Original Article

RBAFS Revista Brasileira de Atividade Física & Saúde
SOCIEDADE BRASILEIRA DE ATIVIDADE FÍSICA & SAÚDE

rbafs.org.br

Toy Box Project: encouraging the physical activity when play with the family during the COVID-19 pandemic

Projeto Toy Box: estimulando a atividade física ao brincar em família durante a pandemia de COVID-19

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DOI

10.12820/rbafs.29e0329

ABSTRACT

Despite the increased sedentary behavior in childhood, a playful strategy in the family, with traditional play, can encourage a healthy lifestyle. This study verified the impact of a box with traditional toys on children's physical activity level (PAL). Thirty-three children between 7 and 11 years old were divided into following groups: control group (CG, n = 12, ♂ = 4, ♀ = 8) without intervention, and experimental group (EG, n = 21, ♂ = 6, ♀ = 14) that received a box with traditional toys to use with family for a month. The PAL was evaluated thru a questionnaire (DAFA). The Repeated measures ANOVA did not showed significance between moments (p = 0.382), and nether for groups*moments interaction (p = 0.666). However, the EG improved PAL after intervention (Δ = 2.45 ± 10.55) compared to CG (Δ = 0.83 ± 9.40). Beyond that, in GE children became more physically active (pre: 25%; post: 40%) than CG (pre and post: 67%). In conclusion, the traditional toys intervention did not result in a statistically significant PAL improvement in evaluated children, however, the clinical differences showed that the Toy Box project has the potential for promising results in PAL, suggesting the research extension.

Keywords: Children; Sedentary behavior; Play and playthings

RESUMO

*Apesar da alta incidência do comportamento sedentário na infância, brincadeira popular em família pode estimular o estilo de vida saudável. Objetivou-se analisar o impacto da disponibilização de uma caixa com brinquedos populares no nível de atividade física (NAF) de crianças. 33 crianças de 7 a 11 anos, foram divididas em: grupo controle, sem intervenção, (GC, n = 12, ♂ = 4, ♀ = 8) e grupo experimental (GE, n= 21, ♂ = 6, ♀ = 14), que recebeu uma caixa com brinquedos populares para interagir com a família por 1 mês. O NAF foi mensurado pelo do Questionário do Dia Típico de Atividade Física – DAFA. A ANOVA para medidas repetidas de dois fatores não revelou diferença significativa entre os momentos (p = 0,382), e nem na interação grupos*momentos (p = 0,666). Contudo, notou-se que o GE teve um aumento maior no NAF após a intervenção (Δ = 2,45 ± 10,55) comparado ao GC (Δ = 0,83 ± 9,40). Além de uma frequência maior de crianças do GE se tornando mais ativas (pré: 25%; pós: 40%) comparado ao GC (pré e pós: 67%). Concluiu-se que apesar da intervenção com brinquedos populares não ter resultado em diferença estatisticamente significativa no NAF das crianças analisadas, as diferenças clínicas demonstram que o Projeto Toy Box tem potencialidade para resultados promissores no NAF, sugerindo continuidade do estudo.*

Palavras-chave: *Criança; Comportamento sedentário; Jogos e brinquedos.*

Introduction

The act of playing is paramount for the healthy development of human beings, a concept as ancient as human history itself. According to Huizinga[1], advocating for the "homo ludens" (from the Greek: the playing man), there is no humanity without play. Generally, play encompasses a significant aspect, something that gives meaning to the game, presenting a specific space, and pre-established rules. Conversely, playing, understood as a characteristic activity of childhood, entails flexible rules, and is imbued with imagination and spontaneity[2]. Through play, children interpret the diverse realities surrounding them, assimilating habits, beliefs, and values from their culture[2-4]. In addition to fostering the identity and autonomy of the player, play promotes their social and emotional development[5-7], as well as physical and psychomotor capabilities.

Despite scientific evidence regarding the benefits of play in childhood, legally recognized as a fundamental right of the child, included in Article 31 of the Unit-

ed Nations Convention, play has been relegated to a secondary role since the 1960s[8]. Several factors have contributed to this, such as urban expansion accompanied by increased car traffic, accidents, and violence; fewer suitable spaces - playgrounds; social pressures disregarding leisure time and overvaluing materialism, consumerism, and support for content-focused teaching methods, perpetuating the misguided mind-body dichotomy[8]. In addition, early, excessive, and consequently harmful screen exposure is prevalent, contributing to sedentary behavior, overweight, non-communicable chronic diseases, and socio-emotional impacts[9].

Exacerbating this scenario, the COVID-19 pandemic has brought about consequences such as a reduction in outdoor and interactive play, within confined spaces, an increased risk of children witnessing or experiencing domestic violence, physical and psychological abuse, alterations in sleep patterns and nutrition, as well as emotional burdens that may lead to restlessness and aggression, further generating tension and family conflict[10,11]. Thus, as the primary activity of children, the way they interact with the world, play through physical activities can be stimulated by and for the benefit of the family.

Studies such as that of Wilk et al.[12] demonstrate that interaction with parents, friends, and relatives is crucial in motivating active play. Particularly, aspects justifying the relationship between levels of physical activity among parents and their children include: genetic predisposition to increased levels of physical activity[13] , children's motivation derived from parental example, support for children's activities, and the frequency of availability of spaces designated for play[14,15]. In summary, active participation of the family in the child's life is crucial for their full and healthy development, a fact continually sought after in the school setting through the promotion of family-school partnerships.

Initiatives aiming to reduce parental sedentary behavior are consistently associated with favorable impacts on their children's sedentary behaviors[16]. However, this scenario is increasingly scarce due to numerous factors such as parents' working hours, distancing of parents and children from playful activities, and other social obligations promoting low levels of interaction[17].

Recognizing the essential nature of play and the risks associated with its reduction in the contemporary period, several initiatives are taken to stimulate and protect this right at national and global levels[8]. However, play is imbued with subjectivities, requiring further exploration into different stages of children's development, biological, individual, environmental, and socio-cultural factors[12].

Thus, believing that parents can teach their childhood games to their children and consequently make them more active, the aim of this study was to analyze the impact of providing a box of popular Brazilian toys on children's physical activity levels (PAL). It is expected that families will be motivated to interact through popular play activities, and that these activities will contribute to an increase in PAL in the evaluated children.

Methods

Study Design

This is a quantitative experimental study, with an analytical and exploratory nature, designed to investigate the effect of an intervention with popular Brazilian toys on children's PAL. To achieve this, the CONSORT guidelines were followed.

Participants

Initially, 149 families of schoolchildren aged 7 to 11 years from 4 public schools in the Federal District and Goiás participated in the study. Exclusion criteria included non-parents' consent, presence of any disease that would be a barrier to the practice of play activities at various intensities and could be a risk to their own safety, and failure to respond to the PAL questionnaire at pre- or post-moments. Due to the pandemic period (October/2022), the boxes were delivered at school, and families were asked to sign the consent form, as well as fill out the PAL questionnaire via online forms; unfortunately, 116 did not respond to the PAL questionnaire at the post-moment. In the end, the sample consisted of 33 children randomly divided into a control group, without intervention (CG, n = 12), and an experimental group, which received the box of toys (EG, n = 21).

Procedures

Following an inquiry about the childhood games of the legal guardians of the children, a box of toys was customized to meet the needs of the preferences of the participants according to their realities. Each box contained elements aimed at cultural Brazilian appreciation and revival, as well as options for activities ranging from light to vigorous intensity: ball, marbles, small rubber ball for bat-and-ball games, rope, elastic band, chalk, yo-yo, slinky, paddle ball, pick-up sticks, spinning top, kite, along with a booklet explaining and recreating

the games and a Play Diary, featuring questions such as "what did you play," "for how long," "what did you think," for daily self-assessment over one month, and for potential analysis of preferences, frequency, and mood state while enjoying the provided material (Figure 1). The CG remained without intervention but received the toy box at the end of the study. The development and distribution of the boxes were carried out through donations; a fundraising campaign began in the month of children's day, organized by the Research Group and the local community, thus enabling the distribution of the boxes to both groups.

Figure 1 – Box of popular Brazilian toys employed in the Toy Box Project

This study was developed during the COVID-19 pandemic, a disease caused by the SARS-CoV-2 virus. The toys were properly sanitized and packaged, some were delivered to the participants' homes by the research team, while others were picked up by volunteer parents/guardians at their child's school. All individuals involved wore protective masks, adhering to the guidelines for conducting research activities set forth by the Research Ethics Committee during the pandemic, as published by the National Commission of Ethics in Research on May 9, 2020. Additionally, this study complies with Resolution 466/2012 of the National Health Council regarding ethics in research involving human subjects. It was only initiated after approval by the Research Ethics Committee of the Catholic University of Brasília under protocol number 4.281.170 and after obtaining informed consent from the legal guardian and the child.

Instrument

At both pre- and post-moments, one month after the availability of the toy boxes, children from both the EG and CG were assessed for their PAL by electronically completing the Typical Day Physical Activity and Eating Questionnaire - DAFA, along with their parents. This questionnaire, validated by Barros et al.[18], comprises eight multiple-choice questions illustrated with images of physical activities of different intensities (light, moderate, and vigorous), to be marked by the child according to their routine. The child could select the figure representing the physical activity performed (walking, running, jumping rope, climbing stairs, playing ball, swimming, riding a bicycle, skateboarding, stretching, and helping with household chores), and were instructed not to make any marks if they

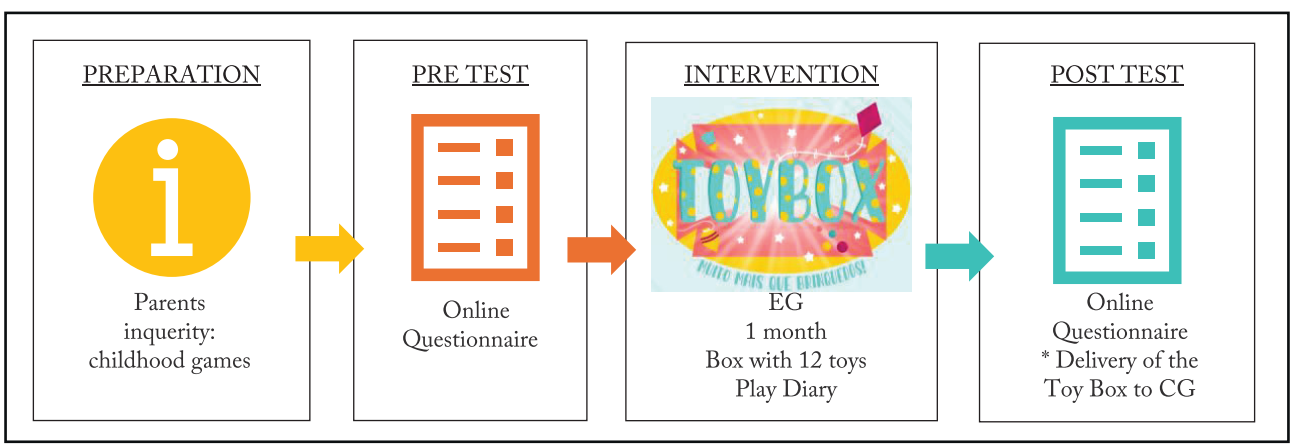

Figure 2 – Flowchart outlining the methodology of the Toy Box Project.
CG = Control group; EG = Experimental group.

did not engage in the respective activity. To obtain the physical activity score in metabolic equivalent of the task (METs), the scores were summed according to the weight of the selected activity, with a score of 1 for light activity (defined by the child as slow), 3 for moderate (defined as fast), and 9 for vigorous (defined as very fast). This criterion represents an approximation of the metabolic cost at different intensities in activities. They classified as the following scores: less active = sum of weights from 0 to 48; intermediate = sum of weights from 49 to 9; and more active = sum of weights above 96. Therefore, the sum of these weights could reach up to 143 points, thus, the higher the scores, the more active the child was classified. The section on eating was not applied as it was not a variable analyzed in this study. The research methodology is illustrated in Figure 2.

Statistical Analysis

The statistical software SPSS 21.0 for Windows was utilized for analysis. Descriptive statistics were employed, with quantitative variables presented as mean and standard deviation, and categorical variables as absolute frequency (n) and relative frequency (%). The normality of PAL data was assessed using the Shapiro-Wilk test. The Wilcoxon test was conducted to examine intragroup changes in sample characterization, and a two-way repeated measures ANOVA was employed to analyze variance between the group factor (GE vs. CG) and the time factor (pre vs. post). The significance level adopted was $p < 0.05$. Additionally, cutoff points were established based on questionnaire scores (quartiles) to classify children as less active (below the 50th percentile) and more active (above the 50th percentile). The graph was generated using GraphPad Prism v.10.0 for MacOS.

Results

According to the established exclusion criteria, participants who reported a diagnosis of illness (n = 1) and those who did not respond to the questionnaire (n = 114) were excluded from the study. Additionally, data from one child in the EG were excluded due to outlier values (insufficient questionnaire completion). Thus, the sample comprised 33 children randomized into CG (n = 12, ♂ = 4, ♀ = 8) and EG (n = 21, ♂ = 6, ♀ = 14). Table 1 presents the sample characterization data.

The results demonstrated that there was no significant difference in the analysis between time points ($F(1,30) = 0.79$; $p = 0.382$; $\eta 2 = 0.026$), nor in the interaction between groups and time points ($F(1,30) = 0.19$; $p = 0.666$; $\eta 2 = 0.006$). Despite this, an increase in the PAL was descriptively observed in the post-test in both the experimental group (($\Delta = 2.45 \pm 10.55$; $p > 0.05$) and the control group (($\Delta = 2.45 \pm 10.55$; $p > 0.05$) (Figure 3). Table 2 presents the classification of the children's physical activity levels.

Table 1 – Comparison of sample characterization data by group at pre- and post-intervention time points.

Group	Pre	Post	Z	p
Experimental (n = 20)				
Age (years)	8.60 ± 1.27	8.90 ± 1.41	-2.12	0.034*
Weight (kg)	36.93 ± 9.12	37.24 ± 8.97	-1.14	0.255
Height (cm)	134.84 ± 12.81	136.32 ± 15.33	-1.05	0.293
Control (n = 12)				
Age (years)	8.92 ± 1.16	8.92 ± 1.16	-	-
Weight (kg)	38.01 ± 8.65	39.67 ± 10.01	-1.25	0.212
Height (cm)	132.58 ± 19.09	136.83 ± 10.68	-0.74	0.462

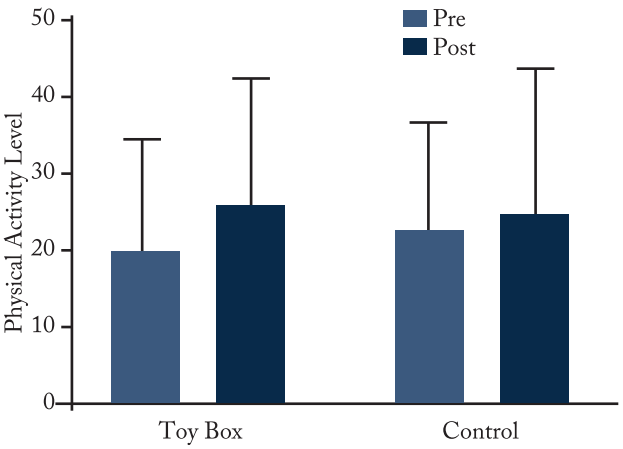

Figure 3 – Score corresponding to the Physical Activity Level of the Toy Box and Control Groups at pre- and post-intervention moments.

Children who scored below the 50th percentile were classified as less active, while those above the 50th percentile were classified as more active. The results demonstrated that, in the pre-test of the EG, there was a prevalence of 75% less active children and 25% more active children, and in the post-test, 60% less active children and 40% more active children. In the CG, there was a prevalence of 33% less active children and 67% more active children, both in the pre-test and post-test.

Less than 10% of the Play Diaries were returned to the researchers, consequently, the data from this instrument were excluded from the analysis.

Table 2 – Means, standard deviation, and confidence interval of the Physical Activity Level (PAL) of children according to groups, genders, and moments, obtained through the Typical Day Physical Activity and Eating Questionnaire (DAFA).

DAFA	Experimental (n = 20)	Control (n = 12)	Total (n = 32)
Pre			
Boys	31.33 ± 10.98 (CI95%: 19.8 – 42.9)	37.50 ± 13.10 (CI95%: 16.7 – 58.3)	33.80 ± 11.59 (CI95%: 25.5 – 42.1)
Girls	29.57 ± 9.60 (CI95%: 24.0 – 35.1)	37.25 ± 15.73 (CI95%: 24.1 – 50.4)	32.36 ± 12.40 (CI95%: 26.9 – 37.9)
Total	30.10 ± 9.77 (CI95%: 25.5 – 34.7)	37,33 ± 14,29 (CI95%: 28.3 – 46.4)	32.81 ± 11.99 (CI95%: 28.5 – 37.1)
Post			
Boys	36.33 ± 8.26 (CI95%: 27.7 – 45.0)	35.50 ± 8.23 (CI95%: 22.4 – 48.6)	36.00 ± 7.79 (CI95%: 30.4 – 41.6)
Girls	30.93 ± 14.10 (CI95%: 22.8 – 39.1)	39.50 ± 12.77 (CI95%: 28.8 – 50.2)	34.05 ± 13.97 (CI95%: 27.8 – 40.2)
Total	32.55 ± 12.66 (CI95%: 26.6 – 38.5)	38.17 ± 11.23 (CI95%: 31.0 – 45.3)	34.66 ± 12.28 (CI95%: 30.2 – 39.1)

Note: Values in mean and standard deviation.

Table 3 – Distribution of the means obtained in the Typical Day Physical Activity and Eating Questionnaire (DAFA) into quartiles.

Quartil	DAFA	Experimental		Control	
		Pre	Post	Pre	Post
1º	0.00 - 25,00	7 (35.0%)	7 (35.0%)	3 (25.0%)	2 (16.7%)
2º	26.00 – 34,00	8 (40.0%)	5 (25.%)	1 (8.3%)	2 (16.7%)
3º	35.00 – 44.50	2 (10.0%)	4 (20.0%)	5 (41.7%)	4 (33.0%)
4º	Above 45.00	3 (15.0%)	4 (20.0%)	3 (25.0%)	4 (33.0%)

Discussion

This study aimed to investigate the influence of the availability of popular Brazilian toys (Toy Box Project) on the PAL of children. Although no statistically significant difference was observed between groups and time points, the EG showed an improvement in PAL after the intervention compared to the CG. Furthermore, while in the CG more than half of the children were already more active and remained so at the post-intervention moment, in the EG, only a quarter were more active at pre-intervention, but there was an increase to 15% in the frequency for this category in the post-test. These findings, although nuanced and without deterministic implications, suggest a potentially beneficial practical impact of this intervention in encouraging physical activity among children.

Undoubtedly, lifestyle habit change for any individual is complex, involving structural, social, economic, cultural, and individual aspects[12,19,20], reflecting challenges for behavioral science, particularly regarding the form and timing of practice. The time and frequency required for habit consolidation or change vary due to the subjectivity of individuals and contexts[20,21]. Therefore, the possibility exists that the one-month intervention period defined for this study may be insufficient for more emphatic results. Such consideration is supported by the study of Lally et al.[20], which investigated the development of automaticity among 39 volunteers who chose a healthy behavior – such as eating (n = 10), drinking (n = 15), or exercising (n = 13) – that they wished to make habitual. The automaticity of this healthy behavior ranged from 18 to 254 days.

However, the establishment of good habits, such as regular physical activity, should begin in childhood, a phase characterized by openness to discovery and the formation of attitudes and values. In this sense, it is the responsibility of caregivers, whether legal or social, to guide children towards positive and varied experiences. Therefore, the manner of guidance involves the path of teaching and learning, which occurs through communication. One of the non-verbal and enjoyable forms of communication for children is through play[5], where playfulness is present. According to Caillois[22], the term "playful" derives from the Latin word "ludere" – illusion, thus, the escape from reality into a fictional world accesses abstractions for the realization of personality and customs in and of the individual.

Playfulness, therefore, also proves to be important

for adults. A study by Solomon-Moore et al.[23] illustrates the affective memory in the play experiences of individuals, as parents, when questioned about their perceptions of their children's current activities, report considering their own play experiences as more attractive. This result does not classify traditional play as better than modern ones, as each has its own meanings. However, it reinforces that affective memory can encourage and influence children's views towards a particular practice based on the educational management of parents and other agents.

In accordance, Wiggers et al.[24] analyzed the preferred play patterns of 145 Brazilian children aged 6 to 12 years. The drawings were categorized into technological media, traditional play, and sports activities. It was noted that 61 drawings was related to traditional play, 44 portrayed sports activities, 16 illustrated media-based play, and 24 depicted other forms of play. These findings underscore the robust appeal and potential effectiveness of traditional play as it exhibits a high propensity for engagement among individuals exposed to it.

Thus, in addition to strengthening socio-affective bonds, the reverberations of the Toy Box Project can be supported by Rebould et al.[25], who emphasize that active parental involvement is paramount in fostering positive physical activity experiences with lifelong implications. They compared children's physical activity levels under three conditions: 1. children left alone in play spaces by their parents; 2. those observed by their parents; and 3. those actively playing with their parents. The authors concluded that children engaging in play with their parents demonstrated higher levels of activity compared to the other groups. The most effective physical activity interventions were noted to hinge on parental adherence and involvement, regardless of the intervention setting (home, community, school, or primary care).

The choice of popular toys as a stimulus for physical activity, in addition to facilitating greater interaction between parents and children, who could relive their childhoods and both teach and learn from their children, can also help reduce screen time. The evident prevalence of screen time in current play, exacerbated by the COVID-19 pandemic[10,11] and its widespread use, along with its association with sedentary behavior and obesity as previously mentioned, leads to detrimental effects on sleep, learning, creativity, and fosters symptoms of anxiety, depression, social isolation, consumerism, cyberbullying, among others[26,10].

It is worth noting that the need for rest and the relevance of technology, especially in communication and access to information[27], are not denied, but as highlighted by Pereira et al.[28], emphasis is placed on conscious and controlled use and motivation to maintain healthy behavior such as preventing a decrease in PAL, valuing activities of direct interaction among peers and with the environment[8,12,14,15], as encouraged in the present study, both during and after the pandemic[10,11].

Despite the current digital age and the expected familiarity with technological tools, the volunteers encountered significant difficulty in responding to the virtual questionnaire. Buchholz et al.[29], in a more recent analysis, raised reflections on online educational experiences following the pandemic. The authors highlighted that digital literacy goes beyond technical ability, involving critical skills to read, write, interpret, and interact through screens, leading to a lack of democratic and equitable digital citizenship, as illustrated in the present study.

This need for digital literacy is highlighted in reports from the Internet Management Committee[27] as one of the strong pillars for the implementation of school connectivity programs in an equitable, inclusive, and secure manner. This is because the use of information and communication technologies in the educational process is a competence demanded in contemporary times, and it can also contribute to achieving Sustainable Development Goals such as Quality Education.

In parallel to this educational scenario, Szucs[30] highlights the capacities and influence of teachers as motivating agents and guides for children's health education. Thus, the continuation of the present study in collaboration with teachers is suggested, as they can assist in raising awareness, motivation, and guidance for families regarding the act of playing critically and autonomously. An example of partnership with teachers includes implementing the project within the school, with weekly visits comprising the delivery of one toy at a time, explanation of active play options to be carried out, and a one-hour period of play with the entire class.

Additionally, it is worth noting as a limitation of the study the lack of monitoring of daily playtime, due to participants not recording and submitting their diaries. The sample size, which was reduced due to the volunteers' difficulty in responding to the virtual questionnaire, could have been mitigated by administering the questionnaire in person, but this was not possible due to the pandemic. The pandemic context itself is an unknown scenario fraught with negative psychosocial consequences, both for families and especially for chil-

dren. Furthermore, the lack of funding from a scientific research funding agency hindered the continuation of the work, with attempts to increase the number of participants, for example. In conclusion, although the availability of popular toys did not result in a statistically significant difference in the level of physical activity among the analyzed children, the clinical differences between the groups regarding classification (more active) and variation (deltas) demonstrate the potential of the Toy Box Project for promising outcomes in physical activity levels, necessitating future applications to adjust the intervention time, administer the questionnaire according to the volunteers' digital literacy, monitor daily practices, and consider the role of teachers as partner agents.

Conflict of Interest

The authors declare no conflict of interest.

Funding

This work was carried out with financial support from volunteers and the authors themselves.

Authors' Contributions

Pereira RMS: Conceptualization, Methodology, Validation, Formal analysis, Investigation, Resources, Supervision, Project administration, Visualization, Writing - original draft, manuscript, Writing - review & editing, Approval of the final version. Cruz RS: Conceptualization, Methodology, Validation, Investigation, Resources, Project administration, Writing - original draft, manuscript, Writing - review & editing, Approval of the final version. Leite CD: Methodology, Data analysis, Resources, Data curation, Visualization, Writing of the original manuscript, Writing - original draft, manuscript, Writing - review & editing, Approval of the final version. IA branches: Conceptualization, Methodology, Validation, Formal analysis, Investigation, Resources, Supervision, Project administration, Visualization, Writing - original draft, manuscript, Writing - review & editing, Approval of the final version.

Declaration regarding the use of artificial intelligence tools in the article writing process

For the development of this manuscript, the artificial intelligence tool ChatGPT was used for the activity text translation. The authors declare that all material derived from such process has been reviewed, and the authors assume full responsibility for all the content of the manuscript.

Availability of research data and other materials

The data of this study is available on demand from referees.

Acknowledgments

The authors would like to thank the supporters and donors of toys, the school directors, the parents, the volunteer children, the research groups Neuromov/UCB/Uniprojeção and GESSI/Unieuro for providing all the support for the research execution, and CAPES for the scholarships offered to the authors, enabling greater engagement in the academic and scientific communit.

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Received: 24/09/2022
Approved: 18/03/2024

Associate editor
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Cite this article as:
Pereira RMS, Cruz RS, Leite CD, Ramos IAV. Toy Box Project: encouraging the physical activity when play with the family during the COVID-19 pandemic. Rev. Bras. Ativ. Fis. Saúde. 2024;29:e0329. DOI: 10.12820/rbafs.29e0329