Relationship Between Pain, Physical Activity, Screen Time and Age among Young Children during the Covid-19 Pandemic

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Article

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Abstract: Introduction: During the COVID-19 pandemic, many countries implemented restrictions, social distancing measures, and lockdowns to limit the spread of the disease. The lockdowns have affected children's screen time (ST), pain, and physical activity (PA) levels. The present study aimed to explore the relationships between several personal factors during the COVID-19 pandemic. Methods: The caregivers of 329 children (median age=8 years) filled out an online self-reported survey about the children's PA, ST, and pain before, during, and after the COVID-19 curfew. Spearman's rank correlation coefficient was used to explore the associations between these variables. Results: After the curfew, pain that existed before the pandemic had a weak negative relationship with PA intensity (-0.11, p=0.04) and a weak positive relationship with ST (r=+0.12, p=0.04). There was a strong positive relationship between ST in all time periods (p>0.01). PA and ST had a weak negative relationship (p>0.05) during the curfew and after the curfew but not before the COVID-19 pandemic. Age had a weak positive correlation with ST in all time periods (p>0.01). In addition, ST was affected by the curfew. Conclusion: The study findings indicated that young children had longer ST during the curfew and after the curfew compared with before the curfew. Increasing PA could lessen children's ST, which could, in turn, increase the probability that their general pain would decrease.

Keywords: Physical Activity; Screen Time; Children; Covid-19 pandemic

1. Introduction

Managing pain in children and adults is crucial for maintaining a high quality of life and enabling active engagement in essential daily activities [1,2]. In children, pain can be attributed to multiple factors, such as trauma, psychological stress, and acute or chronic illnesses [3]. Musculoskeletal pain, including low back pain, has been shown to be higher in inactive school-aged children and adolescents compared with their active peers [4]. In children, pain can be exacerbated by engaging in sedentary activities, such as passive screen time (ST) and online games. During the COVID-19 pandemic, the physical activities (PAs) of children, adolescents, and adults decreased significantly. Children's diets were also affected [5]. Rates of obesity, musculoskeletal issues, and other health-related conditions have been rising since the pandemic. Meanwhile, PA did not rapidly bounce back to normal levels after the pandemic [6].

The prevalence of pain and the use of digital technology among children increased with the dramatic lifestyle changes caused by the pandemic-related lockdowns. A large number of adolescents as well as adults sustained the same minimal level of activity to which they became accustomed during the pandemic [7–9].

The psychological impact of the pandemic and the isolation it caused led to physical and psychological issues associated with inadequate sleep quality and migraines [9]. In addition, online

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schooling automatically increased children's ST. Schools and universities have advocated for preventative measures to increase students' daily activities [8]. However, younger children may not have received the same attention regarding engaging in PA.

Daily curfews were imposed in Saudi Arabia and other countries to control the spread of COVID-19 [10]. The curfews restricted children's participation in routine daily activities, which could have contributed to their pain levels. Children's age and sedentary behaviors, including long periods of ST, might have also played a role in increasing their pain levels.

The present study aimed to understand the relationships among children's pain, PA levels, age, and ST before the COVID-19 pandemic, during the COVID-19-related curfew, and after the COVID-19 curfews. This study also aimed to identify factors that could contribute to pain in young children so that these factors could be addressed by researchers and policymakers in the future.

2. Materials and Methods

2.1. Study Sample

This cross-sectional study, which included an online survey administered via social media, was conducted during the official school summer holiday in 2022, when there was a partial curfew in place in the country due to the COVID-19 pandemic. The population selected for sampling was caregivers of six- to nine-year-old children in Saudi Arabia. Ethics approval for the study was obtained from the ethics committee of Princess Nourah bint Abdulrahman University in Riyadh, Saudi Arabia (H-01-R-059), in accordance with the Helsinki Declaration on ethical standards in human research. Informed consent was obtained from all caregivers prior to commencing the data collection process.

2.2. Instrumentation

A self-reported survey was designed to collect information about pain, PA, and ST during three time periods: before the COVID-19 pandemic, during the COVID-19 pandemic-related curfew, and during the COVID-19 pandemic but after the curfew ended (i.e., when social distancing was in effect but there was no curfew). The survey had three main parts. Part one concerned demographic information, including the age and gender of the child. Part two included a question about pain frequency in which the respondents were asked to use a five-point Likert scale to describe how often the child suffered from pain during the COVID-19 pandemic (no pain, rarely, sometimes, often, always). In addition, the respondents were asked to use a four-point Likert scale to describe changes related to pain that the child first experienced before the COVID-19 pandemic (no pain, better/pain decreased, no change, worse/pain increased).

Part three provided clear definitions of PA and ST. It also included questions about the child's PA frequency in days (e.g., How many days did your child practice athletic activities for at least 60 minutes?), PA intensity in days (e.g., How many days did your child practice athletic activities to strengthen his/her bones and muscles, such as jumping rope, climbing high objects, running, dancing, or performing aerobic exercise with a family member?), and PA duration in minutes (e.g., For approximately how many minutes per day did your child practice athletic activities to strengthen his/her bones and muscles, such as jumping rope, climbing high objects, running, dancing, or performing aerobic exercise with a family member?). These questions were repeated for each time period under study. Valid and reliable PA questions were adopted from Prochaska et al. [11]. Part three also included three questions about ST adopted from Melkevik et al. [12] about the total number of hours that the child spent watching screen, engaging in screen play, and using devices generally.

All questions were written in English and then translated into Arabic in a three-step process by a certified translation center to ensure the validity of the Arabic version of the survey. To confirm the clarity of the questions in Arabic, eight caregivers from different educational levels and backgrounds reviewed and commented on the survey twice before the study commenced. All comments were considered, and modifications were made to the survey.

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2.3. Data and Statistical Analysis

All continuous variables were screened to assess normality using Kolmogrov–Smirnov tests and graphical inspection methods, including histograms, normal quantile–quantile (Q-Q) plots, and box plots. Since the variables did not follow a normal distribution, nonparametric analysis was used. Regarding the descriptive statistics, frequencies, percentages, and medians were calculated for all variables. Spearman's rank correlation coefficient was used to explore the associations for the continuous and categorical variables. The level of significance was set at $p \leq 0.05$ at 95% confidence intervals (CIs).

3. Results

3.1. Descriptive Statistics

A total of 329 surveys completed by caregivers of six- to nine-year-old children were included in the study. The median age of the children was 8 years. There were slightly more female children (54%) than male children (47%) in the sample. The descriptive statistics of the children's demographic characteristics and the variables examined across the three periods under study are presented in Tables 1 and 2.

Table 1. Descriptive statistics of the children's demographic characteristics and the variables.

Variables		Count from a total of 329	%	median
Age	6y	67	20%	
	7 y	78	24%	
	8 y	96	29%	8y
	9 y	92	28%	
Screen hours	After curfew	-	-	8h
	During curfew	-	-	8h
	Before Covid-19	-	-	4h
Gender	female	178	54%	
	male	155	47%	
Pain frequency	0 (No pain)	293	89%	0
	1(Rarely)	11	3%	
	2 (Sometimes)	23	7%	
	3 (Often)	6	2%	
	4 (Always)	0	0%	
Pain behaviour	0 (No pain)	306	93%	0
	1(better/ pain decreased)	3	1%	
	2 (no change)	15	5%	
	3 (worse /pain increased)	9	3%	
Pain type	Headache	4	11%	-
	Abdominal	6	17%	
	Musculoskeletal	19	56%	
	Fever associated body ache	5	15%	
	Other	6	11%	

Y, years; h, hours; %, percentage

Table 2. Children's PA frequency, intensity, and duration (n=329).

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N of Days	After curfew N(%)	During curfew N(%)	Before Covid N(%)		After curfew N(%)	During curfew N(%)	Before Covid N(%)		After curfew N(%)	During curfew N(%)	Before Covid N(%)
PA frequency				PA intensity				PA duration			
0d	114 (35%)	49 (15%)	57 (17%)	0d	130 (40%)	112 (34%)	65 (20%)	0 min	113 (34%)	92 (28%)	57 (17%)
1d	60 (18%)	43 (13%)	40 (12%)	1d	51 (16%)	48 (15%)	41 (12%)	≥ 30 min	127 (39%)	143 (43%)	116 (35%)
2d	62 (19%)	43 (13%)	73 (22%)	2d	57 (17%)	48 (15%)	87 (26%)	<30 min	54 (16%)	63 (19%)	85 (26%)
3d	30 (9%)	49 (15%)	64 (19%)	3d	39 (12%)	52 (16%)	60 (18%)	≥60 min	39 (12%)	35 (11%)	75 (23%)
4d	27 (8%)	23 (7%)	46 (14%)	4d	15 (5%)	27 (8%)	22 (7%)		-	-	-
5d	15 (5%)	17 (5%)	25 (8%)	5d	11 (3%)	15 (5%)	24 (7%)		-	-	-
6d	7 (2%)	6 (2%)	10 (3%)	6d	8 (2%)	7 (2%)	11 (3%)		-	-	-
7d	7 (2%)	32 (10%)	18 (5%)	7d	22 (7%)	24 (7%)	23 (7%)		-	-	-

N, numbers; %, percentage

3.2. Correlation

Pain that started before the COVID-19 pandemic had a significant but weak inverse association with PA intensity (r=-0.11, p=0.04) and a significant but weak positive association with the ST after the (r=+0.12, p=0.04). No significant associations were found between pain behavior and the variables for the other two time periods (i.e., before the COVID-19 pandemic and during the curfew). Similarly, no significant associations were found in pain frequency during any of the time periods.

In all time periods (after the curfew, during the curfew, and before the COVID-19 pandemic), ST had a significant and strong positive relationship (r=+0.82, +0.62, and +0.58, respectively; p=0.00). In the last seven days, ST had significant but weak inverse correlations with PA frequency, intensity, and duration during the curfew (r=-0.12, -0.19, and -0.25, respectively; p=0.03, 0.00, and 0.00, respectively). It also had a significant but weak inverse correlations with PA intensity and duration after the curfew (r=-0.23 and -0.25, respectively; p=0.00 and 0.00, respectively). ST had significant but weak inverse correlations with the PA variables during the curfew (r=-0.11, -0.11, and -0.18, respectively; p=0.05, 0.04, and 0.00, respectively) and during the last seven days (r=-0.13 and -0.14, respectively; p=0.02 and 0.00, respectively). However, for the period before the COVID-19 pandemic, the correlations between ST and all other variables were weak, negative, and nonsignificant (Table 3).

Age had a significant but weak positive correlation with ST during all three time periods (r=0.18, +0.15, and +0.17, respectively; p=0.00, 0.01, and 0.00, respectively). No significant associations were found between age and the PA variables during any of the time periods (Table 3).

Table 3. Variables and correlation coefficient analysis during the three time periods.

variables	age	PA frequency	PA intensity	PA duration	Screen time	PA frequency	PA intensity	PA duration	Screen time	PA frequency	PA intensity	PA duration	Screen time
		After curfew, r (p)				During curfew, r (p)				Before Covid , r (p)			

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Pain frequency	+0.08 (0.16)	+0.03 (0.58)	-0.10 (0.08)	0.00 (0.95)	+0.07 (0.18)	+0.02 (0.74)	-0.10 (0.07)	+0.02 (0.76)	+0.07 (0.19)	+0.03 (0.60)	+0.02 (0.78)	+0.10 (0.08)	+0.04 (0.52)
Pain Behaviour before Covid	+0.03 (0.64)	+0.06 (0.31)	-0.11 (0.04*)	-0.03 (0.53)	+0.12 (0.04*)	+0.02 (0.66)	-0.09 (0.11)	-0.01 (0.88)	+0.08 (0.16)	+0.01 (0.88)	+0.02 (0.72)	+0.06 (0.29)	+0.04 (0.49)
age		+0.01 (0.83)	-0.02 (0.78)	-0.05 (0.33)		+0.05 (0.41)	+0.05 (0.34)	+0.04 (0.49)		+0.04 (0.45)	+0.03 (0.65)	+0.05 (0.34)	
Screen Time Last 7 days	+0.18 (0.00*)	-0.10 (0.08)	-0.23 (0.00*)	-0.25 (0.00*)		-0.12 (0.03*)	-0.19 (0.00*)	-0.25 (0.00*)	+0.58 (0.00*)	+0.02 (0.73)	-0.09 (0.09)	-0.00 (0.93)	
Screen Time During curfew	+0.15 (0.01*)	-0.04 (0.48)	-0.13 (0.02*)	-0.14 (0.00*)	+0.82 (0.00*)	-0.11 (0.05*)	-0.11 (0.04*)	-0.18 (0.00*)		+0.05 (0.42)	+0.01 (0.89)	+0.08 (0.16)	
Screen Time Before covid	+0.17 (0.00*)	-0.01 0.79	-0.01 (0.82)	-0.03 (0.58)	+0.65 (0.00*)	-0.07 (0.21)	-0.06 (0.30)	-0.10 (0.06)		-0.07 (0.20)	-0.05 (0.33)	-0.07 (0.17)	

PA, physical activity; r, Spearman's Rank correlation coefficient; p, significance; *, $p \leq 0.05$;

4. Discussion

This study aimed to investigate the association between pain, PA, and ST during three time periods during the Covid-19 pandemic. Our study showed that the pain, which started before Covid-19, was getting worse in children who spent longer ST while the pain decreased in those who involved in higher PA levels. Also, PA generally correlated inversely with ST during and after curfew but not in the period before the Covid. Screen time spent by children was proportional in all periods. Interestingly, children age was correlated positively with ST in all periods.

Our study showed that pain was significantly correlated with ST after the curfew in the period of Covid. This is consistent with what was found in older school aged children, as pain was also associated with ST [13]. Pain was also significantly associated with the intensity of physical activity. Pain limits the participation in physical activity. According to the PA guidelines for Americans, children should participate daily in at least moderate levels of physical activities to maintain a healthy lifestyle [14]. Staying active can have numerous positive effects on the children's overall health but the lockdown decreased the children's ability to stay physically active [15].

Our study showed that ST increased during and after the curfew that was imposed during the pandemic. This increase is expected with the lockdown especially for young children with the limited access to outdoor activities and social distancing. This is consistent with the results of study done in Saudi Arabia [16]. Evenson et al. (2023), found that the amount of sedentary behaviours increased with the application of Covid-19 restrictions. Our study also showed that ST before and during Covid-19 increase when the children's PA intensity and duration decrease. Increased ST and limited in person communications could negatively impact the children's overall health [17].

Regular at home PA may assist in limiting the negative squeal of sedentary behaviours. Parents, caregivers, as well as teachers should encourage these children to participate in different types of activities that are interesting to these children to decrease their passive engagement in ST activities [18–21].

Age was a significant factor that affected the amount of time spent on screens. An increase in ST with age could be because older children spend more time on social and recreational activities [22]. Children's engagement in ST could also be affected by the amount of time their parents spend on screens [23].

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Parents are advised to limit their online activities and connect with their children and encourage them to explore nature and engage in outdoor activities to promote emotional and behavioral wellbeing [24].

Limitations and Future Studies

Although this study recruited a large number of participants from different regions in Saudi Arabia, the cross-sectional design of this study could confine the generalizability of the results. The pain questions were used in this survey were not thoroughly validated. However, content and face validity were established for these questions. More studies should be conducted to investigate the relationship between different types of pain and ST before and after the pandemic. The results of this study cannot confirm a causative relationship between the studied variables. Experimental studies are needed to identify the best methods that can be used to overcome the unavoidable sedentary behaviours that could accompany any pandemic related lockdowns. Accessibility to virtual reality games and activities could be used by children as an alternative to improve their engagement in physical activities if limitations to outdoor activities were imposed [25].

5. Conclusions

During the pandemic, the amount of ST increased with age before, during, and after the curfew. The result of this study shows that the pandemic related curfew increased the children's ST which in turn could affect the children's participation in physical activities. In case of another pandemic imposing curfew, efforts should be directed toward limiting the children's ST and incorporating actions that aim at increasing their engagement in activities to reach the recommended guidelines for physical activity.

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Informed Consent Statement: Informed consent was obtained from all subjects involved in the study."

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Conflicts of Interest: The authors declare no conflicts of interest.

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