Original Article

Prevalence of the level of physical activity and adherence to the Mediterranean diet in children with special education needs

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ABSTRACT

Research studies show the importance of diet and regular physical activity in order to achieve a good quality of life. For children with specific education needs, the consequences of an unhealthy lifestyle are even worse than that for the general population. The aim is to analyse the adherence to the Mediterranean Diet and the level of physical activity in 130 children with Specific Needs and Educational Support attending regular and specific schools. The instrument used to measure the adherence to the Mediterranean Diet was the Kidmed test, taken as the model healthy diet. The physical activity in children was measured with the PAQ-C. The results showed that among children with Specific Needs and Educational Support, the adherence to the Mediterranean Diet must be improved and that their level of practice of physical activities was moderate. There were not significant differences in adherence regarding gender, school year, population situation or diagnosis. Only that adherence is lower in children in need of educational support. We found the same results with physical activity level, except in the case of the variable gender, with children suffering from ASD.
Keywords: Children; Education needs; Diet; Physical activity; Healthy habits.

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INTRODUCTION

Many scientific studies have demonstrated the benefits of the regular practice of physical activities for health in the general population (Bouchard et al., 2018), including children (Boddy et al., 2015). These benefits are not only shown in the physical aspects, but also in the psychological ones (Estrada et al., 2016; Ahn and Fedewa, 2011). Furthermore, increasing evidence shows that regular physical activity produces so many health benefits to the point of considering physical inactivity as a risk factor in modern non-communicable diseases (Lee et al., 2012; Boddy et al., 2014).

Focusing on children with disabilities or in need of some kind of educational support, a group that has been increasing all around Europe since the beginning of the XXI century, the benefits of a regular practice of physical activity are even more important. Since has been shown to improve aspects such as mobility, autonomy, self-esteem, acceptance by others, sociability, communication, among others. These abilities implicitly reference the health and quality of life of people and are a fundamental activity in the rehabilitation of physical impairments because it helps to keep, to burn fat and to eliminate the excess intake of calories, and it even affects positively psychological well-being and sleep quality (Dursun et al., 2015). Gunnell et al. 2014, proposes that the psychological need of fulfilment during physical activity could be a key mechanism that facilitates increased well-being and better behaviour. But persons with disabilities have higher rates of physical inactivity and obesity than the rest of the population (Hinckson et al., 2013; Sharon et al., 2016). A possible explanation is that children with special education needs participated less frequently and were less involved in physical activities (Bedell et al., 2013).

The most common barriers preventing this group from pursuing physical exercise are lack of knowledge and skill, together with fear and parental behaviour. Furthermore, inadequate facilities, staff competence and costs were also important factors (Shields et al., 2012). The authors indicated that among the facilitators for the practice of physical activities are the child's desire to practice physical skills, to be active and to be involved with peers.

So, it's justified to say that environmental and personal factors play a key role on motivation and barriers for the participation of special need education children on physical activities (Verschuren et al., 2012).

Eating habits are the result of more or less conscious behaviour, on most cases collective and always repetitive, driving a person to choose, prepare and consume certain foods. Youth and children with disabilities might require special diets, individualized nutritional options or they might take drugs such corticosteroids, that can predispose towards obesity (Ells et al., 2006; Lidstone et al., 2006; Chen et al., 2010).

Mediterranean Diet (MD), composed mainly by fruit, greens, cereal, olive oil, legumes and fish, is well known for its health benefits. A varied and balanced diet, MD contains the recommended ratios of essential nutrients needed to keep the organism in good working order (García, 2015).

There are scant research studies on the eating habits of people with disabilities. Even when about 20 % of them are overweight or obese and men show a higher overweight index, a factor that can be associated to a limited consumption of fruits and greens (Montealegre Suárez et al., 2018).

Given the scant scientific evidence about the topic, the present study aims to describe the level of physical activity and the adherence to the Mediterranean Diet in children between 10 and 18 years with special needs and education support (SNES) because it's very important to maintain the quality of life of this group.

MATERIALS AND METHODS

This cross-sectional study tries to analyse the adherence to the Mediterranean Diet and the level of practice of physical activity in 130 children with Specific Needs and Education Support attending normal and specific schools.

The study was conducted according to the ethical standards established by the Declaration of Helsinki (revised by the Declaration of Hong Kong, September 1989) and in agreement with the recommendations of EEC - Good Clinical Practice (Document 111/3976/88, July 1990) and with the Spanish legislation in force governing research.

The questionnaire was administered in small groups or individually in the classrooms of Therapeutic Pedagogy (TP). After communicating the appropriate instructions and once the informed consent form was signed (by the school and families), all students voluntarily completed the requested information, in some cases, with the professionals' help.

Assessment of Anthropometric-Body Mass Index

The assessment of Body Mass Index was performed using a SECA 700 scale with a SECA 200 stadiometer to measure the height and weight of each subject. Then, to determine the BMI, the WHO BMI tables for girl, boys and adolescent from 5 to 18 years old were used. The percentile criteria were used to diagnose overweight and obesity. So, a percentile between 85 and 95 was considered overweight, according the tables by the CDC of Atlanta (Centers for Disease Control, 2005) and over the percentile 95 was evaluated as obesity.

Assessment of dietary habits

To assess the dietary habits, the Kidmed test was used. This test evaluates the adherence to the Mediterranean Diet taken as the prototype of a healthy diet (Serra-Majem et al., 2004). It consists of 16 Yes-no questions. Taking into account this point system, the numerical values can go from 0 (minimal adherence) and 12 (maximum adherence) with the following ranges: 8-12 = optimum Mediterranean Diet; 4-7 = The dietary pattern must be improved to be closer to the Mediterranean model; 0-3 = Low quality diet.

Assessment of Physical Activity

The PAQ-C questionnaire was used to determine physical activity level (Kowalski et al., 1997; Kowalski et al., 2004; Copeland et al., 2005). It's a very simple questionnaire to evaluate the physical activity performed by the child in the last 7 days. The global result of the test is a numerical value between 1-5, allowing the gradation of the level of physical activity of each child, and can determine in which moments of the day and week the children were more active. In this study PAQ-C has been used in primary and secondary students, taking into account their special characteristics. The Cronbach reliability coefficient for this subscale was .867.

Statistical analysis

First, a descriptive analysis of the variables was performed to calculate the mean, the standard deviation, and minimums and maximums. Subsequently, Analysis of Variance (post-hoc tests –Bonferroni- if significant) and T tests of comparison of independent means was performed. Afterward, the relationship between BMI, physical activity index and level of adherence to the Mediterranean diet was analysed using Pearson's correlation coefficients. The level of significance was set at $p < .05$, a priori. For the analysis of the data the statistical program SPSS 23.0 was applied.

RESULTS

The participants were 130 students with Specific Needs and Education Support attending normal and specific schools. The gender distribution is not equal among the participants because 70.8% were boys and 29.2% were girls.

The participants ages ranges from 10 to 18 years ($\bar{x}$ = 12.59; SD = 2.21), weight varies between 23 and 133 kilograms ($\bar{x}$ = 55.01; SD = 19.07), and height between 110 and 184 centimetres ($\bar{x}$ = 155.89; SD = 13.87). Most of the students attend primary education centres (46.2 %), following by those in secondary education centres (30.8 %) and lastly, those attending a special education centre (23.1 %).

Even though most of them have no Curriculum Accommodation Plan (CAP) of any kind (56.2 %), we must point out that usually these students repeat grades and so, they attend primary education or first year of high school. All children attending a special education centre have CAP.

Most of the children with CAP attend higher courses and their mean age is higher ($\bar{x}$ = 14.11). The mean age of children without CAP is $\bar{x}$ = 11.41. The cause is that the older a student with Special Education Needs is more difficult is the teaching-learning process during their school years.

Table 1. Mean anthropometric parameters (N = 130).

	Age	Weight	Height	BMI	KIDMED	PAQ
Mean	12.59	55.01	155.89	22.19	5.76	2.63
Median	12.00	51.00	157.00	20.69	6.00	2.630
Mode	10	60	165	16.90	2.495	1.15
SD	2.219	19.078	13.87	5.517	6.225	0.799
Minimum	10	23	110	11.73	1.00	1.00
Maximum	18	133	184	45.79	11.00	4.42

Body Mass Index

The Body Mass Index goes from 11.73 to 45.79 ($\bar{x}$ = 22.19; SD = 5.51). Most of the students are eutrophic (80.8 %) and have a weight index considered optimum. But, a 10 % of the students are obese and a 4.6 % are overweight. A 4.6 % of the students are very thin.

Dietary Habits

In regard to the diet habits, the mean was 5.76, so it's imperative to improve the eating habits of this group. Paying attention to the frequencies of the different items in KIDMED makes the results easier to understand.

As we can see, even though a 70 % eats fruit daily, only 32.3 % have a second piece of fruits, far from the recommended five pieces a day. Zeroing on the intake of vegetables, the percentages are even lower. Only 54.6 % eat vegetables daily. Fish eating is below 70 %, pasta and rice are close to 47 % and the intake of cereals or bread for breakfast is 73.1 %. Nevertheless, most of them consume olive oil (83.1 %) and milk products for breakfast (84.6 %) or take a yogurt every day (43.1 %). The percentage of students that don't eat breakfast is very high (29.2 %). Those eating industrial pastries is close to 37 % and the percentage eating fast food once a week is close to 20 %.

Table 2. Distribution of adherence to the Mediterranean diet.

Items	Frequency	%
Eats a piece of fruit or drinks juice every day?	91	70
Eats a second piece of fruit every day	42	32.3
Eats fresh, raw, on salad or cooked vegetables once a day regularly	71	54.6
Eats fresh, raw, on salad or cooked vegetables once a day regularly more than once a day	26	20
Eats fresh fish regularly (at least 2 or 3 times per week)	87	66.9
Goes once or more a week to a fast food restaurant (e.g., Burger joint)	25	19.2
Likes legumes and eats them once per week	90	69.2
Eats pasta or rice almost daily (5 days or more per week)	61	46.9
Eats cereal or a derivative (bread, toasts, etc.) for breakfast	95	73.1
Eats nuts regularly (at least 2 or 3 times per week)	52	40
Uses olive oil at home	108	83.1
Doesn't eat breakfast	38	29.2
Has for breakfast some dairy product (milk, yogurt, etc.)	110	84.6
Eats industrial pastries for breakfast	48	36.9
Eats 2 yogurts and/or 40 g. of cheese every day	56	43.1
Eats candy and sweets every day	28	21.5

Based on these eating patterns and according to the grouping of point results, a 20 % of SNES students follow a very low-quality diet and only a 25.4 % shows a high adherence to the Mediterranean Diet. Slightly over half of the participants (54.6 %) need to improve their eating patterns to closely match the Mediterranean model.

In the case of adherence to the Mediterranean Diet, there is no difference in regard to gender (t = -1.378; sig = .171) or education level (t = -.356; sig = .723). Even though girls ($\bar{x}$ Girls = 6.23; $\bar{x}$ Boys = 5.57) and students in High School or older ($\bar{x}$ Primary = 5.91; $\bar{x}$ Secondary = 6.10) seems to have a higher mean that would point to a better adherence in those subgroups. Neither there are differences of eating patterns in regard to the school year (F = -1.96; sig = .104), diagnosis (F = -.960; sig = .414) nor BMI (F = 1.25; sig = .292). But there are differences it the student has CAP or not (t = -2.368; sig = .17). That is, a student without CAP has a higher mean adherence to the Mediterranean Diet, but the adherence is still not high.

Physical Activity

Regarding physical activity, the mean is relatively moderate ($\bar{x}$ = 2.63), with a minimum of 1 and a maximum of 4.42. On the positive side, children with education needs with specific support are not sicker than other children. Only a 13.8 % said to be ill in the previous week. In the cases of illness, they are the usual ones in children: stomach-ache (5), flu (4), feet pain (3), asthma (2), allergies (2), lumbar contracture (1) and backache (1).

Most the individual physical activities of students with SNES were walking, riding a bike and running; and the collective sports were football and basketball. Although games such as "*tag*" stand out. The rest of activities hardly surpass a mean of 1.5. The level of physical activity, as usual when dealing with adolescents and teenagers, girls ($\bar{x}$ = 2.4226) have a lower index of physical activity than boys ($\bar{x}$ = 2.72) (t = -2.053; sig. = .43). But anyway, low in both genders.

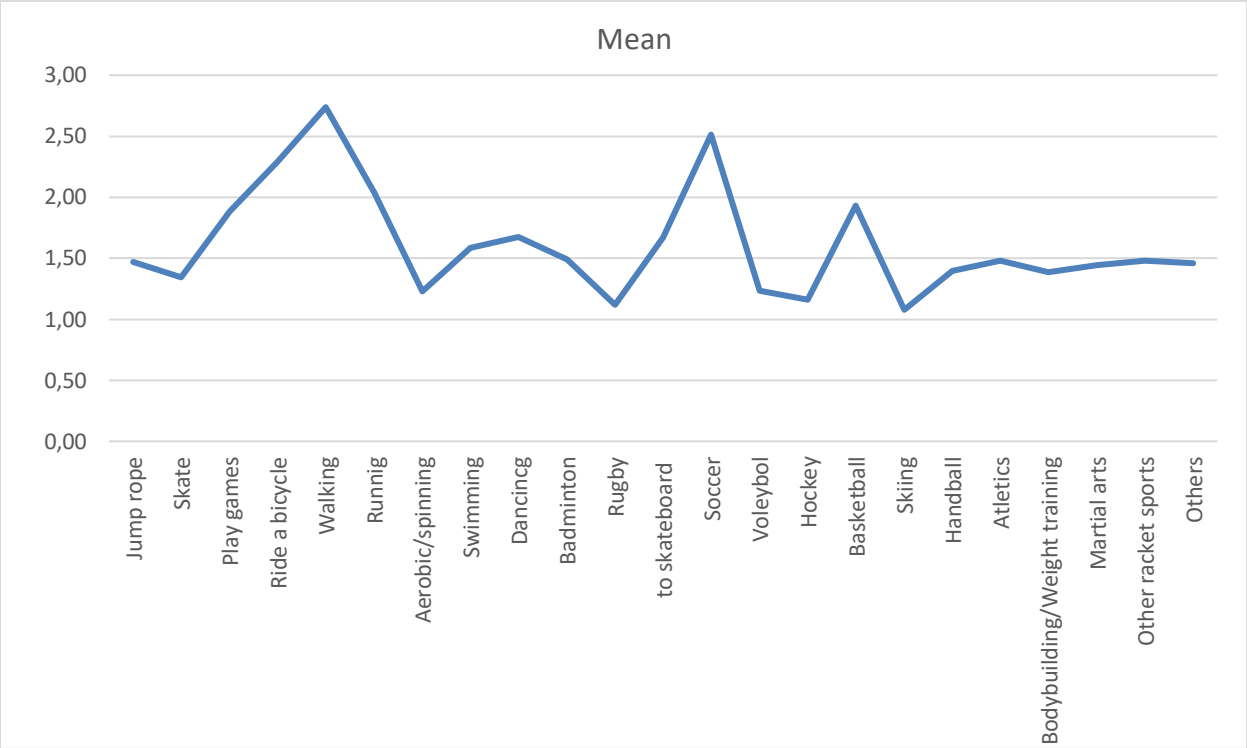

Figure 1. Sports Practised by Children with SNES.

Table 3. Anova Bonferroni NEAE.

		N	Mean	F	Sig.	Bonferroni
PAQ	ASD	8	18.373			ASD/ADHD = .017
TOTAL	ADHD	39	27.587			ASD/Maturation d. = .001
	Maturation Delay	5	29.154	3.366	.021	ASD/Others = .045
	Others	64	26.308			
	Total	116	26.314			

There were no differences between the means of physical activity (F = 2.080; sig. = .88) in relation to the school year of the students, but it must be stated that is low for those children attending a special education centre ($\bar{x}$ = 2.15). There were not significant differences taking into account the province where the education centre is located (F = 2.103; sig. = .104) but the most rural provinces have a higher level of physical activity (Urbans = 2.51; Rurals = 2.86). There was a significant difference according to the type of SNES that the student was diagnosed with (F = 3.36; sig. = .021). In fact, the students with maturational delay show a higher index of physical activity ($\bar{x}$ = 2.91), followed by ADHD ($\bar{x}$ = 2.75) and the group where we clustered several deficits ($\bar{x}$ = 2.63), and lastly the children diagnosed with autism ($\bar{x}$ = 1.83).

Table 4. Values of Student's t for the variable CAP.

	CAP	N	Mean	Levene's test		Student's t-test	
				F	Sig.	t	Sig. (2-tailed)
PAQ-C	Yes	45	22.911	.056	.814	-3.863	.000
	No	71	28.470				

There was also a significant difference between children if they have or not Curriculum Accommodation (t = -3.86; sig. = .0001). The children with CAP show a lower level of physical activity ($\bar{x}$Yes = 2.29; $\bar{x}$No = 2.984).

But no difference appears in regard to BMI (F = 2.014; sig. = .116).

Table 5. ANOVA results for the variable.

KIDMED	N	Mean PAQ-C	F	Sig.	Bonferroni
LOW	23	21.643	6.173	.003	Low-Medium = .021
MEDIUM	63	26.759			Low-High = .002
HIGH	30	28.959			High-Low = .002
Total	116	26.314			

Analysing the index of physical activity taking into account the adherence to the Mediterranean Diet grouped in the three categories described in the method section ($\bar{x}$low = 2.16; $\bar{x}$half = 2.67, $\bar{x}$high = 2.89) significant differences were found between the groups and the level of physical activity is lower in children with a low adherence to the Mediterranean Diet (F = 7.17; sig. = .003).

Table 6. Statistics of Pearson's correlation N = 130.

		Age	BMI	KIDMED
BMI	r	.459**		
	Sig.	.000		
KIDMED	r	-.177*	-.137	
	Sig.	.044	.119	
PAQ	r	-.281**	-.208*	.306**
TOTAL	Sig.	.002	.025	.001

The analysis of the correlations between age, BMI, adherence to the Mediterranean Diet and the level of physical activity show a positive correlation between age and BMI (r = .459; sig = .0001), between age and adherence to the Mediterranean Diet (r = -.177; sig = .044) and between age and level of physical activity (r = -281; sig = .002). That is, as age increases so does the BMI, but the adherence to the Mediterranean Diet and the level of physical activity are lower. Also, a negative relationship, as logically expected, between BMI and the level of physical activity was found (r = -.208; sig = .25). The relationship between BMI and the adherence to the Mediterranean Diet was not significant (r = -.137; sig = .119). Finally, there was a positive significant relationship between the adherence to the Mediterranean Diet and the level of physical activity (r = .306; sig = .001).

DISCUSSION

Physical activity index and level of adherence in children with SEN is a priority in health education given the implications for their quality of life. Right now, the neglect of a healthy diet plus a sedentary lifestyle worsens the well-being and health of the population, especially in developed countries (Butt et al., 2011). The main consequence is obesity, but modern societies show many others, such as diabetes mellitus, cardiovascular diseases, hypertension or cerebrovascular accidents (WHO, 2017).

There is a clear lack of research on this topic regarding the group with SNES (Boddy et al., 2015). But for them, the consequences of an unhealthy lifestyle are even worse, because both the right amount of physical activity and a suitable diet increase the chances of independent and autonomous life for a longer period of

time (San Mauro et al., 2016), improves motor skills (Desbrow et al., 2016), improves cardiovascular health and several psychological aspects such as self-esteem, acceptance by others, social and communication skills and skill needed in everyday life.

However, in our study the children with SNES, especially those with CAP and autistic, showed a low adherence to the Mediterranean Diet and a physical activity level that was relatively low. So, the important intervention in this group is to improve its eating pattern and increase the level of practice of physical activity. In fact, Ells et al. (2006) shows that obesity and disability are increasing globally, and more evidences suggest that those two health priorities can be related. In fact, several studies indicate that the prevalence of obesity in youths suffering from intellectual disability is almost twice that of the general population (Krause et al., 2016; Hinckson and Curtis, 2013; Rimmer and Marques, 2012; Maiano et al., 2016). Also, in youths suffering from Down's Syndrome the rates of overweight and obesity are also higher (Bertapelli et al., 2016).

In our study, the fact that almost 75 % of the population under study must improve their eating habits and almost 15 % of the students has developed obesity or overweight seems to indicate the need for an urgent intervention. The data can be explained by the low consumption of fruit, because only a 32.3 % has a second piece of fruit, far from the daily recommendation of five. And looking into the consumption of greens, the percentages are even lower. Those results are similar to those found in other studies of normal groups (Sandvik et al., 2007).

The percentage of students that don't eat breakfast was very high, close to 30 %, those having industrial pastries near 37 % and those having fast food once per week is close to 20 %. Gotthelfa and Tempesttia (2017), found that 55.1 % of students in their study don't eat breakfasts and of those having breakfast, a 79.5 % was of low o very low quality. So, it seems that the eating patterns of children with SNES doesn't vary that much from that of groups of the same age that do not manifest any disorder.

In regard to the positive relation between physical activity and the Mediterranean Diet, there are studies showing that adolescents that performed a higher level of physical activity, both mild and moderate intensity, manifest a higher adherence to the eating pattern associated to the recommended Mediterranean Diet (López et al., 2013). There was a negative relationship between BMI and the index of physical activity. Physical inactivity is one of the decisive factors of overweight and obesity in groups suffering from chronic illnesses (Valenzuela et al., 2018).

Nevertheless, in this study the relation between body mass index and adherence to the Mediterranean Diet is not significant. There aren't clear evidences on the relation of these two variables.

Index of adherence to the Mediterranean diet and personal and academic variables

In regard to the adherence to the Mediterranean Diet, in the group studied, there are not differences by gender or educational phase, neither in school year, diagnosis or BMI. In comparison with normalized populations, in some cases our results differ from those in other studies.

In regard to age, in the study by Ayechu and Durá (2010) the index of adherence to the Mediterranean Diet decreased with age. In regard to gender, in the study by Vernetta Santana et al. (2018), in a rural setting, an optimal adherence to the Mediterranean Diet was found with a BMI of 20.35 kg/m2 and no differences by gender.

Level of physical activity and personal and academic variables

In our case, students with autism have a lower index of physical activity that student with maturation delay or ADHD and most of the individual physical activities by students with SNES consist of walking, bicycle riding and running; and as collective sports we have soccer and basketball.

In regard to the level of physical activity, children with disabilities have a lower level of physical activity and they are not active enough to benefit their health (Hinckson et al., 2013; Boddy et al., 2015; Bingham et al., 2015). Studies involving groups of adolescent and teenagers, girls have a lower index of physical activity than boys (Alvariñas-Villaverde et al., 2018). That situation can be due to the different motivations and barriers perceived by each gender, with motivation higher for boys and the barriers higher for girls.

Although little is known about children with autism spectrum. Some research showed similar results with children with ASD, even emphasizing that that girls are far away from the recommended level of physical activity (Memari et al., 2013; Vicente et al., 2015).

We have been unable to find studies related to the adherence to the eating pattern or about the level of physical activity if the students have CAP or no although this situation does seem to have and incidence in both. The students with CAP have a lower adherence to the Mediterranean Diet that those that don't have it and children with CAP have also a lower level of physical activity. It must be made clear that curriculum accommodations are a kind of educational strategy aimed to students with SNES consisting in an accommodation of the curriculum to certain education level so to make it accessible to those students. That is, students with CAP are children suffering of serious academic difficulties in most cases a consequence from some cognitive, emotional or physical decline.

Besides, physical activity decreases with age (Portela-Pino, 2018), with the same thing happening with the adherence to the Mediterranean Diet (Aguilà et al., 2017). Consequently, and considering that the less active students show higher indices of BMI, it can be said that BMI increases with age (Telford et al., 2014). So, it seems our results are consistent with previous studies with normalized groups.

LIMITATIONS AND LINES OF ACTION

Among the limitations of the study is the need for additional and complementary studies with a bigger and more diverse group in terms of race/ethnicity, family incomes/education level and geographical region to determine up to what point the results can be generalized (Bedell et al., 2013).

Children with disabilities are the part of the population more vulnerable to obesity, a period of growth with important maturation changes of physical and psychological natural in which the eating profile can have undesirable and negative consequences, adding to it the lack of autonomy. So, it's important to promote healthy lifestyle habits to be established during childhood and preserved in adulthood. The combination of the Mediterranean Diet and the regular practice of physical activity is an excellent way to stop the epidemic of obesity, that is not only an aesthetic problem but a health one. To revert the increasing tendency to give up healthy lifestyles we must point out the importance of encouraging healthy habits in school that strengthen and persist during the rest of the life (Macias et al., 2012).

Primary school plays a very important role in the process of transmitting and promoting healthy lifestyles, because is one of the spaces where children spend many hours of the day. Besides, focusing on the group of children with Special Education Needs, the creation of positive environments, both to improve their eating

habits and their index of physical activity, could be a great help to optimize their habits towards healthier life-styles (Sánchez-Muniz, 2016; Fairclough et al., 2013).

Likewise, we must take into account that research with children suffering from unusual and congenic disorders usually requires assistance from many facets of the public service. Taking care of their physical need can't be in conflict with their educational and socialization needs. It's of upmost importance that their school life be organized in such a way that the diagnosis of their condition doesn't have an unnecessary impact on their education and social life (Johansen et al., 2013).

According to the results of the present study and previous research projects, the proposal is to create specific programs for that group of children to support the design of resources and the tailoring of the facilities, to raise awareness among the families on the importance of keeping healthy habits, especially in children in most need of educational support, physical activity in the case of the female gender and diet in the case of boys, and to work toward the explicit inclusion of disability in the public health programs.

Moreover, current research corroborates an association between a greater adherence to the MD and a reduced risk of mortality, the incidence of chronic diseases such as cancer, diabetes mellitus type 2, metabolic syndrome, obesity, neuropsychological diseases and cardiovascular diseases. In consequence, MD is resulting in a positive impact on health and quality of life.

Future research should focus on analysing the underlying reasons that may explain why children with SEN have low levels of physical activity engagement and adherence to the Mediterranean diet. We can point to the dearth of orientation services available to these social groups beyond those provided by their schools or centres; it should equally be noted that there are very few opportunities for mobility or physical activity outside their habitual sphere of coexistence. Furthermore, as many of them depend on their parents or family unit, educational programmes on areas such as physical activity, nutrition and diet would necessarily have to impact the whole family.

AUTHOR CONTRIBUTIONS

María Luisa Baamonde and Margarita Pino Juste conceived the idea, Iago Pino-Juste carried out the research design and all the authors participated in the follow-up of data collection, contributed to the writing of the manuscript and revised the final version.

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