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# COVID-19 as a threat to the mental health of the adolescents

# COVID-19 como amenaza a la salud mental de los adolescentes

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**Dear Editor:**

A recent article in The Lancet highlights the importance of the impact of the Coronavirus Disease 2019-2020 (COVID-19) on the mental health of adolescents (1). As a true threat to the global public health (2), this pandemic has led to millions of children and adolescents being confined to their homes due to quarantines or other forms of mobility restrictions. In this context, it is worth asking, can the period of confinement affect the neurobiological development, as well as the psychological well-being of adolescents? Considering this question, this Letter to the Editor focuses on the impact of COVID-19 on the mental health of adolescents.

The brain development is a continuous process throughout life and neuroplasticity mechanisms are important in it (3–5). During puberty and adolescence, stages in which neurophysiological and behavioral development is particularly complex, the brain experiences a large 'window' of neuroplasticity (3–5). In adolescence, several stimuli and compounds participate in organizational phenomena of the central nervous system (e.g., myelination, neuronal pruning, apoptosis, dendritic remodeling, and epigenetic changes), which structurally configure some brain circuits (3–5). Thus, adolescence is a "unique opportunity period" in which multiple stimuli, internal or external, can permanently reconfigure these circuits, which can manifest itself in behavioral changes.

Stress is defined as inherited, defensive and / or adaptive behavior, with specific neuro-endocrine activation in the face of a threatening stressor (6). The impact of stress on adolescents is robust, long-lasting, and sex-specific, in part because sex hormones and stress hormones (e.g., glucocorticoids such as cortisol and corticosterone) interact to shape future endocrine responses (6). Activation of the stress response, culminating in the secretion of stress hormones (Figure 1), induces genetic alterations in multiple brain regions in humans and rodents (7).

Post-traumatic stress disorder (PTSD) involves long-lasting psychological disturbances attributed to the experience of a major traumatic event (8). The state of catastrophe due to the COVID-19 pandemic constitutes a significant stressor that can generate PTSD, characterized by nightmares, repetitive memories, irritability, anxiety and depressive features, among others. Young people who experience traumatic stress and who develop post-traumatic symptoms secrete higher levels of cortisol than those without a history of trauma (9). Animal studies suggest that excessive corticosterone secretion may produce neurotoxicity in areas of the brain rich in glucocorticoid receptors (e.g., hippocampus and prefrontal cortex) (9). These two areas are involved in memory processing and executive function, both critical for learning (9).

The evidence described above constitutes an important call to pay attention to the effects of the pandemic on the mental health of adolescents, an age group that is especially vulnerable from the point of view of the stage of neurobiological development in which they are found.

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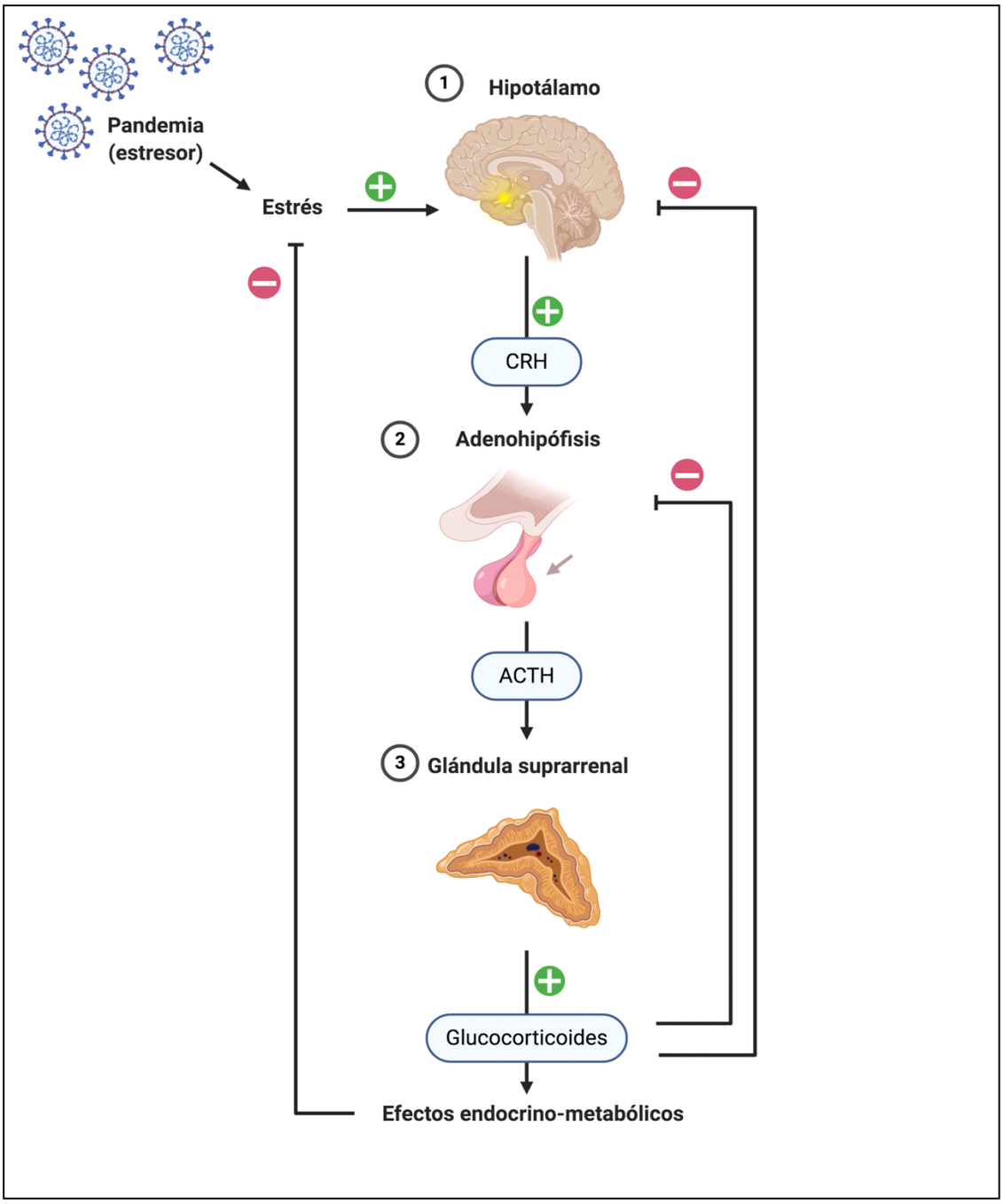


**Figure 1. Stress response of the hypothalamic-pituitary-adrenal axis. The COVID-19 pandemic, caused by SARS-CoV-2, is a stressor that could affect the homeostatic regulation of this axis. CRH: corticotropin-releasing hormone. ACTH: adrenocorticotrophic hormone. Figure created with the Biorender.com program**

## Contribution of the authors

Sole authorship.

## Interest conflict

We declare that we have no conflict of interest.

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