Title Page

Title: Differences in emotional state and autistic symptoms before and during confinement due to the COVID-19 pandemic

Authors:

Agustín E. Martínez-González [a,*], Beatriz. Moreno-Amador [b], and José A. Piqueras [b]

[a] Department of Developmental Psychology and Didactics, University of Alicante, Spain. Postal Address: Carretera San Vicente del Raspeig, s/n-03690, San Vicente del Raspeig, Alicante, Spain.

[b] Department of Health Psychology, Miguel Hernández University of Elche, Edificio Altamira, Avda. de la Universidad, s/n Elche, 03202 Alicante, Spain.

*Corresponding author: Agustín E. Martínez-González. Department of Developmental Psychology and Didactics, University of Alicante. Education Faculty. PO 99, 03080, Alicante (Spain). +34 965903400 x 2268. https://orcid.org/0000-0002-9576-7348 e-mail address: agustin.emartinez@ua.es

Abstract

Background: The COVID-19 pandemic has generated a global crisis that has affected the emotional health of both the general and the clinical population. Method: The present study aimed to analyze the differences between the emotional states of a group of individuals with ASD and a neurotypical group both during and after the COVID-19 confinement. The study also examined the changes in autistic symptoms between a group of individuals with ASD who were confined during the COVID-19 pandemic and another group of individuals with ASD who were studied prior to the COVID-19 pandemic period. Results: Higher levels of aggression, irritability, hyperactivity and impulsivity, lack of attention and anxiety, among other symptoms, were found in individuals with ASD during confinement when compared to healthy controls ($p < .05$; $p <.01$). Higher levels of repetitive, restrictive, and stereotyped behaviors were also found in pandemic-era ASD individuals when compared to the group of individuals with ASD who were assessed prior to the pandemic ($p <.01$). Conclusions: the confinement is related to an increase in symptomatology and dysfunctional behaviours characteristic of ASD, and therefore it is necessary to implement actions that help to reduce this impact now, as well as in future crisis events.

Keywords: COVID-19 pandemic, Confinement, ASD, Emotional state, Repetitive behaviors.

1. Introduction

Confinement due to the COVID-19 pandemic has greatly affected the emotional state of the general population. Research results during the confinement period have found a logical increase in mental health problems (e.g.: Ahmed, et al., 2020, Cao, et al., 2020; Liu et al., 2020; Pappa et al., 2020; Wang, et al., 2020), and a greater need for medical and therapeutic intervention in the mental healthcare of the general population (Roy et al., 2020). Specifically, an increase in anxiety levels has been found (23.2% - 29%), generalized anxiety (24.9%), stress (8.1%), depression (22.8%-37.1%), and insomnia (38.9%) in the non-clinical population (e.g.: Ahmed et al., 2020; Cao et al., 2020). Studies have concluded that anxiety disorders and depression appear more frequently when there is an absence of social communication in the community (Xiao, 2020).

This pandemic has generated an unprecedented global crisis (e.g.: rising unemployment, collapse in hospitals, etc.), causing the stress levels of the general population and medical staff to increase considerably (e.g.: Huang et al., 2020; Liu et al., 2020; Lu et al., 2020). In addition, home confinement has led to the interruption or suspension of countless intervention, evaluation and care processes in the health system, day centers, early care centers, special education centers, and more. School and academic routines have also changed drastically, which has affected the entire student body. In many countries, educational systems have tried to adapt by providing tele-education to students, with parents taking on the responsibility for creating routines and guiding children through educational activities generated by teachers. Many students have spent more than a year suffering the consequences of the pandemic, without going to a special education center, day center, etc. (Jeste et al., 2020).

Autism spectrum disorder (ASD) is a neurodevelopmental disorder characterized by difficulties in social communication, and restricted and repetitive behaviors (RRBs) (APA, 2013). Previous studies have found that there is a clear relationship between RRBs and negative emotional states (anxiety and stress) in ASD (e.g.: Glod et al., 2019; Russell et al., 2019). Specifically, difficulties in emotional self-control, self-injurious behavior, and externalizing behaviors have been associated in individuals with ASD (Carter-Leno et al., 2018; Richards et al., 2017). Thus, these results are consistent with *"Continuous emotional state-repetitive behavior in ASD"* theoretical hypothesis which suggests that repetitive behaviors of similarity and stereotypes are associated with lower anxiety levels while self-injury behaviors are more associated with higher levels of anxiety (Martínez- González & Andreo-Martínez, 2020). On the other hand, there are differences in the severity of RRBs in the ASD depending on the comorbidity with intellectual disability (ID). In this sense, the severity levels of RRBs are higher if an individual with ASD has ID (Martínez-González & Piqueras, 2019a; 2019b). In fact, the comorbidity condition of ID is a relevant variable in the development of biological and psychological treatments in autism (Andreo-Martínez et al., 2021; Bordini et al., 2020; Cameron et al., 2020).

The first international studies on the effects of confinement on children with ASD indicate very worrying data when compared to the neurotypical population of children. It has been found that children with ASD present sleep problems which influence the severity of autism symptoms (Mutluer et al., 2020; Türkoğlu et al., 2020), leading to a greater increase in stereotypes, aggression, hypersensitivity, anxiety levels, behavioral problems and appetite alterations when compared to neurotypical children (Alhuzimi, 2020; Amorim et al., 2020; Mutluer et al., 2020; Nonweiler et al., 2020). It seems that a factor that contributed substantially to high anxiety levels in children with

ASD was the loss of their daily routines (Amorim et al., 2020). Furthermore, parents of children with ASD also had higher levels of anxiety than healthy controls during confinement (Alhuzimi, 2020; Amorim et al., 2020; Nonweiler et al., 2020). Evidently, both parents and the educational system have had to adapt to a global crisis, without having the sufficient means or support to do so (Ameis et al., 2020).

In conclusion, this pandemic has caused an imbalance in the emotional state of the general population, as well as in individuals with special needs. Individuals with ASD frequently require specialized care which is based on establishing routines, so confinement due to the COVID-19 pandemic has meant a break with such personalized and specialized care. Therefore, the present work aims to analyze the unique consequences of this historic global health crisis in individuals with ASD.

The novelty of this research with respect to the previous ones published on ASD in the COVID-19 period is that differences in autistic symptoms in two different periods, before and during COVID-19 confinement period are analyzed. In addition, the characteristics of the sample (age, gender, and diagnosis) are similar between the groups and the same assessment measure was used.

2. Objectives

The present study aimed to analyze: 1) the differences in the emotional states between a group of individuals with ASD and a neurotypical group before and during lockdown due to the COVID-19 pandemic, and 2) the differences in autistic symptoms between a group of individuals with ASD who were confined during the COVID-19 pandemic and another group of individuals with ASD analyzed prior to the COVID-19 pandemic period.

3. Method

3.1. Participants

The characteristics of the groups (2018 ASD group, COVID-19 period ASD group, and neurotypical group or NT COVID-19 period) are shown in Table 1. There was a higher percentage of men in the sample. These gender differences are well established, with male-female ratios of 3:1 and 4:1 (i.e., Loomes et al., 2017). The samples provided in this case study were all previously diagnosed with ASD by the mental health service and referred to specific support centers.

3.2. Measures

Social-demographic Questionnaire

This instrument was developed *ad-hoc* by Lam & Aman (2007). The Spanish version was included in the present study (Martinez-González & Piqueras, 2018). It contains a series of social-demographic (age, gender, country of origin) and diagnostic questions; type of ASD, severity, presence and severity of intellectual disability, etc. (see Table 1).

[Insert Table 1]

Emotional state

This instrument was developed *ad-hoc* by Lam & Aman (2007), and linguistically adapted to Spanish by Martinez-González & Piqueras (2018). This instrument evaluates the emotional state of children through 12 items: 5 fear items (going out of the house, being alone, fear of the possibility of having a virus, fear that a friend will get sick or die from a virus, fear that a family member will become ill or die from a virus and fear that mom or dad will get sick or die from a virus). The remaining 7 emotional states are each addressed with an item that corresponds to: aggression, depression, irritability, hyperactivity and impulsivity, lack of attention or distraction, anxiety or nervousness,

and anticipatory anxiety. The items are classified on a Likert scale of four points, starting at 0, which refers to an emotional state that does not occur, up to a score of 3, which would correspond to a frequent and very serious emotional state. The assessment of emotional state was based on observations and interactions reported by a relative, caregiver, or professional who knew the person well and could assess their behavior both before and during COVID-19 confinement.

Social Communication Questionnaire, SCQ form B (SCQ-B)

The SCQ-Form B (Rutter et al., 2003; Spanish adaptation by Pereña & Santamaria, 2005) is a scale oriented towards parents and caregivers, with a total of 40 items that determine the possible presence of ASD. It provides an overall total score and three additional scores (Social Interaction Problems, Communication Difficulties and Restricted, Repetitive and Stereotyped Behaviors). In the present study, the Form B of the scale was used, and those who completed the form were instructed to answer based on the behavior from the past three months. Scores above 15, the cut-off, suggest that the individual is likely to have ASD and a more extended evaluation should be undertaken. The scale has shown adequate psychometric properties in many different studies, in both international (e.g.: Gau et al., 2011; Marvin et al., 2017; Rutter et al., 2003), and Spanish samples (Pereña & Santamaria, 2005). In the same way, this scale has been used in international protocols for both the ASD population with and without ID (Efron et al., 2020; Uljarević et al., 2020). For this sample, the internal consistency values were: .87 for social interaction problems; .64 for communication difficulties; .78 for restricted, repetitive and stereotyped behavior and .90 for the total overall score.

3.3. Procedure

Participants were recruited from online advertisements, email campaigns, blogs, social media, and SMS campaigns which covered the entire country (Spain). All procedures conducted were approved by the Ethics Committee of University of Alicante (reference: UA-2019-10-04). Informed consent was obtained electronically before data were collected from the participating caretakers. Detailed information about the sample for this study is presented in Table 1.

Participating caregivers had children with ASD as well as children with typical or neurotypical development. The state of emergency in Spain was effective between March 13 and June 20, 2020, and home confinement lasted from March to May 2020. The surveys were completed in June 2020. Respondents answered the tests based on the emotional state of individuals with ASD and without ASD both during and prior to confinement.

For this study, a group of individuals with ASD who had been evaluated in 2018 with the SCQ-B instrument was also included. This allowed us to evaluate the differences between autistic symptoms in an ASD group during the COVID-19 period and a group evaluated in 2018. Therefore, both samples were independent. The 2018 sample of individuals with ASD was randomly selected from a larger sample of 233 people (Martinez-González & Piqueras, 2018). Using the SPSS program, the 2018 sample of individuals with ASD was randomly selected, but equivalent sociodemographic and clinical features were taken into account in order to obtain a balanced sample for comparison: similar sample size, type of intellectual disability, age and gender (female/males) were taken into account. It was possible to analyze the differences in emotional state during and before confinement in 36 individuals with ASD and 11 healthy controls. However, 5 cases were eliminated from the sample of 36

individuals with ASD during the confinement period because they did not complete the SCQ-R.

The protocol was completed by participating caretakers who had relevant information about the diagnoses of the participants who were previously diagnosed by the health center as per the DSM criteria for ASD (APA, 2013).

3.4. Data analysis

Statistical analyses were performed using IBM SPSS Statistics v 24.0 for Windows (IBM SPSS Corp., Chicago, IL). The means and standard deviations of each sample were obtained from the direct scores provided by the participants for each of the items corresponding to each test.

The effects of interaction between age, gender, and intellectual levels differences in overall comparison on emotional state during COVID-19 confinement between individuals with ASD and healthy controls was primarily analyzed using MANOVA.

The analysis of differences in emotional states between the ASD group and the control group was carried out using the *t* test. In the same way, the analysis of the differences in autism symptoms between the ASD group during the confinement period and ASD participants in 2018 was carried out using the *Student's t* test. Those differences with $p < .05$ were considered significant. To determine if there were statistically significant differences between the proportions found, the corresponding effect size was calculated: $.20 \leq d \leq .50$ was a low effect size, while $.51 \leq d \leq .79$ was moderate and $d \geq .80$ was high (Cohen, 1988).

4. Results

The effects of age, gender, and intellectual levels differences in overall comparison on emotional state during COVID-19 confinement between individuals with ASD and healthy controls was primarily analyzed using MANOVA. The MANOVA results indicate that there were no statistically significant differences between gender groups (Lambda Wilks = .61, F (12, 31) = 1.62, p = .13), age groups (Lambda Wilks = .58, F (12, 31) = 1.83, p = .09), and intellectual levels groups (Lambda Wilks = .71, F (12, 31) = 1.84, p = .09) in emotional state during COVID-19 confinement between individuals with ASD and healthy controls. Additionally, once the effect of age, gender and level of intellectual disability was controlled for, if there were statistically significant overall differences between individuals with ASD and healthy control (Lambda Wilks = .37, F (12, 31) = 3.28, p < .001). Having confirmed these differences by considering all 12 dependent variables together, the independent variable and the three covariates, we went on to perform Student's t-tests for each variable.

Table 2 presents the means and standard deviations of the different emotional states obtained from the individuals with ASD and the control group during COVID-19 confinement. The group with ASD, when compared with the control group, presented significantly higher mean scores for aggression, irritability, hyperactivity and impulsivity, lack of attention or distraction, anxiety and anticipatory anxiety, with a difference magnitude between moderate and high.

(Include Table 2 here)

The results obtained for the differences in emotional state before and during COVID-19 confinement in individuals with ASD can be seen in Table 3. The results suggest that individuals with ASD present higher levels of both internalizing and externalizing symptoms during confinement. Statistically significant differences have been found in all emotions (fear, depression, aggressiveness, hyperactivity, and anxiety)

during COVID-19 confinement as compared to pre-confinement, with an effect size between low and moderate.

Regarding emotional state before and during COVID-19 confinement in individuals with ASD, the analysis of the covariates has not been carried out since it is the same group, and the measures are repeated.

(Include Table 3 here)

Means and standard deviations of the differences in autistic symptoms between a sample from the COVID-19 pandemic period and a sample from 2018 with similar characteristics are shown in Table 4. Higher levels of repetitive, restrictive, and stereotyped behaviors and total SCQ-B scores were found in individuals with ASD during the COVID-19 confinement period as compared to a similar sample from 2018, and a high effect size was shown.

(Include Table 4 here)

Finally, in the autistic symptoms between a sample in COVID-19 confinement period and a sample of 2018 with similar characteristics, no analysis of the covariates was performed because both groups were balanced or matched in terms of their clinical and socio-demographic characteristics.

5. Discussion

The results of the present study confirm that individuals with ASD present higher levels of aggression, irritability, hyperactivity, impulsivity, attention difficulties, and anxiety when compared to a neurotypical group during the COVID-19 confinement. This indicates that emotional symptoms in the ASD population have been more externalizing. These results coincide with recent literature (Alhuzimi, 2020; Amorim et al., 2020; Mutluer et al., 2020; Nonweiler et al., 2020). On the other hand, caregivers

have reported a significant increase in levels of fear, depression, aggression, hyperactivity, and anxiety during COVID-19 confinement in individuals with ASD when compared to their pre-pandemic behaviors. In addition, the results indicate an increase in repetitive behavior in individuals with ASD during confinement as compared to individuals with ASD who were evaluated prior to the pandemic. Thus, repetitive behavior is a behavioral and emotional manifestation in individuals with ASD which serves as a relief mechanism against certain internal or external distress (Martínez-González, & Piqueras, 2019). Severity of this repetitive behavior was increased during the confinement period. These results are in line with results found on increased irritability and aggression, among others (e.g.: Alhuzimi, 2020; Amorim et al., 2020).

An increase in the negative emotional states of children with ASD and their parents has been evident in the home environment during confinement (e.g.: Alhuzimi, 2020; Amorim et al., 2020; Mutluer et al., 2020; Nonweiler et al., 2020). The global COVID-19 crisis highlights that education systems do not currently have efficient alternatives to meet the needs of individuals with autism and their families. Across the globe, online school has attempted to serve the needs of families and people with ASD but it has fallen short. In addition, the difficulties in managing the negative emotions of children with ASD during the COVID-19 confinement have led to an increased need for resources and online counseling services (telehealth) in order to mitigate the negative impact of said pandemic and future ones that could occur. Thus, this crisis is an opportunity to promote resilience in both the general population as well as in individuals with ASD and their families, through more flexible and immediate intervention systems (Ameis et al., 2020).

Research in the COVID-19 pandemic period has focused on analyzing the

differences between people with ASD and neurotypical people in different psychological variables (emotional, etc.) (e.g.: Alhuzimi, 2020; Mutluer et al., 2020; Nonweiler et al., 2020). However, unlike other studies, this study analyzes the differences in repetitive behavior, as an externalizing symptom of a negative emotion, in two different periods (before and during the COVID-19 pandemic). In addition, the differences in emotional state with a neurotypical group are analyzed.

The results of our study indicate that RRBs is a behavioral symptom that might indicate emotional distress in an individual with ASD. This psychological marker is decisive for implementing comprehensive intervention programs which help mitigate the anxiety state of the individuals with ASD. In addition, these results have great practical utility since the professional and caregiver can use psychometric measurement instruments which allow monitoring the RRBs (e.g.: COREAT app: Martínez-González, 2019). However, it is necessary to have a multidisciplinary perspective in order to understand emotional states of individuals with ASD (Andreo-Martínez et al., 2021; Martínez-González & Andreo-Martínez, 2020).

The results of this study support the need to develop follow-up and intervention protocols in individuals with ASD for future pandemics or global crises. In this sense, a recent research in the field has developed a program for children and youth with ASD after the period of confinement by COVID-19. Specifically, this an online transition package to guide parents and educators in preparing children and young people for the resumption of regular daily routines following the lifting of COVID-19 restrictions (Smyth et al., 2021). Therefore, it is necessary to prepare programs for future crises with the aim of promoting the wellbeing of children and young people with ASD, their families and teachers.

Future studies should carry out longitudinal follow-ups to measure the impact of the

COVID-19 pandemic period on the emotional state of individuals with ASD. Further, different evaluation measures of the emotional state should be included. In the same way, such studies would have to include a large sample of participants. Finally, it would be important that the trajectories in the emotional state of different diagnostic groups could be compared (e.g.: ASD with and without ID).

6. References

Ahmed, M. Z., Ahmed, O., Aibao, Z., Hanbin, S., Siyu, L., & Ahmad, A. (2020). Epidemic of COVID-19 in China and associated Psychological Problems. *Asian Journal of Psychiatry*, 102092.https://doi.org/10.1016/j.ajp.2020.102092

Alhuzimi, T. (2020). 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. *Research in Developmental Disabilities, 108*, 103822. https://doi.org/10.1016/j.ridd.2020.103822

Ameis, S. H., Lai, M. C., Mulsant, B. H., & Szatmari, P. (2020). Coping, fostering resilience, and driving care innovation for autistic people and their families during the COVID-19 pandemic and beyond. *Molecular Autism, 11*(1), 1-9. https://doi.org/10.1186/s13229-020-00365-y

American Psychiatric Association (2013). *Diagnostic and Statistical Manual of Mental Disorders (5th.Ed.)*. Washington, DC: American Psychiatric Publishing.

Amorim, R., Catarino, S., Miragaia, P., Ferreras, C., Viana, V., & Guardiano, M. (2020). Impacto de la COVID-19 en niños con trastorno del espectro autista. *Revista de neurología, 71*(8), 285-291.

Andreo-Martínez, P., Rubio, M., Veas, A., Sánchez-Meca, J., & Martínez-González, A.E. (2021). A meta-analysis on the gut microbiota in children with autism. *Journal of autism and developmental disorders.* https://doi.org/10.1007/s10803-021-05002-y

Bordini, D., Paula, C. S., Cunha, G. R., Caetano, S. C., Bagaiolo, L. F., Ribeiro, T. C., ... & de Jesus Mari, J. (2020). A randomised clinical pilot trial to test the effectiveness of parent training with video modelling to improve functioning and symptoms in children with autism spectrum disorders and intellectual disability. *Journal of Intellectual Disability Research*, *64*(8), 629-643. https://doi.org/10.1111/jir.12759

Cameron, L. A., Phillips, K., Melvin, G. A., Hastings, R. P., & Gray, K. M. (2020). Psychological interventions for depression in children and young people with an intellectual disability and/or autism: systematic review. *The British Journal of Psychiatry*, 1-10. https://doi.org/10.1192/bjp.2020.226

Cao, W., Fang, Z., Hou, G., Han, M., Xu, X., Dong, J., & Zheng, J. (2020). The psychological impact of the COVID-19 epidemic on college students in China. *Psychiatry research, 112934.*https://doi.org/10.1016/j.psychres.2020.112934

Carter-Leno, V., Vitoratou, S., Kent, R., Charman, T., Chandler, S., Jones, C. R., ... & Simonoff, E. (2018). Exploring the neurocognitive correlates of challenging behaviours in young people with autism spectrum disorder. *Autism,* 1362361318769176. https://doi.org/10.1177/1362361318769176

Cohen, J. 1988. *Statistical power analysis for the behavioral sciences (2ª ed.).* Hillsdale, NJ: Erlbaum.

Efron, D., Taylor, K., Payne, J. M., Freeman, J. L., Cranswick, N., Mulraney, M., ... & Williams, K. (2020). Protocol: Does cannabidiol reduce severe behavioural problems in children with intellectual disability? Study protocol for a pilot single-site phase I/II randomised placebo controlled trial. *BMJ Open*, *10*(3). e034362. https://doi.org/10.1136/bmjopen-2019-034362

Gau, S. S. F., Lee, C. M., Lai, M. C., Chiu, Y. N., Huang, Y. F., Kao, J. D., & Wu, Y. Y. (2011). Psychometric properties of the Chinese version of the Social Communication Questionnaire. *Research in Autism Spectrum Disorders*, *5*(2), 809-818. https://doi.org/10.1016/j.rasd.2010.09.010

Glod, M., Riby, D. M., & Rodgers, J. (2019). Relationships between sensory processing, repetitive behaviors, anxiety, and intolerance of uncertainty in autism spectrum disorder and Williams syndrome. *Autism research, 12*(5), 759-765. https://doi.org/10.1002/aur.2096

Huang, L., Ming F., & rong Liu, H. (2020). Emotional responses and coping strategies of nurses and nursing college students during COVID-19 outbreak. *medRxiv*. https://doi.org/10.1101/2020.03.05.20031898

Jeste, S., Hyde, C., Distefano, C., Halladay, A., Ray, S., Porath, M., ... & Thurm, A. (2020). Changes in access to educational and healthcare services for individuals with intellectual and developmental disabilities during COVID-19 restrictions. *Journal of Intellectual Disability Research*, *64*(11), 825-833. https://doi.org/10.1111/jir.12776

Lam, K. S., & Aman, M. G. (2007). The Repetitive Behavior Scale-Revised: Independent validation in individuals with autism spectrum disorders. *Journal of Autism and*

Developmental Disorders, 37(5), 855-866. https://doi.org/10.1007/s10803-006-0213-z

Liu, N., Zhang, F., Wei, C., Jia, Y., Shang, Z., Sun, L., ... & Liu, W. (2020). Prevalence and predictors of PTSS during COVID-19 outbreak in China hardest-hit areas: Gender differences matter. *Psychiatry research, 112921*.https://doi.org/10.1016/j.psychres.2020.112921

Liu, N., Zhang, F., Wei, C., Jia, Y., Shang, Z., Sun, L., ... & Liu, W. (2020). Prevalence and predictors of PTSS during COVID-19 outbreak in China hardest-hit areas: Gender differences matter. *Psychiatry research, 112921*.https://doi.org/10.1016/j.psychres.2020.112921

Lu, W., Wang, H., Lin, Y., & Li, L. (2020). Psychological status of medical workforce during the COVID-19 pandemic: A cross-sectional study. *Psychiatry Research,* 112936. https://doi.org/10.1016/j.psychres.2020.112936

Martínez-González, A. E. (2019). *Conducta Repetitiva Autismo Test (COREAT).* University of Alicante. Spain. Avalaible from: http://hdl.handle.net/10045/90512

Martínez-González, A. E., & Piqueras, J. A. (2018). Validation of the Repetitive Behavior Scale-Revised in Spanish-Speakers Participants with Autism Spectrum Disorder. *Journal of autism and developmental disorders*, *48*(1), 198-208. https://doi.org/10.1007/s10803-017-3276-0

Martínez-González, A. E., & Piqueras, J. A. (2019). Diferencias en la gravedad de los síntomas del Trastorno del Espectro Autista según el contexto educativo. *European Journal of Education and Psychology, 12*(2): 153-164. https://doi.org/10.30552/ejep.v12i2.280

Martínez-González, A.E. & Andreo-Martínez, P. (2020). *Implications of Gut Microbiota and Gastrointestinal Symptoms in Autism.* In Lowell T. Duncan, ed. Advances in Health and Disease. EEUU: NOVA Science Publishers, Inc; Vol. 29. p. 16-21. Available from: https://novapublishers.com/shop/advances-in-health-and-disease-volume-29/

Martínez-González, A.E., & Piqueras, J.A. (2019a). Differences in the severity of Autistic Spectrum Disorder symptoms according to the educational context. *European journal of education and psychology, 12* (2) 153-164. https://doi.org/10.30552/ejep.v12i2.280

Martínez-González, A.E., & Piqueras, J.A. (2019b). Standard scores of the repetitive behavior scale-revised for people with autism and intellectual disability in Spain. *Actas española de psiquiatría, 47*(6), 209-17. *https://pubmed.ncbi.nlm.nih.gov/31869421/*

Marvin, A. R., Marvin, D. J., Lipkin, P. H., & Law, J. K. (2017). Analysis of Social Communication Questionnaire (SCQ) screening for children less than age 4. *Current developmental disorders reports*, *4*(4),137-144. https://doi.org/10.1007/s40474-017-0122-1

Mutluer, T., Doenyas, C., & Aslan Genc, H. (2020). Behavioral Implications of the Covid-19 Process for Autism Spectrum Disorder, and Individuals' Comprehension of and Reactions to the Pandemic Conditions. *Frontiers in Psychiatry, 11*, 1263. https://doi.org/10.3389/fpsyt.2020.561882

Nonweiler, J., Rattray, F., Baulcomb, J., Happé, F., & Absoud, M. (2020). Prevalence and associated factors of emotional and behavioural difficulties during COVID-19 pandemic in children with neurodevelopmental disorders. *Children, 7*(9), 128.

https://doi.org/10.3390/children7090128

Pappa, S., Ntella, V., Giannakas, T., Giannakoulis, V. G., Papoutsi, E., & Katsaounou, P. (2020). Prevalence of depression, anxiety, and insomnia among healthcare workers during the COVID-19 pandemic: A systematic review and meta-analysis. *Brain, Behavior, and Immunity.* https://doi.org/10.1016/j.bbi.2020.05.026

Pereña, J., & Santamaría, P. (2005). *Cuestionario de Comunicación Social: SCQ: Manual.*[Social CommunicationQuestionnaire: Handbook].Madrid, España: TEA.

Richards C., Davies L. & Oliver C. (2017). Predictors of self-injurious behaviour and self-restraint in autism spectrum disorder: towards a hypothesis of impaired behavioural control. *Journal of autism and developmental disorders, 47*, 701–713. https://doi.org/10.1007/s10803-016-3000-5

Roy, D., Tripathy, S., Kar, S. K., Sharma, N., Verma, S. K., & Kaushal, V. (2020). Study of knowledge, attitude, anxiety & perceived mental healthcare need in Indian population during COVID-19 pandemic. *Asian Journal of Psychiatry,51,* 102083. https://doi.org/10.1016/j.ajp.2020.102083

Russell, K. M., Frost, K. M., & Ingersoll, B. (2019). The relationship between subtypes of repetitive behaviors and anxiety in children with autism spectrum disorder. *Research in autism spectrum disorders, 62*, 48-54. https://doi.org/10.1016/j.rasd.2019.03.006

Rutter, M., Bailey, A., & Lord, C. (2003). *The social communication questionnaire: Manual.*Los Ángeles, CA: Western Psychological Services.

Smyth, S., Mc Laughlin, N., Egan, C., *et al.* (2021). Study protocol for autism specific transition resources (T-Res Study): developing a flexible resource package for dealing with the loosening and/or lifting of COVID-19 related restrictions. *HRB Open Research*, *4*, 12. https://doi.org/10.12688/hrbopenres.13155.1

Türkoğlu, S., Uçar, H. N., Çetin, F. H., Güler, H. A., & Tezcan, M. E. (2020). The relationship between chronotype, sleep, and autism symptom severity in children with ASD in COVID-19 home confinement period. *Chronobiology International, 37*(8), 1207-1213. https://doi.org/10.1080/07420528.2020.1792485

Uljarević, M., Frazier, T. W., Phillips, J. M., Jo, B., Littlefield, S., & Hardan, A. Y. (2020). Quantifying research domain criteria social communication subconstructs using the Social Communication Questionnaire in youth. *Journal of Clinical Child & Adolescent Psychology*, 1-11. https://doi.org/10.1080/15374416.2019.1669156

Wang, Y., Di, Y., Ye, J., & Wei, W. (2020). Study on the public psychological states and its related factors during the outbreak of coronavirus disease 2019 (COVID-19) in some regions of China. *Psychology, Health & Medicine,* 1-10. https://doi.org/10.1080/13548506.2020.1746817

Xiao, C. (2020). A novel approach of consultation on 2019 novel coronavirus (COVID-19)-related psychological and mental problems: structured letter therapy. *Psychiatry investigation, 17*(2), 175–176. https://doi.org/10.30773/pi.2020.0047

Table 1

Sociodemographic and diagnostic characteristics

	ASD 2018 period		ASD COVID-19 period		NT COVID-19 period
N	31		31		11
Age (*M/SD*)	10.87 (5.46)		12.41 (7.75)		8.72 (4.42)
Gender (male/female)	(25; 80.6%/ 6; 19.4%)		(25; 80.6%/ 6; 19.4%)		(5; 45.5%/ 6; 54.5%)
Reported diagnosis	N	%	N	%	
ASD w/o ID	17	54.8	17	54.8	
ASD w Mild ID	4	12.9	4	12.9	
ASD w Moderate ID	4	12.9	4	12.9	
ASD w Severe ID	6	19.4	6	19.4	

Note. w = with; w/o = without; ASD = Autism Spectrum Disorder; NT = Neurotypical; ID = Intellectual Disability; M = Mean; SD = Standard Deviation

Table 2

Differences in emotional state during COVID-19 confinement between individualswith ASD and healthy controls.

Emotional state	ASD COVID-19 period (n=36) M (SD)	NT COVID-19 period (n=11) M (SD)	t	p	d
Fear (e.g.: going out of house, being alone, etc.).	.75 (1.05)	.45(.52)	1.25	.21	-
Fear of the possibility of having a virus.	.36 (.72)	.45 (.52)	-.47	.64	-
Fear that a friend will get sick or die from a virus.	.17 (.44)	.36 (.50)	-1.16	.26	-
Fear that a family member will become ill or die from a virus	.31 (.62)	.27 (.46)	.18	.85	-
Fear that mom or dad will get sick or die from a virus	.47 (.73)	.64 (.67)	-.69	.49	-
Aggressiveness towards others or towards material objects	.92 (1.10)	.27 (.46)	2.77	.00**	0.66
Depression (e.g.:crying, sadness, etc.)	.50 (.65)	.27 (.46)	1.27	.21	-
Irritability (e.g.: irritable, mood swings, etc.)	1.36 (.93)	.45 (.52)	4.10	.00**	1.07
Hyperactivity and impulsivity	1.64 (.96)	.27 (.46)	6.40	.00**	1.58
Lack of attention or distraction	1.53 (.84)	.45 (.68)	4.28	.00**	1.34
Anxietyornervousness	1.39 (1.02)	.36 (.50)	4.48	.00**	1.12
Anticipatory anxiety (e.g.: for a party, outing, etc.)	1.14 (1.01)	.45 (.52)	2.95	.00**	0.75

*Note.*ASD = Autism Spectrum Disorder; NT = Neurotypical; M = mean; SD = standard deviation.* $p \leq .05$, ** $p \leq .01$

Table 3

Differences in emotional state before and during COVID-19 confinement in individuals with ASD (n=36)

Emotional state	During confinement M (SD)	After confinement M (SD)	t_{36}	p	d
Fear (e.g.: going out of house, being alone, etc.).	.75 (1.05)	.14 (.35)	3.92	.00**	0.77
Fear of the possibility of having a virus.	.36 (.72)	.11 (.52)	3.00	.00**	0.39
Fear that a friend will get sick or die from a virus.	.17 (.44)	.03 (.16)	1.96	.05	0.42
Fear that a family member will become ill or die from a virus	.31 (.62)	.08 (.28)	2.25	.03	0.47
Fear that mom or dad will get sick or die from a virus	.47 (.73)	.19 (.40)	2.71	.01	0.47
Aggressiveness towards others or towards material objects	.92 (1.10)	.53 (.69)	3.20	.00**	0.42
Depression (e.g.:crying, sadness, etc.)	.50 (.65)	.33 (.47)	2.23	.03	0.47
Irritability (e.g.: irritable, mood swings, etc.)	1.36 (.93)	1.06 (.92)	1.92	.06	-
Hyperactivity and impulsivity	1.64 (.96)	1.31 (.82)	3.41	.00**	0.47
Lack of attention or distraction	1.53 (.84)	1.36 (.76)	1.78	.08	-
Anxietyornervousness	1.39 (1.02)	1.08 (.87)	2.74	.01	0.32
Anticipatory anxiety (e.g.: for a party, outing, etc.)	1.14 (1.01)	.94 (.89)	2.02	.05	0.32

*Note. M = mean; SD = standard deviation. * p < .05; ** p <.01.*

Table 4

Differences in autistic symptoms between a sample in COVID-19 confinement period and a sample of 2018 with characteristics similar

SCQ-B	ASD 2018 period M (SD)	ASD COVID-19 period M (SD)	t_{31}	p	d
Reciprocal Social Interaction	7.90 (5.83)	8.19 (5.21)	-.14	.44	-
Communication	4.29 (1.93)	5.32 (2.18)	-1.01	.15	-
Repetitive, restrictive, and stereotyped behaviors	2.80 (2.52)	4.70 (1.71)	-1.80	.03*	0.88
Total score	10.35 (8.57)	18.22 (6.27)	-1.97	.02*	1.04

Note. SCQ-B = *Social Communication Questionnaire form B; M = mean; SD = standard deviation.* $p < .05$; ** $p < .01$.