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Posted Date: 6 November 2023

doi: 10.20944/preprints202311.0282.v1

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Article

# Alterations in Healthy Behaviors in Arab Israeli ASD Children during the COVID-19 Pandemic

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**Abstract:** The coronavirus (COVID-19) pandemic limitations may negatively affect children and youth in terms of health behaviors, and this can be specifically stimulating for children identified with neurodevelopmental conditions for instance, children and youth diagnosed with Autism Spectrum Disorder (ASD). The present study assessed alterations in healthy behaviors including physical activity, screen-based time, and sleep period of ASD children and the proportion of achieving the 24-hour movement recommendations during the coronavirus pandemic. Forty-six Arab Israeli mothers of children with ASD were surveyed by an online cross-sectional survey. As reported by the mothers, the results show a significant decrease in physical activity, a significant increase in screen time, and a significant increase in sleep duration during the COVID-19 pandemic. Moreover, the proportion of the sample who gained the physical activity and screen time recommendations lessened while the percentage of children who met the sleep duration guidelines increased. The prevalence of ASD children who achieved the overall 24-hour movement guidelines was very small during the COVID-19 outbreak. The outcomes extend the existing literature on the negative impacts of the coronavirus pandemic on those who are diagnosed with neurodevelopmental disorders and highlight the need for instant healthcare and interventions and programs for ASD children.

**Keywords:** ASD; coronavirus; physical activity; screen time; sleep duration; healthcare

## 1. Introduction

The coronavirus 2019 (COVID-19), which was first identified in China in December 2019, quickly spread throughout the world, and was declared a global pandemic by the World Health Organization (WHO) on March 11, 2020 [1]. People infected with coronavirus might eventually experience difficult respiratory indicators. Coronavirus is dispersed through contact and respirational drops. As of October 12, 2023, this has led to around seven million deaths and 771.2 million confirmed COVID-19 cases globally [2].

As of February 27, 2020, the first case of coronavirus was detected in **Israel**. the pandemic has led to about 4.9 million positive cases and 12691 deaths in Israel as of today (October 16, 2023) [2]. The authorities in Israeli declared three overall quarantines (between March 2020 and the beginning of 2021) to prevent this pandemic, look after social isolation, and limit movement. Schools and academic institutions were consequently shut down, classrooms were replaced by small-group learning, and the majority of learning/instruction methods changed to online and at-home distance learning [3].

Of relevance to the current research, Arabs in Israel (nearly 2.04 million; 21.1% of the total number of Israeli citizens) constitute a national and linguistic minority group in Israel [4]. In Israel, child protection agencies frequently discriminate against and ignore Arabs, and this problem has gotten worse throughout the course of COVID-19 as fewer resources are allocated to them [5]. It was expected that the Arab Israeli population would face complex rates of infection and more challenging outcomes compared to the general population because of their demographic structures—such as

lower levels of wealth, bigger families, dense population structure, cultural backgrounds, peripheral location, and increased likelihood of comorbidities [6–9].

On children with special needs, the COVID-19 outbreak has had a significant impact and cast a wide shadow. Due to the massive disruption of medical care and rehabilitation during the lockdown and the difficulty in physical communication needed for a child with special needs to develop and improve his mental and physical abilities as we adhere to the policy of physical distancing, it denied them of many opportunities to improve their condition [10]. About 50% of special needs children suffered substantial effects from the lockout on their sensory-motor growth, cognitive abilities, sleep, morale, conduct, and social relationships. There is also a ton of evidence pointing to COVID-19's negative impacts and the steps we are taking to stop it from spreading to families of disabled children [10,11]. Children with disabilities and special needs may also be more susceptible to getting the virus and developing problems due to specific primary medical disorders. These kids, especially those with sensory processing and integration issues like tactile, vestibular, proprioceptive, and difficulties with hearing, vision, and cognitive performance, have difficulty taking the necessary precautions during epidemic times, like donning masks, maintaining physical distance, etc. [12]. Autism is a spectrum disorder (ASD) with a wide variety of clinical symptoms. Autism itself places a significant burden on families of children with autism, with severe economic and psychological burdens. This impact has been multiplied many times over by the COVID-19 pandemic [13–15].

Children and adolescents with autism often suffer from co-occurring psychiatric conditions. Autism is characterized by social and communication difficulties as well as restricted and repetitive behaviors, interests, and activities [16]. Many children and adolescents with autism rely on carefully constructed support networks and daily routines that were abruptly interrupted by the onset of the COVID-19 pandemic. The first coronavirus lockdown in Israel began in March 2020. School buildings were closed, classes for most students quickly moved to online learning, and all but essential services were forced to close. This major change in daily life can have an impact on the mental health of young people with autism and their families [17].

The majority of children with ASD stopped obtaining crucial education and clinical treatments during the closure. Additionally, children with ASD often resist deviations from their routines. Therefore, most of them were forced to endure confinement when kindergartens, schools, and other health services they usually attended on a daily basis were closed. Simultaneously, the family shows alterations in its structure with parents often absent from home, spending more time with siblings, or separated from their usually present grandparents [10]. Additionally, children with ASD or intellectual disabilities are more likely to be neglected by others throughout the pandemic whilst basic caring public supports are no longer applicable [18]. Moreover, prolonged stay at home increases inattentive and hyperactive behaviors, screen and game addiction, and sleep disturbances leading to accompanying mental health disorders and reduced healthy behaviors in autistic children. Depriving autistic children of therapeutic intervention will cause an environmental deprivation of the specific tools, devices, and sensory inputs that accelerate changes in development and rate of progress. This change is necessary because online education and home-based training alone cannot overcome clinical symptoms in autistic children [19].

For children and adolescents with ASD, growing research shows that increased participation in physical activity (PA), reduced screen time (ST), and appropriate sleep duration can help improve symptoms associated with ASD and have the potential to alleviate stress and anxiety associated with the coronavirus pandemic [20–22]. Regrettably, there is a potential that the COVID-19 outbreak will negatively affect people's health-related activities, and behavioral aspects of children and adolescents with ASD, potentially creating barriers to PA engagement, while also increasing rates of sedentary behavior and screen time due to being at home. As recent studies continue to demonstrate the advantages of participating in PA, including reduced anxiety and improved social skills and communication problems, children and adolescents with ASD must continue to participate in PA, while limiting ST. Additionally, reduced PA levels, along with increased ST levels, may adversely impact sleep patterns, which can be especially challenging for people with ASD, who are already prone to sleep difficulties [23–25].

It is crucial to investigate whether the COVID-19 pandemic may have an impact on health-related behaviors, given the magnitude of health-related behaviors, e.g., physical activity and screen time, in children and youth with ASD. Additionally, children from deprived populations, such as ethnic minorities, and those with preceding mental difficulties, are more prone to be at risk of suffering more from restrictions [7,8]. To this end, the current study aimed to investigate how the COVID-19 pandemic has affected the health behaviors of Arab Israeli children with ASD (such as PA, ST, and sleep duration) and see if there are any age-group differences (preschool and elementary school children). The additional objective of the study is to shed light on the effects of the lockdown and "stay home" on children with ASD and to add to the body of knowledge about the impacts of the COVID-19 outbreak on children with neurodevelopmental disorders such as children with ASD.

Based on recent literature, we hypothesize that children with ASD had greater reduced PA engagement, increased ST, and shorter sleep duration due to the pandemic and lockdowns. In addition, we hypothesize that 6-10 years old children are, negatively, more influenced than younger children (preschool children) during the coronavirus pandemic in sleep duration, screen time, and physical activity.

By revealing whether such alterations happen, professionals and investigators can focus on interventions that can be established to advance healthy behaviors over the long term when children are out of a structured environment and constant daily routines, such as during this COVID-19 pandemic and war.

## 2. Materials and Methods

### 2.1. Participants and Setting

The current study was conducted amongst Arab Israeli mothers of children with ASD using a digital measure, between 02 February and 28 February 2021, following the conclusion of three general lockdowns in Israel and protracted periods of home quarantine. Here, primary data from mothers were gathered using non-probability sampling techniques. First, mothers in Israel who had one child diagnosed with ASD between the ages of three and ten (preschool through fourth grade) based on the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5), absent of severe physical, visual, and hearing difficulties that would bound their participation in physical activity or using screens were chosen, and a link to a Google form designed for the survey arranged by the author and then shared by groups of professionals, teachers, and parents. The link was shared on social media platforms including Facebook, Telegram, WhatsApp, and Instagram. It was accompanied by an audio clip and typed text that described the study and its goals. We leveraged numerous recruitment resources for subjects diagnosed with ASD to enhance our sample such as the Israeli Association of Autistic Subjects' Parents and institutions for children with ASD. In some, 51 mothers returned the forms to the authors, and after ignoring incomplete forms and incorrect responses, a total of 46 participants were retained for final analysis.

The sample size calculation was accomplished before recruiting the research participants. Based on a sensitivity power analysis using G\*Power 3.1 [26], a priori analysis of sample size given  $\alpha = .05$  and power of .90 with an effect size 0.50 indicated that a sample size greater than 15 participants per group was required for interaction assessment of the overall analysis (considering both 3-5 years age group and 6-10 years old age group across two time points: pre- and during COVID-19 outbreak).

Participants receive no financial rewards and confidentiality of information was guaranteed. We requested informed consent to participate in the study, and participants were informed that, at any time, they could stop their contribution. The Declaration of Helsinki's guidelines and the local College of Education's human research procedure (12/2020-103) were adhered to during the online manner of this study.

### 2.2. Data Collection Procedure

Data were gathered using a digital questionnaire, as in-person interviews were avoided due to COVID-19 pandemic restrictions.

### 2.2.1. Sociodemographic characters of the Sample

Sociodemographic questions about the mothers were contained in the survey (for instance, educational level, gender, and age of the mothers). The demographic data of the children were labeled into age, sex, and school type. School type was divided by age and grades, such as preschool (age 3-5 years of age) and elementary school (grades 1 to 4/6–10 years of age). Additionally, school type was labeled based on the special needs of education conditions, for instance, regular class, a special class in regular school, or special school).

### 2.2.2. Health behaviors measures

Mothers fulfilled a survey that included items assessing the health behaviors of their children pre- and during the COVID-19 outbreak:

*Physical activity (PA)*. The single question, "Per week, how many days does your child partake in a minimum of 60 minutes of physical activity?" was used to measure physical activity. This assessment has been demonstrated to have sufficient reliability as well as validity [27]. Response options ranged from 0 to 7 days per week in 1-day increments. To meet the physical activity suggestions, one must engage in moderate to vigorous physical activity (MVPA) for at least sixty minutes a day.

*Screen time (ST)*. The question, "How many hours of screen time (tablet, iPhone, TV, computer, etc.) does your child spend on a standard weekday?" was used to calculate the number of hours spent in front of a screen each day. For a typical weekend, the same question was posed. Interestingly, participants were instructed not to account for the time they spent on electronic devices for school, including tablets and computers.

*Sleep Duration (SD)*. Mothers were questioned individually regarding their children's typical weekday and weekend bedtimes and wake-up times to assess sleep duration. In addition, these queries were raised during the COVID-19 lockdown. Lopez-Gil et al. (2021) [28] stated that the following method was used to determine each participant's average daily sleep duration: [(average nocturnal SD on weekdays 5) + (average nocturnal SD on weekends 2)] /7. As per the global guidelines for early childhood development by the World Health Organization, responses falling between 10–13 hours for 3–5-year-olds and 9–11 hours for 5–13-year-olds were considered to be "meeting sleep guidelines." Participants who did not select one of these options, however, were regarded as "not meeting sleep guidelines" [29].

### 2.3. Data Analyses

Descriptive statistics were performed to describe the mothers' and children's demographics. The percentage of children meeting the 24-hour guidelines was assessed. A repeated measures analysis of variance (rm-ANOVA) was implemented to test the differences between the pre-and during the pandemic in terms of physical activity, screen time, sleep duration, and meeting the three 24-hours movement guidelines. The same procedure was conducted to compare two age groups (3-5 years old and 6-10 years old) regarding, physical activity, screen time, sleep duration, and meeting the three 24-hours movement guidelines pre- and throughout the coronavirus pandemic. In the case that rm-ANOVA yielded a significant interaction, the basis of the interaction was ascertained using independent sample t-test analysis and Cohen's d effect size for the t-test.

All analyses were conducted using IBM SPSS Statistics 28 with a significance level set at  $p < 0.05$ .

## 3. Results

### 3.1. Socio-demographic descriptions

Table 1 displays the socio-demographic descriptions of mothers and their children.

Regarding the mothers, the respondents were aged 21 to 58 and most of the mothers (32) were aged between 36-45 years old, (69.6%), 67.4% were employed during the lockdown, and 37% had BA degree. (See Table 1 for details).

Among children, 71.7% of the children were males, 50% aged 3-5 years old, 26.1% of the children detected COVID-19, and 54.3% of the children were asked to be in isolation because they had been exposed to COVID-19 diagnosed case (Table 1).

**Table 1.** Sociodemographic characteristics of mothers and children.

	<b>Total (N = 46)</b>
<b>Mothers</b>	
Age {M (SD)}	37.65 (6.22)
<u>Age group{N(%)}</u>	
25 years old and below	3 (6.5)
26-35 years old	7 (15.2)
36-45 years old	32 (69.6)
46-55 years old	3 (6.5)
Over 55 years old	1 (2.2)
<u>Education {N(%)}</u>	
Elementary	6 (13)
Secondary	13 (28.3)
BA degree	17 (37)
≥MA degree	10 (21.7)
Working (yes) {N(%)}	31 (67.4)
Did one of your family diagnose COVID-19? (yes) {N(%)}	22 (47.8)
Did one of your family was in isolation? (yes) {N(%)}	36 (78.3)
<b>Children</b>	
Female {N(%)}	13 (28.3)
Age {M (SD)}	6.37 (2.03)
<u>Age Level {N(%)}</u>	
3-5 years old	23 (50)
6-10 years old	23 (50)
<u>Type of school{N(%)}</u>	
Regular kindergarten	11 (23.9)
Kindergarten for children with special needs	12 (26.1)
Regular class in regular school	5 (10.9)
Special class in a regular class	9 (19.6)
Special school	9 (19.6)
Diagnosed with COVID-19	12 (26.1)
Asked to be in isolation	25 (54.3)

### 3.2. Physical activity, screen time, and sleep duration before and during the coronavirus pandemic:

The children's physical activity, screen time, and amount of sleep pre- and during the coronavirus pandemic by overall sample and age group are presented in Table 2.

**Table 2.** Means and standard deviation values of the children's (in total and by age group) physical activity, screen time, and sleep duration before and during the coronavirus outbreak.

Measure	Total (n=46)		3-5 years old (n=23)		6-10 years old (n=23)	
	Pre M (SD)	During M (SD)	Pre M (SD)	During M (SD)	Pre M (SD)	During M (SD)
Physical activity (days a week)	5.96 (.76)	4.41 (.86)	5.91 (.79)	4.48 (.89)	6 (.74)	3.34 (.83)

Screen time (hours a day)	1.61 (.48)	3.01 (.65)	1.58 (.47)	2.93 (.71)	1.65 (.49)	3.09 (.59)
Sleep duration (hours a day)	8.54 (.55)	9.35 (.68)	8.48 (.60)	9.15 (.68)	8.61 (.50)	9.55 (.66)

### 3.2.1. Physical activity

On the whole, the analysis shows a decline in PA with a significant main effect of time-point ( $F(1, 44) = 210.84, p < 0.001, \eta^2 = 0.83$ ). Nonetheless, there was a non-significant interaction between physical activity and age group ( $F(1, 44) = 1.05, p = 0.312, \eta^2 = 0.02$ ) and no significant main effect of age group ( $F(1, 44) = .01, p = 0.962, \eta^2 = 0$ ). The two age groups did not differ significantly before or during the COVID-19 outbreak ( $t(44) = -0.39, p = 0.702, d = 0.11$ , and  $t(44) = 0.46, p = 0.649, d = 0.14$ , respectively). Thus, these findings are noteworthy. During the COVID-19 outbreak, both groups' PA significantly decreased ( $F(1, 22) = 66.55, p < 0.001, \eta^2 = 0.75$  and  $F(1, 22) = 191.37, p < 0.001, \eta^2 = 0.90$ ; for children aged 3-5 and 6-10, correspondingly).

### 3.2.2. Screen time

During the COVID-19 outbreak, there was a noteworthy rise in ST ( $F(1, 44) = 273.74, p < 0.001, \eta^2 = 0.86$ ). However, neither the main effect of age group ( $F(1, 44) = 0.62, p = 0.437, \eta^2 = 0.01$ ) nor the interaction between ST and age group ( $F(1, 44) = 0.19, p = 0.664, \eta^2 = 0.00$ ) were statistically significant. The two age groups differed significantly both before and during the COVID-19 outbreak ( $t(44) = -0.79, p = 0.436, d = 0.23$ ;  $t(44) = -0.55, p = 0.582, d = 0.16$ ). During the COVID-19 pandemic, both groups' ST levels significantly increased ( $F(1, 22) = 137.91, p < 0.001, \eta^2 = 0.86$  and  $F(1, 22) = 136.13, p < 0.001, \eta^2 = 0.86$ ; for 3-5 and 6-10-year-olds, in that order).

### 3.2.3. Sleep duration

During the COVID-19 outbreak, there was a significant rise in ST ( $F(1, 44) = 273.74, p < 0.001, \eta^2 = 0.86$ ). Nevertheless, neither the age group nor the sleep duration had any significant interactions ( $F(1, 44) = 2.23, p = 0.143, \eta^2 = 0.05$ ) or main effects ( $F(1, 44) = 1.52, p = 0.225, \eta^2 = 0.03$ ). The two age groups did not differ significantly before the COVID-19 outbreak ( $t(44) = -0.24, p = 0.824, d = 0.07$ ), and they did not differ significantly during the COVID-19 outbreak ( $t(44) = 2.63, p = 0.019, d = 0.51$ ). Between the ages of three and ten, the two age groups slept more during the COVID-19 outbreak than they usually did ( $F(1, 22) = 11.02, p = 0.003, \eta^2 = 0.33$  and  $F(1, 22) = 37.95, p < 0.001, \eta^2 = 0.63$ , for the respective age groups).

### 3.3. Prevalence rates of meeting 24-hour guidelines

Table 3 shows the rates at which children meet the 24-hour movement guidelines. (%)

**Table 3.** Prevalence Rates of children meeting guidelines.

	Total % (n=46)	3-5 years old % (n=23)	6-10 years old % (n=23)	<i>t</i> ( <i>p</i> , <i>d</i> )
<b>Before COVID-19 outbreak</b>				
PA	26.1	26.1	26.1	0 (1, 0)
ST	67.4	34.8	100	<b>-6.42 (&lt;.001, 1.89)</b>
SD	52.2	4.3	100	<b>-22 (&lt;.001, 6.49)</b>
24 h combined	15.2	4.3	26.1	<b>-2.11 (.041, .62)</b>
<b>During COVID-19 outbreak</b>				
PA	↓ 6.5	↓ 8.7	↓ 4.4	-0.59 (.561, .17)
ST	↓ 6.5	↓ 0	↓ 13.4	<b>-1.82 (.038, .54)</b>

SD	↑ 58.7	↑ 17.4	100	<b>-10.22 (&lt;.001, 3.01)</b>
24 h combined	↓ 2.2	0	↓ 4.4	-1 (.323, .29)

PA= physical activity, ST= screen time, SD= sleep duration, 24 h combined= meeting the three 24-h movement guidelines. Bolded type denotes significant values. ↓ = significant increase (p <.001), ↑ = significant decrease (p <.001).

The prevalence rates of children who achieved the PA and ST guidelines decreased during the COVID-19 outbreak ( $F(1, 44) = 10.73, p = 0.002, \eta^2 = 0.20$  and  $F(1, 44) = 95.82, p < 0.001, \eta^2 = 0.69$ ), both the 3–5-year-old and 6–10-year-old samples demonstrate a significant decline in PA ( $p = 0.043$  and  $p = 0.022$ ; 3-5 years old and 6-10 years old, respectively) and ST ( $p = 0.002$  and  $p < 0.001$ ; 3-5 years old and 6-10 years old, respectively). However, overall, the SD increased ( $F(1, 44) = 4.63, p = 0.037, \eta^2 = 0.10$ ), notably, the prevalence rate was increased in the younger age group ( $p = 1$ ) and maintained in the older age group ( $p = 1$ ) (Table 3).

In total, as reported by their mothers, the prevalence rates of children who accomplished all three movement guidelines declined during the COVID-19 outbreak ( $F(1, 44) = 6.11, p = 0.017, \eta^2 = 0.12$ ), both the 3–5-year-old and 6–10-year-old samples showed a decrease in meeting the guidelines (4.3% to 0% for 3-5 age group and 26.1% to 4.4% for the 6-10 age group). In addition, the results show a significant main effect of age group ( $F(1, 44) = 6.82, p = 0.012, \eta^2 = 0.13$ ) that was modulated by a significant interaction of PA X age group ( $F(1, 44) = 6.11, p = 0.017, \eta^2 = 0.12$ ). According to the analysis, the reason for the interaction is that, in contrast to what happened during the COVID-19 outbreak, there were significant differences between the two age groups prior to the outbreak. (See Table 3).

#### 4. Discussion

The aim of the current study is to test the effects of the COVID-19 outbreak on healthy behaviors, meeting the 24-hour movement guidelines and psychosocial aspects among Arab Israeli children diagnosed with ASD, and to test possible differences between preschool children and school children. The additional aim of the study is to shed light and contribute to the knowledge about the effects of the COVID-19 outbreak on children with neurodevelopmental disabilities.

##### 4.1. Physical activity

The results of the present research are in proportion to those of other studies that found a decrease in the time spent taking part in physical activity in typical children [3,7,28,30–34] as well as in ASD children [35–38], and in meeting PA recommendations in healthy children [7,28,39,40] and children diagnosed with ASD [41–45]. The PA decrease appeared in various age stages. show a severe and hazardous downward tendency in usual PA levels in ASD children during the COVID-19 outbreak. [43,45–48]. Social restrictions including online education and treatment, and home quarantine commendations have limited the participation and engagement of ASD children in physical education practices, sports, or other methods of school-related PA; consequently, a lessening in outside play might give rise to deteriorated PA [22,49,50].

Before the pandemic outbreak, only about 26% of ASD children met the recommended time for daily physical activity and it has declined to about 4-8%. The failure of most children with ASD to achieve the PA movement guidelines converges with the findings of previous research [51–54]. For instance, replicating our results, Stanish et al. [54] found that ASD children did not spend nearly as much time engaging in moderate-vigorous PA as their typical development counterparts (29 min/day vs. 50 min/day, respectively), falling far short of the 60 min/day PA movement guidelines.

Our results show similar trends of reduction in PA for the two age groups despite the fact that older children experienced a greater decline in PA during the COVID-19 outbreak. This result is in contrast to findings regarding children with typical development that demonstrate that, during COVID-19, children from the older age group (5–13 years old) encountered the PA movement guidelines more frequently, and that the PA decreased more in children aged 3–4 years old [7]. Our

results demonstrate that by adolescence, a more severe decline in MVPA exists for children with ASD due to home confinement. A probable mechanism for these detected MVPA variances might be that because of early atypical sensory sensitivity to stimuli, children with ASD show problems in partaking in activities with physical requirements and social communication as they grow older [55,56].

#### 4.2. Screen time

The results also indicate an increase in the ST of preschool children as well as school children during the COVID-19 epidemic. These results confirm a large body of literature concerning reports about the COVID-19 pandemic and home confinement in typical children [3,7,28,57–59] children with ASD [41,46,60–62]. The current study's findings are consistent with the "structured day hypothesis", a phenomenon that contends that children and young people engage in healthy habits like increased physical activity and decreased ST) while following a structured timetable during the day [63]. This suggests that disturbance of Structured education days could be an important factor explaining the reduction in PA and increase in ST. Because youth with ASD tend to enjoy an established routine and structure, this disturbance to their daily lives may have a negative impact on their health behaviors [64,65]. A better insight into how SDH may possibly explain the influence of the COVID-19 pandemic on the health behaviors of children and youth with ASD is reasonable.

Furthermore, the context of the COVID-19 pandemic and lockdown restrictions may serve as additional examples of these findings, potentially expediting the "displacement theory" [28]. According to this theory, screen time and PA participation time could be interchanged. By the ages of eight and ten, children tended to be less dynamic and had superior weight values [66]. An alternative probable cause for the current results may possibly be the helplessness of mothers to limit SB in their children [39]. Research has revealed an association between children's screen time and abridged mental welfare, with extreme screen time by children correlated with psychological expressions for instance abridged self-control, emotional lability, and indications of depression [67,68]. These conclusions on physical activity and screen time would advise that both behaviors denote health behavior intervention priorities in children with ASD.

The findings show that the preschool group tended to meet the guidelines of ST less than the school children pre- and during the outbreak of the pandemic. This may be because preschoolers demand more play space than older children and have more access to screen-based digital devices while they spend most of the time at home during lockdown and school children may engage in educational activities derived from the online learning and instruction. It may be partially rationalized by the fact that educated mothers may have to work from home and thus let their kids engage in screen games [69].

#### 4.3. Sleep Duration

The results of the current research show that the sleep duration and the proportion of children who achieved sleep suggestions increased during the COVID-19 pandemic in the two age groups. These results are in line with Lopez-Gil et al. (2020) [28] who found an enhancement in SD and meeting SD guidelines among typical Spanish and Brazilian children. In line with the present study, children in Canada were found to have slept for longer periods of time during the COVID-19 pandemic [33]. The small sample size of the current study may have limited the ability to detect differences in sleep patterns, even though our study's results are unable to pinpoint the precise causes of the lack of change in sleep duration. Francisco et al. (2020) [57] reported a similar outcome in a children sample. from three European countries. It is probable that the move from frontal to online teaching/learning might have supplied extra time for sleep. Nevertheless, in contrast to our results, Bruni et al. (2021)[60] found that, overall, there was no significant increase in sleep duration of 1-18 years old children and adolescents with ASD (24.1% increased; 25% decreased) during the COVID-19 pandemic. The same pattern of results was reported by Garcia et al. (2021)[46] who examined changes in sleep duration in adolescents with ASD due to the COVID-19 pandemic and found no changes regarding sleep duration were observed during the COVID-19 outbreak compared to the

period before. An explanation for Gracia et al. [43] results is that it is probable the study's small sample size limited the possibility of detecting differences in sleep. On the other hand, the results of Bruni et al. [61] can be explained by the fact that the ASD participants experienced other sleep difficulties. Therefore, as stated by researchers, the findings of the current study regarding SD revealed a favorable change in children's behaviors during the COVID-19 outbreak. However, other aspects of sleep, such as the children's sleep quality, were not considered in our research and could have affected the outcomes. It may be difficult to determine whether this increase in sleep hours is due to poor sleep quality; this hypothesis needs to be investigated in future studies. Notably, a higher percentage of participants in the 6–10 age group adhered to the recommended amount of sleep. Notably, it is advised that children aged 3 to 4 sleep 10 to 13 hours a day, and that children aged 6 to 10 sleep 8 to 11 hours a day [29]. In both age groups, the percentage of people who complied with the sleep guidelines grew as a result. The results of this study should be considered to promote healthy everyday plans and practices for children and youth during and afterward pandemic restrictions, especially in children with neurodevelopmental disabilities. Accordingly, it is recommended to enhance physical activities and decrease screen time during "homestay", in order to enhance healthful performance in children and youth. Parents, educators, health councils, and authorities should be responsive to this state and ought to make efforts to advance practical approaches and interventions to enhance physical activity rates and inhibit negative health-related behaviors as much as possible.

#### *4.4. Limitations and Implications for Future Studies*

The present research has some limitations that should be contemplated. Undertaken the health threats, a face-to-face meet-up was averted, but virtual self-reporting has weaknesses in comparison to face-to-face meetings. Due to the digital type of this research and the sources accessible, applying standardized diagnostic measurements to verify ASD diagnosis and comorbid conditions was not probable. Second, mother scores of their children's functioning may be impacted by the mother's functioning; however, the research focused solely on child behavior and did not collect data regarding the mothers' own COVID-19 effects. Thus, future research endeavors ought to focus on children and specifically examine their performance throughout the COVID-19 pandemic. Third, it may be difficult to generalize the sample to other populations because it was drawn from the Arab Israeli population. In order to explore the potential for cultural effects, future research should compare the effects of COVID-19 on Arab and Jewish children in Israel.

While a larger sample size would be more effective, the current setup made it difficult to collect larger samples on a larger scale.

Lastly, future studies should look into potential mediating factors related to parents' environments and socioeconomic status that may lower parental attention and availability as well as their capacity to handle their kids' needs and challenges.

## **5. Conclusions**

In summary, the findings of this study add to the body of information about the detrimental impacts of the COVID-19 pandemic on the health-related behaviors and movement recommendations of children with ASD. Children and their families face numerous difficulties as a result of COVID-19 and the physical isolation restrictions that accompany it. It is assumed that these difficulties are more severe for children with neurodevelopmental disorders, such as ASD children. As such, it is critical to highlight child-friendly health behaviors, interventions, and techniques.

Understanding how COVID-19 affects health behaviors in kids and young adults with ASD is essential for developing strategies that will mitigate the harmful effects and safeguard against potential long-term health risks from the current outbreak and other similar-sized events in the future, like a war. To protect children and enhance their wellbeing and mental health, authorities, scientific communities, regional healthcare organizations, and legislators bear primary responsibility for creating and executing targeted interventions. In order to help children weather the pandemic and contain potential costs, educators, social policy experts, and administrators should collaborate

with parents to reduce the negative effects of social distancing and school closures. This will also improve the children's development, health, and well-being.

**Author Contributions:** Conceptualization, R.G.; Data curation, R.G. Formal analysis, R.G.; Funding acquisition, R.G.; Investigation, R.G.; Methodology, R.G.; Project administration, R.G.; Resources, R.G.; Software, R.G.; Supervision, R.G.; Validation, R.G.; Visualization, R.G.; Writing—original draft, R.G.; Writing—review & editing, R.G.

**Funding:** This research received no external funding.

**Institutional Review Board Statement:** The study was conducted according to the guidelines of the Declaration of Helsinki and approved by the ethics committee of Oranim College of Education (12/2020–103).

**Informed Consent Statement:** Informed consent was obtained from all participants involved in the study.

**Data Availability Statement:** The data presented in this study are available on request from the corresponding author.

**Acknowledgments:** We thank the mothers for participating.

**Conflicts of Interest:** The authors declare no conflict of interest.

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