# Changes in lifestyle behaviors during the COVID-19 confinement in Spanish children: A longitudinal analysis from the MUGI project

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20 **Abbreviations**

21 20-m SRT: 20-meters shuttle run test

22 ANCOVA: analysis of covariance

23 BMI: body mass index

24 FAS: family affluence scale

25 KIDMED: the Mediterranean diet quality index for children and teenagers

26 OW/OB: overweight/obesity

27 PA: physical activity

28 SES: socioeconomic status

29 SPSS: statistical package for social sciences

30 TV: television

31 WHO: world health organization

32 YAP: youth activity profile questionnaire.

33

## ABSTRACT

### Background

Home confinement during the COVID-19 pandemic could have affected lifestyle behaviors of children, however evidence about it is emerging and yet scarce.

### Objectives

To examine the effects of the COVID-19 confinement on lifestyle behaviors in Spanish children, and to assess the influence of social vulnerabilities on changes in lifestyle behaviors.

### Methods

Physical activity (PA), screen time, sleep time, adherence to the Mediterranean diet (KIDMED) and sociodemographic information were longitudinally assessed before (N=291, 12.1±2.4 yr., 47.8% girls) and during the COVID-19 confinement (N=113, 12.0±2.6 yr., 48.7% girls) by online questionnaires.

### Results

During the COVID-19 confinement, PA (-91±55 min/day, P<0.001) and screen time (±2.6 h/day, P<0.001) worsened, whereas the KIDMED score improved (0.5±2.2 points, P<0.02). The decrease of PA was higher in children with mother of non-Spanish origin (-1.8±0.2 *vs*. -1.5±0.1 h/day, P<0.04) or with non-university studies (-1.7±0.1 *vs*. -1.3±0.1 h/day, P<0.005) in comparison to their counterparts.

### Conclusion

This study evidence the negative impact of the COVID-19 confinement on PA levels and sedentary behaviours of Spanish children. These findings should be taken into account to design and implement public health strategies for preserving children´s health during and after the pandemic, particularly, in children with social vulnerabilities.

## INTRODUCTION

The COVID-19 outbreak began in China in December 2019 and was rapidly spread globally.[1] On the 11th of March 2020, the World Health Organization (WHO) declared the COVID-19 as global pandemic.[1] Many governments adopted emergency measures to prevent further transmission of the infection.[2] In Spain, one of the most affected countries, the government decreed on 14th March 2020 one of the most strict alarm state, closuring schools and establishing mandatory home confinement for children (6 weeks of total locked down, where children were not allowed to leave their house at all, from 14th March to 26th April).[3] By the end of March, more than 150 million of youths all over the world were affected by these measures.[4] The measures adopted during the COVID-19 pandemic may strongly impact lifestyle behaviors and physical and mental health of children.[2,5] Previous studies assessed the impact of natural disasters on lifestyle and psychological health in children.[6,7] For example, after the earthquake and tsunami in 2011 in Japan, physical activity (PA) significantly decreased among children over the 3 years following the disaster.[6] In 2013, Sprand and Silam[7] showed that the prevalence of post-traumatic stress disorders were 4 times higher in those children that followed a confinement than in their non-confined peers. On the other hand, children are less active and more sedentary on unstructured days than on school days.[8] Daily PA of children is derived from active commuting to schools, recess, physical education classes, organized sports, games, or free play at parks and playgrounds.[5] However, these opportunities for movement have been restricted during the COVID-19 pandemic period.[5] Since emergency measures were adopted, many efforts have been invested in analyzing the effect of COVID-19 pandemic on lifestyle behaviors all over the world.[9–13] However, to date in Spain, and to the best of our knowledge, there is only one study examining the effects of COVID-19 pandemic on lifestyle behaviors (dietary habits) in adults,[14] but none is yet available in children. The

84 knowledge of its effects on lifestyle behaviors, especially from those countries with
85 severe home confinement such as Spain, would be of prime interest for future pandemic
86 strategies.
87 It is noteworthy that healthy lifestyles enhance the immune system,[15] reduce the risk for
88 respiratory infections[16] and inflammation,[17] and are effective in the prevention of many
89 chronic conditions that increase the risk of severe COVID-19 infection.[18] In addition, PA
90 enhances the efficacy of vaccines,[19] and is beneficial for anxiety and depression in
91 stressful situations.[20,21]Therefore, to maintain healthy lifestyles continues to be of vital
92 importance, or even further, during the confinement and its subsequent phases. However,
93 already in non-pandemic circumstances, more than 80% of children around the world
94 were inactive,[22] more than 60% did not meet screen time guidelines,[23] and nearly a half
95 have a scarce adherence to the Mediterranean diet;[24] figures that could worsen because of
96 the COVID-19 pandemic, further negatively affecting children´s current and future
97 health.
98 The effects of the COVID-19 confinement may be stronger in children with social
99 vulnerabilities.[5,25,26] They usually live in small houses where the physical distancing is
100 unfeasible,[5] and their lack of indoor space to move, sports equipment, or Internet access
101 substantially hinders the performance of PA at home.[26] A better understating of the effects
102 of the confinement on lifestyle behaviors, as well as the identification of social
103 vulnerabilities may help to develop suitable strategies as part of the pandemic responses.
104 The hypothesis of this study is that the measures adopted during the COVID-19 pandemic
105 may have negatively affected lifestyle behaviors of children in Spain, and especially in
106 those most socially vulnerable children population.
107 Therefore, the objectives of the current study were: 1) to examine the effects of the
108 COVID-19 confinement on lifestyle behaviors in a longitudinal cohort of Spanish

children, and 2) to assess the influence of social vulnerabilities on changes in lifestyle behaviors.

## METHODS

### Study design and participants

The current study was conducted in the cohort of children of the MUGI project. The MUGI project is a longitudinal cohort study, which aim to evaluate PA levels and other lifestyle behaviors of a representative study of the schoolers of Navarra (North of Spain) aged 8 to 16 years and their trajectories over time. For the present purpose, baseline data from the MUGI project (henceforth "before the confinement", September-December 2019) and from the second evaluation, during COVID-19 confinement (henceforth "during the confinement", March-April 2020), were included in the study. The Ethics Committee of the Public University of Navarra approved the study protocol (PI-022/19), which complies with the ethical guidelines of the Declaration of Helsinki (2013 revision). Before the enrolment in the study, all parents/legal guardians were informed about the purpose of the study and signed an informed consent.

*Sample size and school's selection*

Sample size calculation of the MUGI project was conducted before the beginning of the MUGI project (September 2019), based on the prevalence of non-adherence to PA recommendations of at least 60 minutes per day of moderate-to-vigorous PA.[27] According to previously published data, we assumed 50% non-adherence among Spanish children and adolescents. Based on this assumption and our previous data on a participation rate of 75%, a total of 240 participants were needed, 120 in each age group (primary school: 8-11 years, and secondary school: 12-16 years) to achieve a statistical power of ≥80%.

Randomization was performed by a four-stage sampling procedure. To obtain a sample of 240 children/adolescents, assuming a mean of 18-20 pupils per classroom, 16 participating classrooms were required: 8 from primary schools (grades 3-6) and 8 from secondary schools (levels 1-4). In a second step, 16 schools were randomized taking into account the proportionality of schools of the three regions of Navarra (23% in the North, 56% in the Middle region, and 58% in the Ribera of Navarra), and the type of schools (78% public, 21% state funded, and 1% private). In a third step, scholar-year per school was randomized. In the fourth step, a classroom for each scholar-year was randomly selected.

The selected educational centers received an invitation letter to participate in the MUGI project (September 2019). Once the head teacher accepted to participate, families and schoolers were invited to participate in the study. When an educational center refused to participate, it was randomly replaced by another with the same characteristics.

*Inclusion and exclusion criteria*

Children and adolescents who were enrolled in a participating school were eligible for inclusion. Pupils with an intellectual or a physical disability that prevents response to the lifestyle questionnaires were initially excluded from the MUGI project.

**Measurements**

*First evaluation: before the confinement*

Social vulnerabilities were evaluated by using questionnaires to collect: 1) the country of origin of the mother, 2) socioeconomic status (SES) using the Family Affluence Scale (FAS), and 3) maternal educational level (university *vs*. non-universities studies).[28]

Height (SECA 217), weight (SECA 899), body composition (TANITA, SC-240MA), and waist circumference (SECA 201) were measured in duplicate using standard protocols.

156 Then, body mass index (BMI) was calculated as body mass (kg)/height ($m^2$), and children
157 weight status was categorized according to the cut-off points established by the World
158 Obesity Federation.[29]

159 Physical fitness components were assessed by the Alpha-fitness tests (20-meter shuttle
160 run test, handgrip, and standing broad jump), which were reliable and valid for this group
161 of age.[30] Thereafter, children were classified as unfit for each fitness test if they achieved
162 a result below the test according to the sex- and age-specific $20^{th}$ centile created by
163 Tomkinson et al.[31]

164 PA and screen time during leisure were assessed by "The Youth Activity Profile"
165 questionnaire (YAP).[32] Children were classified as inactive[33] if they did not meet the
166 international guidelines[27] by wrist-worn accelerometer (ActiGraph, Pensacola, FL). Sleep
167 time was calculated on the basis of wake-up time and bedtime from the daily log of each
168 child.

169 The adherence to the Mediterranean dietary pattern was assessed using the Mediterranean
170 Diet Quality Index for children and teenagers (KIDMED) questionnaire.[34] Children were
171 classified as having low adherence to the Mediterranean diet when they achieved a score
172 <8 out of a total of 12 points.

173 Parents filled the printed or online socioeconomic and demographic questionnaires at
174 home. Questionnaires on lifestyle data were filled online at school by the children.
175 Trained researchers collected anthropometric and physical fitness measurements at
176 schools.

177 *Second evaluation: during confinement*

178 At the end of March 2020, and after the confinement measurements were decreed by the
179 Spanish Government, all the families and schoolers of the MUGI project were contacted
180 by e-mail or telephone, and invited to participate in a second evaluation.
181 Due to the extraordinary confinement circumstances, some of the measurements of the
182 first/baseline evaluation were not possible to been assessed in this second evaluation (i.e.
183 accelerometry, physical fitness, anthropometry), and some of the lifestyle questionnaires
184 needed to been adapted (**Table S1**). Specific questions (space for movement at home,
185 exercise tools, and company, screen access, cooking interest, etc.) were included in the
186 questionnaire in order to know their lifestyle conditions during the confinement period
187 (**Table S1**). Children filled the online lifestyle questionnaires of this second evaluation at
188 home.

189 **Statistical analysis**

190 The data are presented as means ± standard deviations or absolute and relative prevalence
191 (N, %), unless otherwise was indicated. Differences in the baseline characteristics
192 between children that only participated in the baseline/first assessment and those who
193 participated in both first and second evaluations were examined by independent *t* test
194 (continuous variables) or chi-square test (categorical variables). Differences between
195 primary or secondary school children were analyzed by independent *t* test (continuous
196 variables) or chi-square (categorical variables). Among those children that participated in
197 both first and second evaluations, differences in lifestyle habits before and during the
198 confinement were assessed by dependent *t* test (continuous variables).

199 Analysis of covariance (ANCOVA) was employed to evaluate the differences on changes
200 in PA, screen time, and dietary pattern between school grades (primary *vs*. secondary
201 schools), sex, weight status (non-overweight *vs.* overweight/obesity), country of origin of
202 the mother (Spanish *vs.* non-Spanish), SES (low/medium *vs.* high SES), maternal

203 educational level (university *vs.* non-university), or specific lifestyle conditions
204 categories. Age, sex, and baseline values were included into the model as covariates.

205 All the analyses were performed using the Statistical Package for Social Sciences (SPSS,
206 version 23.0; SPSS Inc, Chicago), and the level of significance was set at $\alpha = 0.05$.

207 **RESULTS**

208 **Figure S1** shows the flow diagram of the participants of the MUGI project in the
209 baseline/first assessment (before the confinement) and in the second evaluation (during
210 the confinement). A total of 291 children (12.1±2.4 yr. at baseline, 47.8% girls) were
211 included in the MUGI project and assessed in the baseline evaluation. During the
212 confinement, 113 children from the whole sample agreed to participate in the second
213 evaluation, and completed the online questionnaire (39% participation rate; 12.0±2.6 yr.
214 at baseline, 48.7% girls). Missing data and its reasons are detailed in Figure S1.

215 **Description of the sample before the COVID-19 confinement**

216 **Table 1** shows the baseline descriptive characteristics before the confinement of the
217 whole sample of the MUGI project (N=291), as well as the differences in baseline
218 characteristics between children that only participated in the first evaluation (N=178) and
219 children that participated in both the first and the second evaluation (N=113). Before the
220 confinement, 20.8% of the whole sample had overweight and 3.5% obesity, 60% were
221 inactive, 61% used screens ≥2 h/day, >70% did not meet the sleep recommendations, and
222 77.1% had a low adherence to the Mediterranean diet (Table 1). There were some
223 differences between children who participated in the two evaluations of the study, and
224 children that did not participate in the second one. Those children that did not participate
225 in the second evaluation had higher baseline BMI and waist circumference, and were less
226 fit and active than those who did it (P<0.05, Table 1).

227 **Figures S2 and S3** show the differences in baseline lifestye habits between
228 sociodemographics categories in the whole sample of the MUGI project. Briefly, boys
229 did more PA, but spent more time using screens than girls (P<0.005), and children of
230 primary school did more PA than those children of secondary school (P<0.05).

231 **Lifestyle changes during the COVID-19 confinement**

232 **Table 2** shows the differences in lifestyle behaviors between before and during the
233 COVID-19 confinement. During the confinement, total PA decreased (-91±55 min/day,
234 P<0.001, Table 2), while the screen time increased (1.9±2.6 h/day, P<0.001) compared
235 to the baseline situation. The prevalence of children who used screens ≥2 hours/day
236 increased from 66.0% to 87.7% (P<0.001, Table 2). Differences in home and family
237 characteristics related to PA and sedentary behaviors between primary and secondary
238 school children during the confinement are shown in **Table S2**.

239 Children increased sleeping time within both week and weekend days (0.8±1.1 h/day, and
240 0.7±1.6 h/day, respectively, P<0.001, Table 2).

241 The KIDMED score improved 0.5±2.2 points during the confinement (P<0.02, Table 2),
242 although the prevalence of children with low adherence to the Mediterranean diet did not
243 significantly change (P>0.5, Table 2). Answers for each KIDMED questions, as well as
244 to other questions such as the number of meals, cooking interest, and snacks consumption
245 during the confinement are detailed in **Table S3** and **S4**, respectively.

246 The prevalence of children that worsened their lifestyle behaviors during the COVID-19
247 confinement were 95.2% for PA, 69.8% for screen time, and 31.4% for the adherence to
248 the Mediterranean diet, respectively.

249 **Figure 1** depicts the changes in PA, screen time, and adherence to the Mediterranean diet
250 according to school grade, sex, and weight status. During the confinement, boys increased

more screen time than girls (2.3±0.3 h/day *vs*. 1.3±0.3 h/day, for boys and girls, respectively; P<0.03, Figure 1A), whereas there were no differences in changes on PA or KIDMED score by sex (both P>0.5, Figure 1A). No significant differences were found on changes in lifestyle behaviors between primary and secondary schools (all P>0.05, Figure 1B), or between weight status categories (all P>0.05, Figure 1C).

**Figure 2** depicts the changes in PA, screen time, and adherence to the Mediterranean diet according to socioeconomic factors. Those children with mothers of non-Spanish origin decreased more their PA levels (-1.8±0.2 h/day *vs.* -1.5±0.1 h/day, P<0.04), but increased more the adherence to the Mediterranean diet (2.0±0.4 *vs*. 0.4±0.2, P<0.05) in comparison to those children whose mother was born in Spain (Figure 2A). Children with mothers with non-university studies showed a higher decrease in PA during the confinement (-1.7±0.1 h/day *vs*. -1.3±0.1 h/day, P<0.005, Figure 2C) compared to their peers with mothers with university studies.

Children with outside space at home or others big spaces (garage, attic, or gym) decreased significantly less their PA levels than their peers without them (-1.4±0.1 h/day *vs*. -1.7±0.1 h/day, P<0.01, **Figure 3A**). Children with TV in their bedroom increased significantly more screen time than those without it (3.1±0.6 h/day *vs*. 1.7±0.2, P<0.03, Figure 3B). Only those children who showed interest for cooking during the confinement increased the KIDMED score during this period (0.7±0.2 *vs*. -0.1±0.3, P<0.02, Figure 3C).

## DISCUSSION

The present study examines, to the best of our knowledge, for the first time the effect of COVID-19 pandemic home confinement on PA, sedentary behavior, sleep time, and adherence to the Mediterranean diet in Spanish children. The main findings of this work are: 1) Spanish children decreased their physical levels and increased the time spent on

screens during the confinement, and 2) lifestyle deterioration was greater in children belonging from families of non-Spanish origin or low educational level with social vulnerabilities. These results highlight the importance of developing, promoting and implementing healthy lifestyle behaviors strategies and interventions for children in order to preserve their health during and thereupon the COVID-19 confinement.

Before the confinement, 60% of school children did not meet the PA recommendations and used screens ≥2 h/day, and more than 75% had a low adherence to the Mediterranean diet. Our results are in concordance with those from the PASOS study,[35] where the authors observed that 63.6% of the children were inactive, and that 54.5% and 79.3% exceeded screen time recommendations in week and weekend days, respectively. They also reported that 60% of them had a medium/low adherence to the Mediterranean diet.[35] These worrying results alert for the unhealthy lifestyle behaviors that the Spanish school children already had before the confinement. In fact, physical inactivity and sedentarism were already global pandemics (with approximately 3.1 million of deaths per year) before the COVID-19, needing a call to global action.[36,37]

However, this situation has even worsened during the COVID-19 confinement. Our results shed the light on future consequences for children´s health due to strict confinement, showing a significant change of PA levels (-91 min/day) and screen time (+1.8 h/day) during the COVID-19 confinement. The few studies published to date examining the effect of COVID-19 pandemic on lifestyle behaviors are in line to our results.[2,9–14] Xiang et al.[2] reported a decrease of 435 min/week of PA and an increment of 4.7 h/week of total screen leisure time in a sample of 2426 Chinese youths. Similarly, in a sample of 41 children with obesity in Italy (3 weeks of lockdown), they have also found a decrease of sport activities (2.30±4.60 h/week), and an increment on time spent with screens (4.85±2.40 h/day).[9] Two studies have reported that the level of restriction of the

confinement (total, partial or no confinement) influenced the magnitude of the decrease of PA.[11,38] These results should be taken into consideration because of the metabolic impacts that the worsened of lifestyle habits will likely entail during and after the COVID-19 pandemic.[39]

Regarding dietary behaviors, we observed that the KIDMED score increased during the confinement, although the prevalence of children with a high adherence to the Mediterranean diet was not significantly improved. This result could be explained due to the fact that the number of children that scored positively in some of the KIDMED items (i.e. legumes or olive oil consumption) increased during the confinement; however, this score increment was not enough for reaching a KIDMED total score of at least 8 points (cut-point for a medium-high adherence for the Mediterranean diet) in many of these children. Pietrobelli et al.[9] reported that some diet behaviors improved (i.e., fruit intake), whereas others worsened (i.e. sugar-sweetened beverages consumption) in Italian children during the confinement. In line with our results, a study in 1036 Spanish adults reported that dietary habits improved during the confinement.[14] The improvement in dietary habits during the confinement may have been due to an increment in the time and interest for cooking. More research about the impact of COVID-19 on childhood lifestyle behaviors are needed to understand the side effects and health implications of the pandemic and to act in consequence.

Social factors influenced the lifestyle changes during the confinement. Children from families with a maternal foreign origins and lower studies were those than more decreased their PA levels. As the maternal level of the studies did not affect PA levels before the confinement, it could have played a specific role during the confinement behavior changes. Likewise, other specific lifestyle conditions such as having outdoor or big spaces for movement at home, not having a TV in the bedroom, or showing an interest in cooking

during the confinement seem to partly mitigate the deleterious effects of confinement on children lifestyle behaviors. Socioeconomic factors are lifestyle determinants of non-pandemic conditions; however, to our knowledge this is the first study examining the potential role of these factors on COVID-19 confinement related lifestyle changes in children. Our results showed that the COVID-19 pandemic has affected more negatively families with social vulnerabilities, and therefore, more attention should be devoted to these social groups.

Previous literature suggested that the COVID-19 confinement may have adverse consequences on physical and psychological health in children. In particular, the confinement may be associated with increased total and abdominal fat or insulin resistance levels[39].[25] Additionally, it has been shown that lifestyle changes during less structured days (i.e. out of school periods such as weekend and holidays) result in weight gain in children.[40] Therefore, these 6 weeks of total lockdown and the subsequent "new normality" conditions might influence in long-term weight management, and in children physical and psychological health. Clinical and political measurements should be developed to palliate this COVID-19 pandemic adverse consequences for children health.

For the time being, some recommendations for different target groups (i.e. health professional, parents, educators, governments, media, general population) have been proposed for promoting healthy lifestyle behaviors trying to palliate its anticipated deleterious consequences due to the confinement.[5,26,41,42] Some insights provided for clinicians were to have a comprehensive knowledge of the COVID-19, and current guidelines on lifestyle patterns to recommend them to the parents or caregivers, as well as to children in face-to-face or virtual meetings.[5] Nevertheless, to date, environmental and family-based interventions for the management of lifestyle changes and health consequences of the COVID-19 pandemic have not been developed yet. Since these kind

351 of interventions have been proved as effective strategies for improving lifestyle
352 behaviors,[43,44] obesity,[45] and other health complications[46,47] in non-pandemic
353 circumstances, the development and implementation of similar and adapted interventions
354 are needed in order to mitigate the negative effects of the COVID-19 confinement on
355 children lifestyles and health.

356 This study has some limitations and strengths. Firstly, from the whole study sample of
357 the MUGI project, only the 39% participated in the second evaluation of the study during
358 the confinement. Children from lower socioeconomic status and with higher BMI and
359 waist circumference were those with a lower participation in the second evaluation of the
360 study. These responsiveness differences may be due to the digital character of both the
361 questionnaire and contact procedure with the family. Seasonal lifestyle differences
362 between the two measurements time-points (before confinement in autumn and winter *vs*.
363 during the confinement in spring) may be considered as a possible limitation. However,
364 it was been expected that, without confinement, children would have been more active in
365 spring than in winter,[48,49] which was the opposite that happened during the confinement.
366 Other study limitations are that some validated questionnaires (i.e. the YAP
367 questionnaire) had to be modified in order to adapt them to the extraordinary
368 circumstances. Measurement tools should be developed and validated to measure PA
369 during the pandemic.[26] Finally, some potential confounding factors, such as energy and
370 nutrient intake, psychological factors, pubertal status or changes in adiposity during the
371 confinement, were not measured in the present study. Thus, the results of this study could
372 have been even worse, and should be taken with caution. The main strengths of the present
373 work are that the two measurements were conducted in a short period of time (avoiding
374 or mitigating the effect of other potential reasons for lifestyle changes), that the study was
375 conducted during the most critical period of the Spanish lockdown, and that this is one of

the first studies that have analyzed the impact of the COVID-19 confinement on children lifestyle behaviors and could help to provide some guidance for future public strategies and measures. It is important to note that the results of the present work confirm the results of previous literature. Although the participation rate (39%) was not very high in the second evaluation (during the COVID-19 confinement), it is important to underline that the data of the study derived from a representative cohort study of school children of Navarra.

In conclusion, our findings evidence the negative effects of the COVID-19 confinement on PA levels and sedentary behaviors of Spanish children and adolescents. Safe and accessible healthy lifestyle strategies should be developed and implemented by governments, medias, parents, and teachers as part of the pandemic responses for preserving children´s health; in particular for the most socially vulnerable children population.

## Conflict of interest statement

The authors have no conflicts of interest relevant to this article to disclose. The founding sponsors had no role in the design of the study, in the collection, analyses, or interpretation of data, in the writing of the manuscript, and in the decision to publish the results.

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M.M. analyzed the data, generated figures and takes full responsibility for the integrity of the data. M.M. and C.C.-S. drafted the manuscript. M.M., M.O., L.A., and M.A. collected the data. I.L. designed the study, coordinated, and supervised data collection. All authors participated in the interpretation of the results, critically revised the manuscript for important intellectual content, and approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

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**Table 1.** Characteristics of the whole sample of children participating in the MUGI project at baseline (first evaluation, before the confinement), and differences in baseline characteristics between children that participated or not in the second evaluation.

| | Whole sample at baseline | | Children not participating in the second evaluation | | Children that participated in the second evaluation | | |
|---|---|---|---|---|---|---|---|
| | N | Mean (SD) | N | Mean (SD) | N | Mean (SD) | P* |
| Age (years) | 290 | 12.1 (2.9) | 178 | 12.2 (2.3) | 112 | 12.0 (2.6) | 0.472 |
| Girls (N, %) | 291 | 139, 47.8 | 178 | 84, 47.2 | 113 | 55, 48.7 | 0.805 |
| Primary (N, %) | 291 | 140, 48.3 | 178 | 81, 45.5 | 113 | 59, 52.2 | 0.264 |
| Public School (N, %) | 291 | 169, 58.3 | 178 | 93, 52.2 | 113 | 76, 67.3 | **0.011** |
| Non-Spanish origin of the mother (N, %) | 286 | 55, 19.2 | 175 | 38, 21.7 | 112 | 17, 15.2 | 0.170 |
| Low/Medium socioeconomic status (FAS) (N, %) | 289 | 191, 66.1 | 177 | 125, 70.6 | 113 | 67, 59.3 | **0.047** |
| Mother with university studies (N, %) | 283 | 133, 47.0 | 172 | 79, 45.9 | 112 | 54, 48.2 | 0.706 |
| **Body composition** | | | | | | | |
| Weight (kg) | 284 | 45.3 (13.1) | 174 | 46.3 (12.8) | 110 | 43.8 (13.5) | 0.119 |
| Height (cm) | 284 | 151 (15) | 174 | 152 (14) | 110 | 150 (15) | 0.277 |
| BMI (kg/m$^2$) | 284 | 19.4 (3.0) | 174 | 19.7 (3.0) | 110 | 19.0 (3.0) | **0.049** |
| BMI categories (N, %) | 284 | | 174 | | 110 | | |
| Underweight | | 15, 5.3 | | 9, 5.2 | | 6, 5.5 | 0.244 |
| Normal weight | | 200, 70.4 | | 118, 67.8 | | 82, 74.5 | |
| Overweight | | 59, 20.8 | | 38, 21.8 | | 21, 19.1 | |
| Obesity | | 10, 3.5 | | 9, 5.2 | | 1, 0.9 | |
| Fat mass (%) | 284 | 20.1 (7.5) | 174 | 20.5 (7.9) | 110 | 19.4 (7.0) | 0.206 |
| Waist circumference (cm) | 284 | 63.3 (7.4) | 174 | 64.2 (7.8) | 110 | 61.8 (6.6) | **0.006** |
| **Physical fitness** | | | | | | | |
| 20m-SRT (laps) | 284 | 51 (26) | 175 | 49 (27) | 109 | 54 (25) | 0.118 |
| Handgrip (kg) | 289 | 23 (8) | 178 | 23 (8) | 111 | 22 (8) | 0.710 |
| Standing broad jump (cm) | 289 | 149 (32) | 178 | 147 (33) | 111 | 152 (30) | 0.244 |
| Unfit (20m-SRT) (N, %) | 284 | 25, 8.8 | 175 | 21, 12.0 | 109 | 4, 3.7 | **0.011** |
| Unfit (handgrip) (N, %) | 289 | 48, 16.6 | 178 | 34, 19.1 | 111 | 14, 12.6 | 0.099 |
| Unfit (standing broad jump) (N, %) | 289 | 64, 22.1 | 178 | 46, 25.8 | 111 | 18, 16.2 | **0.037** |
| **Physical activity (min/day)** | 280 | 151 (39) | 173 | 150 (38) | 107 | 154 (40) | 0.427 |
| Children no meeting PA recommendations (<7 days with 60 min/MVPA/day) (N, %) | 224 | 134, 60 | 135 | 89, 66 | 89 | 45, 51 | **0.022** |
| **Sedentary behaviors** | | | | | | | |
| Screen time (h/day) | 280 | 4.4 (2.5) | 173 | 4.5 (2.6) | 107 | 4.3 (2.4) | 0.583 |
| Non-meeting screen time recommendations (≥2h/day) (N, %) | 280 | 172, 61 | 173 | 102, 59 | 107 | 70, 63.6 | 0.280 |
| **Sleep habits** | | | | | | | |
| Sleep time (h/day) | | | | | | | |
| Week days | 280 | 9.1 (1.0) | 170 | 9.0 (1.0) | 110 | 9.1 (0.9) | 0.431 |
| Weekend days | 280 | 9.6 (1.2) | 167 | 9.7 (1.2) | 109 | 9.4 (1.1) | **0.035** |
| Non-meeting sleep recommendations (<8 or >9 h/day) (N, %) | | | | | | | |
| Week days | 279 | 197, 70.6 | 170 | 118, 69.4 | 109 | 79, 71.8 | 0.583 |
| Weekend days | 279 | 221, 79.2 | 167 | 136, 81.4 | 109 | 85, 77.3 | 0.482 |
| **KIDMED score** | 280 | 5.9 (2.0) | 173 | 5.9 (2.1) | 107 | 5.9 (1.8) | 0.950 |
| Low adherence to the Mediterranean diet (KIDMED score < 8) (N, %) | 280 | 216, 77.1 | 173 | 129, 74.6 | 107 | 87, 79.1 | 0.192 |

**Table 2.** Changes in lifestyle habits before (baseline evaluation) and during the COVID-19 confinement (second evaluation) in those children participating in the two evaluations (N=113).

| | **Before the confinement** | | **During the confinement** | | |
|---|---|---|---|---|---|
| | N | Mean (SD) | N | Mean (SD) | P* |
| **Physical activity (min/day)** | 106 | 154 (40) | 106 | 63 (39) | **<0.001** |
| **Sedentary behaviors** | | | | | |
| Screen time (h/day) | 106 | 4.3 (2.4) | 106 | 6.1 (2.4) | **<0.001** |
| TV time ≥2h/day (N, %) | 106 | 3, 2.8 | 106 | 14, 13.2 | **0.005** |
| Videogames time ≥2h/day (N, %) | 106 | 6, 5.7 | 106 | 7, 6.6 | 0.775 |
| Computer (no homework) ≥2h/day (N, %) | 106 | 1, 0.9 | 106 | 0, 0.0 | 0.316 |
| Total mobile-phone ≥2h/day (N, %) | 106 | 4, 3.8 | 106 | 20, 18.9 | **0.001** |
| Total screen time ≥2h/day (N, %) | 106 | 70, 66.0 | 106 | 93, 87.7 | **<0.001** |
| **Sleep habits** | | | | | |
| Sleep time (h/day) | | | | | |
| Weekdays | 110 | 9.1 (0.9) | 110 | 9.9 (1.2) | **<0.001** |
| Weekend days | 109 | 9.4 (1.1) | 109 | 10.1 (1.6) | **<0.001** |
| Non-meeting sleep recommendations (<8 or >9 h/day) (N, %) | | | | | |
| Weekdays | 108 | 78, 72.2 | 108 | 96, 88.9 | **0.002** |
| Weekend days | 108 | 85, 78.7 | 108 | 102, 94.4 | **0.001** |
| **KIDMED Score** | 106 | 5.9 (1.8) | 106 | 6.4 (1.5) | **0.018** |
| Low adherence to the Mediterranean diet (KIDMED score < 8) (N, %) | 106 | 86, 81.1 | 106 | 81, 76.4 | 0.476 |

## Table and figure legends

**Table 1:** *Abbreviations*: BMI: body mass index; FAS: Family Affluence Scale; KIDMED: the Mediterranean Diet Quality Index for children and teenagers test; PA: physical activity; SRT: shuttle run test. Values are means (standard deviation) unless otherwise indicated. P*: differences between children who participated or not in the second evaluation (independent t test for continuous variables or Chi squared test for categorical variables). Boldfaced values: P<0.05.

**Table 2**: *Abbreviations*: KIDMED: the Mediterranean Diet Quality Index for children and teenagers test; TV: television. Values are means (standard deviation) unless otherwise indicated. P*: differences in lifestyle outcomes before and during the confinement in children who participated in the second evaluation (t test for continues variables and Chi squared test for categorical variables). Boldfaced values: P<0.05.

**Figure 1.** Changes (Δ) on PA, screen time, and KIDMED Score according to school grade, sex, and weight status in children. Differences in changes were examined by adjusting with age, sex (except for the sex category), and baseline values.

*Abbreviations*: KIDMED: the Mediterranean Diet Quality Index for children and teenagers; OW/OB: overweight/obesity.

**Figure 2.** Changes (Δ) on PA, screen time, and KIDMED Score according to sociodemographic variables: origin of the mother (A), economic status (B), or maternal education (C). Differences in changes were examined by adjusting with age, sex, and baseline values.

*Abbreviations*: KIDMED: the Mediterranean Diet Quality Index for children and teenagers.

**Figure 3.** Changes (Δ) on PA (A), screen time (B), and KIDMED Score (C) according to specific lifestyle conditions during the confinement. Differences in changes were examined by adjusting with age, sex, and baseline values of the dependent variables.

*Abbreviations*: KIDMED: the Mediterranean Diet Quality Index for children and teenagers; TV: television.