

# The effect of physical activity on mother-child relationship and parental attitudes: a follow-up study examining the long-term effects of COVID-19

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**Abstract. – OBJECTIVE:** This study was planned to evaluate effects of game-based physical activity model on mother-child relationship and parental attitudes during the prolonged COVID-19 pandemic period.

**SUBJECTS AND METHODS:** This study was designed using a web-based quasi-experimental model with a pre-test/post-test evaluation, with a control group. The mothers who accepted to participate in the study and their children were divided into experimental (group I, n=28) and control groups (group II, n=31). The mothers and children in the experimental group were asked to apply web-based game-based physical activity model for 20 minutes/day for 4 weeks. The online questionnaire included socio-demographic data form, Child Parent Relationship Scale (CPRS), and Parental Attitude Scale (PAS).

**RESULTS:** There were no significant differences between mean scores of pre-test and post-test subscales of the PAS in group I ( $p>0.05$  for all subscales). It was found that post-test scores of democratic subscales of PAS statistically significant decreased ( $p=0.047$ ) and the authoritarian attitude subscale scores significantly increased ( $p=0.033$ ) in group II. The mean pre- and post-activity scores of positive/close relationship and conflictual relationship subscales of CPRS differ between groups ( $p<0.05$  for both subscales). Pre-post test scores of group II were found to be significantly lower compared to group I.

**CONCLUSIONS:** Our study provides a moderate improvement in parameters evaluated; however, we suggest that longer-term activities may have a more permanent and statistically significant effect.

*Key Words:*

COVID-19, Game-based physical activity model, Mother-child relationship, Parental attitudes, Intervention program.

## Introduction

Coronavirus disease-19 (COVID-19) is caused by a beta-coronavirus that can spread through human-to-human transmission, similar to severe acute respiratory syndrome (SARS). Soon after the first cases of COVID-19 were reported, in late 2019, several restrictions were implemented around the world to prevent the spread of the epidemic<sup>1,2</sup>.

In the current literature, it is stated that the global epidemic process mostly affects children and mothers. Since children are more vulnerable than adults, it is predicted that the pandemic process may have longer-term negative consequences and this effect may be reflected in the future lives of children<sup>3</sup>.

The parent-child relationship is one of the determining factors in the development of the personality of children. Life experiences and family attitudes play an important role for a child to be a healthy individual. The attachment, communication and interaction established between individuals and their families throughout childhood affect their whole lives. It has been stated that family characteristics and intra-familial relationships, especially in early childhood, can affect

the personality structure of the child positively or negatively<sup>4</sup>. However, other situations such as the pandemic, can affect children as well as adults and significantly limit individual and social relationships, school and social lives, and affect their development processes. The pandemic process also has significant effects on family life and in this context, it has been reported that it causes a change in the child-parent relationships<sup>4-6</sup>.

Parental attitudes have an important impact on the developmental processes of children<sup>7</sup>. The social isolation that has been implemented since the epidemic process began, caused children to spend most of their time at home with their parents. These new and extraordinary conditions may directly affect the attitudes of parents towards their children. Parental attitudes, which are important and critical for children, have changed in the new life order led by the epidemic process<sup>8</sup>.

Childhood period covers the years when individuals are more physically active<sup>6</sup>. It is known that physical activities have many positive effects on the health of children<sup>9</sup>. Play environment and play activities are learning environments and activities that allow the acquisition of goals determined in the pre-school period. Games are activities that require communication and active participation among the participants. Although it is seen as an occupation for children, game is an activity that individuals of all ages can perform. It has been reported that game-based physical activity between children and adults have very important effects<sup>10,11</sup>.

It is known that the pandemic has traumatic effects also on society. However, it is not always easy to realize this psychological effect, especially on children, and sometimes it can remain uncertain for a long time. For this reason, it is extremely important to evaluate the effects of the pandemic process on children more broadly and holistically. All components of mother-child health are also affected due to measures and practices that change day by day. It is thought that the new normal pattern of negative behavioral adaptations, especially sedentary life, will create potential health and economic problems in the long run<sup>12,13</sup>. It has been reported that societies need to invest in sound public health infrastructures to meet the needs of individuals affected after a traumatic event. Therefore, it is clear that there is a need for strategies that have continuity and applicability<sup>14</sup>.

This study was planned especially for the need for intervention research for the child-parent rela-

tionship and parent attitudes, which are known to be negatively affected by the pandemic process. It is thought that the results of the study will provide a ground for further studies to eliminate the future negative effects of pandemic process due to the changing lifestyle and adaptations on family relations.

## Subjects and Methods

### Study Design

This study was designed using a web-based quasi-experimental model with a pre-test/post-test evaluation, conducted between January 2021 and April 2021. The sample size was calculated as at least 30 mothers-children in each of the study and control groups as according to the power analysis performed for Type 1 error amount (alpha) 0.05, test power (1-beta) 0.8, and effect size 0.53<sup>15</sup>. Ethical approval for the study was obtained from the Inonu University Health Sciences Non-Interventional Clinical Research Ethics Committee (2020/1415). All participants were informed by the informed consent form and their consent was obtained electronically. At the time of the study, there was a partial quarantine restriction due to COVID-19 in Turkey. People could go out to meet certain needs. However, there was a time limit. For this reason, each parent implemented a game-based exercise program in their own home.

The participants were determined by the snowball sampling method. The data of mothers and children were obtained *via* a Google survey system with an online self-report method. Mothers between the ages of 20 and 50 and children between the ages of 3 and 6 who did not attend any education program were included in the study. Mothers and children with neurological and orthopedic problems, those with musculoskeletal complaints for at least 6 months and those who thought that they could not perform the activity model were excluded from the study. Mothers and children included in the study were selected from individuals without any known psychiatric disease. However, due to the quarantine period, the participants were not subjected to a detailed psychiatric examination. The mothers and children who accepted to participate in the study were divided into experimental (group I, n=28) and control groups (group II, n=31) by using the improbable random sampling method. The study flowchart is shown in Figure 1.

### Data Collection Tools

The online questionnaire used to collect the data included socio-demographic data form, Child Parent Relationship Scale (CPRS), and Parent Attitude Scale (PAS). During the design phase of the study, a pilot study was conducted, and the comprehensibility and appropriateness of the questions and answers included in the questionnaire were checked by 2 physiotherapists, 2 child development specialists and a child psychiatrist.

### Socio-Demographic Data Form

This form was created by the researchers and includes questions about sociodemographic characteristics such as age, gender, height, weight, and educational status.

### Child Parent Relationship Scale (CPRS)

Child Parent Relationship Scale was developed by Pianta<sup>16</sup> in 1997 to determine the relationship between mother, father, and child. The original of the scale consists of 3 sub-dimensions and 30 items: the conflict sub-dimension includes 14 items, the attachment sub-dimension includes 6 items, and the positive relationship sub-dimension includes 10 items<sup>16</sup>. The Turkish adaptation of the scale was conducted by Akgün and Yeşilyaprak<sup>17</sup> in 2010. During the adaptation studies, 6 items were removed from the original scale and the Turkish form of the scale included 24 items under two subscales. The questions are answered on a five-point Likert type scale and the lowest possible score is 24 and the highest score is 120. The scale is evaluated on two subscales including positive/close subscale and conflicting subscale. Positive/Close relationship subscale is reverse coded and high scores indicate a conflictual relationship. In both sub-dimensions low scores reflect a positive relationship, while high scores reflect a conflictual relationship<sup>17</sup>.

### Parental Attitude Scale (PAS)

PAS was developed by Karabulut Demir and Şendil in order to measure the behavior of parents towards their children aged between 2 and 6. The scale consists of 46 items under 4 subscales including democratic, authoritarian, overprotective, and permissive. The questions are answered on a five-point Likert type scale. The items reflect the frequency of relevant behavior patterns and “Always like this” is scored 5 points; “Mostly like this” 4 points; “Sometimes like this” 3 points; “It is rarely like this” 2 points, and “It is never like this” is scored 1 point. Scores are calculated

separately for each subscale. A high score on a dimension indicates that the behavior pattern represented by that dimension was adopted<sup>18</sup>.

### Intervention

The game-based physical activity prepared by the researchers was sent to the mothers in group I by mail. Before the study started, the model was applied by a mother and 54-month-old daughter and video recordings were made and sent to the study group. The mothers included in group I were asked to practice the activities in this video model with their children for 20 minutes every day, for 4 weeks. In order to follow whether the activities were performed appropriately, the same researcher sent an information message to the participants via WhatsApp to remind them to perform the activities and received feedback on the completion of the activities. While the activities were continued in group I, no intervention was made in group II. All participants in both groups were asked to fill out the questionnaires at the beginning of the study and at the end of the 4<sup>th</sup> week. In this way, pre-post test data were obtained. Since the country was still under partial quarantine at the time of the study, each participant did the application in their own home.

### Exercise Training

All activities in the game-based physical activity were carried out with mother-child participation and association. The model includes 5 activities (Table I).

### Statistical Analysis

The data were analyzed by using SPSS v.25 (Statistical Program in Social Sciences, IBM Corp., Armonk, NY, USA). The normality of the distribution of the data was tested by the Shapiro-Wilk Test. A  $p$ -value<0.05 was considered statistically significant for all tests. Since the data fit to the normal distribution ( $p>0.05$ ), the analy-

**Table I.** Content of physical activity-based play activity model.

Activity model
Slow to fast running motion
Mother-child foot soles combined bike spin action
Crab walk
Walking with a balloon between the knees
Playing with mutual balloons

sis was continued with parametric test methods. Since the assumption of normality was provided, comparisons in dependent pairs were performed by using two paired samples *t*-test, and in repeated measurements, the difference between the groups was tested by using ANOVA. Multiple normal distribution and homogeneity of variance were controlled in the analyses.

## Results

The distributions of age and gender were similar in the groups ( $p>0.05$ ). The mean body mass index (BMI) was  $24.82\pm 2.84$  for mothers and  $18.51\pm 3.22$  for children in group I and  $25.42\pm 5.14$  for mothers and  $17.26\pm 1.94$  for children in group II. It was found that there was no significant difference between the groups in terms of BMI scores ( $p>0.05$ ) (Table II). The descriptive features of the groups were distributed homogeneously.

There were no significant differences between the groups in terms of both the mean pre-test and post-test scores of the democratic, authoritarian, overprotective and permissive subscales of the PAS ( $p>0.05$  for all subscales, Table III). It was found that there were no significant differences between pre-test and post-test mean scores of the subscales of PAS in the group I ( $p>0.05$  for all subscales Table IV). In group II, a statistically significant decrease was detected in the post-

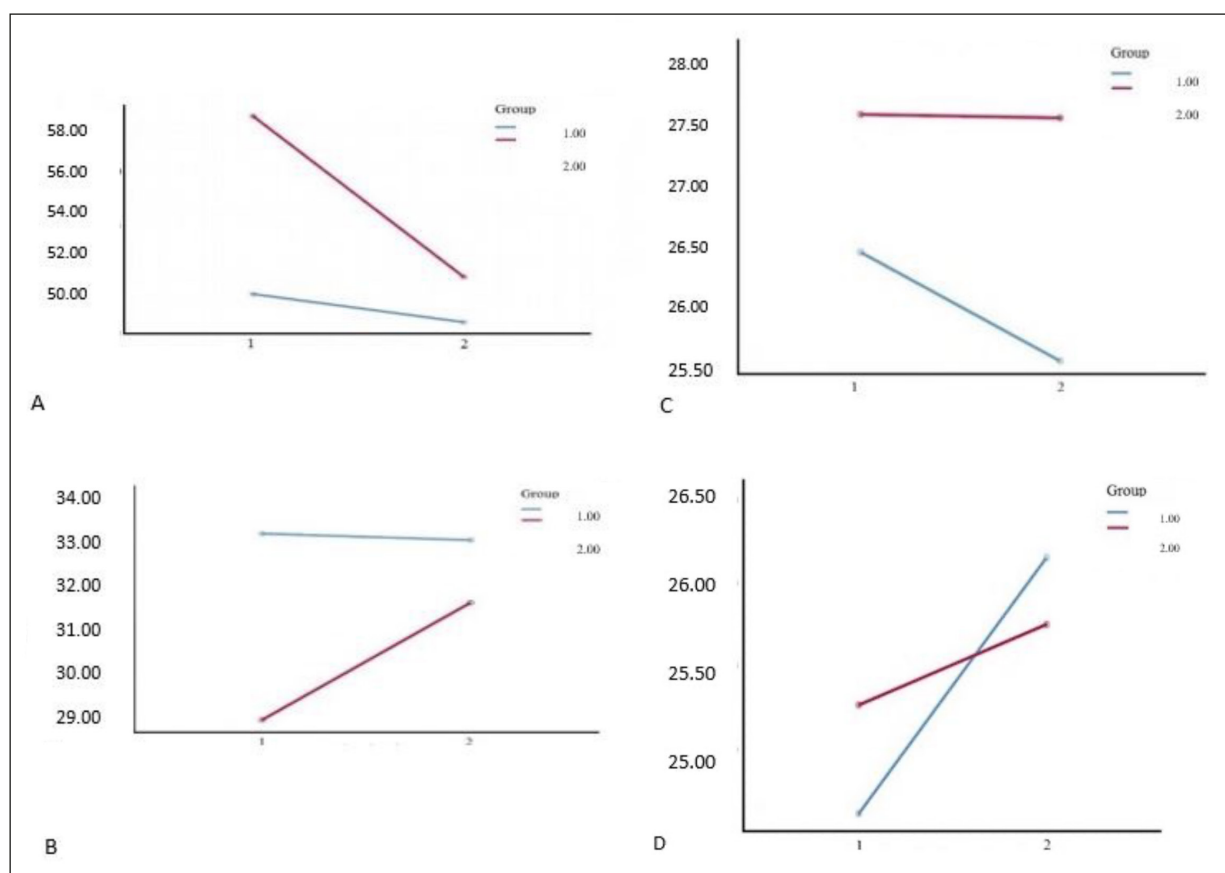
test scores of the democratic subscale of the PAS compared to the pre-test scores ( $p=0.047$ ) while a significant increase was detected in the post-test scores of the authoritarian attitude subscale ( $p=0.033$ ). According to the interaction graphics of PAS subscales-dimensions; there were positive changes in group I, however the difference was not statistically significant compared to group II. It was observed that the decrease in the mean score of the democratic subscale was higher in group I compared to group II (Figure 1). It was found that, the mean score of the authoritarian subscale increased in the post-test in group I, while it was decreased in group II (Figure 1). It was found that the decrease in the mean score of the overprotective subscale was higher in the group I compared to group II (Figure 1). In addition, it was determined that the mean score of the permissive subscale decreased in group I and increased in group II (Figure 1).

The mean pre-test score of the close relationship subscale of CPRS was  $34.14\pm 9.05$  in group I and  $28.52\pm 6.9$  in group II and the mean post-test score was  $33.01\pm 9.26$  in group I and  $28.19\pm 7.22$  in group II. The mean pre-test score of the conflictual relationship subscale was  $19.00\pm 4.99$  in group I and  $15.74\pm 3.94$  in group II and the mean post-test score was  $19.00\pm 4.99$  in group I and  $15.74\pm 3.94$  in group II. It was found that there were significant differences between the groups in both subscales ( $p<0.05$  for both, Table III). The mean pre-test

**Table II.** Comparison of participants by descriptive characteristics.

		Group I n (%)	Group II n (%)	Test value	p-value
Mother age	25 and below	4 (14.3%)	1 (3.2%)	1.841	0.175 <sup>a</sup>
	26-35	16 (57.1%)	20 (64.5%)		
	36-45	8 (28.6%)	7 (22.6%)		
	46-60	-	3 (9.7%)		
Educational status	Primary education	2 (7.1%)	3 (9.7%)	2.226	0.136
	High school	6 (21.4%)	1 (3.2%)		
	University level	12 (12.9%)	11 (35.5%)		
	Postgraduate	8 (28.6%)	16 (51.6%)		
Children age	36-47 months	6 (21.4%)	7 (22.6%)	1.661	0.198
	48-54 months	8 (28.6%)	4 (12.9%)		
	55-60 months	6 (21.4%)	5 (16.1%)		
	61-66 months	5 (17.9%)	7 (22.6%)		
	67-72 months	3 (10.7%)	8 (25.8%)		
Children gender	Female	13 (12.5%)	18 (25.0%)	0.801	0.371
	Male	15 (87.5%)	13 (75.0%)		
BMI (kg/m <sup>2</sup> )	Mother	$24.82\pm 2.84$	$25.42\pm 5.14$		
	Child	$18.51\pm 3.22$	$17.26\pm 1.94$		

Test Value: Test value is the significance of the difference between the two means (*t*-test); *p* statistical significance value, BMI: Body mass index; <sup>a</sup>Pearson Chi-square.



**Figure 1.** Interaction graphics of PAS subscales-dimensions. **A**, Democratic attitude. **B**, Authoritarian. **C**, Overprotective attitude. **D**, Permissive attitude.

**Table III.** Comparison of parental attitude and child-mother relationship between groups.

Variable	Group I X±SS	Group II X±SS	Test value*	p
<b>Parental Attitude Scale</b>				
Democratic pre-test	51.43±25.35	58±27.14	-0.958	0.342
Democratic post-test	50.39±22.47	52.06±27.32	-0.255	0.800
Authoritarian pre-test	33.21±12.59	28.97±13.94	1.223	0.226
Authoritarian post-test	33.07±13.05	31.65±14.66	0.393	0.696
Overprotective pre-test	26.25±7.98	27.52±7.89	-0.612	0.543
Overprotective post-test	25.25±6.75	27.48±7.47	-1.201	0.235
Permissive pre-test	24.61±7.5	25.26±7.76	-0.327	0.745
Permissive post-test	26.14±7.39	25.74±7.38	0.208	0.836
<b>Child Parent Relationship Scale</b>				
Close relationship pre-test	34.14±9.05	28.52±6.9	2.701	<b>0.009</b>
Close relationship post-test	32.96±9.07	28.19±7.22	2.245	<b>0.029</b>
Conflictual relationship pre-test	19.00±4.99	15.74±3.94	2.797	<b>0.007</b>
Conflictual relationship post-test	17.25±4.35	14.42±3.24	2.851	<b>0.006</b>

\*Test Value: Test value is the significance of the difference between the two means (*t*-test); SS: standard deviation; **Bold** font indicates statistical significance:  $p < 0.05$ .

and post-test scores of both subscales of CPRS were found to be significantly lower in group II, in which no physical activity-based plays were performed. When the change between the pre-test and post-test scores between the groups was compared, the difference in both sub-dimensions of CPRS was significant ( $p=0.008$  for close relationship and  $p=0.002$  for conflict, Table IV). When the interaction graphics were examined, it was found that there were significant positive changes in group I compared to group II, after the activity was completed (Figure 2).

## Discussion

The parental attitude and mother-child relationship which are very important for the mental, cognitive, and social development of children have changed due to the substantial changes in the social order after the pandemic. The results of our study, show that physical activity-based

play activity had positive contributions to parent attitudes and mother-child relationship during the pandemic process. It is concluded that such activities should be encouraged during the pandemic process, since it is unknown how long the effects of the pandemic will continue and when the old normal order will be restored.

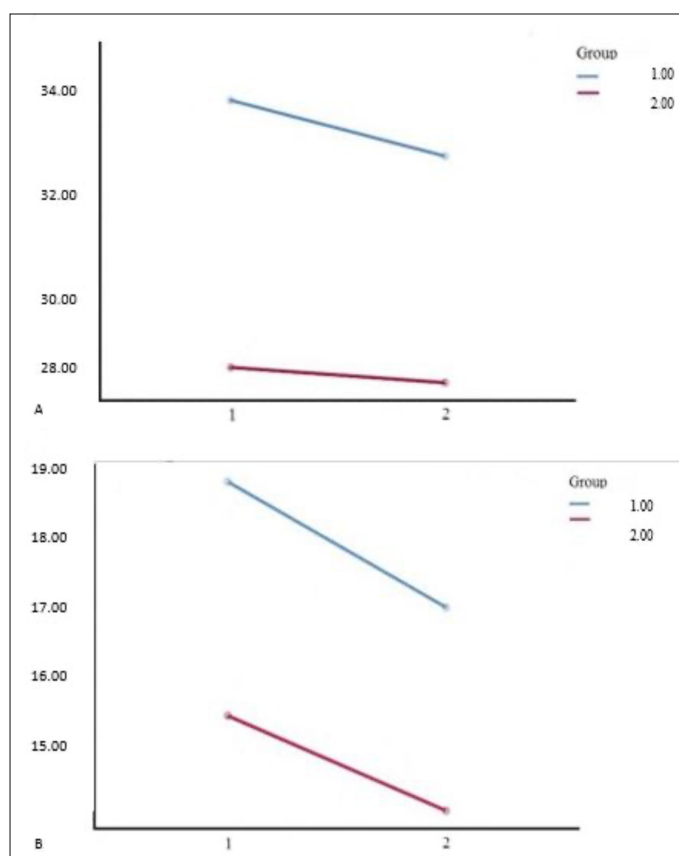
The positive effects of physical activity and exercise on mental health are known, and it is stated that it supports psychological health and well-being, increases cognitive performance and functional recovery, and provides a series of structural changes in the brain. This is explained by the role of physical activity and exercise on plasticity mechanisms<sup>19</sup>. Due to the positive effects of physical activity on mental health, game-based physical activity was chosen in our study.

The pandemic process has affected family life and brought many challenges especially for mothers<sup>20</sup>. For this reason, mothers were included as parents in our study. The quality of the time spent with the child during the pandemic process

**Table IV.** Comparison of parental attitude and child-mother relationship within and between groups.

Group	Mean ± SS	In-group		Between groups			
		t-value	p <sup>1</sup>	F value	p <sup>2</sup>	η(Eta)	
<b>Parental Attitude Scale</b>							
Democratic	Group I	pretest 51.43±25.35 posttest 50.39±22.47	0.236	0.816	0.443	0.508	0.008
	Group II	pretest 58±27.14 posttest 52.06±27.32	2.071	<b>0.047</b>			
Authoritarian	Group I	pretest 33.21±12.59 posttest 33.07±13.05	0.057	0.955	0.744	0.392	0.013
	Group II	pretest 28.97±13.94 posttest 31.65±14.66	-2.237	<b>0.033</b>			
Overprotective	Group I	pretest 26.25±7.98 posttest 25.25±6.75	0.597	0.555	1.076	0.304	0.019
	Group II	pretest 27.52±7.89 posttest 27.48±7.47	0.027	0.978			
Permissive	Group I	pretest 24.61±7.5 posttest 26.14±7.39	-0.892	0.380	0.005	0.943	0.001
	Group II	pretest 25.26±7.76 posttest 25.74±7.38	-0.833	0.411			
<b>Child Parent Relationship Scale</b>							
Close relationship	Group I	pretest 34.14±9.05 posttest 32.96±9.07	0.651	0.521	7.669	<b>0.008*</b>	0.119
	Group II	pretest 28.52±6.9 posttest 28.19±7.22	0.419	0.678			
Conflictual relationship	Group I	pretest 19.00±4.99 posttest 17.25±4.35	1.888	0.070	11.018	<b>0.002*</b>	0.162
	Group II	pretest 15.74±3.94 posttest 14.42±3.24	1.883	0.069			

p<sup>1</sup>: test of significance (t-test) of the difference between two means. p<sup>2</sup> value; ANOVA significance test result in repeated measures between groups, η; Eta value \* $p<0.05$ , there is a statistically significant difference between in-group measurements, \*\* $p<0.05$ , there is a statistically significant difference between groups.



**Figure 2.** A, Child-parent relationship scale first factor. B, Child-parent relationship scale second factor.

is very important. Özyürek and Gürleyik<sup>21</sup> explain the quality of the time spent with the child as the time when activities that are enjoyable for the child and that support the development of the child are performed<sup>21</sup>. Collaborative game-based physical activities are recommended as a qualified activity in family life during the pandemic process<sup>22</sup>.

Parental attitude has is of critical importance in the formation of the personality of children. While the positive and supportive attitudes of parents contribute to the development of the child, their negative and restrictive attitudes cause some mental problems<sup>23</sup>. In the literature, there is a limited number of studies examining the change in family life and parental attitudes in the new lifestyle that emerged with the pandemic<sup>6,24</sup>. Kay et al<sup>6</sup>, in their study, reported that parents define themselves as democratic and authoritarian at the beginning of the pandemic, while they sometimes display a permissive attitude in the following period due to the effect of the epidemic process, but more protective attitudes increase due to the danger of epidemic<sup>6</sup>. In our study, no significant difference was found between the mean pre-test

and post-test scores of the democratic, authoritarian, overprotective and permissive subscales of the PAS. In addition, there were no significant differences between the groups in terms of the mean subscale scores of PAS before and after the program was applied. Although according to the interaction graphics there was no statistical difference, it was observed that there were more positive changes in group I, which performed the activities in the program. In addition, there was a significant decrease in the post-test scores of democratic attitude subscale while authoritarian attitude scores increased significantly in group II. There were no differences between the pre-test and post-test scores of these subscales in group I. This indicates the positive effect of physical activity-based play activity on parenting attitudes, which is one of the hypotheses of the study. While there was no difference between the groups in terms of the pre-test scores of PAS subscales, the decrease in democratic attitudes, which is one of the positive parenting characteristics and an increase in authoritarian attitudes, which is one of the negative parenting characteristics were observed in group II. This may indicate the negative psy-

chiatric effects of the pandemic process on parents. The most prominent finding of the study is that game-based physical activity prevented this negative situation in group I. However, the differences were not statistically significant. We think it may be due to the small sample size of the study. Considering the duration of the study, it was one of the expected results that the difference does not reach the limit of statistical significance. However, from another point of view, this situation makes any change between the two groups even more meaningful. Even in such a long time, the beginning of change also reveals the benefits that parents and children will receive from long-term education programs. We suggest that there is need for studies with a larger sample size and longer follow-up period.

The mother-child relationship is a mutual relationship. When this relationship is positive, the child will build a mental model of being reliable, loved, and valuable, and this model will continue to function in adulthood<sup>17,25</sup>. The parent-child relationship in early childhood also affects individuals during adolescence and adulthood. The conflicting parent-child relationship causes behavioral problems in early childhood and school period children<sup>26</sup>. Considering the importance of intra-family communication, clearly those families, and especially children are heavily affected from the pandemic process and interventions able to positively contribute are needed. In a study conducted by Wang<sup>8</sup>, it is stated that the parent-child relationship based on effective parenting programs is vital in reducing the emotional problems of children in facing difficulties and disasters such as COVID-19 quarantine. In the study conducted by Lee et al<sup>24</sup>, it was reported that the pandemic process provides an opportunity for emotional bonding for some families; however, it has been stated that it mostly causes problems in family relations<sup>24</sup>. In our study, the mother-child relationship was evaluated by two subscales, namely close relation and conflictual relation subscales. In both subscales, low scores reflect positive and high scores reflect conflictual relationships. We found that there was a difference in the mean pre-test scores of close and conflicted relationship subscales between the groups. According to the statistical analyzes, there were also significant differences between groups in terms of post-test scores of CPRS subscales. However, the post-test results could not be evaluated due to the significant difference in the pre-test scores between the groups.

Another important result obtained from the study is that there were differences between the groups in terms of differences between pre-test and post-test scores of CPRS subscales. However, the differences were not statistically significant. This may be due to the fact that participants were included in a study examining the mother-child relationship. The increased awareness seems to be reflected in the level of relationship during the study. While pre-test scores of both close relationship and conflict relationship subscale were higher in group I, it was observed that the scores decreased significantly after game-based physical activity was performed. In other words, less change was detected in the non-intervention group. In addition, interaction graphics also showed that there were more positive changes in terms of close and conflictual relationship subscales in group I compared to group II. These results support the hypothesis that game-based physical activity program positively affected the mother-child relationship. These results also make a significant contribution to the literature<sup>26</sup>, emphasizing the importance of parent-child relationship based on parenting programs.

### **Limitations**

This study has some limitations. First of all, since the Google Forms web survey platform is used in this study, it may not be representative. The results were thus not representative of the entire population. Another limitation of the study is expressed by the mean pre-test scores of CPRS that were not similar between the groups. This makes it difficult to interpret CPRS results.

### **Conclusions**

Children around the world continue to grow and develop. While the pandemic process continues, it is clear that to develop parental attitudes, which have an important role in the growth and development of the child, and interventions that will contribute positively to the mother-child relationship are necessary for the future. The results of our study showed a moderate improvement in the parameters evaluated; however, we think that longer-term programs may create a more permanent and statistically significant effect. We think that the study will provide groundwork for studies to develop prevention strategies that provide a healthier and more productive population in both the short and long term.



### Conflict of Interest

The Authors declare that they have no conflict of interests.

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### Ethics Approval

This study was conducted in accordance with the principles of the Declaration of Helsinki. Ethics Committee Approval was obtained from Inonu University Scientific Research and Publication Ethics Committee (Approval date and number: 16.11.2021/ 2020/1415).

### Authors' Contributions

Mehmet Akif Kay: concept, design, supervision, data collection, literature search, writing manuscript, critical review; Mehmet Saglam: concept, design, data collection, analysis, literature review, writing manuscript, critical review; Filiz Ozdemir: Concept, design, resources, materials, data collection, writing manuscript, critical review; Ilknur Ucu: data collection, Analysis and interpretation, literature review, editing. Burak Bugday: supervision, resources, analysis, data collection, critical review.

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### Data Availability

Data information can be obtained from the author on request.

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