Levels of Physical Activity in Portuguese Children: the Impact of the Covid-19 Pandemic
Niveles de Actividad Física en Niños: Impacto de la Pandemia Covid-19

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Abstract: Portuguese children spend about eight hours/day in sedentary behaviours, presenting only one hour in active play. This inactivity rate is about 84%. The lower levels of physical activity (PA) trigger several health problems in children and, after, in adulthood. With the appearance of the pandemic of COVID-19 and, consequently, increase of confined tasks like distance learning, has been verified the PA decrease and screen and sedentary behaviours increase in children. The objectives are: i) verify PA levels; ii) compare PA levels between genders, before and during the pandemic. The questionnaire "Cuestinário Pictórico de la Actividad Físca Infantil" has been translated and applied in Portugal, across the platform Google Forms, having been answered by 61 children of average age of 12.0±3.1 years. Before the pandemic, male children practice more PA. During the pandemic, has been verified a practise decrease in both genders. The PA levels settled between "Little active" and "Nothing active", not checking differences between genders. The child's age affected positively the formal PA in academies and clubs and, negatively the informal practise. It has been verified that lower PA levels are associated with higher weight values. Portuguese children PA levels are well below the recommended, situation that worsened during the pandemic. In order to combat childhood inactivity and overweight, it is necessary to develop measures to promote PA early specially in situations of pandemic and/or confinement, in which PA reaches even lower levels.
Keywords: Children, Physical Activity, COVID-19, Portugal

Resumen: Los niños portugueses pasan unas ocho horas/día en conductas sedentárias, prestando solo una hora en juego activo. Esta tasa de inactividad es del 84%. Los niveles bajos de actividad física (AF) desencadean varios problemas de salud n los niños y, posteriormente, en la vida adulta. Con la aparición de la pandemia COVID-19 y, en consequência, un aumento de las tareas de confinamento, a saber, aprendizaje a distancia, se espera que haya habido una diminución en la AF y un aumento en los comportamentos de pantalla y los niveles de estilo de vida sedentário en los niños. Los objetivos son: i) comprovar los niveles de AF; ii) comparar los niveles de AF entre sexos, antes y durante la pandemia. El cuestionario "Cuestionario Pictórico de la Actividad Física Infantilfue traducido y aplicado en Portugal, a través de la plataforma Google Forms, habiendo sido respondido por 61 niños com una edad promedio de 12,0±3,1 años. Antes de la pandemia, los niños varones praticaban más AF. Durante la pandemia, hubo una diminución en la práctica en ambos sexos. Los neveles de AF se establecieron entre "Poco ativo" y "Nada activo", sin diferencia entre sexos. La edad de los niños influyó positivamente en la práctica informal. También se encontro que niveles más bajos de AF se asocian con valores más altos de peso. Los niveles de AF de los niños portugueses son muy inferiores a los recomendados, situación que se agravo durante la pandemia. Para combatir el sedentarismo y el sobrepeso en los niños es necessário desarrollar medidas para promover la AF de manera temprana especialmente en situaciones de pandemia y/o confinamento, en las que la AF alcanza valores aún más bajos.
Palabras clave: Niños, Actividad Física, COVID-19, Portugal

Introduction

At the end of 2019 multiple pneumonia cases were detected in the city of Whuan, China (Tang et al., 2020). The discovery of a new coronavirus variant made the World Health Organization (WHO) declare this epidemic a severe public health problem, and the name given to this new SARS-COV-2 variant was Coronavirus 2019 (COVD-19). This type of infection, according to the WHO, is very similar to Severe Acute Respiratory Syndrome (SARS) and can also present in the form of the common flu. It is considered a very contagious strain, which uses the mouth, eyes and nose as the main portals of entry into the body. Being a strain with a very high contagion rate, the virus has reached almost every country in the world, with 102.722.247 confirmed cases and about 2.218.360 COVID-19-related deaths (data obtained on January 30, 2021). In Portugal, the numbers have also been increasing, reaching 698.583 COVID-19 cases and about 11.886 deaths («Coronatracker», 2020).

In response to this pandemic, Portugal, like most of the countries affected by the new coronavirus, declared a state of emergency on March 18, 2020. This government decree closed down schools, non-essential services (public and private) and a large majority of the population went into confinement. The closure of non-essential services has led much of the working class to work from home via teleworking, and education followed suit. Thousands of children began to take classes on online platforms so the school year could end without too significant harm to their education. This type of virtual classroom vetoed access to playgrounds, as was conventional, with children spending most of their time in sedentary behaviours without access to formal or playful physical activity (PA).

Since most of the population, and in this specific case children were in confinement, a natural reduction of their level of PA was to be expected (Button, Clark, & Gilliland, 2020; Emm-Collison, Jago, Salway, Thompson, & Sebire, 2019). In a similar period of absence from school (holidays or weekends), children show higher values of sedentary activities such as playing virtual games or watching television (Olds, Maher, & Dumuid, 2019; Staiano,

Broyles, & Katzmarzyk, 2015). In a non-pandemic scenario, parents try to minimise the sedentary time of their children in non-school periods by signing them up for holiday camps or sports clubs, so that their level of PA doesn't change drastically (Emm-Collison et al., 2019). Guan et al. (2020) states that most of the PA that children get during the day takes place in recess, playtime, trips to school, physical education classes or playgrounds. However, with imposed confinement, children could not leave their homes. In previous studies (Button et al., 2020; Guan et al., 2020; Hesketh, Lakshman, & van Sluijs, 2017) it was found that in non-school periods, children living in rural, safer environments practised more PA than children living in large urban centres.

Studies conducted during the COVID-19 pandemic revealed that pandemic-related restrictions were unfavourably corelated with movement behaviour (Moore et al., 2020). However, there was little evidence that confinement affected children's active time (Guan et al., 2020), and it was found that children remained engaged in some forms of PA (Pombo, Luz, Rodrigues, Ferreira, & Cordovil, 2020). These forms of PA consisted mostly of indoor play or activities requiring a substantial increase in caloric needs (Moore et al., 2020).

This study aimed to verify children's PA levels by comparing them during and before the COVID-19 pandemic, accounting for gender differences as well.

For this study, four hypotheses were made based on previous studies: i) children's PA levels are different before and during the pandemic (Dunton, 2020; Guan et al., 2020; McCormack, Doyle-Baker, Petersen, & Ghoneim, 2020; Moore et al., 2020; Xiang & Zhang, 2020); ii) PA levels are lower in the pandemic period (Dunton, 2020; Guan et al., 2020; McCormack et al., 2020); iii) there are differences in pre-pandemic PA levels between genders (Loucaides & Jago, 2008; Vilhjalmsson & Kristjansdottir, 2003); iv) there are differences between genders in PA levels during the pandemic (Moore et al., 2020).

Material and Method

Sample Characterisation

The For this study, 61 responses were analysed, of which 36 were answered by male children and 25 by female children. The age range of children involved in the study was between 5 and 17 years of age, with an average of 12.0±3.1 years.

Geographically, the children involved in this study were distributed between the northern and central regions of mainland Portugal - 49 children from the district of Santarém, 5 from the district of Lisbon, 3 from the district of Leiria and 1 child (each) from the districts of Aveiro, Setúbal, Viseu and Vila Real.

All data used in the study were previously authorized by participant's parents or guardians, who digitally signed the Free and Informed Consent Form, the children and adolescents participating in the study also accepted and

digitally signed the Free and Informed Consent Form. It is also reiterated that this research was conducted according to standards required by the Declaration of Helsinki (World Health Organization & Ministry of Social Affairs and Health, 2013) and other international organizations.

Procedures and Protocol

The purpose of the study was to analyse the self-perception of Portuguese children in respect to their level of PA, including children that range from primary school to high school age. For this reason, an easy-to-understand survey for younger children was selected. As the surveys available in Portuguese don't allow for easy interpretation by younger children, the Costa Rican survey "Cuestionario Pictórico de la Actividad Física Infantil" was adapted and used (Morera-Castro, Jiménez-Díaz, Araya-Vargas, & Herrera-González, 2018). This survey is easier for children to comprehend as answer options are presented in the form of images (e.g., Fuentes Vega, 2022).

The chosen survey was validated through exploratory factor analysis (due to the fact that it was a new survey) and by comparing it with a validated and reliable survey - Physical Activity Questionnaire for Adolescents (PAQ-C) - where the correlation coefficient between classes was calculated (Meyers, Gamst, & Guarino, 2013). The internal consistency of the survey was determined by Cronbach's alpha, presenting a result of $\alpha=0.637$ (n=742), a value considered acceptable for scientific purposes (Celina & Campo, 2005; Meyers et al., 2013). This survey aimed to measure the level of PA of children taking into account the child's self-perception. All answers to the questions were presented as images (Figure 1), and each illustration represented a level of PA where the figures appear without facial gestures and there are illustrations for both female and male genders: the first image represented a "sedentary" state, the second image represented the "not very active" state, the third image represented the "active" state, and the fourth image represented the "very active" state.
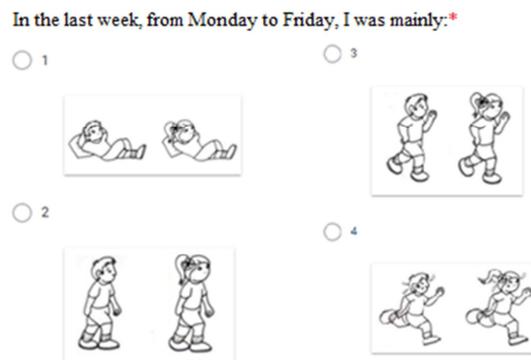

Figure 1. Example of a question and answer from the "Cuestionario Pictórico de la Actividad Física Infantil" (Morera-Castro et al., 2018)

In order to determine the PA levels of children (Morera-Castro et al., 2018), the arithmetic mean of the first five questions was calculated, and points were attributed -

from 1 to 4 - to each image: "Sedentary/Not Active" 1 (one) point, "Not Very Active" 2 (two) points, "Active" 3 (three) points and "Very Active" 4 (four) points. After calculating the arithmetic mean, the closer the result was to 4 (four), the more physically active the child considered to be; the closer the result was to 1 (one), the more sedentary the child considered to be. This questionnaire was translated into Portuguese (Johnson, 1998; Peña, 2007) and later adapted for the Google Forms online survey platform. The surveys were distributed through digital media like e-mail and through platforms such as Facebook ® and WhatsApp ®.

In addition to PA questions, participants were asked about their height and weight. In these two questions, the survey asked the participant to collaborate with a family member. These questions were added in order to explore the possible influence between body mass index (BMI) and PA. After collecting information, the BMI value was calculated individually, as well as its percentile (WHO, 2006).

Statistical Treatment

For the descriptive analysis, mean, standard-deviation, minimum and maximum tests were used. For the inferential analysis, the normality of the distribution was tested with the Kolmogorov-Smirnov test, and not assumed for all variables. Thus, only non-parametric techniques were considered. For gender comparisons was used the U Mann-Whitney test. For comparisons between the values of the variables before and during the pandemic was used the Wilcoxon test. The effect size values for each comparison were calculated following Field's guidelines (2018). The significance level was set for $p \leq 0.05$. All statistical analysis was performed in IBM SPSS Statistics version 26 for Windows.

Results

Physical Activity During and Before the Pandemic

When weekday PA was analysed during the pandemic, presented in Table 1, it was found that 11.5% of children were very active, 32.8% moderately active, 29.5% not very active, and 26.2% not active. In contrast, before the pandemic, 34.4% of children were very active, 49.2% moderately active, 13.1% were not very active, and 3.3% of children were not active. These levels of PA during the week in pandemic and pre-pandemic scenarios showed significant differences, with significantly higher values (Z=-4.857; $p \leq 0,001$; r=0.62) for pre-pandemic PA.

Table 1.
Level of Physical Activity during the week, by period (during and pre-COVID) and gender

Level of PA during the Week	During Covid					Pre-Covid				
	Female		Male		N	Female		Male		N
	Freq	%	Freq	%		Freq	%	Freq	%	
Not Active	5	20.0	11	30.6	26.2	1	4.0	1	2.8	3.3
Not Very Active	8	32.0	10	27.8	29.5	6	24.0	2	5.6	13.1
Moderately Active	7	28.0	13	36.1	32.8	13	52.0	17	47.2	49.2
Very Active	5	20.0	2	5.6	11.5	5	20.0	16	44.4	34.4
Total	25	100.0	36	100.0	100.0	25	100.0	36	100.0	100.0

Notes: Freq- absolute frequency by gender; %- relative frequency by gender; N- percentages not differentiated by gender.

In Table 2, we can observe PA during the weekend. During the pandemic, 8.2% of children were very active, 32.8% are moderately active, 32.8% not very active, and 26.2% not active. On the other hand, during the pre-pandemic period, 27.9% of children were very active, 27.9% moderately active, 23% not very active, and 21.3% not active. There were significant differences between normal and pandemic scenarios (Z=-2.742; $p \leq 0.001$; r=0.35).

Table 2.
Level of Physical Activity during the weekend, by period (during and pre-COVID) and gender

Level of PA during the Weekend	During Covid					Pre-Covid				
	Female		Male		N	Female		Male		N
	Freq	%	Freq	%		Freq	%	Freq	%	
Not Active	7	28.0	9	25.0	26.2	9	36.0	4	11.1	21.3
Not Very Active	8	32.0	12	33.3	32.8	8	32.0	6	16.7	23.0
Moderately Active	8	32.0	12	33.3	32.8	4	16.0	13	36.1	27.9
Very Active	2	8.0	3	8.3	8.2	4	16.0	13	36.1	27.9
Total	25	100.0	36	100.0	100.0	25	100.0	36	100.0	100.0

Notes: Freq- absolute frequency by gender; %- relative frequency by gender; N-percentages not differentiated by gender.

When analysing children's PA during school breaks, presented in Table 3, throughout the pandemic, it was found that 3.3% of children were very active,19.7% moderately active, 29.5% not very active, and 47.5% of them are not active. In contrast, before the pandemic during school breaks 36.1% of children were very active, 26.2% moderately active, 27.9 not very active, and 9.8% not active. Comparing periods, it was possible to observe significant differences (Z=-5.178; $p \leq 0.001$; r=0.66) in PA during school breaks.

Table 3.
Level of Physical Activity during school breaks, by period (during and pre-COVID) and gender

Level of PA during School Breaks	During Covid					Pre-Covid				
	Female		Male		N	Female		Male		N
	Freq	%	re	%		Freq	%	Freq	%	
Not Active	15	60.0	14	38.9	47.5	2	8.0	4	11.1	9.8
Not Very Active	5	20.0	13	36.1	29.5	10	40.0	7	19.4	27.9
Moderately Active	5	20.0	7	19.4	19.7	10	40.0	6	16.7	26.2
Very Active	0	0.0	2	5.6	3.3	3	12.0	19	52.8	36.1
Total	25	100.0	36	100.0	100.0	25	100.0	36	100.0	100.0

Notes: Freq- absolute frequency by gender; %- relative frequency by gender; N-percentages not differentiated by gender.

Table 4.
Level of Physical Activity during extracurricular periods, by period (during and pre-COVID) and gender

Level of PA during Extracurricular Periods	During Covid					Pre-Covid				
	Female		Male		N	Female		Male		N
	Freq	%	Freq	%		Freq	%	Freq	%	
Not Active	5	20.0	14	38.9	31.1	3	12.0	4	11.1	11.5
Not Very Active	15	60.0	11	30.6	42.6	9	36.0	11	30.6	32.8
Moderately Active	3	12.0	8	22.2	18.0	7	28.0	14	38.9	34.4
Very Active	2	8.0	3	8.3	8.2	6	24.0	7	19.4	21.3
Total	25	100.0	36	100.0	100.0	25	100.0	36	100.0	100.0

Notes: Freq- absolute frequency by gender; %- relative frequency by gender; N-percentages not differentiated by gender.

Relatively to extracurricular PA, presented in Table 4,

it was found that during the COVID-19 pandemic, 8.2% of children were very active, 18.0% moderately active, 42.6% not very active, and 31.1% not active. When compared to the pre-pandemic period, 21.3% of children were very active, 34.4% moderately active, 32.8% not very active, and 11.5% not active. Significant differences between scenarios (Z=-4.113; p≤0.001; r=0.53) were found in extracurricular periods.

As for the perception of PA in physical education (PE) classes, presented in Table 5, during the pandemic children were mostly very active with 34.4%, 29.5% were moderately active, 23.0% not very active, and 13.1% not active. Before the pandemic, children were also mostly very active but with a smaller percentage of 68.9%, 24.6% were moderately active, and 6.6% not very active. The present data showed that the significant change in the levels of PA pre and during pandemic was also observed during physical education classes (Z=-4.821; p≤0.001; r=0.62).

Table 5.
Level of Physical Activity during physical education classes, by period (during and pre-COVID) and gender

Level of PA during Education Classes (PE)	During Covid					Pre-Covid				
	Female		Male		N	Female		Male		N
	Freq	%	Freq	%		Freq	%	Freq	%	
Not Active	4	16.0	4	11.1	13.1	0	0.0	0	0.0	0.0
Not Very Active	5	20.0	9	25.0	23.0	1	4.0	3	8.3	6.6
Moderately Active	7	28.0	11	30.6	29.5	8	32.0	7	19.4	24.6
Very Active	9	36.0	12	33.3	34.4	16	64.0	26	72.2	68.9
Total	25	100.0	36	100.0	100.0	25	100.0	36	100.0	100.0

Notes: Freq- absolute frequency by gender; %- relative frequency by gender; N- percentages not differentiated by gender.

In Table 6, it's possible to verify that in general, children during the COVID-19 pandemic presented average PA levels of "not active" during school breaks and in sports clubs/associations attendance. Children also presented an average PA level of "not very active" in weekdays, weekends, extracurricular PA, physical education classes and classes/training at sports clubs/associations. During the pandemic, children presented on average a PA level of "not very active".

Table 6.
Descriptive statistics of physical activity perception (Mean ± Standard Deviation)

Variables	Covid Mean±SD	Pre-Covid Mean±SD
PA Week	2.30±0.99	3.15±0.77
PA Weekend	2.23±0.94	2.62±1.11
PA School Breaks	1.79±0.88	2.89±1.02
PA Extracurricular	2.03±0.91	2.66±0.95
PA Physical Education Classes	2.85±1.05	3.62±0.61
Clubs/Associations Attendance	1.54±0.66	1.63±0.68
Classes/Training at Sports Clubs/Associations	2.57±0.50	2.70±0.47
Level PA	2.24±0.62	2.99±0.67

In the case of the pre-pandemic period, children were on average "not active" in clubs/associations attendance, but only "not very active" during the weekend, school breaks, in extracurricular PA and classes/training at sports clubs/associations. As far as PA during the week is concerned, children were on average "moderately active" during the week and in physical education classes. Before the COVID-19 pandemic, children ranked on average as "not very active". When comparing the level of PA during the pandemic and pre-pandemic, there were differences between the same levels (t=-9.343; p≤0.001; r=0.77).

Physical Activity – Gender Comparison

When comparing results between genders, no significant differences were found with BMI or BMI percentile. However, there were verified several significant differences between males and females in the level of PA before the pandemic (U=289.000; p≤0.02; r=0.29), namely during the week (U=302.000; p≤0.02; r=0.30), during the weekend (U=258.00; p≤0.01; r=0.37) and during school breaks (U=298.000; p≤0.02; r=0.30).

Comparisons between the two periods, during and pre-pandemic, within the same gender also showed significant differences in PA during school breaks for females (Z=-3.123; p≤0.001; r=0.62). As for males, it was possible to observe significant differences in PA during the week (Z=-4.463; p≤0.001; r=0.74), during the weekend (Z=-3.402; p≤0.001; r=0.57) and during school breaks (Z=-4.136; p≤0.001; r=0.69).

When it was investigated the correlation between age and the other variables in study, presented in Table 7, several negative associations were verified, namely with the: PA during the week over the COVID pandemic, extracurricular PA pre-pandemic, and PA during the COVID 19 pandemic. Contrarily, three positive correlations were found between age and the following variables: training attendance (in sports clubs/associations) during the COVID pandemic, training attendance before the pandemic, and the duration of training before the pandemic.

Table 7.
Correlation (Spearman- rho test, probability- p) of fixed and dependent variables

Fixed Variables	Dependent Variables	ρ	P
Age	PA Week Covid	-0.311	0.02
	Attendance Covid	0.439	0.02
	Extracurricular Pre- Covid	-0.288	0.02
	Attendance Pre-Covid	0.446	0.02
	Duration Pre-Covid	0.311	0.05
	Level of PA Covid	-0.386	0.02
Weight	PA Week Covid	-0.323	0.02
	PA Weekend Covid	-0.277	0.05
	PA Extracurricular Covid	-0.345	0.02
	Attendance Covid	0.338	0.02
	PA Extracurricular Pre-Covid	-0.268	0.05
	Attendance Pre-Covid	0.356	0.02
	Duration Pre-Covid	0.294	0.05
	Level of PA Covid	-0.399	0.02

Regarding to the weight, five negative associations were found between this variable with the: PA during the week over the pandemic, PA during the weekend over the pandemic, extracurricular PA before and during the pandemic, and level of PA during the pandemic. Contrarily, three positive associations were also found between the weight's variable with: training attendance before and during the pandemic, and the duration of training before the

pandemic.

By correlating age and other variables by gender it was possible to verify a negative association between age and level of PA in females during school breaks in the period before the beginning of the pandemic ($\rho=-0.515$; $p=\leq0.02$), with no other associations between age and other variables by gender.

Discussion

Considering the first objective, in which we set out to study changes in the level of PA before and during the pandemic, we found that before the pandemic children engaged in significantly more PA (moderately active) than during the pandemic (not very active). These results are in line with those of Dunton (2020), Guan et al. (2020), McCormack et al. (2020), Moore et al. (2020) e Xiang & Zhang (2020). However, Schmidt et al. (2020) presents a study (also conducted via survey) where the level of PA of Germanic children and adolescents increased slightly during the pandemic, mostly in unorganised PA.

Breaks in the level of PA occurred mostly during school breaks, with children generally going from "very active" to "not active". This change was due to online teaching, where children changed subjects in a few minutes without having to change rooms or even get up from their chairs. In contrast, it was found that children, within the "new normal" of distance learning, remained "very active" during physical education classes, with no change between the pre-pandemic and pandemic periods. This lack of change in the level of PA during PE classes possibly results from the adjustments to the new reality made by PE teachers (e.g., Hortigüela-Alcalá, Garijo, & Pérez-Pueyo, 2021) or by the perception of low PA levels during confinement, which might have led the children to perceive PE classes as the height of their PA. The study also shows that physical education classes were the period where there was the greatest practice of PA before and during the COVID-19 pandemic. All these indicators led us to accept the hypothesis that the levels of PA are different before and during the pandemic, being lower during the COVID-19 pandemic.

Regarding the second objective of the study, which aimed to compare levels of PA between genders before and during the pandemic, we found that, as in previous literature (Rodríguez-Fernández, Rico-Díaz, Neira-Martín, & Navarro-Patón, 2020; Schlund, Reimers, Bucksch, Linder, & Demetriou, 2021), males had significantly higher levels of PA than females, though only in the period before the pandemic. These results are in line with another Portuguese study that analysed PA during the COVID period, which showed similar levels of PA in both genders during the pandemic (Pombo et al., 2020). However, Moore et al. (2020) showed that females revealed lower levels of PA than males. Males were found to have a "moderately active" level of PA prior to the pandemic, and during the pandemic this level dropped to "not very

active". While females maintained a PA level of "not very active" in both periods. These indicators allow us to accept the hypothesis that PA levels are different between genders in the period prior to the pandemic, and to reject the hypothesis that there are differences in PA levels between genders during the pandemic.

Given the adaptations that the pandemic brought to children's lives, it was expected that the scope of PA would not be forgotten and that its promotion would continue during the confinement the country was subjected to. There were some activities promoted by government agencies, such as the Portuguese Institute for Sport and Youth (IPDJ). The IPDJ promoted the "Being active at home" initiative, which included "Playing as a Family" and "Being active is for everyone", in order to increase the practice of PA among children and youths (with and without disabilities) («Instituto Português do Desporto e Juventude», 2021). Despite being an initiative with an impact on children and taking into account the results obtained in this study, there is an urgent need to develop programs that promote PA during school breaks, understanding that it is a difficult environment to influence and control during virtual school.

Practical Implications

This study was one of the first to analyse children's PA levels in the periods prior and during the COVID-19 pandemic via survey (checking their perceived levels of PA). The results showed that children presented lower PA levels compared to the pre-pandemic period, with no gender differences during the pandemic. It was noticeable that the highest PA losses occur during school breaks and that physical education classes maintained a level of "very active", showing a good adaptation by the education system and PE teachers.

The results showed an increased concern with the PA of children, as Portugal showed a very low level of PA in this age group. With the pandemic, the scenario became even more worrying, as children effectively practiced less PA when they were at home in online classes during the pandemic (confinement "forces" children to stay at home), and there were few alternatives from the education and health systems to promote the regular practice of PA by children. One of the possibilities could be the practice of outdoor physical activity in green spaces, which provides several physical and psychological benefits, allowing to perform activity with the recommended safety distance. However, for children to practice activities in these spaces, they need to be motivated and have family support to do so (Bello Albeal, Flores Martínez, Salvador Soler, & Giakoni Ramírez, 2021).

Limitations

Although this study presents important results for the understanding of children's levels of PA, there are some

limitations that should be considered.

First, the sample size prevents the data's generalization for the entire population. The fact that the survey had to be completed in a short span of time (because it relies on the memory of the children) led to a short acceptance period for the answers, which in turn led to a reduced eligible sample size. The small sample size also ended up making the comparison between age groups unfeasible, which represents a limitation and, at the same time, a possibility for future studies.

Under ideal conditions, the measurement of participants' weight and height should be carried out using the same equipment, procedures and personnel. Given that the present survey was applied during the confinement by Covid-19, these measurements were carried out by the participant's family members, which may have introduced some measurement error and bias in the data. However, it should be noted that this was the only solution found to allow the calculation of the BMC, and that the measures in question are relatively accessible to any adult individual.

As the survey was answered on online platforms and with parents/guardians close to the children, there is the possibility that their answers to the survey were influenced by adults, thus undermining the results of the study.

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