (66.47 %)
Boredom	Children	n = 108 (62.42 %)

LEVEL OF NUTRITIONAL KNOWLEDGE OF CHILDREN PER COUNTRY

An ANOVA of one factor was carried out to analyze the effect of nationality on the perception of level of NE knowledge of children in each country, and a significant effect was found: $F(3,168) = 17.37, p < 0.001, \eta^2_p = 0.24$. The average in the levels of knowledge, from lowest to highest, were: Spain (M = 2.20, SD = 0.64), Italy (M = 2.37, SD = 0.61), Austria (M = 2.90, SD = 0.65), and Norway (M = 2.93, SD = 0.65). Post-hoc comparisons revealed that there were no differences between Spain and Italy ($p = 1.00$), nor between Austria and Norway ($p = 1.00$). However, significant differences were found between Spain and Austria ($p < 0.001$), Spain and Norway ($p < 0.001$), Italy and Austria ($p = 0.23$), and Italy and Norway ($p = 0.15$). These results indicated that according to the perception of these professionals, most of the children in the surveyed European countries were perceived to have “little” (39 %) to “some” (49.4 %) nutritional knowledge, and only 7 % “a lot of nutritional knowledge”. The general perception of nutritional knowledge perceived by these professionals can be found in figure 2.

DISCUSSION

The objective of this study was to examine the perception of professionals in charge of transferring NE to children, such as elementary school teachers and nutritionists. Understanding the challenges of frontline professionals is important to make progress regarding effective school nutrition reforms (18).

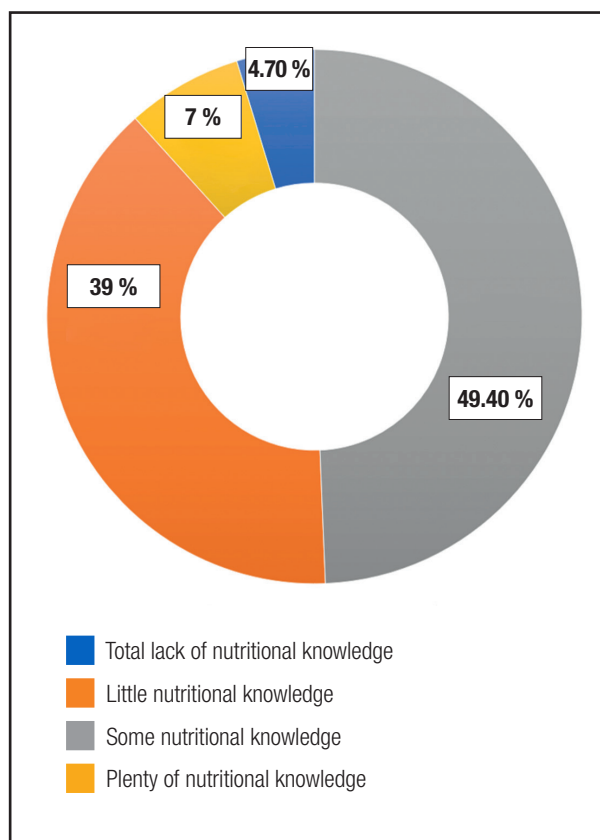


Figure 2. Perception of nutritional knowledge in children in Spain, Italy, Norway, and Austria (n = 173).

It was intended to know their perception about the level of training and resources that they perceive they have to teach NE. Also, it was intended to know how they perceive children's NE knowledge in their country. The results of this exploratory research suggested that these professionals perceived they had not enough pedagogical and theoretical training to teach NE, nor materials available to develop NE programs. On the other hand, due to the results of this study it can be observed that the professionals in southern European countries are not only less prepared than the ones in northern Europe, but also have a reduced amount of materials available to perform this task. Consequently, it seems logical that participants perceived NE programs as little effective. According to the responses of these professionals they perceived that most of them were not prepared to teach NE and also had not enough materials to perform this task. It is noticeable that when participants were asked if they used official guides to prepare NE classes, and which guides specifically, only four elementary school teachers from Spain answered in the affirmative. There was no response to this question from nutritionists and elementary teachers in the other countries. This could lead to infer a lack of knowledge of official guidelines, and that actions are needed to bridge the breach between official guidelines and the professionals transferring this knowledge to children. In this sense, some actions are being taken in order to provide the necessary tools to future educators. For example, implementing NE programs to education university students, obtaining positive results such as increased NE knowledge, healthy eating, and quality of consumed foods (19), or designing and implementing, and evaluating the acceptability and usability of a NE Internet platform with Serious Games created with the purpose of transferring NE theoretical and pedagogical contents to a sample of school teachers, dietitians, and education students in order for them to transfer these contents to children aged 9 to 12 years (20).

In addition, a relevant aspect was that these professionals agreed that technologies can help to a significant extent to overcome the barriers for the implementation of these programs, and therefore increase the level of NE knowledge in children. This bridge between NE and technology has been increasing interestingly, for example using humanoid robots and game-based nutritional education, showing significant increases in the nutritional knowledge of children (21), and apps such as Children Eating Well (CHEW) for preschool-aged children (22). It is also relevant to mention the high rate of professionals that require training in the implementation of a NE program based on ICTs, indicating not only a lack of knowledge in children but also in the professionals.

Analyzing the differences by country, it could be observed that professionals in Spain and Italy did not consider they had enough training or materials, whereas the professionals of Norway and Austria perceived that they had more materials and training but that these remained insufficient. Along similar lines, these results are in connection with the literature where the trends of children with overweight or obesity are higher in the southern countries of Europe, with Spain, Italy, and Greece being most affected (23).

Among the strengths of this study is the detailed information of the perception and experience that nutritionists and teachers from four European countries have to implement NE programs; to the knowledge of the researchers in this project, there is no other study that has such detailed information available. Other strength was the diversity of participants included, having professionals with one year of experience to 36 years, giving with this a broad perspective ranging from that of younger professionals to that of more experienced ones. Another strength was the diversity of the experience working with the population NE programs are directed to, encompassing 57 professionals working with children in preschool and elementary school, and 69 working with all kinds of population, including children, teenagers, and adults. This difference of experience in different environments also provided support to state that the results obtained in this study are strong to reflect the status of knowledge and training of NE in children and professionals in the four countries involved in this research.

Regarding the limitations in this study, decompensation of participants among the several countries involved can be identified as the main one, with Spain being the country where more professionals participated ($n = 67$). However, a low number of professionals from Italy also participated ($n = 17$). To make this study possible a survey tool was used, therefore only the professionals willing to participate did it. The way information was collected could be used through more accurate and rich channels such as one-to-one interviews through digital communication platforms such as Skype, although this would reduce the amount of participants surveyed due to the time investment necessary for this action. These limitations can be avoided in future studies with a broader amount of resources, population, and setting the limit of participants per country and gender, including other countries in Europe.

CONCLUSION

This study provided an overview of four countries in Europe regarding how well prepared a sample of elementary school teachers and nutritionists perceive themselves to teach NE with the materials they have. It concluded that Spain and Italy are among the countries with less knowledge and resources to perform this important task. Also, it concluded that a majority of professionals confirm that they do not perceive having enough training and materials to develop this task, and the most worrying aspect is that they also perceive that children have limited knowledge of nutrition education. The data provided by this study can be helpful for governments and educational organizations in countries of Europe to acknowledge the low level of preparation and resources that nutritionists and teachers have to implement NE programs for children, and with this information countries will be able to provide support to intervene in the high overweight and obesity trends of children in southern European countries.

REFERENCES

- Sahoo K, Sahoo B, Choudhury AK, Sofi NY, Kumar R, Bhadoria AS. Childhood obesity: causes and consequences. *J Family Med Prim Care* 2015;4(2):187-92. DOI: 10.4103/2249-4863.154628
- World Health Organization. Childhood overweight and obesity. 2019 [accessed July 12, 2021]. Available from: <https://www.who.int/dietphysicalactivity/childhood/en/>
- Contento IR. Nutrition education: Linking research, theory, and practice. *Asia Pac J Clin Nutr* 2008;17(1):176-9.
- Habib-Mourad C, Ghandour LA, Moore HJ, Nabhani-Zeidan M, Adetayo K, Hwalla N, et al. Promoting healthy eating and physical activity among school children: Findings from Health-E-PALS, the first pilot intervention from Lebanon. *BMC Public Health* 2014;14(1). DOI: 10.1186/1471-2458-14-940
- Vardanjani AE, Reisi M, Javadzade H, Pour ZG, Tavassoli E. The Effect of nutrition education on knowledge, attitude, and performance about junk food consumption among students at female primary schools. *J Edu Health Promot* 2015;4:53. DOI: 10.4103/2277-9531.162349
- Doak CM, Visscher TLS, Renders CM, Seidell JC. The prevention of overweight and obesity in children and adolescents: A review of interventions and programmes. *Obes Rev* 2006;7(1):111-36. DOI: 10.1111/j.1467-789X.2006.00234.x
- Birch L, Savage JS, Ventura A. Influences on the Development of Children's Eating Behaviours: From Infancy to Adolescence. *Can J Diet Pract Res* 2007;68(1):s1-s56.
- Perez-Rodrigo C, Aranceta J. Nutrition education in schools: experiences and challenges. *Eur J Clin Nutr* 2003;57(S1):S82. DOI: 10.1038/sj.ejcn.1601824
- McAleese JD, Rankin, LL. Garden-based nutrition education affects fruit and vegetable consumption in sixth-grade adolescents. *J Am Diet Assoc* 2007;107(4):662-5. DOI: 10.1016/j.jada.2007.01.015
- Panunzio MF, Antoniciello A, Pisano A, Dalton S. Nutrition education intervention by teachers may promote fruit and vegetable consumption in Italian students. *Nut Res* 2007;27(9):524-8. DOI: 10.1016/j.nutres.2007.06.012
- Hall E, Chai W, Albrecht JA. A qualitative phenomenological exploration of teachers' experience with nutrition education. *Am J Health Educ* 2016;47(3):136-48. DOI: 10.1080/19325037.2016.1157532
- Kushner RF. Barriers to providing nutrition counseling by physicians: A survey of primary care practitioners. *Prev Med* 1995;24(6):546-52. DOI: 10.1177/0884533610380057
- Katsagoni CN, Apostolou A, Georgoulis M, Psarra G, Bathrellou E, Filippou C, et al. Schoolteachers' nutrition knowledge, beliefs, and attitudes before and after an E-learning program. *J Nutr Educ Behav* 2019;51(9):1088-98. DOI: 10.1016/j.jneb.2019.07.001
- Guerra Albuquerque A, Pontes CM, Osório MM. Knowledge of educators and dietitians on food and nutrition education in the school environment. *Rev Nutr* 2013;26(3):291-300. DOI: 10.1590/S1415-52732013000300004
- Tallon JM, Saavedra Díaz R, Costa AM, Leitão JC, Barros A, Rodrigues V, et al. Impact of technology and school-based nutrition education programs on nutrition knowledge and behavior during Adolescence—A systematic review. *Scand J Educ Res* 2019. DOI: 10.1080/00313831.2019.1659408
- MEAL. Modifying Eating Attitudes and Attitudes and Actions Through Learning. [Internet]. [Cited 2020 Sep 28]. Available from: <http://meal.fvaweb.eu/>
- Dominguez-Rodríguez A, Baños R, Cebolla A. Design, development and validation of an online platform aimed at teachers and nutritionists to provide nutritional education to children: MEAL [Diseño, desarrollo y validación de una plataforma on-line dirigida a profesores y nutricionistas para dispensar educación nutricional a niños: MEAL [Disertación]. Valencia, Spain, University of Valencia; 2016.
- Fernandes CSF, Schwartz MB, Ickovics JR, Basch CE. Educator Perspectives: Selected Barriers to Implementation of School-Level Nutrition Policies. *J Nutr Educ Behav* 2019;51(7):843-9. DOI: 10.1016/j.jneb.2018.12.011
- Rodrigo-Vega M, Ejeda-Manzanera JM. Educación alimentaria-nutricional en el Grado de Magisterio: un estudio sobre cambios de conocimientos y hábitos alimentarios (Food/nutrition education in the teaching degree curriculum: a study on changes in knowledge and eating habits). *Nutr Hosp* 2020;37(4):830-7. DOI: 10.20960/nh.02912
- Dominguez Rodríguez A, Cebolla I, Martí A, Oliver E, Navarro J, Baños Rivera RM. Efficacy and acceptability of a web platform to teach nutrition education to children (Eficacia y aceptabilidad de una plataforma web para enseñar educación nutricional a niños). *Nutr Hosp* 2020;37(6):1107-17. DOI: 10.20960/nh.03188
- Rosi A, Dall'Asta M, Brighenti F, Del Rio D, Volta E, Baroni I, et al. The use of new technologies for nutritional education in primary schools: A pilot study. *Public Health* 2016;140:50-5. DOI: 10.1016/j.puhe.2016.08.021
- Hull P, Emerson JS, Quirk ME, Canedo JR, Jones JL, Vylegzhaniya V, et al. A Smartphone App for Families with Preschool-Aged Children in a Public Nutrition Program: Prototype Development and Beta-Testing. *JMIR mhealth and uhealth* 2017;5(8):e102. DOI: 10.2196/mhealth.7477
- Ahrens W, Pigeot I, Pohlmann H, De Henauw S, Lissner L, Molnár D, et al. Prevalence of overweight and obesity in European children below the age of 10. *Int J Obes* 2014;38:S99-S107. DOI: 10.1038/ijo.2014.140