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VARIATIONS IN AIM AND CATCH VALUES IN 11- AND 12-YEAR-OLD CHILDREN IN NORTHERN SPAIN DURING SARS-COV-2 LOCKDOWN

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Abstract

Abstract: Some habits related to diet, PA practice and screen time were modified as a consequence of the appearance of SARS-CoV-2 in Spain, especially in the infant-juvenile population. These changes resulted in lower levels of physical activity and increased time spent in sedentary activities during lockdown, which lasted 4 months between March and June 2020. The aim of this study was to determine the impact on the aiming and catching of 11-12 year old school children during this lockdown. *Methods*: The study involved 50 children aged 11-12 years (M = 11.40, SD = 0.50), 33 (66%) boys and 17 (34%) girls from northern Spain. The Movement Assessment Battery for Children 2 (Movement ABC-2) was used for data collection as well as an ad hoc socio-demographic questionnaire. *Results*: There were significant differences ($p < 0.05$) in the results for the aiming and catching variables measured by the tests established by the MABC-2 in the total sample as well as by gender. There were also significant differences in the boys and girls of the sample in mean, scalar and percentile scores for aiming and catching between pre-lockdown and post-lockdown, with a more pronounced worsening of the measured values in girls than in boys. *Conclusions*: The study showed a significant worsening of aiming and catching values in boys and girls aged 11-12 years during SARS-CoV-2 lockdown.

Keywords: SARS-CoV-2; lockdown; physical activity; children; MABC-2

1. Introduction

Gallahue defines the motor development of people on the basis of 5 moments or phases (Gallahue & Ozmun, 2006): the first of these phases is what he calls the reflex movement phase (0-1 years), a prenatal phase in which involuntary phylogenetic movements predominate. A second phase is called the phase of rudimentary movements (1-2 years). This is followed by the phase of basic motor skills or fundamental movements (2-7 years). And finally, two phases in which the child will produce the greatest achievements at the motor level: the phase of specific motor skills (7-11 years) and the phase of specialised motor skills (children over 11 years).

In the third of the phases cited by Gallahue or by Ruiz Pérez (Ruiz-Pérez et al, 2014), the basic motor skills phase, is where aiming and catching are developed most effectively. Aiming and catching are included in the basic motor skills of throwing and catching and in which the co-ordination elements are of great importance in their development.

At this stage of the child's evolution and motor development, manipulative work and the use of the upper limbs, with special emphasis on the hands, becomes a fundamental instrument in their learning. This importance given to manipulation at an early age is so important that difficulties have been identified in children as a consequence of poor hand control. These difficulties that appear in children as a consequence of these manipulative problems can persist into adulthood (Vericat & Orden, 2013).

This is why educational centres become spaces of great importance for motor development, especially during Physical Education classes. During this school period (up to the age of 12), perceptual motor skills stabilise as a consequence of the maturation of the central nervous system. But in addition to this maturation, the learning process (in this case motor), the acquisition of the body schema and the independence of the limbs also become important factors in motor development (Ruiz-Pérez et al., 2014). The practice of PA becomes an exogenous factor of great importance for its development (Gutierrez 2008). Conversely, low levels of PA practice and not doing it on a regular basis not only slows down motor development, but also has as its main consequence low levels of physical fitness. These low levels of physical fitness are closely related to motor development problems (Cairney et al., 2005; López-Gallego et al., 2016), such as coordination, which facilitates the development of the basic motor skill of throwing and catching and, as a consequence, of aiming and catching. At the end of the Primary Education stage (11-12 years), adequate control and development of coordination skills should be achieved (Ruiz-Pérez et al., 2014).

In addition to the aforementioned exogenous factor of the practice of PA for psychomotor development, there is another series of factors that will influence its development: biological factors and the psychosocial context. It is necessary for the child to have continuous stimulation of a social, affective, educational or ecological nature through active participation in motor activities and to avoid possible problems or deterioration in motor development (Gardner, 1976; Young & Fujimoto, 2004). However, psychological and environmental factors will also play a role (García-López & Rodríguez-Marroyo, 2013).

However, some of these factors were altered as a consequence of the appearance of SARS-CoV-2 in the Spanish population and the measures to prevent and spread the virus. Spain, like many other countries in the world and its neighbouring countries, took measures to prevent the spread of the virus by imposing social measures of home lockdown. In the case of Spain, from 15 March to 21 June 2020 (98 days), a state of alarm was declared by Royal Decree 463/2020 of 14 March, declaring a state of alarm for the management of the health crisis caused by COVID-19. This circumstance prevented the free movement of persons, except for those declared essential workers (Ministerio de Presidencia, 2020). During this period, numerous institutions, such as educational institutions at all levels as well as sports schools, were closed indefinitely, which greatly limited the time school-age children spent doing PA. In addition, the lockdown changed certain habits in the child and youth population, not only in terms of time and frequency of PA practice, but also in terms of the increased use of technological devices with screens and in terms of their eating habits (Arufe-Giráldez et al., 2020; Ramos Álvarez et al., 2021; Reina, 2020). In addition, cramped or crowded dwellings, the living environment during lockdown or the socio-economic level of the family became limiting elements for the motor and physical development of the child during the period of lockdown in Spain (Ruopp et al., 1979). It should be noted that the development of motor competence occurs in parallel with human maturation, but that circumstances such as home lockdown, which prevent regular PA practice, can result in a worsening of people's motor competence (Fort-Vanmeerhaeghe et al., 2017).

Moreover, in this pandemic context, the practice of PA is not only essential for motor development, coordination and basic motor skills such as throwing and catching, but also becomes a fundamental element in preventing infection and drastically reducing the possibility of death from an infectious disease (37%), such as COVID-19. It takes 30 minutes a day of PA practice at least 5 days a week to reduce the risk of catching a virus and improve the effectiveness of vaccines by up to 40% (Chastin et al., 2021).

However, the World Health Organisation (WHO) recommends more PA practice time for school-age children: at least 60 minutes of moderate to vigorous intensity PA (MVPA) daily, which will facilitate better motor development and minimise the risk of diseases associated with physical activity deficits such as overweight and obesity (Organización Mundial de la Salud 2010). On the other hand, it recommends reducing the time of use of technological devices with screens in the population between 5 and 12 years of age: do not use these devices for more than 60 to 90 minutes a day (World Health Organization 2019; Organización Mundial de la Salud 2010). However, these recommendations are far from the data for children between 9 and 15 years of age in Spain. Children in this age group have the highest rates of sedentary lifestyles and dropout of PA and sport outside the school context (85% in the case of girls and 78% dropout in boys), and do not perform the minimum minutes of PA established by the WHO. Moreover, this abandonment of the practice of PA is even more acute in the children who need it most, as children who are overweight or obese as children have higher rates of abandonment of physical activity and sport (Wickel, Belton 2016). These low levels of PA practice and the increased time spent using screen-based technological devices form the so-called technological sedentary lifestyle (Arufe-Giráldez et al., 2020; Lozano-Sánchez et al., 2019) and that it can be linked to other health problems (Díaz & Aladro, 2016).

The main objective of this study is to determine the implication that lockdown in Spain, as a consequence of the irruption of the SARS-CoV-2 virus in society, had on marksmanship and trapping in 11-12 year-old children. Likewise, this research also studied the possible relationships between the marksmanship and trapping tests performed and certain socio-demographic variables, such as the type of housing or place of residence of the children during the period of lockdown, their habits in relation to PA or food during lockdown, etc.

2. Methods

2.1. Study Design

This research is a descriptive, longitudinal, observational study (Ato, M. et al., 2013). The aiming and catching of the children in the sample were the dependent variables of the research. The independent variables of the research were defined on the basis of an ad hoc socio-demographic questionnaire (e.g. age, gender, parents' level of education, employment status) as well as data related to the different variables under study (e.g. perception of tiredness, perception of self-esteem, perception of creativity).

2.2. Participants

Fifty-five children in the sixth grade of a primary school in northern Spain were invited to participate in the study. The school is located in a semi-urban residential area close to the city of Santander. In the end, 50 of the 55 children who were invited participated, 33 (66%) boys and 17 (34%) girls (median age = 11.40, SD = 0.50). The children who did not participate in the research did not do so for two reasons: they were excluded because they did not provide informed consent from their parents or legal guardians. The second reason was because they chose not to participate in the research. 56% of the sample resided in an urban setting, 38% in a semi-urban or residential setting and 6% resided in a rural setting during the SARS-CoV-2 closure period.

The sample that participated in this study has contributed to the understanding of how SARS-CoV-2 lockdown has affected children in Spain. This sample has provided evidence of the impact of lockdown on other dimensions measured by the MABC-2 such as manual dexterity and balance (Ramos Álvarez et al.,, 2022a; Ramos-Álvarez et al., 2022b).

2.3. Instruments

The Movement Assessment Battery for Children 2 (MABC-2) was used in this study, specifically its adaptation from Spanish (Henderson et al., 2007; Ruiz & Graupera-Sanz, 2012). All the data obtained in the research followed the procedures established in the MABC-2 and the evaluation and interpretation of the results was carried out according to the reference values established in this instrument. The MABC-2 is made up of three dimensions: Dimension 1 assesses children's manual dexterity, dimension 2 assesses aiming and catching and finally dimension 3, which assesses balance. This study focuses on the second dimension of the MABC-2, aiming and catching. Each dimension consists of different assessment tests. Two tests were used for this study. The first test involved catching with the dominant hand as well as with the non-dominant hand, and a second test involved aiming at a target.

The first test involved catching the ball with one hand (AC1 and AC2 for throwing with the dominant and non-dominant hand respectively). For the execution of the test, a tennis ball and 25 mm wide yellow adhesive tape are required as specific material. A large space free of obstacles must be available for the execution of the test. A line should be marked with the tape at a distance of 2 m from a smooth wall with no objects. The child must throw the ball against the wall from the tape mark and must catch the ball after it bounces off the wall before it hits the floor. To perform the test, the evaluator must perform a demonstration, insisting on the basic rules of execution: throw the ball behind the yellow line, it is possible to step to the side to catch the ball if necessary, take into account the necessary throwing force to bounce the ball, catch the ball before it bounces on the floor and catch the ball with the throwing hand, not being able to use the other hand, clothes or any other part of the body. The child will have a total of 15 throws: 5 pre-tests and 10 throws that will count towards the result of the test. During the 10 throws of the test, the examiner may give feedback to the child in case of failure, but not help him/her in his/her execution. The maximum score (10 points) is achieved if the child manages to catch the ball correctly on all 10 throws.

The target throwing test (AC3) requires a tennis ball, a red target attached to the wall and the yellow adhesive tape. For the test, the child is positioned 2.5 m from the wall behind the tape in front of the wall with the target, which is placed above the height of the child's head. The test consists of throwing the ball and trying to hit the inside of the target. It is recommended that the ball is thrown from the bottom to the top, but there is no penalty for the way the ball is thrown. As in the previous test, the examiner will give a demonstration indicating the basic rules of execution: throwing from behind the line and throwing with only one hand. It is not necessary to catch the ball as it bounces off the target. As in the previous test, the child has 5 pre-tests and 10 throws to count towards the result of the test. During the 10 throws of the test, the examiner can give feedback to the child in case of failure, but not help him/her in his/her execution. The maximum score (10 points) is achieved if the child succeeds in hitting the target with the ball correctly on all 10 throws.

For the execution of the tests, the following specific materials were used as established in the MABC-2: 25 mm wide yellow adhesive tape, a tennis ball and a red target. A smooth wall, preferably white, was also required for the execution of the tests.

An ad hoc questionnaire was also designed and used to obtain socio-demographic information, consisting of 50 dichotomous items, Lickert scale and other open questions. According to the Cronbach's alpha coefficient test ($\alpha = 0.71$), the questionnaire showed acceptable internal consistency (George & Mallery, 2003; Nunnally & Bernstein, 1994). The questionnaire was addressed to parents or legal guardians and collected information of an economic and educational nature of the family, in relation to the time spent by family members and children in the sample on PA practice, information on the time spent in sedentary activities as well as the time spent by the children in the sample and the type of technologies they used pre-lockdown as well as during the period of lockdown.

2.4. Procedure

This research was conducted during the academic year 2019-2020. The first two data collections were carried out before the lockdown in Spain due to the SARS-CoV-2 health crisis. These data collections were carried out in physical education classes. The first one took place the week of 14 October 2019. The second data collection took place the week of 2 March 2020. Finally, a third data collection was conducted after lockdown, namely in the week of de-escalation from home lockdown in Spain. This data collection took place during the week of 28 May 2020.

Household containment in Spain takes place from 15 March 2020 due to the outbreak of SARS-CoV-2 in Spain (Ministerio de Presidencia, 2020). By means of a Royal Decree published by the Spanish Government, a State of Alarm is decreed throughout the country. This Royal Decree closes indefinitely companies and public institutions indefinitely. Among these closures were the closure of primary schools, secondary schools and higher education, as well as the paralysation of all sporting activities. With the start of the lockdown, all participants in this study were contacted and informed in writing of the changes in the process for the third data collection. These changes did not cause any sample member to drop out of the research.

The same procedures used for the previous data collection were followed for this post-lockdown data collection. The main novelties that occurred with respect to the pre-lockdown data collections were to ensure compliance with the health measures established by the Spanish government to prevent the spread of SARS-CoV-2. The first novelty was that data collection took place outside physical education classes. This is a consequence of the fact that primary schools remained closed during the de-escalation. The second novelty was in the organisation of the children participating in the research. Groups of six children were organised in different time slots and in an outdoor space. During this third data collection, data from the socio-demographic questionnaire were collected. This questionnaire was carried out by means of a paper survey and completed by the parents or legal guardians. Once the three data collections were completed, the statistical analysis between the results obtained between pre-lockdown 2 and post-lockdown 2 was carried out.

2.5. Statistical Analysis

SPSS v. 26 statistical software (IBM Corporation, New York, NY, USA) was used to perform all statistical analyses in the study. For the main research variables, descriptive analyses were performed as well as normality tests of the quantitative variables to test the hypotheses. The Kolmogorov-Smirnov statistic ($n > 50$) was used to perform the normality analyses of the sample, while the Shapiro-Wilk statistic ($n < 50$) was used to perform this test by sex.

The Mann-Whitney U test for paired samples was used to show whether there were statistically significant differences ($p < 0.05$) between the data obtained between the data collections for the research variables: the two pre-lockdown data collections and the post-lockdown data collection. This test was conducted for the sample as well as by sex. The test was conducted because the sample of girls was smaller than 25 participants in the study and has been shown to be the most appropriate test in research with sample sizes similar to this study (Ortega et al., 2021; Ramírez & Polack, 2020).

Finally, the Kruskal-Wallis H-test was also performed in the case of three or more groups for the analysis of the data collected in the family habits questionnaire.

2.6. Ethical aspects

The ethical and deontological principles established by the American Psycho-logical Association have been followed in this research (American Psychological Association no date), as well as ethical recommendations for educational research (Paz, 2018).

The research protocol was approved by the EDUCA Ethics Committee under code 82019.

3. Results

3.1 Aiming and catching evaluation tests and scores

3.1.1. Descriptive and Functional Analysis

The Shapiro-Wilk test was used to confirm the normality of the evaluation scores as well as the aiming and catching tests performed between sexes. The Kolmogorov-Smirnov test was used to confirm the normality of the total sample. In relation to the results of normality of the total sample, the test rejects the hypothesis of normality, both in the two data collections prior to lockdown and in the post-lockdown data collection. Exceptions are the scalar score of the first pre-lockdown data collection ($p = 0.083$) and the post-lockdown aiming and catching dimension score ($p = 0.090$).

In relation to the results obtained by the Shapiro-Wilk test to confirm the hypothesis of normality by sex, in the case of females the hypothesis is accepted in the dimension score, in the scalar score and in the percentile in all three data collections, except in the percentile score in the second pre-lockdown data collection ($p = 0.010$). The test results in the children did not accept the hypothesis of normality in the pre-lockdown collection as well as in the post-lockdown percentile score ($p = 0.003$).

Table 1 shows the values obtained in the total score of aiming and catching, scalar score and percentile, as well as in the aiming and catching tests performed in this research in the three data collections carried out. Significant differences in these results were also evident (Table 1).

Table 1
The aim and catch test results between pre-lockdown 1, pre-lockdown 2 and post-lockdown using descriptive analysis.

	Pre-Lockdown 1			Pre-Lockdown 2			Post-Lockdown		
	***n* (Total)**	**Boys**	**Girls**	***n* (Total)**	**Boys**	**Girls**	***n* (Total)**	**Boys**	**Girls**
SD	18.34 ± 4.81*	18.78 ± 4.26*	17.47 ± 5.78*	23.48 ± 4.08**	23.96 ± 4.17**	22.52 ± 3.82	16.78 ± 5.01***+	16.78 ± 5.36***+	16.76 ± 4.42+
SSD	9.02 ± 2.99*	9.33 ± 2.66*	8.41 ± 3.57*	12.34 ± 2.67**	12.63 ± 2.72**	11.76 ± 2.56	8.10 ± 3.14***+	8.12 ± 3.34***+	8.05 ± 2.81+
PS	41.53 ± 27.74*	44.59 ± 25.87*	35.58 ± 31.01*	73.44 ± 24.87**	76.33 ± 23.71**	67.82 ± 26.81	32.13 ± 26.01***+	34.66 ± 29.51***+	27.20 ± 17.08+
AC1	7.08 ± 2.73*	7.72 ± 2.36*	5.82 ± 3.02*	8.82 ± 1.46	9.06 ± 1.41**	8.35 ± 1.49	6.56 ± 2.80+	6.72 ± 2.74***+	6.23 ± 2.96+
AC2	6.32 ± 2.85*	6.78 ± 2.49*	5.41 ± 3.33*	7.96 ± 2.19	8.39 ± 1.85**	7.11 ± 2.59	6.12 ± 2.54+	6.24 ± 2.57+	5.88 ± 2.54+
AC3	4.72 ± 1.56*	4.69 ± 1.61*	4.76 ± 1.52*	6.98 ± 1.22	6.93 ± 1.29**	7.05 ± 1.08	4.14 ± 1.76+	4.12 ± 1.81+	4.17 ± 1.70+

Note. Data are presented as mean ± standard deviation. n = 50; boys = 33; girls = 17. SD: aim and catch score dimension; SSD: aim and catch scalar score dimension; PS: aim and catch percentile score; AC1: aim and catch 1 - ball catch test with dominant hand; AC2: aim and catch 2 - ball catch test with non-dominant hand; AC3: aim and catch 3 - throw to a target. * $p < 0.001$ = significant for pre-lockdown 2. ** $p < 0.05$ = significant for pre-lockdown 1. *** $p < 0.001$ = significant with pre-lockdown 2. + $p < 0.05$ = significant with pre-lockdown 2.

The research hypothesis was accepted with 95% confidence that there were statistically significant differences in the mean value of the variable between the different data collections. For the acceptance of the hypothesis, tests for related samples were performed when the p-value was significant ($p < 0.05$). These statistically significant differences are evident in the results of all data collections. This circumstance appears in the total sample between the three data collections in the aiming and catching dimension score, in its scalar score as well as in the percentile score. Similarly, in the case of the boys in the sample, the same results are also repeated, with statistically significant differences between all the results of the three data collections. The girls present similar results to the boys, but do not present statistically significant differences in the scores between the first pre-lockdown data collection and the post-lockdown data collection: aiming and catching dimension score ($p = 0.569$), scalar score ($p =$

0.669) and percentile score (p = 0.191).

In the analysis carried out for the different aiming and catching tests, the total sample presents statistically significant differences in the tests between the three data collections, except in the results obtained between the first pre-lockdown data collection and the post-lockdown data collection of catching the ball with the dominant hand (p = 0.148) as well as with the non-dominant hand (p = 0.414) and with the throw to target test (p = 0.059).

In the case of the results obtained by sex, in the case of the girls, identical results are obtained as with the total sample, data without statistically significant differences in catching the ball with the dominant hand (p = 0.689) as well as with the non-dominant hand (p = 0.607) and the throw to target (p = 0.341) between the first pre-lockdown data collection and the post-lockdown data collection. In relation to the results obtained in this test with the children, results with statistically significant differences are obtained except in the results between the first pre-lockdown data collection and the post-lockdown data collection in the catching the ball with the non-dominant hand (p = 0.108) and in the throwing to target test (p = 0.124).

The results obtained in this study in the different marksmanship and trapping tests performed, show a worsening in their values between the data collection immediately after lockdown and the post-lockdown collection. This worsening in their values occurs in all the tests and in a significant manner. In relation to the results by sex, although both sexes have a worsening between pre-lockdown and post-lockdown, boys obtain better results than girls, except in the target throwing test (boys: p = 4.12; girls: p = 4.17).

3.1.2. Evolution of the Test

Following the reference values of the MABC-2, there was an improvement in the results of the aiming and catching tests between the data obtained in pre-lockdown 1 and pre-lockdown 2. Moreover, these improvements occurred significantly in all tests and for the total sample and for both sexes. The results obtained in the post-lockdown data collection, not only suffer a worsening with respect to the data collection immediately prior to lockdown, but also worsen the initial values collected in this research.

The results obtained for Dimension 2 of the MABC-2 in the pre-lockdown and post-lockdown data collections are shown in Table 1 and Figure 1. The results are shown for the mean value for boys, girls as well as for the total sample. Also shown are the results obtained in their total, scalar and percentile scores as well as for each of the aiming and catching tests established in the MABC-2.

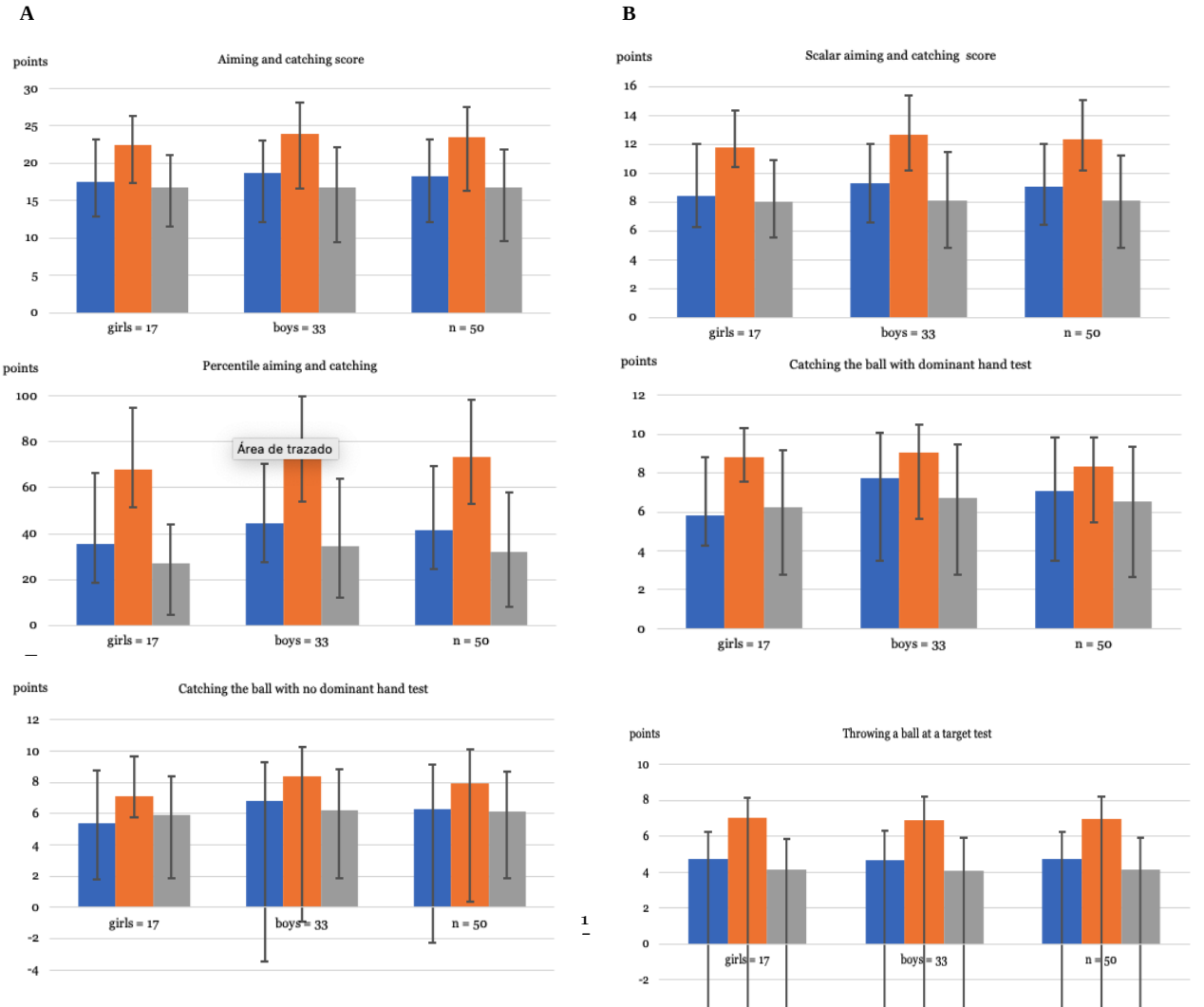

Fig. 1. Columns of the evolution of mean aim and catch scores and their different tests with standard deviation bars. Aim and catch score dimension (panel A), Aim and catch scalar score dimension (panel B), Aim and catch percentile score (panel C), Aim and catch 1 - ball catch test with dominant hand (panel D), Aim and catch 2 - ball catch test with non-dominant hand (panel E) and Aim and catch 3 - throw to a target (panel F).

According to the scores of the sample members on the MABC-2 (Ruiz & Graupera-Sanz, 2012), are classified into different zones. The first zone is the so-called Red Zone. Sample members with a total score of less than 62 points are classified in this zone. The Red Zone is associated with possible movement difficulties. Children who score between 63 and 69 points are classified in the Amber Zone. This classification is characterised by the possibility of some risk of movement problems for children in the sample with these scores. And a third classification called the Green Zone for children with scores above 69 points. In this last classification, children should not present movement problems.

Following these classifications and according to the mean scores obtained by the sample in the first data collection, the sample is classified in the Green Zone, i.e. without movement problems: total sample (M = 71.220), boys (M = 70.636) and girls (M = 72.352).

The second data collection carried out on the sample, just before the moment of lockdown, showed a positive evolution of the results with an improvement in all the tests performed: an improvement of 19.23% for the overall sample, an improvement of 19.60% in the case of the boys in the sample and 18.53% in the case of the girls. With this improvement in the results obtained, the sample remained in the so-called Green Zone (sample (M = 84.920), boys (M = 84.484) and girls (M = 85.764)). However, in the post-lockdown data collection the results obtained had a negative evaluation and a worsening compared to the previous data collection. The mean scores decreased for the boys (M = 62.636) and for the whole sample (M = 65.580), which placed them in the Amber Zone. According to this MABC-2 classification, both the sample, and more especially the children, could be at risk for movement problems. The part of the sample constituted by the girls, although they presented a worsening in their results, continued to be in the so-called Green Zone (M = 71.294).

With reference to the results of the specific aiming and catching tests, the same evolution occurs as in the overall results of the MABC-2. According to the scalar scores of the aiming and catching tests, the sample starts from normal levels: total sample (M = 9.02), boys (M = 9.33) and girls (M = 8.41). These results show a positive development and therefore an improvement in the second pre-completion data collection: sample (M = 12.34), boys (M = 12.63) and girls (M = 11.76). The results obtained do not show that there may be a risk of movement in the sample, according to the reference values of the MABC-2 (Ruiz & Graupera-Sanz, 2012). This positive evolution in the results obtained is lost after the lockdown period. With the collection of post-lockdown data, a worsening is evident in the total sample (M = 8.10), in the boys (M = 8.12) and in the girls (M = 8.05). Although these results show a clear deterioration and worsening as a consequence of the period of lockdown, there is no risk in movement as a consequence of home lockdown due to SARS-CoV-2.

3.2 Family Habits

3.2.1. Descriptive Analysis

With the data provided by the children's parents or legal guardians through the questionnaire on family habits during lockdown, a basic descriptive analysis was carried out. The information used from this questionnaire in this research was in reference to the children's screen exposure time during lockdown, information on the time the children spent on educational and cultural activities, their hours of rest, the time devoted to PA practice and characteristics of the place of residence, the place and size of residence during lockdown, the time spent in the home during lockdown, and the time spent in the home during lockdown (Ramos-Álvarez et al., 2022a).

In reference to the children's screen exposure time during lockdown, 100% of the sample exceeded 60 min of screen exposure. The main devices used were video game consoles (52%), television (50%) and computers (48%). Tablets and computers were used by a smaller percentage of the sample, 30% and 26% respectively.

Other data of relevance to this research were related to the location and size of the sample children's residence during the period of lockdown. These data were considered relevant to this research because of their possible influence as a limiting factor for children's physical activity during the period of lockdown. According to the areas of residence of the sample during this period, 6% resided in a rural environment during lockdown and 38% of the sample resided in a residential or semi-urban environment. More than half of the sample, 56%, resided in an urban environment during house lockdown.

In relation to the size of the dwelling, dwellings with fewer square metres and without outdoor areas such as terraces or gardens were also considered to be conditioning factors for the practice of physical activity during house lockdown. Eight percent of the sample resided in dwellings smaller than 60 m^2, 28% resided in dwellings of a size ranging from 61 to 90 m^2 , 28% resided in dwellings of a size ranging from 91 to 120 m^2 and 36% of the sample resided in dwellings with a garden. Although both place of residence and house size during the lockdown period were considered to be limiting factors for physical activity, these factors were not found to have a significant influence on the differences in PA minutes or aiming and catching scores during lockdown in this research..

In terms of PA habits during lockdown, there were also changes. There was an increase in the number of children who did no physical activity on any day of the week, from 4% before lockdown to 32% during lockdown. Similarly, there was a decrease in the frequency of weekly PA practice

during lockdown: a decrease of 10% of children who practised PA 2 to 3 times a week, a decrease of 14% of children who did it 4 to 5 days a week and a decrease of 4% of children who had practised PA during lockdown 6 to 7 days a week.

Another of the habits that were altered during lockdown were those related to rest and sleep. During lockdown, 20% of the sample slept 8 hours a day, 40% slept 9 hours and 38% slept 10 hours a day.

Finally, changes were also observed in other types of sedentary activities performed during lockdown. Among the sedentary activities studied in this research were those related to educational or school activities, activities of a cultural nature and the time the sample spent on screen consumption. With regard to educational and cultural activities, more than 80% of the sample, 82% to be precise, spent more than 60 minutes a day on school activities. This percentage drops to 30% of the children in the sample who spent more than 146 minutes a day on average on this type of activity. In terms of reading, 38% of the sample spent between 16 and 30 minutes on average per day reading. Only 2% of the sample played musical instruments during lockdown. Finally, less than 10%, or 8% of the sample spent more than one hour on average per day on artistic activities.

3.2.2. Statistically Significant Differences

To determine whether there were statistically significant differences between the variables of marksmanship and trapping and the sociodemographic variables in pre-lockdown and post-lockdown, the Mann-Whitney U test and the Kruskal-Wallis H test were performed. For these tests, the reference values used were those recommended by the WHO (World Health Organization 2022). The results obtained by these tests of independence showed no statistically significant differences ($p > 0.05$) between the data obtained in the post-lockdown collection of the aiming and catching variables and the socio-demographic variables. In these results there were four exceptions that did show statistically significant differences: in relation to the test of catching the ball with the dominant hand and whether a parent practised PA ($p = 0.020$), with the test of whether the child is federated ($p = 0.041$) and with the variable of whether the child practised PA before lockdown ($p = 0.049$). The fourth exception occurs with the test of catching the ball with the non-dominant hand with respect to whether the child practised PA before lockdown ($p = 0.012$).

3.2.3. Post-Lockdown Results.

Subsequently, once the analysis and evaluation of the family habits questionnaire and the post-lockdown aiming and catching test and score variables had been carried out, a statistical analysis was performed between both types of variables. This analysis focused on the relationship between the results of the post-lockdown aiming and trapping variables in relation to the frequency of PA practice in the sample during home lockdown.

Paradoxically, the most positive results between pre-lockdown and post-lockdown occurred in the children in the sample who did not practice PA before or during lockdown. These results showed an improvement of 85.33% in the ball catching test with the dominant hand after lockdown, a percentage that is even higher in the ball catching test with the non-dominant hand. In addition, the worsening in the throwing to target test is only 4.2%. In the case of children who practised PA during lockdown their values were more stable in the post-lockdown data collection and performed better as the child practised PA more frequently. A breakdown of the results can be seen in Table 2.

Table 2.
Pre- and post-lockdown aim and catch test scores in relation to the frequency of children who were not physically active using descriptive analysis.

	PA Practice			
	No PA	**2–3 Times/Week**	**4–5 Times/Week**	**6–7 Times/Week**
AC1 pre-lockdown	3.00 ± 2.82	6.43 ± 2.44	6.40 ± 3.05	9.20 ± 1.30
AC1 post-lockdown	5.56 ± 2.39	7.05 ± 2.98	6.53 ± 2.93	9.00 ± 1.73
AC2 pre-lockdown	1.00 ± 0.00	5.82 ± 2.24	6.40 ± 2.45	8.40 ± 1.51
AC2 post-lockdown	5.06 ± 2.90	6.05 ± 2.10	7.15 ± 2.44	7.66 ± 1.52
AC3 pre-lockdown	4.50 ± 2.12	3.87 ± 1.93	4.30 ± 1.52	4.60 ± 2.07
AC3 post-lockdown	4.31 ± 1.81	3.77 ± 1.95	4.38 ± 1.55	4.33 ± 1.52

Note. Data are presented as mean ± standard deviation. PA: physical activity; AC1: aim and catch 1 - ball catch test with dominant hand; AC2: aim and catch 2 - ball catch test with non-dominant hand; AC3: aim and catch 3 - throw to a target.

The time that the sample spent using and consuming technological devices with screens was a factor studied in this research in relation to the practice of PA during lockdown. In this research, this factor has been considered as an element that may have conditioned the sample's PA time during the lockdown period. The results obtained show that there is a worsening in the results of the aiming and catching tests among the children in the sample who have not spent any minutes a day using technological devices with screens compared to the children in the sample who have spent more minutes using this type of technological device during lockdown, regardless of the device used. However, this worsening is not evident in relation to the time that the sample spent on other types of sedentary activities during the period of lockdown, such as homework, reading, using musical instruments or performing artistic activities.

The details of the results obtained by the sample for the variables analysed by means of the aiming and trapping tests in relation to the time

spent using technological devices with screens to the detriment of the practice of PA during lockdown are shown in Table 3.

Table 3.

The post-lockdown aim and catch test results according to exposure to screens during lockdown using descriptive analysis.

	Average Minutes/Day of Video Game Console Use during Lockdown								
Test	**0**	**1–15**	**16–30**	**46–60**	**61–75**	**76–100**	**101–115**	**116–130**	**+146**
AC1	6.25 ± 3.33	4.00 ± 0.00	9.00 ± 1.41	8.80 ± 1.30	-	7.00 ± 2.00	-	6.26 ± 2.78	5.20 ± 2.38
AC2	5.56 ± 2.80	0.00 ± 0.00	9.00 ± 1.41	7.00 ± 1.58	-	7.66 ± 1.50	-	6.00 ± 2.23	5.60 ± 2.60
AC3	3.81 ± 1.55	4.00 ± 0.00	4.00 ± 5.65	4.60 ± 0.54	-	4.66 ± 1.36	-	4.00 ± 1.64	4.60 ± 2.70
	Average Minutes/Day of Television Use during Lockdown								
Test	**0**	**1–15**	**16–30**	**31–45**	**46–60**	**76–100**	**101–115**	**116–130**	**+146**
AC1	7.25 ± 3.59	8.00 ± 1.41	8.75 ± 2.50	4.00 ± 2.82	7.46 ± 2.18	5.00 ± 0.00	8.00 ± 0.00	6.35 ± 2.71	3.40 ± 2.96
AC2	6.50 ± 1.00	8.00 ± 0.00	9.00 ± 0.81	5.00 ± 4.24	6.07± 2.53	3.00 ± 2.82	8.00 ± 0.00	6.35 ± 2.39	3.40 ± 1.81
AC3	5.00 ± 1.41	4.50 ± 0.70	5.00 ± 2.16	5.00 ± 1.41	4.23 ± 1.42	5.00 ± 1.41	4.00 ± 0.00	3.82 ± 2.18	2.80 ± 1.30
	Average Minutes/Day of PC Use during Lockdown								
Test	**0**	**1–15**	**16–30**	**31-45**	**46-60**	**61-75**	**76-100**	**116–130**	**+146**
AC1	7.30 ± 3.09	10.00 ± 0.00	4.40 ± 2.88	6.00 ± 0.00	6.33 ± 2.29	6.00 ± 0.00	6.50 ± 3.10	7.13 ± 2.72	5.25 ± 3.50
AC2	6.30 ± 2.26	10.00 ± 0.00	5.20 ± 3.34	8.00 ± 0.00	6.77 ± 1.39	4.00 ± 0.00	5.25 ± 2.50	6.40 ± 2.47	4.25 ± 4.34
AC3	4.30 ± 1.63	8.00 ± 0.00	3.60 ± 2.07	6.00 ± 0.00	4.66 ± 1.50	3.00 ± 0.00	4.25 ± 0.95	3.80 ± 2.04	3.25 ± 0.95
	Average Minutes/Day of Tablet Use during Lockdown								
Test	**0**	**1–15**	**16–30**	**31-45**	**46-60**	**76–100**	**101–115**	**116–130**	**+146**
AC1	6.70 ± 2.14	9.00 ± 1.41	6.60 ± 3.77	6.00 ± 0.00	6.00 ± 3.16	6.00 ± 1.41	-	7.22 ± 3.03	4.25 ± 2.87
AC2	6.05 ± 2.30	9.50 ± 0.70	5.90 ± 3.72	8.00 ± 0.00	6.40 ± 1.14	3.50 ± 3.53	-	6.11 ± 1.69	5.75 ± 2.87
AC3	3.88 ± 1.69	7.50 ± 0.70	4.10 ± 1.19	6.00 ± 0.00	4.20 ± 2.95	5.00 ± 1.41	-	3.33 ± 1.41	4.50 ± 1.29
	Average Minutes/Day of Mobile Phone Use during Lockdown								
Test	**0**	**1–15**	**16–30**	**31-45**	**46-60**	**61-75**	**101–115**	**116–130**	**+146**
AC1	7.30 ± 2.76	6.50 ± 2.12	6.33 ± 3.21	6.00 ± 0.00	4.60 ± 2.07	7.00 ± 0.00	-	7.00 ± 2.44	4.66 ± 3.55
AC2	6.84 ± 2.29	8.50 ± 0.70	5.00 ± 2.00	7.00 ± 0.00	4.40 ± 2.60	8.00 ± 0.00	-	4.66 ± 1.36	5.16 ± 3.86
AC3	4.26 ± 1.84	5.00 ± 2.82	3.33 ± 2.08	3.00 ± 0.00	4.60 ± 1.51	4.00 ± 0.00	-	4.00 ± 2.28	3.66 ± 1.21

Note. Data are presented as mean ± standard deviation. PA: physical activity; AC1: aim and catch 1 - ball catch test with dominant hand; AC2: aim and catch 2 - ball catch test with non-dominant hand; AC3: aim and catch 3 - throw to a target.

4. Discussion

The aim of this research was to determine the implication that home confinement due to SARS-CoV-2 in Spain had on marksmanship and trapping in a school population aged 11-12 years.

As a consequence of the lockdown due to SARS-CoV-2, the children participating in this research between 11 and 12 years old and living in the north of Spain, have shown an involution in the values assessed in this study of marksmanship and trapping: fewer traps and fewer hits on the target in the post- lockdown data collection compared to the pre- lockdown data collection. This involution is not only shown in a worsening in the values of the total sample, but also in both boys and girls, the latter having a more marked worsening than in the case of boys. It should be noted that different studies show that this worsening is produced in other spheres of children's movement, having negative consequences on the physical condition of the population, on their coordination and manual dexterity as well as on their static and dynamic balance (Ramos-Álvarez et al., 2021; Ramos-Álvarez et al., 2022a; Ramos-Álvarez et al., 2022b). The vast majority of these studies agree that these negative consequences have a multifactorial origin (Ramos-Álvarez et al., 2021), triggered by a decrease in the time devoted to PA practice, the increase in the use of technological devices with screens such as mobile phones, tablets or video game consoles, or an increase in other types of activities that do not require a great deal of movement.

According to the reference values, scales and classifications of the MABC-2 (Ruiz Pérez & Graupera-Sanz, 2012) in their total test scores, the sample of this research not only showed a decrease in the values of the aiming and catching tests, but also a worsening in the scores of the total evaluations of their movements. According to the ranges and Zones established in the MABC-2, the sample was in the so-called Green Zone (over 69 points) before lockdown. After the period of lockdown, the girls continued to present results that kept them in the Green Zone, although with a worsening in the values obtained, p = 85.764 pre-lockdown versus p = 71.294 post-lockdown. In the case of the boys (p = 62.636) as well as in the

total sample (p = 65.580), the results after the end of the lockdown period suffered a notably greater deterioration than the girls, placing their results in the so-called Amber Zone (between 63 and 69 points), that is to say, with possible risks of movement problems (p = 65.580).

These results reinforce other similar investigations in which the impact of SARS-CoV-2 lockdown has been studied in the population of the same age group. These studies also show the improvement that children of these ages have had in psychomotor skills, such as manual dexterity, coordination and balance (Ramos-Álvarez et al., 2022a; Ramos-Álvarez et al., 2022b) or on physical fitness itself, with implications for the health of pediatric children (Ramos-Álvarez et al., 2021). Other research has shown that lockdown has caused slight and significant delays in 10.35% of the sample in aspects that are so important for aiming and catching, such as coordination, both final and gross (Sánchez-Reyes et al., 2020).

Similarly, and although such studies have yet to be further explored, some research suggests that the linking of disparate motor skills, language skills and socio-cognitive skills are intertwined with school-age children's development. Such is the link between motor skills and theory of mind (ToM) that this research suggests relationships between fine motor skills and school-age children's reading and mathematical skills, i.e., their academic performance (Obeid et al., 2022). Along the same lines, a recent study shows the relationship between deficiencies in fine motor skills and poor performance in working memory and graphomotor tasks, which may lead to poor academic performance in preschool children. This same study emphasises the need for automation of movements related to fine motor skills in order to improve their performance (Michel & Molitor, 2022).

In the same line of research, a meta-analysis conducted on the relationship between motor skills (balance, manual dexterity, locomotor skills and object control skills, including aiming and catching) and executive functions (response inhibition, working memory and cognitive flexibility) in the school-age population showed that balance and manual dexterity had a significant relationship with all components of executive functions (response inhibition, response working memory, working memory and cognitive flexibility). In contrast, a weak relationship between locomotor and object control skills and executive functions was found (Gandotra et al., 2022).

However, other studies warn of the damage that lockdown has had on all spheres of people's movement, not just some aspects of it, especially children's (Wang et al., 2020a). Children currently have rates of overweight and obesity that have been aggravated by the period of lockdown and have affected their coordination, and consequently their aiming and catching. These diseases can lead to other pathologies when they enter adulthood that continue to worsen the health of our population (Lizondo-Valencia et al., 2021; Wang et al., 2020b).

Likewise, through this study it has been shown that the sample during the period of lockdown modified some of their habits, especially habits related to food and habits related to the time dedicated to the practice of PA and that may affect their physical fitness (Ramos-Álvarez et al., 2021), including the marksmanship and trapping tests. This change in habits may have been an influential factor in the worsening of the aiming and catching values of the sample between the pre-lockdown data collection and the post-lockdown data collection. Some other studies have shown the importance of these changes in eating habits and PA practice as elements with direct implications in different areas of the population (Arufe-Giráldez et al., 2020; Santos-Miranda et al., 2022; Villaseñor et al., 2020).

However, in addition to these changes in habits, there is another important factor that has been modified during the period of lockdown. This change in habits has not only occurred in children and young people, as in the sample of this research, but also in other age groups: these are the changes in the consumption habits of technological devices with screens. The substantial change in this habit has been the increase in the amount of time spent daily using and being exposed to screens. This increase in time spent on this sedentary activity has been to the detriment of time and frequency of PA practice. This loss of time spent doing PA is less than the global recommendations of the WHO (World Health Organization 2019), aggravated by lockdown and which has led some governments, such as the Chinese government, to limit the use of technology, prevent addiction and mitigate the high levels of sedentary lifestyles among children and adolescents (Radio Televisión Española, 2021).

Finally, the sleep and rest habits of the sample were also altered. This research showed that none of the study participants complied with the WHO recommendations for this age group during lockdown: at least 11 hours of sleep per day (Ramos-Álvarez et al., 2021).

It should be noted that a deficit in the practice of regular PA in children and adolescents, as well as having a direct impact on their physical health, also has a direct impact on their mental health. These alterations are produced at a muscular level, a poor postural attitude that can cause pain in different parts of the body such as the back or neck or an increase in clinical manifestations of pain related to sedentary lifestyles (Martínez-López et al., 2015). For these reasons, the practice of regular PA is essential and, furthermore, in which strength work has an important implication in order to avoid possible injuries, provide more stability to the subject and improve their levels of coordination, a fundamental aspect for aiming and catching work (Comité Nacional de Medicina del Deporte Infantojuvenil, 2018; Kordi et al., 2016).

Furthermore, it should be noted that being in good physical condition as a result of regular PA practice is a preventive element in case of SARS-CoV-2 infection as well as minimising the risk of suffering from the disease with worse consequences and worse prognostic recovery (Chastin et al., 2021; Chen et al., 2020; Ortiz & Villamil, 2020). Regular PA practice has anti-inflammatory, anti-fibrotic and antioxidant effects, which minimise the negative effects of SARS-CoV-2 infection.

This study has had its main limitations in terms of the sample. On the one hand, the sample size itself, and on the other hand, the quantitative difference between the genders in the sample. It is because of these limitations that we cannot generalise the results obtained in this research to the rest of the 11-12 year-old population in Spain. However, the numerous studies cited in this research work on samples with similar characteristics to the one presented in this research. Likewise, other governmental documents with similar samples have been consulted for this study: the latest survey of the National Institute of Statistics (INE) in 2020 (Instituto Nacional de Estadística 2021) and EUROSTAT reports (OECD/European Observatory on Health Systems and Policies 2019). Through these government documents, it is possible to study populations with similar characteristics to the research sample in terms of PA practice and dietary habits.

5. Conclusion

Through this research, it has been shown that lockdown as a containment measure in the spread of SARS-CoV-2 has resulted in a worsening of marksmanship and trapping in children aged 11-12 years. This study is in line with and complements other similar studies that show the negative consequences that lockdown has had on the population. It is worth noting that this worsening, which is present in the total sample, is more pronounced in the case of girls. Following the reference values for aiming and catching established in the MABC-2 and although there was an evident worsening of their values after lockdown, none of the participants in the research presented problems in their evaluation of movement related to aiming and catching. Despite the results obtained in this research, it is not possible to generalise them to the general population due to the main limitation of this study, the size of the sample.

It is clear that adherence to the practice of PA should continue to be promoted in the child population on a regular basis and over time. It is also necessary to continue working to ensure that the intensity of PA practice is adequate. Similarly, and despite the confinement, the initial values of this research were not the desired ones, and the levels of child overweight and obesity present in today's society are yet another argument for reinforcing these strategies to promote regular and lasting physical activity. This work must be carried out by the different social agents involved in children's education, from the family to schools and sports schools. This is why this promotion of physical activity must go hand in hand with the teaching of healthy habits related to nutrition or the responsible use of new technologies.

Author Contributions

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The study was conducted according to the guidelines of the Declaration of Helsinki, and approved by Ethics Committee of EDUCA (protocol code 82019 and date of approval 20 September 2019).

Informed Consent Statement

Informed consent was obtained from all subjects involved in the study.

Data Availability Statement

Data sharing not applicable.

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Conflicts of Interest

The authors declare no conflict of interest.

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