

## Letter to editor

# Muscle contraction can improve psychological resilience during the COVID-19 lockdown: Neural effects of resistance training at home

Abolfazl Shakibae<sup>1\*</sup>, Elahe Akbari<sup>2</sup>, Mohadeseh Zohrabi<sup>2</sup>, Malihe Najafi<sup>2</sup>

## Dear Editor-in-Chief

The world has recently experienced one of the hardest pandemics, COVID-19. Clinical signs of this disease include fever, dry cough, and diarrhea, or different symptoms that lead to acute respiratory distress syndrome with a further increase in the severity of the disease. Although the first observations of this disease are the involvement of symptoms and respiratory and heart injuries, various studies have also shown the nerve damage caused by this disease. Common neurological symptoms include headache, dizziness, anosmia, seizures, or paralysis. The elderly and critically ill are in the high-risk group and have shown severe neurological symptoms after COVID-19. Apart from COVID-19-induced cellular and neurological damage, this disease has a profound effect on the mental health of people around the world. Increasing the duration of this disease and staying at home causes social and economic problems and as a result mental health problems (Verma et al., 2020). Neurological and mental illnesses are very common all over the world.

Psychological resilience was an important issue during COVID-19 epidemic. In other words, during an epidemic, mental health of people should be considered and checked, and entertainment programs should be prevented from causing psychological damage. Research during the COVID-19 epidemic found that because of the psychological pressures to increase psychological resilience, people tended to be more exposed to the outdoors, exercise more, receive more social support from family, friends and important people, sleep better, and pray more, that these factors were effective in mitigating psychological trauma. In most studies, spiritual health affects mental health, because repeated prayers and worships have been more independently associated with psychological resilience (Killgore et al., 2020). In other

words, those who actively participate in these spiritual activities and strengthen their relationship with God are found to have the most psychological resilience to the mental health challenges imposed by COVID-19. In addition, the effects of exercise at the cellular level can help improve memory and psyche and be effective in improving psychological resilience. To date, no studies have been performed on secretions due to muscle contraction and its effect on the brain and psychological function, and psychological resilience especially to control the psychological damage caused by an epidemic.

Exercise has many beneficial effects on brain health and helps reduce the risks of dementia, depression, and stress, and is involved in restoring and maintaining cognitive function and metabolic control. The fact that exercise is sensed by the brain suggests that environmental factors induced by the muscle allow a direct link between muscle function and the brain. Muscles secrete myokines that help regulate hippocampal function. Evidence is accumulating that myokine cathepsin B crosses the blood-brain barrier to increase brain-derived neurotrophic factor production, resulting in neurogenesis, memory, and learning. In addition, the muscle tissue itself can affect the central nervous system, memory, and psyche in form of endocrine by increasing BDNF expression. Exercise also increases the expression of the neurogenic gene FNDC5 (which encodes myogenic FNDC5-dependent PGC1 $\alpha$ ), which in turn can help increase levels of brain-derived neurotrophic factor (Pedersen, 2019).

Serum levels of myokine, IL-6, increase with exercise and may have beneficial effects on the central nervous system. Exercise also increases PGC1 $\alpha$ -dependent muscle expression and the enzymes kynurenine aminotransferase, which beneficially alters the balance between the neurotoxic kynurenine and the neuroprotective Kynurenic acid, thereby reducing depressive symptoms. Signaling myokine and other muscle factors and exercise-induced hepatokines and adipokines play a role in the beneficial effects of exercise on neurogenesis, cognitive functi-

1. Exercise Physiology Research Center, Life Style Institute, Baqiyatallah University of Medical Sciences, Tehran, Iran. 2. Department of Sport Physiology, Faculty of Sport Sciences, Alzahra University, Tehran, Iran.

\*Author for correspondence: [shakibaeabolfazl2@gmail.com](mailto:shakibaeabolfazl2@gmail.com)

-on, appetite, and metabolism, thus supporting the existence of a muscle-brain endocrine axis. Also, it can affect psychological resilience which needs more studies.

## References

Killgore, W. D., Taylor, E. C., Cloonan, S. A., & Dailey, N. S. (2020). Psychological resilience during the COVID-19 lockdown. *Psychiatry research*, 291, 113216. doi: <https://doi.org/10.1016/j.psychres.2020.113216>

Pedersen, B. K. (2019). Physical activity and muscle–brain crosstalk. *Nature Reviews Endocrinology*, 15(7), 383-392. doi: <https://doi.org/10.1038/s41574-019-0174-x>

Verma, K., Amitabh, Prasad, D. N., Kumar, B., & Kohli, E. (2020). Brain and COVID-19 crosstalk: pathophysiological and psychological manifestations. *ACS Chemical Neuroscience*, 11(20), 3194-3203. doi: <https://doi.org/10.1021/acscemneuro.0c00446>