Research article

# Association between 24-hour movement behaviors and anxiety in children after social isolation

## Asociación entre conductas de movimiento de 24 horas y ansiedad en niños después del aislamiento social

## Associação entre comportamentos de movimento 24 horas e ansiedade em crianças após o isolamento social

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## ABSTRACT

In recent years, Brazil has been facing the effects of COVID-19. The need for social isolation has affected 24-hour movement behaviors and the psychological well-being of children and adolescents. The main objective of this study is to evaluate possible associations between 24-hour movement behaviors and anxiety levels in preschool children after social isolation. The sample consisted of 61 children of both sexes, aged between three and six years, enrolled in public schools. Adapted questionnaires were applied to assess 24-hour movement behaviors and anxiety. We used descriptive analysis through frequency distribution and network analysis. It was observed that children do not adhere to physical activity recommendations during the week or on weekends. Being hurt and dependence on parents were the anxiety-related behaviors with the highest values. Adhering to physical activity recommendations during the week does not guarantee compliance with other behaviors. Anxious behavior tends to influence the increase of other behaviors. The variables most likely to generate changes in the network were: fear of separation, dependence on parents, symptoms of fear and anxiety, and screen use during the weekend. It can be concluded that not complying with 24-hour movement behavior recommendations can increase anxiety levels. It is suggested that more studies focused on this topic be developed, considering its high relevance.

Keywords: Exercise; Sedentary behavior; Child, Preschool; Anxiety.

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## RESUMEN

En los últimos años, Brasil ha enfrentado los efectos de la COVID-19. La necesidad de aislamiento social ha afectado las conductas de movimiento durante las 24 horas y el bienestar psicológico de niñas, niños y adolescentes. El principal objetivo del presente trabajo es evaluar posibles asociaciones entre las conductas de movimiento durante las 24 horas y los niveles de ansiedad en niñas y niños preescolares después del aislamiento social. La muestra estuvo compuesta por 61 niñas y niños de ambos sexos, con edades entre tres y seis años, matriculados en escuelas públicas. Se aplicaron cuestionarios adaptados para evaluar las conductas de movimiento y la ansiedad durante las 24 horas. Se utilizó un análisis descriptivo mediante la distribución de frecuencias y análisis de redes. Se observó que las niñas y los niños no siguen las recomendaciones de actividad física tanto durante la semana como el fin de semana. Sentirse herido y la dependencia de los progenitores fueron las conductas de ansiedad con valores más altos. Cumplir con las recomendaciones de actividad física durante la semana no garantiza el cumplimiento de otras conductas. Las conductas ansiosas tienden a influir en el aumento de las demás. Las variables con mayor probabilidad de generar cambios en la red fueron: miedo a la separación, dependencia de los progenitores, síntomas de miedo y ansiedad, y el uso de pantallas durante el fin de semana. Se concluye que no cumplir con las recomendaciones de las conductas de movimiento durante las 24 horas puede aumentar los niveles de ansiedad. Se sugiere que se desarrollen más estudios enfocados en este tema, considerando su alta pertinencia.

Palabras clave: Ejercicio físico; Conducta sedentaria; Ansiedad; Preescolar.

## RESUMO

Nos últimos anos, o Brasil vem enfrentando os efeitos da COVID-19. A necessidade de isolamento social afetou os comportamentos de movimento 24 horas e o bem-estar psicológico de crianças e adolescentes. O presente trabalho tem como principal objetivo avaliar possíveis associações entre os comportamentos de movimento 24 horas e os níveis de ansiedade em crianças pré-escolares após o isolamento social. A amostra foi composta por 61 crianças de ambos os sexos, com idades entre três e seis anos, matriculadas em escolas públicas. Foram aplicados questionários adaptados para avaliar os comportamentos de movimento 24 horas e ansiedade. Utilizou-se análise descritiva por meio da distribuição de frequência e análise de redes. Verificou-se que as crianças não aderem às recomendações de atividade física tanto durante a semana quanto no final de semana. Os comportamentos de ansiedade com valores mais altos foram "ficar magoado" e "dependência dos pais". Aderir às recomendações de atividade física durante a semana não garante o cumprimento dos demais comportamentos. Um comportamento ansioso tende a influenciar o aumento de outros. As variáveis mais propensas a gerar modificações na rede foram: medo de separação, dependência dos pais, sintomas de medo e ansiedade, e uso de telas durante o fim de semana. Conclui-se que não cumprir as recomendações dos comportamentos de movimento 24 horas pode aumentar os níveis de ansiedade. Sugere-se que mais estudos voltados para essa temática sejam desenvolvidos, considerando que é um tema de grande relevância.

Palavras chave: Exercício físico; Comportamento sedentário; Ansiedade; Pré-escolar.

## INTRODUCTION

Twenty-four-hour movement behaviors are characterized by three components that interact with each other: sleep time, sedentary behavior, and physical activity (Tremblay et al., 2016). However, since these three variables make up the entire 24-hour period, the time dedicated to one of these elements will influence the time spent on the others, making the variables dependent on each other (Tremblay et al., 2016). The way in which this relationship occurs can have an impact on the health of children and adolescents (Saunders et al., 2016). It is noteworthy that children and young people who present better combinations of movement behaviors tend to have a positive impact on adiposity measurements and cardiometabolic health compared to those who present inadequate combinations (Saunders et al., 2016).

It is important to highlight that physical inactivity in early childhood can impact other stages of life (Barnett et al., 2016), such as low proficiency in fundamental motor skills (Logan et al., 2015), executive functions, health outcomes (Etnier et al., 2016) and mental health (Jiménez-Pavón et al., 2020). In addition, poor sleep quality has a negative impact on children's emotional symptoms (Fochesatto et al., 2020), which may possibly extend to physical activity practices. When performed regularly during the day, these can play a protective role in reducing anxiety in children and other aspects of emotional control (Saez, 2017; Aguilar-Ozejo, 2024). Given the importance of combining and relating behaviors, the Physical Activity Guide for the Brazilian Population recommends that children aged three to five should practice at least three hours of physical activity per day, regardless of intensity. However, there should be at least one hour of moderate to vigorous intensity, which can be accumulated throughout the day. The guide also emphasizes the importance of reducing sedentary behavior as much as possible and informs that the time spent in front of screens should be up to one hour per day for children aged one to five (Ministry of Health, Brazil, 2021). As for sleep time, between 10 and 13 hours of good quality sleep is recommended for children aged three to four, and 9 to 10 hours for five-year-olds (World Health Organization, 2019).

It is advisable to pay more attention to the combination of behaviors, aiming at a healthy movement profile, and not just to a healthy behavior in isolation (Tremblay et al., 2016; World Health Organization, 2019). A study conducted by De Lucena Martins et al. (2021) showed that only 3% of a group of preschool children from Paraíba (between three and five years old) met the recommendations for movement behaviors. One possible explanation for this result would be the socioeconomic factors of the families, as the children were in a vulnerable situation.

In recent years, Brazil has been struggling with the effects of the COVID-19 pandemic, mainly in the socioeconomic area. In 2019, the global extreme poverty rate was 8.4%, and it jumped to 9.5% in 2020 (Sachs, 2021). According to the Fiocruz technical report (Silva et al., 2020), before the pandemic hit Brazil, there were millions of people living in situations of social vulnerability, with around ¼ of the population living below the poverty line. In addition, with the need for social distancing, schools and public spaces were closed, and most activities began to be carried out in the home office format, resulting in changes to the routines of millions of Brazilians.

Thus, social isolation directly affected 24-hour movement behaviors. A study conducted by Santos et al. (2017) reported that participants reported negative behaviors, such as changes in sleep, increased screen time, and reduced physical activity. For Racine et al. (2021), restrictions also affected the psychological well-being of children and adolescents, with clinically elevated rates of anxiety and a global prevalence of mental illness.

Isolation measures proved to be of paramount importance in reducing the spread of the virus. However, the physical and mental well-being of children and adolescents was negatively affected due to confinement. Along with the quarantine, there was an increase in cases of anxiety and depression in children and adolescents, in addition to a greater propensity for poor diet and a sedentary lifestyle (Almeida & da Silva Júnior, 2021; da Mata et al., 2020). In short, 24-hour movement behaviors, combined with the difficulties faced during the pandemic, may be associated with psychological factors, such as anxiety in children. In this sense, it is necessary to investigate the associations between 24-hour movement behaviors and anxiety levels in preschool children after the period of social isolation. The present study aims to evaluate possible associations between 24-hour movement behaviors and anxiety levels in children after the period of social isolation.

## METHODS

### Type of research, participants and ethical procedures

This study is characterized as descriptive and associative. The study population consisted of 61 children of both sexes, aged between 3 and 6 years, from public schools in the city of Juazeiro do Norte - CE. The sample was selected voluntarily and by convenience, with the consent of parents and guardians, who accepted the terms of the research. The children also gave verbal consent to participate in the study. As inclusion criteria, it was considered that the children should be enrolled in public schools and be between 3 and 6 years old. The research was approved by the Ethics Committee for Research with Human Beings (CEP) of the Regional University of Cariri - URCA, with protocol number 4.330.160. The research procedures followed the Guidelines and Regulatory Standards for Research Involving Human Beings, in accordance with Resolution 466/12 of the National Health Council of the Ministry of Health (CNS/MS), which aims to identify, analyze and evaluate the ethical implications in scientific research involving human beings.

### Instruments

#### Physical activity

The assessment of the level of physical activity was carried out through adapted questions about the parents' perception regarding the level, duration and intensity of the physical activity performed by the children. The questions included: "How many times a week (or weekend) does the child participate in physical activity?", "How long does each session last? Ex.: 50 minutes" and "Regarding the perception of the intensity of the physical activity performed by the child during the week (or weekend), considering most of the time", with illustrated alternatives: A) Light effort, B) Moderate effort, C) Vigorous effort and D) Moderate and vigorous effort. The parents' responses were collected separately for the week and for the weekend. Subsequently, the responses were analyzed according to the

Physical Activity Guide for the Brazilian Population, which presents the recommendations for the necessary time of physical activity for the age group in question. The adaptations were made based on the questionnaire proposed and validated by Barros et al. (2019).

### Screen Time

To assess screen time, parents or guardians reported the average total time their children were exposed to screens (computer, tablet, cell phone, TV, and video game) during the week and on the weekend. The questions included: "How many hours per day during the week does your child usually watch TV, use a computer, tablet, or cell phone for activities, watch videos, or play electronic games?" and "How many hours during a weekend day does your child usually watch TV, use a computer, tablet, or cell phone for activities, watch videos, or play electronic games?" Screen time (ST) was calculated as follows: (((ST on weekdays) x5) + ((ST on weekends) x2)) / 7. For statistical analyses, the variable was dichotomized into ≤1 h/day and >1 h/day, as per Lee et al. (2017) and De Craemer et al. (2018).

### Sleep Time

To assess sleep time, parents or guardians reported the times their child went to sleep and woke up during the week and on the weekend. Questions included: "On weekdays, what time does your child usually go to sleep?" and "On weekdays, what time does your child usually wake up?" The same question was asked for weekends. The average hours of sleep during the week were calculated as follows: (Wake-up time - Bedtime) * 5 and for the weekend: (Wake-up time - Bedtime) * 2. The total average was calculated as: [(Weekday wake-up time - Weekday bedtime) * 5] + [(Weekend wake-up time - Weekend bedtime) * 2] / 7 (Goodlin-Jones et al., 2008). After the calculation, children were classified as "meeting" or "not meeting" sleep recommendations, according to the age group of the study.

### Child Behavior Inventory for Ages 1.5 to 5 (CBCL/1.5-5)

We used the Child Behavior Inventory (CBCL/1.5-5) (Achenbach & Rescorla, 2000), which aims to assess emotional and behavioral problems of children aged between 18 months and 5 years and 11 months, from the perspective of parents or guardians. The Brazilian version of the instrument was translated by Silvares et al. (2010) and has 99 items that assess various types of problems manifested by children. The inventory can be analyzed using scales based on the Diagnostic and Statistical Manual of Mental Disorders (DSM-5), including affective problems, anxiety problems, pervasive developmental problems, attention deficit/hyperactivity disorder, and oppositional defiance problems. In this study, we used only the items related to anxiety problems, with composite reliability > 0.80, indicating good item consistency.

### Data Collection

Data collection took place during the month of December 2022. A public school in Juazeiro do Norte, Ceará, was contacted to participate in the study. The school principal signed the Consent Form after receiving clarifications about the data collection. The school administration authorized access to the group of parents/guardians through the WhatsApp communication platform. The link to Google Forms was made available, and parents/guardians were able to access the Free and Informed Consent Form (FICF) and the questions. Participants were free to respond accurately by clicking "I agree to participate" after reading the FICF, and then began the session of questions about movement behaviors in 24 hours and the CBCL/1.5-5. The questionnaire consisted of five sections: the child's socio demographic form,

the child's usual physical activity, screen time, sleep duration, and CBCL. The link was also posted on the social network Instagram.

*Data Analysis*

Descriptive statistics were used, with frequency distribution for categorical variables. Descriptive analyses were performed using the JASP 0.16.4.0 program. Possible relationships between 24-hour movement behavior and anxiety were investigated through Network Analysis, a statistical analysis based on Machine Learning techniques that seeks to establish interactions between variables through graphical representations (Epskamp et al., 2012). The study variables are represented in the network by nodes, and the relationships between variables are represented by edges, which can be red (negative relationship) or blue (positive relationship). The thickness of the edges indicates the strength of the relationship, ranging from -1 to 1. To optimize network accuracy, we used the random fields of the pairwise Markov model, with L1 penalty (regularized regression). Regulation was estimated by a least complete selection and contraction operator (Lasso). The extended Bayesian information criterion (EBIC) was used to select the Lambda of the regularization parameter, with y = 0.50. The accuracy matrix was obtained with LASSO algorithms. The network was generated in the RStudio program, using the q-graph package, and the estimation was made by correlation ("color"). The accuracy of the network was verified by bootstrapping with 1000 resamplings, showing reliable correlation (Epskamp et al., 2012). The robustness of the network was ensured to minimize problems related to sample size. Then, the expected influence centrality index was investigated to assess the proximity between the variables (nodes), indicating those most likely to generate changes in the network. The stability of the centrality (CS) showed an adequate result, CS > 0.5.

## RESULTS

Table 1 presents the results of the descriptive analyses. Data on physical activity during the weekend were excluded because there was no variability in the responses. The sample consisted of 54.09% male children and 45.90% female children. It was found that most children did not meet the physical activity recommendations both during the week and on the weekend, with only one child adhering to the recommendations. Similarly, screen time during the week and on the weekend showed the same result. Sleep recommendations during the week were not met by 28% of the children, while on the weekend, 34% of the children did not adhere to the recommendations. No child simultaneously adhered to all the recommended behaviors. The anxiety items with the highest values were related to dependence on parents and ease of getting hurt.

**Table 1.**
*Descriptive analysis of data.*

| Sociodemographic | Total participants | | |
|---|---|---|---|
| Gender | 61 | | |
| **Behaviors** | **Adhere (n%)** | **Do not adhere (n%)** | |
| Physical activity | 1 (1.63) | 60 (98.36) | |
| Sleep/Week | 33 (54,09) | 28 (45,90) | |
| Sleep/Weekend | 40 (65,57) | 21 (34,42) | |
| Screen/Week | 16 (26,23) | 45 (73,77) | |
| Screen/Weekend | 10 (16,39) | 51 (83,60) | |
| *Anxiety* | **Not true (n%)** | **Somewhat true (n%)** | **Very true (n%)** |
| Item 1 | 10 (16,39) | 25 (40,98) | 26 (42,62) |
| Item 2 | 6 (9,83) | 22 (36,06) | 33 (54,09) |
| Item 3 | 24 (39,34) | 28 (45,90) | 9 (14,75) |
| Item 4 | 40 (65,57) | 15 (24,59) | 6 (9,83) |
| Item 5 | 27 (44,26) | 21 (34,42) | 13 (21,31) |
| Item 6 | 33 (54,09) | 14 (22,95) | 14 (22,95) |
| Item 7 | 21 (34,42) | 22 (36,06) | 18 (29,50) |
| Item 8 | 58 (95,08) | 2 (3,27) | 1 (1,63) |

*Note: Item 1- Clings to adults or is very dependent. Item 2- Gets hurt easily. Item 3- Gets nervous when separated from parents. Item 4- Seems unhappy for no good reason. Item 5- Is nervous or tense. Item 6- Is awkward in front of other people or worried about what others will think. Item 7- Is very fearful or anxious. Item 8- Is unhappy, sad, or depressed.*

In both sexes, non-adherence to physical activity and screen time was observed during the week, a behavior that extended to the weekend. Regarding sleep recommendations, most girls adhered to them both during the week and on the weekend, unlike boys, who adhered only on the weekend. There were no significant differences in the highest anxiety items between boys and girls. Further information can be found in Table 2.

Table 2.
*Descriptive analysis according to sex.*

| Behaviors | GIRLS (N:28) | | | BOYS (N:33) | | |
|---|---|---|---|---|---|---|
| | Adhere (n%) | Do not adhere (n%) | | Adhere (n%) | Do not adhere (n%) | |
| Physical activity | 0 (0.00) | 28 (100) | | 1 (3.03) | 32 (96.97) | |
| Sleep/Week | 17 (60.71) | 11 (39.28) | | 16 (48.48) | 17 (51.51) | |
| Sleep/Weekend | 18 (64.28) | 10 (35.71) | | 22 (66.66) | 11 (33.33) | |
| Screen/Week | 8 (28.57) | 20 (71.42) | | 8 (24.24) | 25 (75.75) | |
| Screen/Weekend | 5 (17.85) | 23 (82.14) | | 5 (15.15) | 28 (84.84) | |
| ***Anxiety*** | **Not true (n%)** | **Somewhat true (n%)** | **Very true (n%)** | **Not true (n%)** | **Somewhat true (n%)** | **Very true (n%)** |
| Item 1 | 4 (14.28) | 12 (42.85) | 12 (42.85) | 36 (18.18) | 13 (39.39) | 14 (42.42) |
| Item 2 | 3 (10.71) | 10 (35.71) | 15 (53.57) | 3 (9.09) | 12 (36.36) | 18 (54.54) |
| Item 3 | 10 (35.71) | 13 (46.42) | 5 (17.85) | 14 (42.42) | 15 (45.45) | 4 (12.12) |
| Item 4 | 18 (64.28) | 7 (25.00) | 3 (10.71) | 22 (66.66) | 8 (24.24) | 3 (9.09) |
| Item 5 | 14 (50.00) | 10 (35.71) | 4 (14.28) | 13 (39.39) | 11 (33.33) | 9 (27.27) |
| Item 6 | 15 (53.57) | 7 (25.00) | 6 (21.42) | 18 (54.54) | 7 (21.21) | 8 (24.24) |
| Item 7 | 7 (25.00) | 13 (46.42) | 8 (28.57) | 14 (42.42) | 9 (27.27) | 10 (30.30) |
| Item 8 | 27 (96.42) | 0 (0.00) | 1 (3.57) | 31 (93.93) | 2 (6.06) | 0 (0.00) |

*Note: Item 1- Clings to adults or is very dependent. Item 2- Gets hurt easily. Item 3- Gets nervous when separated from parents. Item 4- Seems unhappy for no good reason. Item 5- Is nervous or tense. Item 6- Is awkward in front of other people or worried about what others will think. Item 7- Is very fearful or anxious. Item 8- Is unhappy, sad, or depressed.*

Figure 1 shows the network analysis. It can be seen that adhering to the physical activity recommendations during the week does not guarantee compliance with the sleep recommendations (0.17) or the screen time recommendations during the week (0.06) or on the weekend (0.005). However, these results should be interpreted with caution due to the low variability of the sample. Children who adhere to the sleep recommendations during the week tend to also comply with the sleep recommendations on the weekend (0.20) and the screen time recommendations (0.14). Compliance with the sleep recommendations on the weekend is related to compliance with the screen time recommendations both during the week (0.05) and on the weekend (0.02). When children adhere to the screen time recommendations during the week, they tend to also comply with them on the weekend (0.52).

The anxiety items tend to feed back, that is, an increase in one behavior tends to influence an increase in the others, with variations from 0.33 to 0.01. The strongest relationships were observed between the behavior of being clingy or very dependent on parents and appearing unhappy (items 1-4), and between being nervous when separating from parents and being very nervous or anxious (items

3-7), with negative relationships of greater intensity (0.16 and 0.20, respectively). The more dependent the child is on their parents, the more anxious they will be when separating from them (0.63). However, children who meet sleep recommendations during the weekend tend to show a reduction in symptoms of dependence on their parents (0.49). Failure to meet screen time recommendations during the week and on the weekend tends to increase levels of nervousness when separating from parents, with the strongest relationship being with screen time during the week (0.31). Failure to meet physical activity recommendations is strongly related to high levels of anxiety, with variations between 0.01 and 0.17.

Regarding gender, boys tend to adhere more to physical activity (0.09), sleep on the weekend (0.07) and screen time on the weekend (0.04), while girls adhere more to sleep during the week (0.08) and screen time during the week (0.11). Girls also tend to have higher levels of anxiety, with variations between 0.002 and 0.19. The accuracy of the network, with confidence intervals of 1000 resamplings for a more precise estimate, showed good precision results.
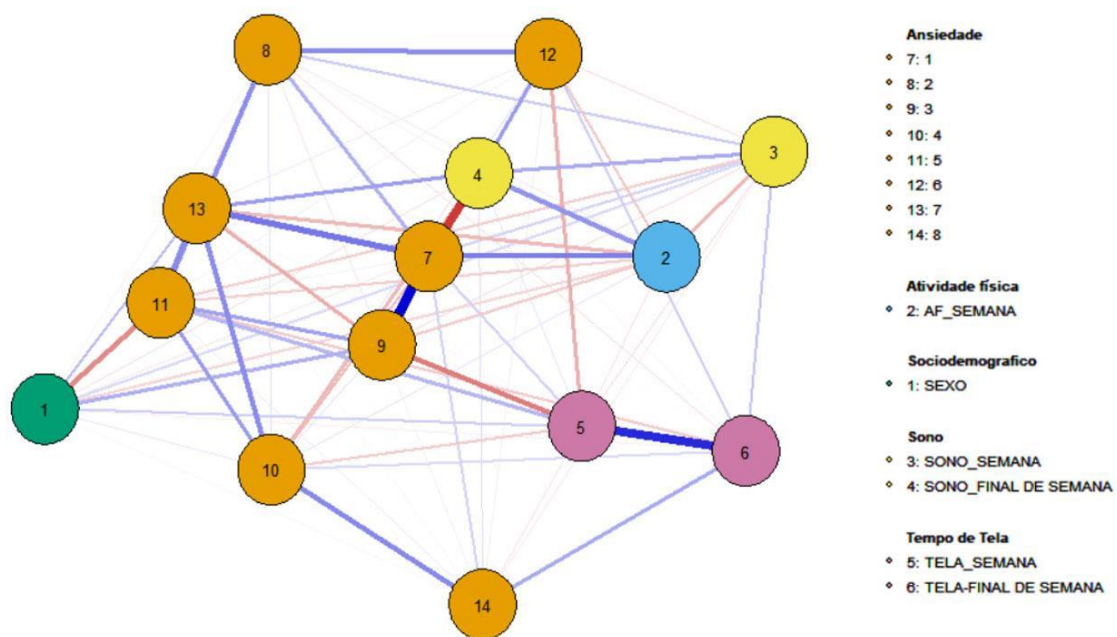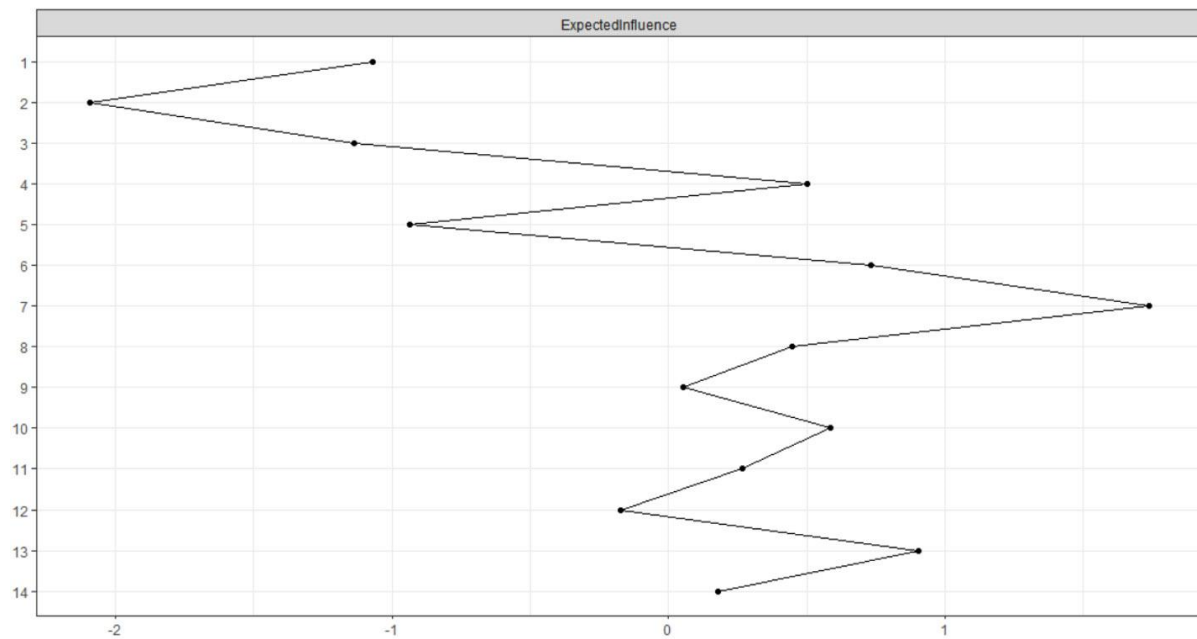
**Figure 1.**

*Network analysis.*



Figure 2 shows the results of the expected influence analysis. The items that presented the highest results were: fear of separation from parents (Item 7), symptoms of fear and anxiety (Item 13) and use of screens during the weekend (Item 6). These variables are the most likely to generate changes in the network. The stability analysis of the expected influence indicated an adequate result (CS > 0.5).

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**Figure 2**.
*Expected influence*



*Note: 1- Sex, 2- Physical activity, 3- Sleep during the week, 4- Sleep on the weekends, 5- Screen time during the week, 6- Screen time on the weekends, 7- Clings to adults or is very dependent, 8- Gets hurt easily, 9- Gets nervous when separated from parents, 10- Seems unhappy for no good reason, 11- Is nervous or tense, 12- Is awkward in front of other people or worried about what others will think. 13- Is very fearful or anxious. 14- Is unhappy, sad or depressed.*

## DISCUSSION

The aim of this study was to assess possible associations between 24-hour movement behavior and anxiety levels in children after the period of social isolation.

Regarding adherence to 24-hour movement behaviors, we found that no child adhered to the recommendations simultaneously, corroborating previous studies that indicate that the number of children who follow these recommendations is extremely low (De Craemer et al., 2018; Mota et al., 2020; De Lucena Martins et al., 2021). It is important to note that only 10% to 20% of children worldwide meet the recommendations (Santos et al., 2017; Chaput et al., 2017). Failure to comply with these recommendations can be attributed to several factors, such as socioeconomic conditions, lack of understanding on the part of parents, cultural patterns, limitations of access and opportunities, in addition to the absence of adequate public policies (De Lucena Martins et al., 2021).

It is important to highlight that not following the recommendations for physical activity and limiting screen time can have negative consequences for children's health, whether during periods of confinement or not. These consequences include decreased energy, difficulty in social interaction, obesity and the development of chronic diseases (Brooks et al., 2020; Buitrago-Garcia et al., 2020). On the other hand, adhering to the recommendations brings numerous benefits. Studies show that children who follow these guidelines have lower rates of obesity (Carson et al., 2017), higher performance in fundamental motor skills (Mota et al., 2020) and better cognitive and social development (Cliff et al., 2017).

With regard to anxiety outcomes, "getting hurt easily" and "dependence on parents" were the most prevalent anxious behaviors. The pandemic context of social isolation has changed the dynamics of interpersonal relationships, even within the home, whether due to contagion, presence of the virus, or preventive measures. However, children, due to their need for closeness, demand the presence of their parents, and this distancing may explain the development or increase in separation anxiety and fear due to sudden changes (da Silva, 2021). Associative analyses reveal that complying with physical activity recommendations does not guarantee compliance with other movement behaviors. This data converges with the literature, which indicates that children can be physically active, exercise regularly, and still maintain sedentary behavior regarding screen time and have poor quality sleep (De Lucena Martins et al., 2021). Furthermore, children who maintain healthy behaviors during the week tend to prolong these practices on weekends.

Physical activity during the week, as well as screen time and sleep quality on the weekend, are more common behaviors among boys, while girls tend to meet sleep and screen time recommendations during the week. Studies indicate that preschool-aged girls engage in less physical activity and are less physically active than boys in the same age group (Hinkley et al., 2008; Hinkley et al., 2012; De Craemer et al., 2012). In addition, structured and unstructured physical activities are culturally more encouraged for boys (Dumith, 2021). The study by Schmidt et al. (2020) suggests that girls tend to be more active in low-intensity activities, which may partly explain the non-compliance with recommendations, especially with regard to moderate-to-vigorous intensity activities.

Another relevant point observed was that anxiety behaviors tend to feed off each other; In other words, an increase in one anxious behavior intensifies others, creating a vicious cycle. For example, the more dependent a child is on their parents, the more nervous they become when they are away from them. These behaviors of parental dependence are related to separation anxiety and begin to manifest between nine and thirteen months of age, and can intensify at four years of age, when the child starts school (Figueroa et al., 2015). Entering the school environment causes a separation from attachment figures and provides new socialization experiences, which can increase social anxiety and nervousness when separating from parents.

Symptoms of parental dependence may have worsened during the pandemic, as with social isolation, parents spent more time at home with their children. This dynamic may have contributed to the increase in screen time, since many parents resorted to screens to keep their children occupied while working from home, a behavior that may have persisted after the end of isolation. Furthermore, studies show that parents have difficulty limiting screen time, as they themselves are also subject to long periods of exposure (Schoeppe et al., 2016; Assathiany et al., 2018).

Following physical activity recommendations can reduce anxiety levels. While sedentary behavior is related to an increased likelihood of developing mental health problems, regular physical activity helps reduce these disorders (Bélair et al., 2018). According to Angelo & Zilberman (2016), regular physical exercise lasting at least 30 minutes and of moderate intensity can positively influence both anxiety and depression symptoms. According to Sanches et al. (2016), physical activity stimulates the production of endorphins, contributing to improved mood and reducing hormones related to increased anxiety and stress, such as adrenaline and cortisol.

The variables that showed the greatest sensitivity in the network analysis were "fear of separation from parents", "fear" and "anxiety". Considering that there is a tendency for anxious behaviors to feed back, intervening in these behaviors can improve the overall anxiety picture in children. Another influential variable is screen time during the weekend. It has already been shown that excessive screen use has consequences for anxiety, generating mood swings (De Alencar Rocha, 2022). Intervening in these behaviors is essential to ensure the quality of life of these children.

## CONCLUSION

Based on the results, it was possible to verify that there were associations between 24-hour movement behavior and anxiety levels in children after the period of social isolation. It was observed that no child simultaneously met the daily recommendations for 24-hour movement behaviors. Anxiety levels tend to increase due to non-compliance with these recommendations.

There is a clear need to implement public policies that encourage the practice of physical exercise, as well as limit the use of screens. In addition, it is essential that parents and educators are attentive to children's behavior, encouraging them through positive reinforcement, with the aim of developing self-confidence and reducing anxiety symptoms.

It is suggested that more studies be carried out on this topic, since it is a relevant subject that requires greater in-depth study.

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