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BRIEF REPORT

Autism Spectrum Disorder and screen time during lockdown: an Italian study. [version 1; peer review: 1 approved with reservations]

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Abstract
Background: Lockdown due to Covid-19 pandemic brought deep changes to the daily lives of children with Autism Spectrum Disorder (ASD), greatly increasing their amount of time spent at home.
Methods: A cohort of 243 parents of children with ASD (2-15 years old) completed an original online survey regarding the child's screen time and the modification of the ASD symptomatology during lockdown to investigate the relationship between them.
Results: The data show that high solitary screen time is related with the worsening of ASD core symptoms.
Conclusions: This study may help to increase awareness in the excessive use of screen in children with ASD during the lockdown, both during the pandemic as well as after it ends.

Keywords
Autism Spectrum Disorder, screen time, lockdown, children, parents, solitary screen time, Covid-19, survey

Open Peer Review

Reviewer Status ❓

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	1
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1. **Nagwa A. Meguid**, National Research Centre, Giza, Egypt

Any reports and responses or comments on the article can be found at the end of the article.

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Introduction

The lockdown imposed to contain the Covid-19 pandemic introduced strict restrictive measures to avoid the spread of the virus (Government, 2020). The adopted measures included a stay-at-home order and the closure of schools and educational facilities. Literature reported that during lockdown, parents of children faced serious difficulties in the organization of the children's free time (Ozturk & Yalçin, 2021). This plight was even more challenging for families of children with developmental disabilities. One specific and wide subgroup of these families and children, are children with Autism Spectrum Disorder (ASD). The latest revision of DSM American Psychiatric Association Diagnostic and Statistical Manual of Mental Disorders. 5th ed. (APA, 2013), adopted the umbrella term Autism Spectrum Disorder with two features: difficulties in social communication and social interaction; and restricted and repetitive behavior, interests or activities. These two sets of symptoms have a wide range of severity levels, which may be different for each child with ASD (Lord et al., 2020). ASD symptomatology presented additional challenges for children to cope with during the COVID-19 pandemic, for instance the disruption of routines. Literature reported a worsening of the ASD core symptoms as an increase of behavioral problems, mannerisms and stereotypes, worsening in the area of sleep regulation, intensification of self and other-directed aggressive behaviors, increases in sensory motor agitation and restlessness (Di Renzo et al., 2020; Colizzi et al., 2020), and higher levels of anxiety and emotional dysregulation (Amorim et al., 2020). Furthermore, due to their children's often difficult behavior, parents may have allowed more screen time (such as tablets, smartphones and television) during lockdown as a means of regulating their children (Thompson & Christakis, 2005), for its calming effect, and as a respite from the challenges posed by them (Nally et al., 2000). Literature shows that many children with ASD used electronic devices more often and for longer periods of the day, with it becoming an absorbent interest and that they found it difficult to switch from one activity to another (Istituto Superiore di Sanità [ISS], 2020). In fact, because of their deficits in impulse control and response inhibition, and because of their lower engagement in social and physical activities, children with ASD preferred screen use over other leisure activities, rendering them more prone to problematic screen use. However, no studies have focused on the relationship between the activities performed by children during lockdown (from March to May 2020) and any modification, either worsening or improvement, of ASD core symptoms. In this study we focus on a very common set of activities "screen time activities". The aim of this brief report is to investigate the possible relationships between the amount of screen time and modification of the ASD core symptoms during lockdown, in children with ASD.

Methods

Participants

The survey population composed of 243 parents of children with ASD between 2 and 15 years old, of both sexes (86% (n = 209) males). The child's mean age was 7 years ($SD = 3.3$). The mothers' mean age was 38.4 years ($SD = 6.6$) and fathers' mean age was 42.4 years ($SD = 7.5$).

In respect to the child's ASD diagnosis, 69 (28.4%) children presented a high symptoms severity, 108 (44.5%) medium and 66 (27.1%) low. 56 (23%) of the children had no language faculties, 46 (19%) produced single words, 92 (37.8%) produced short sentences, and 49 (20.2%) produced complex sentences. Lastly, 79 (32.5%) of children had a high cognitive functioning, 115 (47.3%) medium, and 49 (20.2%) low.

Procedure

Parents of children with ASD filled out an anonymous online Qualtrics Survey (Qualtrics Survey Platform, RRID: SCR_016728), after reading and signing the written consent form and explicitly agreeing to take part to the study. The survey was shared via social media (autism related groups and pages on Facebook, and Whatsapp) for a limited time window (from May 15th to 30th, 2020). In cases where a parent had multiple children with ASD, the parent was asked to report on one child only and filled another survey for the other children. There was no monetary compensation for participating. The study was approved by the ethical committee of the Department of Neuroscience Imaging and Clinical Science of the University of Chieti-Pescara (Ethical approval number: DNISC2962) and was conducted according to the American Psychological Association guidelines in accordance with the 1964 Helsinki Declaration.

Materials

For the purposes of the study, the survey was reviewed and edited by a team of expert developmental psychologists, developmental neuropsychiatrists and statisticians. The survey consisted of three sections, each preceded by a small introduction:

Sociodemographic characteristics of the children

In the first section we asked parents information regarding their age and sex and about the age and the sex of the child.

ASD diagnosis

The second section concerned the child's ASD diagnosis – specifically, parents reported the severity level of the autistic symptoms that the child was assigned when last seen by a Neuropsychiatrist. Diagnosis included ASD symptoms severity (high, medium and low), language competences (no language faculties, single words, short sentences, complex sentences) and cognitive functioning (high, medium and low).

Survey on the screen time of children with Autism Spectrum Disorder during lockdown

The third area consisted of an original questionnaire named "Survey on the screen time of children with Autism Spectrum Disorder during lockdown". All the questions in this area referred to the past months (March-April-May, 2020). The instrument was created considering the existing literature and the daily issues experienced by the families during the lockdown.

Here, the first set of questions were about the eventual ASD core symptoms modification during lockdown. Parents reported values on a 3-point Likert scale as improved (1) , same (2), worsened (3) about: language and communication, emotional regulation, social interaction, stereotypies, behavioral problems, restricted interests, and autonomies. A reliability analysis was carried out on these seven items. Cronbach's alpha showed this part to reach acceptable reliability, $\alpha = 0.86$.

The second set of questions collected information about the time spent by the child in different activities at home during lockdown. Parents were asked to rate how much time the child was spending with this activity as: never (1), short time (around 2 hours per day) (2) and a lot of time (more than 3 hours per day) (3). Activities were comprised of playing video-games, playing with friends online, using social networks, and watching television.

Data analysis
The data were analyzed with Pycharm version 2020.1 (PyCharm, RRID:SCR_018221), a software that uses the Python language. Descriptive and Spearman correlation statistics were computed on the original survey data. The variables expressed on a Likert scale were transformed into dichotomous variable in order to depict and highlight the effect of any improvements or worsen of child's symptomatology, weakening the negative impact of a relatively low sample size on model accuracy; the time spent in the activities done during lockdown were reparametrized as a percentage of time spent in a specific activity over the total time spent in all activities.

Results
ASD symptoms modification during lockdown
The eventual modifications in the ASD symptoms during lockdown were considered. Looking at the data, more parents reported that language and communication competencies, emotional regulation and autonomies and social interaction improved during the lockdown, and stereotypies, behavioral problems, and restricted interests worsened (Table 1).

Types of screen time activities performed during lockdown
The data regarding activities suggested that children spent more time watching television (Never: N = 17, 7%; short time: N = 153, 63%; a lot of time: N = 73, 30%) and playing videogames (Never: N = 58, 23.9%; short time: N = 118, 48.6%; a lot of time: N= 67, 27.6%), than playing online with friends (missing = 18; Never: N = 171, 70.4%; short time: N = 51, 20.9%; a lot of time: N = 3, 1.2%) and using social networks (Never: N = 180, 74.1%; short time: N = 47, % 19.3; a lot of time: N = 16, 6.6%).

Association between screen time activities and ASD symptoms modification during lockdown
Furthermore, we took into consideration the relationship between ASD symptoms modification and activities performed during lockdown. Table 2 shows the Spearman correlation coefficient between modification of ASD symptoms and the proportion of time spent in each single activity. The correlation between the variables suggested that more time spent watching TV, playing with videogames, and spending time on social networks was associated with a worsening of of ASD symptoms.

Discussion
During lockdown, the closure of school and educational facilities, the loss of psychological and rehabilitation services, and the general stay-at-home orders, all led to more time spent at home, as well as daily spare time increasing considerably. Furthermore, any activities were more limited and mostly carried out either alone or with a parent. Children with ASD are highly attracted to screens and this kind of activity increased substantially during lockdown

Table 1. ASD symptoms modification during lockdown.

Core symptoms		Improved		Equal		Worsened	
		N	%	N	%	N	%
Language and communication		151	61.9	57	23.4	32	13
Missing	3						
Emotional regulation		96	39.4	76	31.1	65	26.6
Missing	6						
Social interaction		87	35.7	70	28.7	78	32
Missing	8						
Stereotypes		54	22.2	102	41.8	83	34
Missing	4						
Behavioral problems		62	25.4	95	38.9	81	33.2
Missing	5						
Restricted interests		75	30.7	81	33.2	82	33.7
Missing	5						
Autonomies		126	51.7	78	32	32	13
Missing	7						

Table 2. Correlation analysis between time spent on different activities and ASD core symptom modification during lockdown (*p value > .01 and < .05; **p value < .01 and > 0.001; ***p value < .001)

	Language and communication	Emotional regulation	Social interaction	Stereotypies	Behavioral problems	Restricted interests	Autonomies
TV	*−.15	***−.25	*−.18	**−.20	*−.14	*−.17	**−.20
Play video-games	*−.16	−.12	−.11	*−.18	−.07	**−.19	*−.15
Play with friends online	−.05	−.01	.02	.02	.04	−.00	.03
Social network	*−.16	−.06	−.03	*−.14	−.11	**−.21	***−.24

(Olive et al., 2020). The aim of his study was to investigate the relationship between the amount of screen time and the modification of the ASD symptoms during lockdown. Focusing on the ASD symptoms modification during lockdown our results showed a slight worsening of some core symptoms in the "restricted, repetitive patterns of behavior, interests, or activities" cluster. As previous research showed (i.e., Colizzi et al., 2020; Di Renzo et al., 2020), the lost support from school could have intensified the symptoms in these areas of ASD, and the increased worry of parents further exacerbated children's psychological well-being and increased their behavioral problems (Zhang et al., 2020). On the other hand, the improvements in the "social communication and social interaction area" may be explained because those skills acquired before the lockdown period, when supported by the parents, were not lost (Di Renzo et al., 2020). Indeed, attunement improved between parents and children, so children had more direct stimulation from more stable and even more emotionally positive reference.

Our data show that children spent more time watching television and playing video-games than using social networks and playing online with friends. This evidence is confirmed in literature. In fact, children with ASD tend to have higher rate of solitary screen time, such as video game and television, than social interactive media (Mazurek et al., 2012). Considering the loss of school social interactions, the high rate of solitary use of social media appears to be an ulterior risk factor for the children wellbeing because makes them unavailable to learn through home social interactions, boosting an addiction to screens (Wetsby et al., 2020).

The present study shows a relation between the more time children spent with screen during lockdown, and the worsening of ASD core symptoms. The social withdrawal hypothesis proposes that increased screen time may limit social interactions with family members (Varni et al., 2011) which are crucial for language, communication, and socioemotional skills, heightening the difficulties in social communication and social interaction (Mazurek et al., 2012). Furthermore, high screen use leads to sleep disorders, emotional dysregulation, increases stress and anxiety and produces overstimulation (Wallenius et al., 2010) and ADHD-like behaviors (Ra et al., 2018). This can lead to an increase in behavioral problems and restricted and repetitive behaviors, interests or activities (Wetsby et al., 2020).

However, the current study is not without limitations. This study relied on a parent's evaluation of children's ASD symptoms modification, so responses are potentially flawed due to social desirability. However, studies have found that parent concerns and reports accurately reflect the child's ASD symptomatology (Ozonoff et al., 2009; Richards et al., 2016).

In the light of the profound changes that lockdown brought to the daily lives of children with ASD, the results of this study highlight the importance of considering the impact that prolonged screen time activities may have on the wellbeing of children. Considering that we live in a world surrounded by screens, that children with ASD are highly attracted to screens, and that we still live in a time of restrictions, it's important to underline that high screen time represents a risk factor for the wellbeing of children with ASD. Increased awareness of the risk factors in this population in this unprecedented event is needed to prevent them in the short and long terms. Future research should deepen this argument enlarging the range of screen tools and ASD wellbeing topics. This study may help to increase attention of parents of children with ASD and health care providers and enable healthcare providers to coach parents in more suitable forms of play for children with ASD, both during the pandemic as well as after it ends.

Data availability statement

Underlying data

Dryad: Autism Spectrum Disorder and screen time during lockdown. https://doi.org/10.5061/dryad.r2280gbdd. (Logrieco, 2021).

This project contains the following underlying data:

- Autism_Spectrum_Disorder_and_screentime_during_lockdown_copia.xlsx. Raw data file which includes the parents' responses to the survey.

- read_me_.docx. An explanatory document.

Data are available under the terms of the Creative Commons Zero "No rights reserved" data waiver (CC0 1.0 Public domain dedication).

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Open Peer Review

Current Peer Review Status: ❓

Version 1

Reviewer Report 16 December 2021

❓ **Nagwa A. Meguid**
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Comments

ASD is a complex neurodevelopmental disorder characterized primarily by differences in social communication skills and the presence of restricted/repetitive behaviors, with a prevalence of 1 in 44. Screen time is typically associated with social isolation: it is now paradoxically enabling virtual social connections to mitigate the impact of physical and social distancing requirements.

The study is clearly defined and the introduction outlines the complexities and advantages of study, the aim of which was to investigate the relationship between the screen time and modification of the ASD symptoms during lockdown. They focused on ASD symptom modification during lockdown.

Results showed a slight worsening of some core symptoms in the "restricted, repetitive patterns of behavior, interests, or activities" cluster. Results of this survey study revealed that children with ASD were less likely than those without to benefit from screen time to cope with social isolation, and screen time resulted in significantly more lost time on social interactions than the community sample, which may exacerbate difficulties in social domains.

Tables and figures are well presented, illustrated and adequate in number. Likewise, the Discussion is well organized and informative.

Recommendations:

1 - The survey was developed in consultation with parents of children with ASD and Parent Perceived Impact. Parents who are not actively engaged in screen time with their children may not be able to accurately account for their technology use. Authors are required to include parental attitudes if possible, otherwise the results are not definite.

2 - Is there a difference between weekday and weekend screen time?

3 - More details should be added to the survey to cover these areas: (1) the type of technology program used before and during the COVID-19 pandemic, and (2) the parent perceived impact of technology use on parent perceived quality of life and mental health In addition to the diagnostic, socio-demographic, and family characteristics of respondents. The inclusion of economic status and household income of the engaged families is recommended.

4 - Authors are requested to discuss gender breakdowns in how boys and girls are spending time on each device or activity such as violent vs. non-violent video games.

5 - On the other hand, we recommend to add that ASD group, as well as children who are not autistic, may have benefits of screen time during the COVID-19 pandemic for their social connectivity, education, and leisure time depending on the programs used.

Conclusion

Less is known about screen time experiences of children and youth with autism spectrum disorder (ASD), who are at increased risk of adverse outcomes from screen time. Computer use is traditionally associated with a multitude of negative physical and mental health outcomes. Further critical examination of the predictors of screen time change and perceived impact to understand changes in screen time use and its impact on the well-being and quality of life of children with ASD is highly recommended.

Finally, this is recommended for approval, subject to minor changes.

Is the work clearly and accurately presented and does it cite the current literature?
Yes

Is the study design appropriate and is the work technically sound?
Yes

Are sufficient details of methods and analysis provided to allow replication by others?
Yes

If applicable, is the statistical analysis and its interpretation appropriate?
Yes

Are all the source data underlying the results available to ensure full reproducibility?
Yes

Are the conclusions drawn adequately supported by the results?
Partly

Competing Interests: No competing interests were disclosed.

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have

significant reservations, as outlined above.

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