

COVID-19 Confinement In Portugal: Effects On The Household Routines Of Children Under 13

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Abstract

Objective

To know how confinement affects children's routines, more specifically their physical activity (PA) and sedentary time.

Methods

An online survey was launched to assess how Portuguese children under 13 years of age are adjusting their daily routines to confinement. Parents reported the daily time each child was engaged in different activities, which were used to calculate overall sedentary time and overall physical activity time.

Results:

Data from 2159 children, indicated that during confinement: i) there was a decrease in children's physical activity time (72.3%); and an increase in screen time (71.3%) and family activities (83.9%); ii) the only sex differences were found on Playful Screen Time (boys > girls) and in Play without PA (girls > boys); iii) along age groups, there was a trend for the increase of the overall sedentary time and a complementary decrease of overall physical activity time (both $F(3,2097) = 97.951, p < .001$).

Conclusion:

Overall, PA of confined children showed low levels and a clear decreasing trend along childhood. Conjoint family and societal strategies to target specific age groups should be organized in the future.

Introduction

In December 2019, a series of unexplained cases of pneumonia were reported in the city of Wuhan, China (Tang et al., 2020). On the 30th of January of 2020, WHO classified this epidemic as a public health emergency of international interest (Huang et al., 2020; Zhu et al., 2020) and on February 11th classified the disease as Corona Virus Disease 2019 (COVID-19).

On the 3rd of March, 1.026.974 cases in the world were confirmed, of which 53.975 resulted in death. In Portugal, on that same date, 9.034 cases were registered, 209 of which resulted in death (Coronatracker, 2020). In the absence of effective treatments, the best way to deal with COVID-19 was to control the sources of infection, enforcing social isolation and confinement (Sun et al., 2020). These measures were implemented on most of the European affected countries. The entire school system was shut-down, non-essential government and private services were closed, corporations change their employees' work to a home online mode, and millions of families were asked to stay at home. In some countries, governments declared the state of emergency, tightening the effort to keep people at home.

In Portugal, schools, companies and non-essential public services across the country were closed on March 16th. The state of emergency was declared two days later, on March 18th. Children were kept at home-schooling, starting what it seems would be a long period of movement restriction, without any organized physical activity (PA) or free play time outdoors. It is known that during long periods without school, children are more susceptible to unhealthy behaviors, such as excessive sedentary behaviors (Carrel et al., 2007; Hesketh et al., 2017), but we never had a situation such as this where millions of children all over the world were mandatorily confined to their home spaces and separated from their peers for such a long period of time.

Nothing was known on the way Portuguese children would be acting through the days and weeks to come. Nothing was known on the adaptations and behavioral acting of these children in this situation.

This study will be the first to analyze children's house routines while in confinement. It aims to understand how Portuguese families with children under 13 years old have been facing this troubled period, mainly concerning to the time spend in physical activity, sedentary activity, intellectual activity, play, outdoor and screen. We believe that understanding the behavior of children during this period can help to understand how daily activity is affected, supporting the selection of specific action strategies in order to minimize the negative effects of a prolonged confinement.

Materials And Methods

The survey

To assess how children under 13 years of age were dealing with confinement due to the COVID19 situation, we created a survey on *LimeSurvey*, hosted on the *Faculty of Human Kinetics, University of Lisbon*. The survey was approved by the *Faculty of Human Kinetics* ethics committee, launched online on the 23rd March and publicized through the social media (Facebook, Instagram, WhatsApp), and by email. It takes approximately 5 minutes to complete, it is anonymous, and comprises 4 sections:

1. Household: Questions regarding the composition of the household and the number of children and adults who were at home and how many were working from home.
2. Housing characteristics: Type and characteristics of the house, and existence or not of indoor and outdoor space for physical activity.
3. Household routines: Questions about the level of concern regarding the situation of Covid-19 and the way family routines were being adjusted (physical activity time, screen time, sleep, family activities)
4. Children's routines: Questions related to the characterization of each child (age, sex, health status) and the hours spent in different activities during the previous day.

Sample

The survey was completed with information regarding 2 948 children during the second week and beginning of third week of confinement (between 23rd of March and 1st of April) by a parent reporting to children under 13 years of age present in the household. All respondents read the information about the study and gave their consent to the conditions by clicking to proceed on the first page of the survey. Withdraw from the survey could be done at any given time by not proceeding or not submitting the survey at the end. After cleaning the database for missing or obviously wrong information (e.g., more than 24 hours reported in a day, or no sleep time reported for children; n=789 total), data regarding 2159 children under 13 (1117 boys and 1042 girls) was used in this study.

Statistical analysis

Analysis of the results were based in answers relative to a total of 2159 children. Children were divided into four age groups (group 1 = 0-2 years; n=462, group 2 = 3-5 years, n=765; group 3 = 6-9 years, n=606 and group 4 = 10-12 years, n=326). Descriptive statistics and frequency analysis were used to describe children's living environments and routines during this period. Five categories of activities were analyzed: Intellectual activity (school assignments and online classes); Playful screen time (games, movies, social networks, internet, audio and video calls); Play without physical

activity (reading, drawing, painting, board games, cards, Legos, etc.); Play with physical activity (hide and seek, jumping, running, etc.); Physical activity (organized physical activity indoors, physical activity outdoors, walk the dog). The first three categories (Intellectual activity, playful screen time and play without physical activity) were added to calculate overall sedentary time, and the last two categories (play with physical activity and physical activity) were added to calculate overall physical activity time. Separate 4x2 ANOVAs (age group by sex) were performed to investigate how the different activities and routines of the confined children were being organized according to children's age and sex.

Results

Most children live in apartments (60.3%) and do not have a space dedicated to physical exercise (gym or exercise room) (80.8%). Regarding outdoor space, 26.4% of the households do not have any space outside the apartment, 37.6% have outside spaces of no more than 12m² and 36.0% have outside spaces with more than 12m². It should be noted that 44.8% consider that it has been easy to be in isolation with their children.

Families changed their routines, more specifically they changed the organization of time during the social confinement (see Fig. 1). Most parents reported a decrease in the level of their children's physical activity (24% report that children are doing much less, and 48.3% report less PA than during school time). Conversely, screen time, sleep and family activities have increased. When asked to compare to the pre-confinement period, most parents say their children's screen time has been more (56.7%) or much more (14.6%); that children have been sleeping more (38.5%) or much more (4%); and that they have been doing more (59.5%) or much more (24.4%) family activities (Fig 1).

The results regarding the effect of age and sex on time spent by the children in the different groups of activities performed during the day are presented in Table 1 and Figure 2.

As reported in Table 1 and Figure 2, all categories presented main effects of age groups although with different trends along age. For intellectual Activity and Playful Screen Time, we found that, as getting older, children used significantly more time in these activities than the younger ones (all p 's < .001 compared to previous age group). Boys from the two older groups (6 to 12 years old) engaged more in Playful Screen Time than girls.

Children in the 0-to-2 age group showed low involvement in both playtime categories (Play with PA and Play without PA), and 3- to 5-year-old children were the most engaged in playtime (p < .02 compared to all other age groups). Older age groups showed a steady significant decrease in both categories of Play after the age of 5 (all p 's < .001 compared with previous age group). Girls older than 2 years of age engaged more in Play without PA than boys.

When looking for the use of confinement time in Physical Activity we can see that all childhood groups (from 3 to 12 years old) showed similar values (all p 's > .45), and that the 0-to-2 age group showed significant less involvement in Physical Activity time (p < .002 relative to all other age groups).

For a better understanding of the relative importance of each five categories of activities in the child's day for the different age groups, the time spent in each activity was converted into percentage, considering the total time reported for all categories. Overall physical activity and sedentary time were also calculated (Fig. 3).

The mean percentage analyzes (Fig. 3) showed that Intellectual Activity and Playful Screen Time increased across the age groups, while the opposite trend occurred for all other categories. Additionally, Play without Physical Activity was prevalent in the two younger age groups (32.7% and 33.9%), the 6-9 year old age group presented its higher values on Playful Screen Time (27.16%) and the activity prevalent for the older age group was Intellectual Activity (33.17%).

When categories were grouped together on Overall Physical Activity (sum of Physical Activity and Play with Physical Activity), and Overall Sedentary Time (sum of Intellectual Activity, Playful Screen Time, and Play without Physical Activity), the results showed a decrease in the Overall Physical Activity percentage and an complementary increase in Sedentary Time day allocation as children's age increases (both $F(3,2097) = 97.951, p < .001$).

Discussion And Conclusion

As expected, the confinement living condition of these children leads them to spend more time in sedentary behaviors than in a normal school day, especially as they are growing older. Our results demonstrate higher values of total sedentary time compared to studies that evaluated sedentary time on school days (60% among 5 to 9 year-old children(Zimmo et al., 2017) and 64% among 10 to 12 year-old children(Abbott et al., 2013; Verloigne et al., 2017)). School days ensure structure and opportunities for children that can lead them to healthier behaviors regarding physical activity, sleep, and diet(Fu et al., 2017). Opportunities, both in school and in organized sports (e.g. sport clubs), for children to be physical activity and to achieve the recommendations for a moderate to vigorous physical activity. Previous studies have suggested a decrease in moderate to vigorous physical activity accompanied by an increase in sedentary behaviors as children grow up, and these unfavorable trends were also observed in our study. Nonetheless, the lower involvement in physical activity and higher time in sedentary behavior usually found for girls (Fu et al., 2016; Kann et al., 2018; Telford et al., 2016), was not confirmed in our sample. Probably because all children are in a confinement situation. Usually, in this spectrum of ages, vigorous physical activity needs large spaces to happen and since boys and girls are in a same situation constrained by space, they are restrained to similar behavior.

Acknowledging that these children are taking online school classes, we see an increase of screen time not only to study but also for leisure purposes. This fact can be heavily influenced either by the popularity of social networking, which is the only way to keep in contact with friends during this period, or by other screen time related to playing video games or just watching TV. The increase in these type of sedentary activities is a concern, since these behaviors may be contributing to obesity(Del Carmen Morales-Ruán et al., 2009). Additionally, the home environment may provide more unrestricted access to foods high in fat and sugar compared with the school environment(Moreno et al., 2013), particularly because in Portugal no shortage of food supplies happened so far in this epidemic time. Past research has shown that children who watch TV for more than 3 h a day have a 65% higher chance of being obese compared to children who watch less than 1 h of TV per day(Singh et al., 2008), and that the presence of a TV, computer, or video game device in the child's bedroom increases sedentary behavior(Tandon et al., 2014) not to mention that probably most of them, specially the older ones, have a smartphone (Mascheroni & Ólafsson, 2016; Zilka, 2020). This can explain our results of higher percentage of screen time as ages increase.

From 3 years of age, intellectual activities are the prevalent type of activities reported by parents. The percentage time of these activities in the child's day relative to all reported activities steadily increases with age, and in the two older groups, children spent about 4 hours per day in organized or leisure intellectual activities. These values were not surprising, since children in the older age groups are already in primary school (1st to 6th grade) and many of them had several school tasks to do during confinement, although at this stage of confinement a government organized system of home schooling was not yet in place. Besides school homework activities, the amount of time spent in leisure time intellectual activities is always above 1 hour for all age groups.

Primary school children also show a decline in their play time, when compared to younger age groups. Inversely to intellectual activities, play activities steadily decrease as children grow older, being the most prevalent daily activity in the younger age group but, occupying only a small part of the older age group day.

Although social confinement seems to be a necessary and effective strategy to prevent the human-to-human transmission of the COVID-19, our results confirm that it is detrimental to children's physical activity levels, as suggested by previous opinions (Chen et al., 2020; Wang et al., 2020). Also, we verify that prolonged home stay, in fact leads to an increase in sedentary behaviors, such as spending excessive amounts of time sitting, reclining, or lying down for screening activities (playing games, watching television, using mobile devices); reducing regular physical activity (hence having lower energy expenditure); or engaging in activities that, consequently, lead to an increased health risk (Owen et al., 2010). Our results are only from the first and second week of confinement but probably these routines will change along the weeks of home confinement, both in relation to the type of activities and its duration.

Home stay is a fundamental safety step that can limit infections from spreading widely, but it can contribute to anxiety and depression, which in turn can lead to a sedentary lifestyle known to result in a range of chronic health conditions (Chen et al., 2020). Stressors such as prolonged duration confinement, fears of infection, frustration and boredom, inadequate information, lack of in-person contact with classmates, friends, and teachers, lack of personal space at home, and family financial loss, can result in more problematic and enduring effects on children and adolescents (Brooks et al., 2020), even if sufficient physical activity time is maintained during the social confinement.

Considering that some countries are already experiencing a second wave of Covid-19 infection, leading to a new confinement period, along with the fact that this virus will probably not be the last one linked to zoonotic spillover events (Rodriguez-Morales et al., 2020) (animal origin virus that infect human), and that PA can provide protection from viral infections, especially among vulnerable populations (Laddu et al., 2020), there are important implications in our results to be considered by public health practitioners, researchers, and parents focused on tackling child inactivity in this specific situation. It is necessary to think on fast solutions to protect against sedentarism to minimize the impact of such a confinement in health, which can be implemented in a home environment and with the necessary social isolation.

Home confinement could offer a good opportunity to enhance the interaction between parents and children, involve children in family activities, and improve their self-sufficiency skills (Wang et al., 2020). Children are vulnerable to environmental risks, to their physical and mental health, and their behavior in life span is deeply rooted in early years (Clark et al., 2020), so a great effort is required to address these issues effectively and to avoid long-term consequences in children's life. Parents play an important role as healthy behavior models for children, and we know that more physically active parents bring up more physically active children (Sigmund et al., 2008), so interventions that maintain families together in regular physical activity within their safe home environment can be important for healthy living during the coronavirus crisis or any other in the future.

Increasing active screen time (Tremblay et al., 2017) in which children are encouraged to engage in PA, can be another viable solution. Active video games (AVGs), also called "exergames", are video games that require movement or physical exertion (Kann et al., 2018). Studies have shown that playing AVGs over short periods of time is similar to light-to-moderate physical activities (Biddiss & Irwin, 2010; Wagener et al., 2012). Interventions using a giant exercising board game showed a significant increase in ambulatory PA among nursing home residents (Mouton et al., 2017), so maybe it can be effective in promoting PA among families.

Younger children need their playtime to improve and develop several facets of growing up. Maybe play time can also be used to improve more intense movement involvement. Studies have suggested that story-telling has positive effects in intellectual, social and emotional development (Mokhtar et al., 2011). Also, it has a potential for developing physical as well as narrative aspects, if children 'act out' a story. Combining movement and story-telling interventions enhances

motor competence(Duncan et al., 2019), which is a key contributor to children's physical, cognitive and social development, and provides foundations for healthy living trajectories (Lubans et al., 2010).

Although this study provides important information considering the routines of children during this confinement situation it is important to highlight that it has some limitations. First, it is a cross-sectional study design and thus susceptible to biases. Second, it is a parental report online and not a direct or quantifiable observation of the children's time. We believe that these methodological options were necessary considering the confinement situation we are living.

Along the confinement period we will be (already are) experiencing several different attempts to improve movement time and quality within the households. Social media, YouTube channels, television programs, social influencers, organized groups (e.g. sport clubs, health clubs, universities, government health authorities, , etc.), and many others will be trying to deliver to the families and to children the best of their ideas to help them keep active and healthy throughout the social confinement period. The final consequences of this forced living style will be lived long after the end of the confinement, but a better understanding of the effects will only be possible if a thorough description of this period is possible. With this study we hope to contribute to characterize the children's routines of the social confinement period, but also to offer possible ways for changing the families present situation. The survey will be continued during all the confinement time, offering a full picture of the families' routines on such a period.

In conclusion, this study offers as a first look at the children's routines within the families' households, and its impact in the physical activity time of children living in a social confinement situation. The results suggest that the known general trend of physical activity time decreasing along childhood also happens while children are mandatory confined to their homes where the amount of physical activity is much lower. Although screen time increases along age groups, and a gender effect was detected, with girls being more involved with Play without Physical Activity, and boys with Playful Screen Time, there were no sex differences in Overall Physical Activity.

Overall, this pandemic can have a deleterious effect on the children health by increasing their sedentary behavior and decreasing their levels of physical activity, but the follow up of this situation along the confinement period is warranted to act on this situation in order to change it for the better. Strategies to increase activity during confinement must be specially targeted to the specific age group, and conjoint families' strategies. The tracking of the situation along the weeks to come will allow to evaluate the effect of different physical activity initiatives that are appearing every day in the community and propose how to minimize the impact of this situation in children's health.

Declarations

Compliance with Ethical Standards

The study was approved by the Faculty of Human Kinetics – Lisbon University ethics committee, CEIFMH N.o: 6/2020.

1. Disclosure of potential conflicts of interests

Conflicts of Interests: The authors declare that they have no conflict of interest.

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2. Research involving human participants and/ or animals

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the Helsinki Declaration on Ethical Principles for Medical Research in Human Beings (2013) and the Convention on Human Rights and Biomedicine ("Oviedo Convention", 1997).

3. Informed consent:

Informed consent: All respondents read the information about the study and gave their consent to the conditions by clicking to proceed on the first page of the survey.

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Tables

Table 1. Descriptive statistics and ANOVA results regarding the effect of age, sex and their interaction on groups of activities done by children during the day, as reported by parents.

Variable	Group	Gender	Mean	SD	Two way ANOVA
Intellectual Activity (h)	0-2 years	Boys	.38	.91	Fage (3,2151) = 428.938, p = .000
		Girls	.38	.02	
	3-5 years	Boys	1.05	1.26	Fage*sex (3,2151) = 1.222, p = .300
		Girls	1.02	1.30	
	6-9 years	Boys	2.65	1.74	
		Girls	2.91	1.87	
	10-12 years	Boys	3.50	2.04	
		Girls	3.66	2.10	
Playful Screen Time (h)	0-2 years	Boys	1.37	1.55	Fage (3,2151) = 120.14, p = .000
		Girls	1.30	1.48	
	3-5 years	Boys	2.41	1.38	Fage*sex (3,2151) = 5.51, p = .001
		Girls	2.38	1.42	
	6-9 years	Boys	3.00	1.63	
		Girls	2.41	1.36	
	10-12 years	Boys	3.63	2.13	
		Girls	3.05	1.79	
Play without Physical Activity (h)	0-2 years	Boys	2.06	1.97	Fage (3,2151) = 55.38, p = .000

	Girls	2.03	2.03	Fsex (1,2151) = 17.52, p = .000
3-5 years	Boys	2.82	1.59	
	Girls	3.26	1.65	Fage*sex (3,2151) = 2.56, p =.054
6-9 years	Boys	2.31	1.38	
	Girls	2.60	1.42	
10-12 years	Boys	1.64	1.33	
	Girls	2.17	1.46	

Play with Physical Activity (h)	0-2 years	Boys	1.45	1.47	Fage (3,2151) =29.18, p = .000
		Girls	1.31	1.51	
	3-5 years	Boys	1.66	1.23	Fsex (1,2151) = 2.75, p = .098
		Girls	1.51	1.17	
	6-9 years	Boys	1.27	1.05	Fage*sex (3,2151) = .39, p =.761
		Girls	1.24	.93	
	10-12 years	Boys	.89	.90	
		Girls	.86	.90	

Physical Activity (h)	0-2 years	Boys	.76	1.10	Fage (3,2151) =10.929, p = .000
		Girls	.62	.95	
	3-5 years	Boys	.99	1.10	Fsex (1,2151) = .819, p = .365
					Fage*sex (3,2151) = .594, p =.619

	Girls	.95	.96
6-9 years	Boys	1.07	1.10
	Girls	1.03	1.09
10-12 years	Boys	.90	.98
	Girls	.95	1.14

Figures

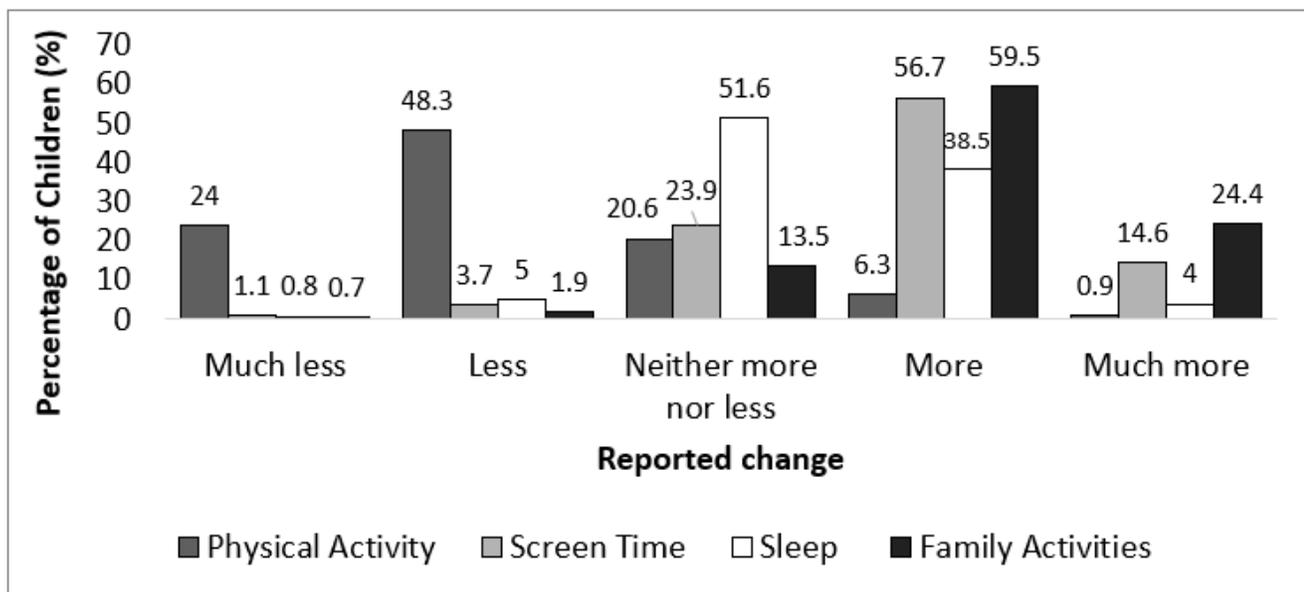


Figure 1

Changes in time that children spent doing different activities during social confinement when compared to previous school time (reported by parents).

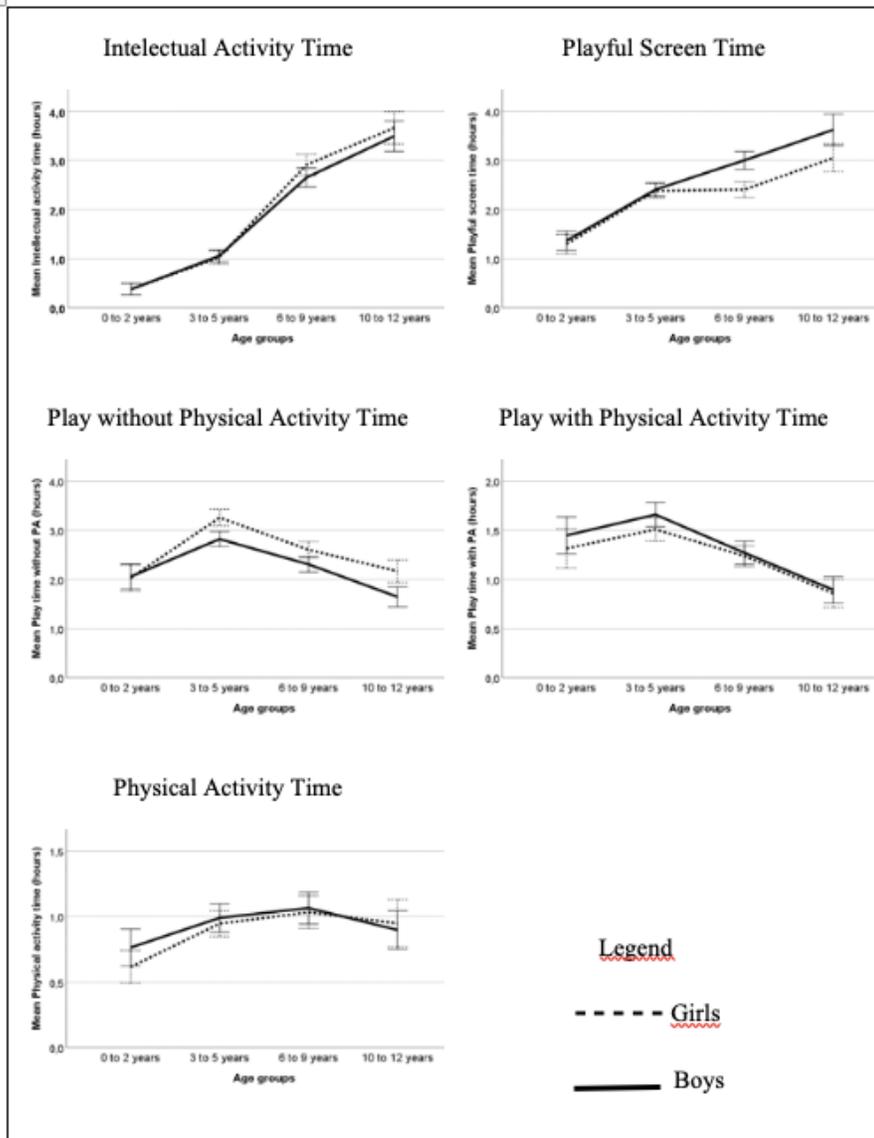


Figure 2

Children’s average time (hours) as reported by parents, in different activities during social confinement according to sex and age groups. Error bars represent 95% CI.

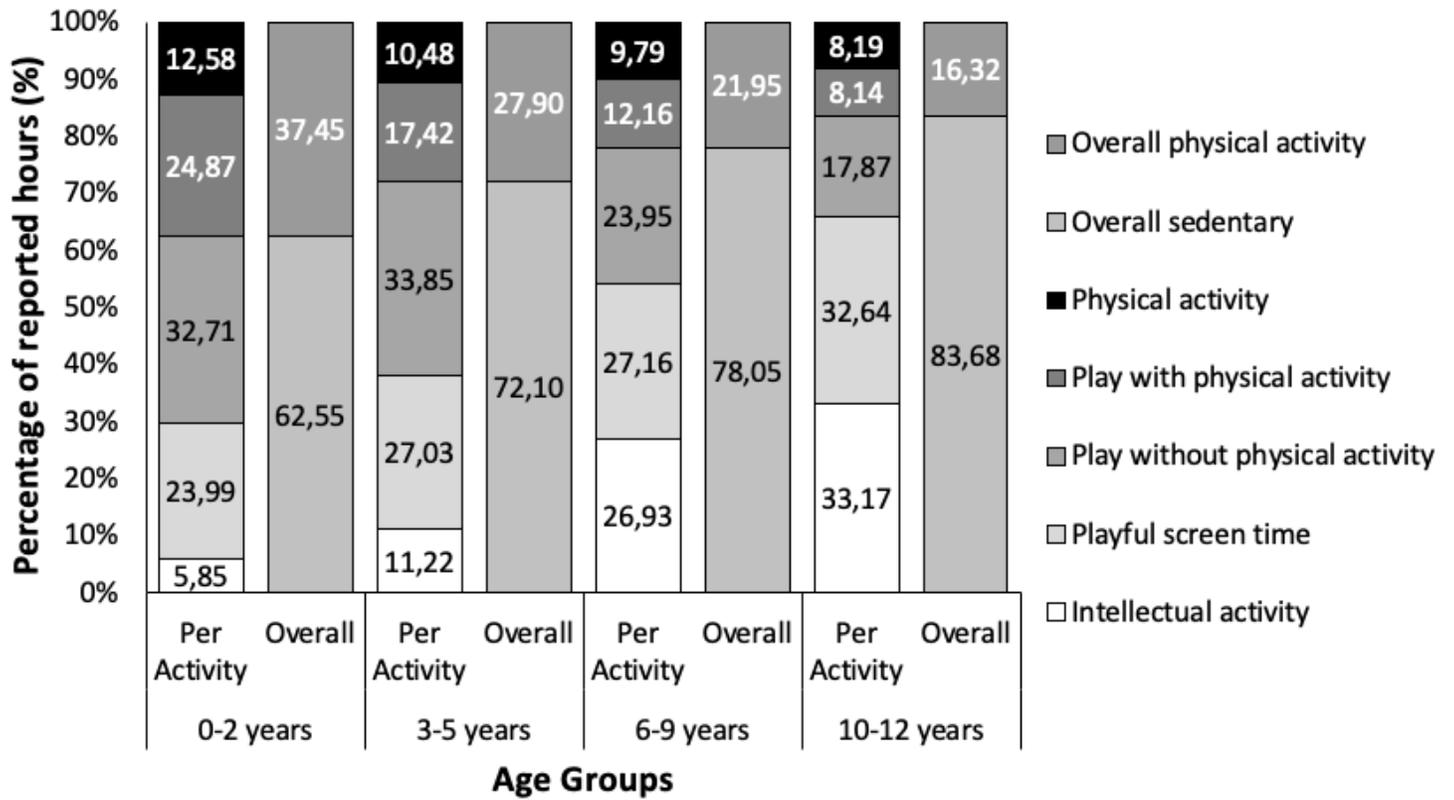


Figure 3

Mean percentage of time that children spent doing different activities, and overall physical activity and sedentary time, as reported by parents.