



# Enfermedades Infecciosas y Microbiología Clínica

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## Letter to the Editor

### Long-COVID psychological symptoms in child and adolescent population: A standardized proposal for its exploration



#### *Síntomas psicológicos del COVID prolongado en población infanto-juvenil: una propuesta estandarizada para su exploración*

In the paediatric population, one of the possible consequences following SARS-CoV-2 infection, along with multisystem inflammatory syndrome, is long COVID.<sup>1,2</sup> Long COVID is a heterogeneous syndrome that involves different signs and symptoms (neurological, sensory, mental health, cardiorespiratory, etc.) that persist after contracting COVID-19.<sup>1,2</sup> Long COVID in children and adolescents has recently been described as a condition that occurs in young people with confirmed SARS-CoV-2 infection characterised by exhibiting one or more persistent symptoms (that cannot be explained by an alternative diagnosis) for a minimum of 12 weeks and where these symptoms (which can persist or develop after infection, or fluctuate over time) have an impact on the person's daily functioning.<sup>3</sup>

At an applied level, in Spain there have been exploratory research proposals aimed at the adult population, based entirely on the use of psychometric tools to assess the symptoms of long COVID.<sup>4</sup> In the same vein, in children and adolescents suffering from long COVID, having fully psychometric evaluation research proposals based on the scientific literature could help to standardise the assessment of the symptoms of this complex clinical condition. This type of exploratory proposal could be especially useful in psychological manifestations, since these are usually measured using different scales, questionnaires, etc. and usually manifest in the post-acute phase of COVID-19.<sup>5</sup> The aim of this paper was therefore to develop a research proposal for the psychometric evaluation of the main psychological symptoms of long COVID in the paediatric and adolescent population, considering the findings of various recent review studies.

A search was carried out in PubMed for studies that address the symptomatological analysis of long COVID in children-adolescents. The search, carried out on 9 August 2022, included the following combination of terms: “long-COVID-19” OR “post-acute COVID-19 syndrome” OR “post-COVID-19 condition”, along with the age filters (population up to 18 years of age) and review, systematic review or meta-analysis studies, with no date restrictions applied. Of 21 papers identified, only five jointly met the requirements for subject matter, age range and type of study-objective of interest (Table 1).

As can be seen in Table 1, the frequency of prolonged symptoms of COVID-19 showed wide variability in the different studies. Specifically, fatigue,<sup>1,2,6</sup> sleep problems (insomnia, hypersomnia and poor sleep quality),<sup>1,2,8</sup> emotional symptoms (anxiety, depres-

sion, sadness, anger and irritability)<sup>2,6,7</sup> and cognitive changes (attention and concentration difficulties, learning difficulties and memory loss)<sup>1,2,6–8</sup> were the most frequently reported psychological symptoms in the included reviews.

Based on these findings, a proposal for symptomatological psychometric evaluation was made considering potentially useful instruments (for example, because they were quick to apply, were aimed at exploring the manifestations described, would have been recommended in management guides for this problem, in review studies, etc.)<sup>9,10</sup> to cover the widest possible age range. Regarding fatigue, tools such as the PedsQL Multidimensional Fatigue Scale (MFS), which assesses general, cognitive and rest-related fatigue (applicable from two to 18 years of age), and the FACIT Fatigue Scale, which measures self-reported fatigue and its impact on daily activities (the paediatric version being indicated for ages eight to 18 years of age), could be of use. Regarding sleep problems, screening tools such as the Bruni Sleep Disturbance Scale for Children (for ages six and a half to 15 years old) or the BEARS questionnaire (applicable from ages two to 18 years of age) could be considered, which evaluate different general aspects of sleep (daytime sleepiness, falling and staying sleep, regularity and duration of sleep, etc.). Regarding the evaluation of emotional symptoms, it would be interesting to consider measurement tools aimed at detecting emotional and behavioural problems, such as the Sistema de Evaluación de Niños y Adolescentes (SENA) [Child and Adolescent Evaluation System], which assesses age subgroups between three and 18 years of age, or the Strengths and Difficulties Questionnaire (SDQ), which measures different groups of symptoms, such as emotional disturbances, behavioural problems or hyperactivity in children from four to 17 years of age. Finally, to evaluate cognitive performance, the D2-R Test to specifically assess selective attention and the ability to concentrate, and which can be administered from the age of six, could be of interest, as well as the NEPSY-II neuropsychological battery applicable between the ages of three and 16, which would allow for a selective evaluation of memory and attention through the domains: a) memory and learning and b) attention and executive functions.

Depending on the symptoms reported by the child or adolescent and by their parents, the above tools would be used to study persistent psychological symptoms in greater depth, with two evaluation periods being relevant after overcoming the acute phase of COVID-19: one in the first 12 weeks after this phase, the minimum period of symptom persistence in long COVID,<sup>3</sup> and another at six months, a period in which improvements in persistent symptoms have been reported in different groups of children and adolescents.<sup>8</sup>

The manifestation of psychological symptoms in a case of child-adolescent long COVID would determine the possible need for specialised care (for example, by mental health teams, long COVID units, etc.) due to the impact that it can have on the child's or adolescent's development and state of health. Based on the proposed tools to consider, the use of screening measures by the clinician, such as the FACIT Fatigue Scale, the SDQ and the BEARS Ques-

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**Table 1**

Characteristics and results of the studies included in the review.

Study	Study type	Symptoms of long COVID (%)	Psychological symptoms in long COVID (%)
Zimmermann et al., 2021 <sup>1</sup>	Systematic review	4%–66%	Fatigue (3%–87%) Concentration difficulties (2%–81%) Sleep disorders (2%–63%)
Howard-Jones et al., 2022 <sup>6</sup>	Narrative review	0%–27%	Fatigue <sup>a</sup> Cognitive changes <sup>a</sup> Depression <sup>a</sup>
Gupta et al., 2022 <sup>7</sup>	Systematic review	n.r.	Cognitive difficulties <sup>a</sup> Emotional/behavioural symptoms <sup>a</sup>
Buonsenso et al., 2022 <sup>8</sup>	Narrative review	1.8%–66.5%	Cognitive changes <sup>a</sup> Sleep problems <sup>a</sup>
López-León et al., 2022 <sup>2</sup>	Systematic review and meta-analysis	25.24%	Emotional symptomatology (16.50%) Fatigue (9.66%) Sleep disorders (8.42%) Cognitive changes (6.27%)

\* Frequency reported by the different studies that specify it; n.r. = not reported.

<sup>a</sup> = Frequency not specified.

tionnaire, could help identify fatigue problems, psychopathological symptoms or sleep problems that would indicate the need for referral to specialists. Finally, it should be taken into account that long COVID would be diagnosed by exclusion,<sup>9</sup> meaning a general study would be necessary to conduct an appropriate differential diagnosis and rule out the fact that the psychological symptoms that could be detected are due to an aetiology other than SARS-CoV-2 infection.

In conclusion, the characteristics of the different proposed tools (e.g., quick to apply, adaptation, broad age of application, etc.) make these useful measures that could be combined (depending on needs, age, etc.) in order to carry out a standardised investigation of the main psychological symptoms of long COVID identified in the literature in a wide range of children and adolescents.

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## Conflicts of interest

The authors have no conflicts of interest to declare.

## References

- Zimmermann P, Pittet LF, Curtis N. How common is long COVID in children and adolescents? *Pediatr Infect Dis J*. 2021;40:e482–7, <http://dx.doi.org/10.1097/inf.0000000000003328>.
- López-León S, Wegman-Ostrosky T, Ayuzo NC, Perelman C, Sepúlveda R, Rebolledo PA, et al. Long-COVID in children and

- adolescents: a systematic review and meta-analyses. *Sci Rep*. 2022;12:9950, <http://dx.doi.org/10.1038/s41598-022-13495-5>.
- Stephenson T, Allin B, Nugawela MD, Rojas N, Dalrymple E, Pinto S, et al. Long COVID (post-COVID-19 condition) in children: a modified Delphi process. *Arch Dis Child*. 2022;107:674–80, <http://dx.doi.org/10.1136/archdischild-2021-323624>.
- Arnanz I, Martínez M, Recio S, Blasco R, Benedito T, Sanz M. Las escalas en la COVID-19 persistente. *Med Gen Fam*. 2021;10:79–84, <http://dx.doi.org/10.24038/mgyf.2021.017>.
- Badenoch JB, Rengasamy ER, Watson C, Jansen K, Chakraborty S, Sundaram RD, et al. Persistent neuropsychiatric symptoms after COVID-19: a systematic review and meta-analysis. *Brain Commun*. 2021;4:fcab297, <http://dx.doi.org/10.1093/braincomms/fcab297>.
- Howard-Jones AR, Burgner DP, Crawford NW, Goeman E, Gray PE, Hsu P, et al. COVID-19 in children. II: pathogenesis, disease spectrum and management. *J Paediatr Child Health*. 2022;58:46–53, <http://dx.doi.org/10.1111/jpc.15811>.
- Gupta M, Gupta N, Esang M. Long COVID in children and adolescents. *Prim Care Companion CNS Disord*. 2022;24:21r03218, <http://dx.doi.org/10.4088/pcc.21r03218>.
- Buonsenso D, Di Gennaro L, De Rose C, Morello R, D'Ilario F, Zampino G, et al. Long-term outcomes of pediatric infections: from traditional infectious diseases to long Covid. *Future Microbiol*. 2022;17:551–71, <http://dx.doi.org/10.2217/fmb-2022-0031>.
- Gatell A, López N, Domènech E, Méndez M, Rius N, Soriano-Arandes A. Recomendaciones para el manejo clínico de la COVID-19 persistente en la infancia y adolescencia. *Pediatr Integral*. 2021;25:445.
- Morrow AK, Rowena N, Vargas G, Jashar DT, Henning E, Stinson N, et al. Post-acute/long COVID in pediatrics: development of a multidisciplinary rehabilitation clinic and preliminary case series. *Am J Phys Med Rehabil*. 2021;100:1140–7, <http://dx.doi.org/10.1097/phm.0000000000001896>.

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