

# Effect of COVID-19 on Individuals with Autism Spectrum Disorder (ASD): A Narrative Study

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## Abstract

**Background and aim:** COVID-19 pandemic causes various negative impacts on individuals with Autism Spectrum Disorder (ASD). The main purpose of this study was to investigate the impact of the COVID-19 pandemic on mental health, leisure time at home, education, job status, and vulnerability of autistic people by a narrative review study.

**Materials and methods:** To carry out this study, all studies related to the topic under discussion during 2020-2021 by systematic search in internationally available databases, including Web of Science, Science Direct, Scopus, PubMed, and Google Scholar, were checked out. Finally, 23 completely related studies were selected to extract the results.

**Results:** The results showed that due to the inherent characteristics of people with ASD, such as differences in communication, socialization, and executive function, autistic people are more vulnerable to the COVID-19 pandemic than non-autistic people. A review of similar studies in the past has shown that the negative effects of this pandemic on people with ASD, families, caregivers, and professionals associated with these patients are well felt. In most countries of the world, the COVID-19 pandemic has severely affected mental health, educational and professional activities, leisure, and access to health and medical services in the community of people with ASD.

**Conclusion:** Considering the different negative impacts of this pandemic on individuals with ASD, it can be concluded that different strategies should be used to reduce these negative impacts. These strategies can include setting up special centres to provide health care for autistic individuals, educating parents, educators, and caregivers (to provide different ways of educating individuals with autism), providing financial assistance to families with autistic individuals, etc.

**Keywords:** Autism spectrum disorder • COVID-19 • Psychological impact • Vocational challenges • Education • Leisure time

## Introduction

In December 2019, there were reports in China of the emergence of a new influenza-like virus that has infected many people in Wuhan, China [1]. Despite efforts to control the virus within the city, the disease spread rapidly in China and other countries in Asia and the world [2]. The virus was very similar to the coronavirus that appeared in China from 2002 to 2003 and was known as a Severe Acute Respiratory Syndrome (SARS). For this reason, in February 2020, the World Health Organization (WHO) named the virus SARS COVID 2 and the resulting disease COVID-19 [3].

The COVID-19 pandemic has caused considerable fear and uncertainty worldwide, as it has negatively affected almost every aspect of society, leading to near-global problems and stress [4,5]. In general, infectious disease outbreaks often lead to adverse psychological and behavioral reactions such as increased anxiety and depression, insomnia, decreased immunity, increased alcohol and tobacco use, physical symptoms (such as lack of energy and general weakness), and increased use of different drugs [6]. In addition, the economic consequences of a pandemic can complicate the psychological and behavioral functioning of many people who may be struggling to meet the basic needs of their families due to unemployment, food insecurity, and housing instability [7].

The aforementioned negative consequences highlight some special challenges for individuals with Autism Spectrum Disorder (ASD) and their families [8]. According to some studies on the impact of the COVID-19 pandemic in some parts of the world, people with ASD and their families in

terms of several aspects, including educational and professional dimension, home and leisure activities, access to behavioral health services, and changes in health service delivery has been affected. The impacts of this pandemic, especially for individuals with disabilities, are not yet completely understood. However, it is clear that people with physical and mental disabilities also faced significant challenges before the COVID-19 pandemic [9-14]. Now is the time to evaluate the degree to which the COVID-19 pandemic affects people with ASD and the aspects of their lives that are most important to them.

The consequences of a pandemic disease such as COVID-19 may affect anyone in the community, but individuals with neurodevelopmental disorders, including ASD, are at the highest risk. Individuals with disabilities are more exposed to harassment, and this risk increases during the pandemic [15,16]. Individuals with ASD, especially children, miss out on more opportunities to practice social skills due to the limitations of social distancing. It is difficult for children with ASD to adapt to a changing environment. It has been found that during the COVID-19 pandemic, children with ASD become restless and may have behavioral problems and increased self-harm [17,18].

Considering the negative impacts of the COVID-19 pandemic on different aspects of the life of all people in the community and paying particular attention to the living conditions of people with ASD, so in the present study, we try to show the different impacts of the COVID-19 pandemic on different aspects of life. Therefore, people with ASD should be checked for vulnerabilities, psychological effects, education, leisure time

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at home, employment status, and the pandemic's effects on the autistic community.

## Materials and Methods

A systematic search in available international databases, including Web of Science, Science Direct, Scopus, PubMed, and Google Scholar, was done from 2020 to 2021 to review and extract required results from published articles and reports related to the considered subject. Systematic review was performed using the Mesh terms including "Mental Health", "COVID-19", "ASD", "Autistic", "Patients", "Children", "Adults" and "Autistic spectrum disorder", "Social isolation", "Anxiety", "Stress", "Pandemic", "Depression", "Distress", "Mental wellbeing", "Vulnerability", "Autism Community", "Education", "Job status", "Vocational Challenges", "Leisure time", "Behavioral Health Services", "Home and Leisure Challenges" and "Service Delivery". For other databases, the same Mesh terms were used similarly. The references were thoroughly evaluated to verify that no articles were missed for inclusion in the study (Reference Checking). In addition, the citations from the research were also checked (Citation Tracing) to make sure that the search was thorough and successful. According to Figure 1, the literature review, especially articles, was done according to the PRISMA guideline [19]. In addition, unofficial reports, articles in a letter to editor format, and unpublished articles and content posted on Internet sites were removed from the list of downloaded files. Finally, the results of 23 published articles were reviewed for the present review (Figure 1).

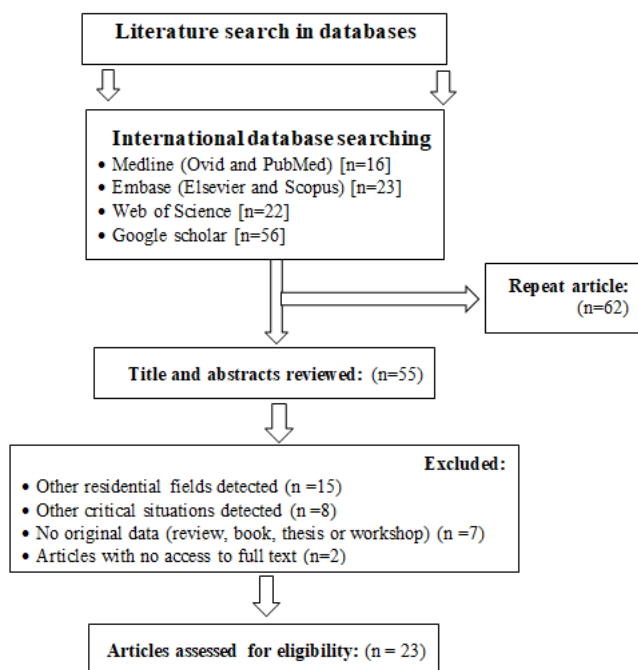


Figure 1. Flow diagram of study identification according to PRISMA.

## Results and Discussion

### The impact of COVID-19 pandemic on vulnerability level of autistic individuals

According to the World Health Organization (WHO), vulnerability is the degree to which a population, individual, or organization cannot anticipate, cope, resist, and recover from the effects of a particular disaster [20]. Due to the inherent characteristics of people with ASD, such as differences in communication, socialization, and executive function, they are more vulnerable to the COVID-19 pandemic than non-autistic individuals [21]. Many autistic people have poor communication skills and have delayed information processing [22]. In addition, the presence of stress and anxiety and the mental disability of autistic individuals affect the effective and efficient response to the COVID-19 pandemic. People with ASD may experience

expressive communication challenges, leading to communication difficulties with pain, symptoms, or emotional distress [23,24]. As a result, people with autism during the COVID-19 pandemic are more in need of their parents, family, and other caregivers to convey important information about the pandemic or observe the symptoms of a possible disease [25].

Anxiety symptoms have increased in the general population since the onset of the pandemic COVID-19, whereas they did not have such anxiety levels before the pandemic [26]. However, individuals with ASD had innate anxiety before the pandemic (due to the characteristics of ASD), and after the pandemic, their anxiety levels increased [27]. Therefore, people with ASD are generally more vulnerable to the general population when exposed to the COVID-19 pandemic in terms of mental health, learning, medical concerns such as seizure disorders, and behavioral health concerns [28].

In addition to diagnostic and mental health vulnerabilities, people with ASD may be more susceptible to genetic and physiological risk factors for COVID-19. Several studies have reported increased levels of proinflammatory cytokines in people with ASD [29]. Evidence suggests that with at least one phenotype of COVID-19 infections, the body can become inflamed through a "cytokine storm", leading to heart and lung damage [30]. The predisposition to proinflammatory status may put people with ASD at a higher risk and more severe symptoms when exposed to the virus [31].

In addition, various studies show that people with ASD than the general population have a higher risk in terms of poor overall health [32], sensory disorders, and physical disabilities [33], and also type 2 diabetes [34] All represent a special risk factor influential in poor recovery in patients with COVID-19 infection [35]. Therefore, on the above results, it can be said that people with ASD are more vulnerable than the general population in the COVID-19 pandemic period; therefore, they need more mental, social, and therapeutic attention health.

### The impact of the COVID-19 pandemic on the community of autistic individuals

Various strategies worldwide (such as staying at home and social distance) have been implemented to counteract the effects of the COVID-19 pandemic. Unfortunately, these strategies left people with disabilities (e.g., ASD patients) without access to vital services and support [8]. Based on the results of previous studies, the impacts of this pandemic on individuals with ASD, their families, caregivers, and specialists who related with these patients were clearly felt [8,36-42].

Families and caregivers of children with ASD use various services and providers for their children's educational, occupational, and functional needs [40]. Adults with ASD may rely on community-based service providers to help them achieve their set social participation goals [41]. This means that during the COVID-19 pandemic, daily life activities are taught with support at home, social skills in the community, and educational and professional tasks on site. Homestay orders, closure of non-essential social facilities and health services, and standards of social distancing have prompted parents and caregivers of people with ASD to try to meet most service needs under severely limited options [42]. In addition, during this pandemic period, specialists used telemedicine to provide their services [8]. In most countries, the COVID-19 pandemic has severely affected educational and professional activities, leisure, and access to health and medical services in the community of people with ASD [8,36-42].

### The impact of the COVID-19 pandemic on the educational process of autistic individuals

At the beginning of the COVID-19 pandemic, most schools in different countries closed to reduce the spread and transmission of coronavirus. As a result, educators and teachers used distance learning methods to provide training courses to learners. Therefore, rapid adaptation to this educational method was an important challenge for most educators and students. Another important challenge related to this issue was the incompatibility of students with mental disabilities with this education method. Due to the complex needs of children with ASD, the problems of this educational method for educators increased [8,43-45]. In addition, during this pandemic, many children with ASD received minimal services such as speech therapy,

occupational therapy, and physical therapy [42].

With children with ASD accustomed to a specific routine, planning, training program, and schedule, now, with the onset of the COVID-19 pandemic, they are forced to receive educational services at home using a tablet or laptop. Unfortunately, they are not compatible with this educational method, representing another challenge for children with autism during the COVID-19 pandemic. Parents of children with autism face two major challenges in educating their children at home during the COVID-19 pandemic. First, the amount of work they have to do at home (such as caring for other family members, cooking, cleaning the house, and the like) is enormous, and they may not have enough time to educate their children. The second problem is that some parents may not have the necessary experience and scientific ability to implement an effective educational program for their children [8].

During the COVID-19 pandemic, performing homework with parents at home was probably unfamiliar and challenging to many students because parents may prefer other priority activities at home. While working and interacting with a tablet or laptop is probably familiar to many children. In the COVID-19 pandemic period, the use of cyberspace for education results in interaction with the teacher, and complete attention to education is very little. In addition, children with ASD have a special mental disability; this may have higher sensitivity and challenge. Therefore, adapting to the above challenges requires more time and effort from parents and caregivers [8,43-45]. Daulay, et al., discuss the challenges and barriers to educating children with ASD at home from the perspective of mothers during the COVID-19 pandemic in Indonesia. The results of this study showed that the implementation of education at home during the pandemic due to the increase in maladaptive behaviors of autistic children, their low adaptation to education at home by parents, the burden of care, and the occurrence of negative emotions had lower than desirable quality level [43].

A study by Cahapay, et al. interviewing mothers of children with ASD in the Philippines found that involving multiple people in educating a child with ASD at home was far more effective than educating one person alone (such as a parent). In addition, the use of different educational methods increases the quality of education [45].

Obliging parents and caregivers to learn their child's educational planning and adaptations, teaching instructors themselves to provide virtual learning methods, giving effective reinforcement strategies, and creating a realistic and sustainable schedule for educating children with ASD by parents or instructors can reduce barriers for children with ASD.

### **The impact of the COVID-19 pandemic on the job status of autistic individuals**

In addition to children with ASD, adults with ASD were also severely affected by the COVID-19 pandemic in several ways, one of which was their occupational status. During this pandemic, autistic adults experienced reduced social services and potential employment [8,42]. In addition, individuals with ASD are at greater risk for social isolation, lower social participation, and lower participation in social activities [46,47].

Although no official statistics have been released to date, it can be assumed that adults with ASD have significant economic problems due to the COVID-19 pandemic. With countries reopening following the initial wave of the pandemic, returning to social activities, such as school and work, may continue to pose challenges for people with ASD [48]. Although most individuals with ASD enjoy social environments, they can also be anxious. In the COVID-19 pandemic, people with ASD, like all community members, have to deal with new restrictive practices such as wearing a mask and occupational restrictions. This can be stressful for individuals with ASD because they face difficult situations previously comfortable with [8]. One of the challenges facing autistic adults after the COVID-19 pandemic is the re-introduction of the workplace and the retraining of skills that have not been practiced for several months, which takes a long time to regain previous skills [8].

### **The impact of the COVID-19 pandemic on the leisure time of autistic individuals**

In the COVID-19 pandemic, everyone in the community experiences a large increase in time at home as a result of restrictions on access to work, school, and community. Access to unstructured time at home poses challenges for many people with ASD who can cope with the performance of autistic people, which includes planning, organizing, getting started, and monitoring themselves [49]. Individuals with ASD, before the COVID-19 pandemic, had almost constant planning and routine activities while at home; now, with the onset of this pandemic, there is plenty of free time for autistic people at home. But limitations in the level and type of skills, changing routines, limitations in creating new ideas by autistic individuals, their parents, and caregivers are challenges that autistic people face [8,50].

### **The impact of the COVID-19 pandemic on the mental health of autistic individuals and their parents**

Another important effect of the COVID-19 pandemic on individuals with ASD is psychological impacts. Considering that autistic individuals have a previous background in terms of mental health deficits, the impact of the COVID-19 pandemic on the reaction Psychology of people with ASD is significant. The results of previous studies showed that this pandemic not only caused anxiety and stress in children with ASD, these psychological impacts were also reported in caregivers, nurses, and their parents [39]. According to the results of some studies, the COVID-19 pandemic caused depressive and anxiety symptoms in both groups of non-autistic and autistic people, but the incidence of these symptoms was higher for individuals with ASD [51]. In addition, during the COVID-19 pandemic, people with ASD showed greater concern about their pets, work, food and drug intake, and safety/security [51]. Each of the above results has been reported in previous studies. For example, according to Pellicano, et al. increasing social isolation associated with this epidemic has had a serious and devastating effect on the mental health and mental well-being of autistic people [52]. The study of Amorim, et al., reported that caregivers and nurses of children with autism experienced more anxiety during quarantine than children without autism [39]. The study results by Oomen, et al. showed that depression, stress, and anxiety in response to this pandemic increased for both non-autistic and autistic groups, but the incidence of these symptoms was higher for adults with ASD [51].

## **Conclusion**

Based on the present study results, it can be concluded that due to the intrinsic characteristics of individuals with ASD, such as differences in communication, socialization, and executive function compared to non-autistic individuals, in the face of the COVID-19 pandemic, are more vulnerable. Furthermore, based on the results of previous studies, the impacts of this pandemic on people with ASD, their families, caregivers, and professionals who work with these patients are clearly felt. Furthermore, in most countries of the world, the COVID-19 pandemic has severely affected educational and professional activities, leisure, and access to health and medical services in the community of individuals with ASD. Finally, one of the other impacts of this pandemic on individuals with ASD is the psychological effects, including increased stress, anxiety, and depression. Based on the various negative impacts that this pandemic has on individuals with ASD, it can be concluded that different strategies should be used to reduce these negative impacts. These strategies can include the creation of special centres to provide health services for autistic individuals, training parents of autistic children, educators, and caregivers to provide different methods of education for individuals with autism, financial assistance to families with autistic children, and so on.

## **References**

1. Ren, Li-Li, Ye-Ming Wang, Zhi-Qiang Wu and Zi-Chun Xiang, et al. "Identification of a Novel Coronavirus causing Severe Pneumonia in Human: A Descriptive Study." *Chin Med J* 133 (2020): 1015-24.

2. Porcheddu, Rossella, Caterina Serra, David Kelvin and Nikki Kelvin, et al. "Similarity in Case Fatality Rates (CFR) of COVID-19/SARS-COV-2 in Italy and China." *J Infect Dev Ctries* 14 (2020): 125-8.
3. Velavan, Thirumalaisamy P. and Christian G. Meyer. "The COVID-19 Epidemic." *Trop Med Int Health* 25 (2020): 278-80.
4. Lugo-Marín, Jorge, Laura Gisbert-Gustemps, Imanol Setien-Ramos and Gemma Español-Martín, et al. "COVID-19 Pandemic Effects in People with Autism Spectrum Disorder and their Caregivers: Evaluation of Social Distancing and Lockdown Impact on Mental Health and General Status." *Res Autism Spectr Disord* 83 (2021): 101757.
5. Alhuzimi, Talal. "Stress and Emotional Wellbeing of Parents Due to Change in Routine for Children with Autism Spectrum Disorder (ASD) at Home During COVID-19 Pandemic in Saudi Arabia." *Res Dev Disabil* 108 (2021): 103822.
6. Funk, Sebastian, Marcel Salathé and Vincent AA Jansen. "Modelling the Influence of Human Behaviour on the Spread of Infectious Diseases: A Review." *J R Soc Interface* 7 (2010): 1247-56.
7. Pak, Anton, Oyelola A. Adegboye, Adeshina I. Adekunle and Kazi M. Rahman, et al. "Economic Consequences of the COVID-19 Outbreak: The Need for Epidemic Preparedness." *Front Public Health* 8 (2020): 241.
8. Baweja, Raman, Sierra L. Brown, Erin M. Edwards and Michael J. Murray. "COVID-19 Pandemic and Impact on Patients with Autism Spectrum Disorder." *J Autism Dev Disord* 52 (2022): 473-82.
9. Williams, Emma, Alan Costall and Vasudevi Reddy. "Children with Autism Experience Problems with Both Objects and People." *J Autism Dev Disord* 29 (1999): 367-78.
10. Oszivadjian, Ann and Fiona Knott. "Anxiety Problems in Young People with Autism Spectrum Disorder: A Case Series." *Clin Child Psychol Psychiatry* 16 (2011): 203-14.
11. Richdale, Amanda L. and Kimberly A. Schreck. "Sleep Problems in Autism Spectrum Disorders: Prevalence, Nature, & Possible Biopsychosocial Aetiologies." *Sleep Med Rev* 13 (2009): 403-11.
12. Weiss, Mary Jane and Sandra L. Harris. "Teaching Social Skills to People with Autism." *Behav Modif* 25 (2001): 785-802.
13. Salomone, Erica, Besterah Kutlu, Kayleigh Derbyshire and Carlye McCloy, et al. "Emotional and Behavioural Problems in Children and Young People with Autism Spectrum Disorder in Specialist Autism Schools." *Res Autism Spectr Disord* 8 (2014): 661-8.
14. Luke, Lydia, Isabel CH Clare, Howard Ring and Marcus Redley, et al. "Decision-making Difficulties Experienced by Adults with Autism Spectrum Conditions." *Autism* 16 (2012): 612-21.
15. Fegert, Jörg M., Benedetto Vitiello, Paul L. Plener and Vera Clemens. "Challenges and Burden of the Coronavirus 2019 [COVID-19] Pandemic for Child and Adolescent Mental Health: A Narrative Review to Highlight Clinical and Research needs in the Acute Phase and the Long Return to Normality." *Child Adolesc Psychiatry Ment Health* 14 (2020): 1-11.
16. Seppälä, Piia, Riitta Vornanen and Timo Toikko. "Are Children with a Number of Disabilities and Long-term Illnesses at Increased Risk of Mental Violence, Disciplinary Violence, and Serious Violence?" *J Interpers Violence* 36 (2021): 11409-34.
17. Singh, Shweta, Deblina Roy, Kritika Sinha and Sheeba Parveen, et al. "Impact of COVID-19 and Lockdown on Mental Health of Children and Adolescents: A Narrative Review with Recommendations." *Psychiatry Res* 293 (2020): 113429.
18. Lee, Joyce. "Mental Health Effects of School Closures During COVID-19." *Lancet Child Adolesc Health* 4 (2020): 421.
19. Moher, David, Alessandro Liberati, Jennifer Tetzlaff and Douglas G. Altman. "Preferred Reporting Items for Systematic Reviews and Meta-analyses: The PRISMA Statement." *Int J Surg* 8 (2010): 336-41.
20. World Health Organization. *The World Health Report 2002: Reducing Risks, Promoting Healthy Life*. Geneva: World Health Organization, Switzerland, (2002).
21. American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders [5<sup>th</sup> ed]*. Chicago: American Psychiatric Association Press, USA, (2013).
22. Wallace, Gregory L., Lauren Kenworthy, Cara E. Pugliese and Haroon S. Popal, et al. "Real-World Executive Functions in Adults with Autism Spectrum Disorder: Profiles of Impairment and Associations with Adaptive Functioning and Co-morbid Anxiety and Depression." *J Autism Dev Disord* 46 (2016): 1071-83.
23. Hubbard, Kathleen and Doris A. Trauner. "Intonation and Emotion in Autistic Spectrum Disorders." *J Psycholinguist Res* 36 (2007): 159-73.
24. Rattaz, Cécile, Amandine Dubois, Cécile Michelon and Marine Viellard, et al. "How do Children with Autism Spectrum Disorders Express Pain? A Comparison with Developmentally Delayed and Typically Developing Children." *Pain* 154 (2013): 2007-13.
25. Baweja, Raman, Sierra L. Brown, Erin M. Edwards and Michael J. Murray. "COVID-19 Pandemic and Impact on Patients with Autism Spectrum Disorder." *J Autism Dev Disord* 52 (2022): 473-82.
26. Huang, Yeen and Ning Zhao. "Generalized Anxiety Disorder, Depressive Symptoms and Sleep Quality During COVID-19 Outbreak in China: A Web-based Cross-sectional Survey." *Psychiatry Res* 288 (2020): 112954.
27. Van Steensel, Francisca JA, Susan M. Bögels and Sean Perrin. "Anxiety Disorders in Children and Adolescents with Autistic Spectrum Disorders: A Meta-analysis." *Clin Child Fam Psychol Rev* 14 (2011): 302-17.
28. Narzisi, Antonio. "Handle the Autism Spectrum Condition During Coronavirus (COVID-19) Stay at Home Period: Ten Tips for Helping Parents and Caregivers of Young Children." *Brain Sci* 10 (2020): 207.
29. Saghazadeh, Amene, Bahar Ataieinia, Kimia Keynejad and Amirhussein Abdolizadeh, et al. "A Meta-analysis of Pro-inflammatory Cytokines in Autism Spectrum Disorders: Effects of Age, Gender, and Latitude." *J Psychiatr Res* 115 (2019): 90-102.
30. Lin, Shi-hui, Yi-si Zhao, Dai-xing Zhou and Fa-chun Zhou, et al. "Coronavirus Disease 2019 (COVID-19): Cytokine Storms, Hyper-inflammatory Phenotypes, and Acute Respiratory Distress Syndrome." *Genes Dis* 7 (2020): 520-7.
31. De Sousa Lima, Matheus Eugênio, Levi Coelho Maia Barros and Gislei Frota Aragão. "Could Autism Spectrum Disorders be a Risk Factor for COVID-19?" *Med Hypotheses* 144 (2020): 109899.
32. Dunn, K., Ewelina Rydzewska, Cecilia Macintyre and Julie Rintoul, et al. "The Prevalence and General Health Status of People with Intellectual Disabilities and Autism Co-occurring Together: A Total Population Study." *J Intellect Disabil Res* 63 (2019): 277-85.
33. Kinnear, Deborah, Ewelina Rydzewska, Kirsty Dunn and Laura Hughes McCormack, et al. "The Relative Influence of Intellectual Disabilities and Autism on Sensory Impairments and Physical Disability: A Whole country Cohort of 5.3 Million Children and Adults." *J Appl Res Intellect Disabil* 33 (2020): 1059-68.
34. Chen, Mu-Hong, Wen-Hsuan Lan, Ju-Wei Hsu and Kai-Lin Huang, et al. "Risk of Developing Type 2 Diabetes in Adolescents and Young Adults with Autism Spectrum Disorder: A Nationwide Longitudinal Study." *Diabetes Care* 39 (2016): 788-93.
35. Cariou, Bertrand, Samy Hadjadj, Matthieu Wargny and Matthieu Pichelin, et al. "Phenotypic Characteristics and Prognosis of Inpatients with COVID-19 and Diabetes: The CORONADO Study." *Diabetologia* 63 (2020): 1500-15.
36. Khan, Yasser Saeed, Abdul Waheed Khan, Mohamed El Tahir and Samer Hammoudeh, et al. "The Impact of COVID-19 Pandemic Social Restrictions on Individuals with Autism Spectrum Disorder and their Caregivers in the State of Qatar: A Cross-sectional Study." *Res Dev Disabil* 119 (2021): 104090.
37. Davidson, Conor James, Keri Lodge and Alwyn Kam. "The Impact of the COVID-19 Pandemic on Autistic Adults—A Survey." *Advances in Autism* 7 (2021): 311-21.
38. Posar, Annio, Paola Visconti and Virginia Giuberti. "The Impact of the COVID-19 Pandemic on the Assessment of Autism Spectrum Disorder." *Turk Arch Pediatr* 56 (2021): 280-2.
39. Amorim, Rita, Sara Catarino, Pedro Miragaia and Cristina Ferreras, et al. "The Impact of COVID-19 on Children with Autism Spectrum Disorder." *Rev Neurol* 71 (2020): 285-91.
40. Cidav, Zuleyha, Lindsay Lawer, Steven C. Marcus and David S. Mandell. "Age-related Variation in Health Service Use and Associated Expenditures among Children with Autism." *J Autism Dev Disord* 43 (2013): 924-31.
41. Dotson, Wesley H., Justin B. Leaf, Jan B. Sheldon and James A. Sherman. "Group Teaching of Conversational Skills to Adolescents on the Autism Spectrum." *Res Autism Spectr Disord* 4 (2010): 199-209.
42. Eshraghi, Adrien A., Crystal Li, Michael Alessandri and Daniel S. Messinger, et al. "COVID-19: Overcoming the Challenges Faced by Individuals with Autism and their Families." *Lancet Psychiatry* 7 (2020): 481-3.

43. Daulay, Nurussakinah. "Home Education for Children with Autism Spectrum Disorder during the COVID-19 Pandemic: Indonesian Mothers Experience." *Res Dev Disabil* 114 (2021): 103954.
44. Majoko, Tawanda and Annah Dudu. "Parents' Strategies for Home Educating their Children with Autism Spectrum Disorder during the COVID-19 Period in Zimbabwe." *Int J Dev Disabil* 66 (2020): 1-5.
45. Cahapay, Michael B. "How Filipino Parents Home Educate their Children with Autism during COVID-19 Period." *Int J Dev Disabil* 66 (2020): 1-4.
46. Howlin, Patricia, Philippa Moss, Sarah Savage and Michael Rutter. "Social Outcomes in Mid-to Later Adulthood among Individuals Diagnosed with Autism and Average Nonverbal IQ as Children." *J Am Acad Child Adolesc Psychiatry* 52 (2013): 572-81.
47. Tint, A., A. L. Maughan and J. A. Weiss. "Community Participation of Youth with Intellectual Disability and Autism Spectrum Disorder." *J Intellect Disabil Res* 61 (2017): 168-80.
48. Neece, Cameron, Laura Lee McIntyre and Rachel Fenning. "Examining the Impact of COVID-19 in Ethnically Diverse Families with Young Children with Intellectual and Developmental Disabilities." *J Intellect Disabil Res* 64 (2020): 739-49.
49. Wallace, Gregory L., Lauren Kenworthy, Cara E. Pugliese and Haroon S. Popal, et al. "Real-World Executive Functions in Adults with Autism Spectrum Disorder: Profiles of Impairment and Associations with Adaptive Functioning and Co-morbid Anxiety and Depression." *J Autism Dev Disord* 46 (2016): 1071-83.
50. Lam, Kristen SL, James W. Bodfish and Joseph Piven. "Evidence for Three Subtypes of Repetitive Behavior in Autism that Differ in Familiarity and Association with Other Symptoms." *J Child Psychol Psychiatry* 49 (2008): 1193-200.
51. Oomen, Danna, Annabel D. Nijhof and Jan R. Wiersema. "The Psychological Impact of the COVID-19 Pandemic on Adults with Autism: A Survey Study across Three Countries." *Mol Autism* 12 (2021): 1-21.
52. Pellicano, Elizabeth, Simon Brett, Jacqueline den Houting and Melanie Heyworth, et al. " " *Autism* 6 (2021): 13623613211035936.

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