

## Case Report

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# Worsening of autistic spectrum disorder symptoms after SARS-CoV-2 infection: A double mechanism hypothesis

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### Abstract

Autism Spectrum Disorder (ASD) is characterized by deficits in communication and social interaction, and restricted, repetitive movements and behavioural patterns. In this case report we would like to describe a worsening symptomatology of a patient affected by ASD following SARS-CoV-2 infection. We have thought that the virus may have affected a child and the caregivers and as so may have caused immune system dysregulation as already described by the scientific literature. Our aim is to describe how the pandemic situation in addition to an infection itself may affect ASD patients stimulating the production of new scientific evidence on this regard.

### Introduction

The SARS-CoV-2 pandemic is affecting both the physical and mental health of population worldwide, particularly the psychophysical balance of patients suffering from psychiatric diseases [1]. Here we present a case of a patient with Autism Spectrum Disorder (ASD) whose symptoms get worse following SARS-CoV-2 infection. The case we present is of particular interest because shows how the pandemic situation and the SARS-CoV-2 infection may together acting as a trigger affecting the symptoms of a psychiatric disorder making those worse.

### Case presentation

We report a case of a patient with ASD who manifested increased hand stereotypies associated with vocal stereotypies, hyperactivity and altered sleep-wake rhythm when he was affected by SARS-CoV-2 infection. The patient is an 8-year-old child who presented low cognitive functioning and a severe level of autistic symptomatology, he attends the third year of elementary school with a teacher assistant, practicing psychomotor and speech therapy, integrated with PACT (Preschool Autism

Communication Therapy). His mainly verbal expression is characterized by the use of single words on request, or spontaneously just in conditions of self-strong motivation, although the production of small, phrased utterances is also possible with proper stimulation. His social skills are poor, he shows difficult in eye engagement and a low searching for others, difficulties in managing expectations and situations perceived as frustrating, with an implementation of behaviours sometimes reactive (crying, complaining, etc.). Personal autonomy is sufficient in the performance of activities of daily living. During the SARS-CoV-2 infection, patient's mother noted a worsening of clinical symptoms. We observed a begin of stereotyped hand movements (flickering) accompanied by vocal stereotypies (repetition of colours) and also an increase in motor activity levels and an alteration in sleep-wake rhythm, with nocturnal awakenings and subsequent difficulty in falling asleep. Luckily, we observed a spontaneous remission of these symptoms a few days after his recovery from SARS infection. Currently persist only some stereotypies of the hands and vocal when emotional activation increase. Since then, the child has been monitored at our centre and although 9 months earlier he made access to our unit

for evaluation of the behavioural, cognitive and adaptive profiles, because of those “events” we re-administered the same scales in order to report the differences observed. We observed a mainly difference on the Aberrant Behaviour Checklist Scale; in fact, if the child previous score was 10, in a phase of clinical equilibrium, after the SARS-CoV-2 infection his score was 18. Interestingly a main contribute to the new reported score was observed in the subscales “Hyperactivity, lack of compliance” and “Stereotyped behaviours”. No major differences were observed in the other scales we used (Social Responsiveness Scale, Short Sensory Profile), except for the Vineland Adaptive Behaviour scale-II interview, that showed some improvements in daily life activities ascribable to the rehabilitation therapies underway.

## Discussion

The SARS-CoV-2 pandemic, as reported, leads to a worsening of the incidence of psychiatric conditions in neurotypical children [2] and to a worsening of symptoms in affected patients with psychiatric disorders [1]. As showed also patients with ASD may be affected by a worsening of behaviours, with an emergence of anxious or depressive symptoms in relation to lockdown. It is noteworthy a worsening of neurological symptoms in patients with pre-existing movement disorders [3]; similarly, infection with this virus itself can lead to neurological manifestations in terms of movement disorders, such as myoclonus, ataxia and tremor [4]. In the case we presented, a Sars-CoV-2 infection, in a child affected by ASD, has led to an increased stereotyped behaviours, worsening of hyperactivity and altered sleep-wake rhythm.

ASD is a neurodevelopmental disorder, in accordance with the diagnostic criteria provided by the DSM-5, characterized by the presence of deficits in communication and social interaction and the presence of patterns of behaviour, interests or repetitive activities [5]. With this regard, one of the main diagnostic signs of the “condition” is the presence of motor stereotypies which can be defined as repetitive, non-goal-directed, rhythmic, patterned movements that stop with distraction and have no accompanying premonitory urge. Examples include hand flapping, body rocking, spinning, repetitive jumping, and finger flicking [6].

Although the diagnosis of ASD can be considered stable over time especially if made in the first years of life [7], individuals with ASD are exposed to a high rate of psychiatric comorbidities, such as the most characteristic represented by attention-deficit/hyperactivity disorder. Both conditions share a similar genetic basis and are associated with deficits in social skills and executive functions [8]. Moreover, sleep disorders are highly represented in ASD patients, especially night awaking and insomnia, and so it is important to recognize this problem in a global assessment and intervene promptly [9]. Considering this we therefore hypothesize two explanations to justify the worsening of symptoms observed. The first is based on the fact that it is well known how stressful events can affect the symptomatology of ASD, leading to their worsening. Some authors have already underlined the need to find any environmental stressors, to provide a comprehensive assessment in the management of such patients [10]. Of great interest is also how parental stress can influence the behavioural profile of ASD patients as some authors refer to this eventuality as “the spill over hypoth-

esis” [11]. Authors have reported how high levels of stress and anxiety in parents, as observed during the pandemic, can “spill over” to their children with ASD worsening their autism symptoms such as increased behavioural challenges, and decreased mental well-being of these children. The second hypothesis is based on neurobiological considerations regarding the infection by Sars-CoV-2. In fact, it has demonstrated that Coronaviruses may activate dysregulated host immune responses. In particular, interleukin-6 is higher in subjects who have contracted the infection and, unfortunately this event is related to a worse outcome [12]. Moreover, authors have hypnotized how viral infections and a dysregulation of the immune system could play a role in the etiopathogenesis of ASD [13,14] and how a higher interleukin-6 concentration is related to a worsening of restrictive and repetitive behaviours [15].

The unique case we presented hope will stimulate other research on this topic with the aim of increasing specialist awareness and so making a better diagnosis and the best management of complex cases. It is important to remember that a clinical worsening in ASD may be due to an organic cause and not necessarily to the evolution of the pathology, even if it is a serious case.

## Declarations

**Data availability:** The data used and or analysed during the current study are available from the corresponding author on reasonable request.

**Conflicts of interest:** The authors declare that they have no conflicts of interest. Authors’ Contributions All authors contributed equally to work.

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