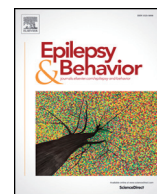




Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.



Letter to the Editor

CoVID-19 vs. epilepsy: It is time to move, act, and encourage physical exercise


To the Editor

Epilepsy is a common disease, found in 2% of the population, that affects people of all ages, geographic localizations, and socioeconomic levels. It is characterized by the occurrence of at least two unprovoked (or reflex) seizures occurring >24 h apart, one unprovoked (or reflex) seizure, and a probability of further seizures similar to the general recurrence risk after two unprovoked seizures, occurring over the next 10 years [1]. The prevalence of epilepsy is 6.4 cases/1000 individuals and is higher in low-income countries [2].

Currently, there is a lot of uncertainty and questions regarding epilepsy vs. coronavirus disease 2019 (CoVID-19). Scientific authorities have proposed that the risk of acquiring CoVID-19 infection by people with epilepsy is the same as that of the general population [3]. However, there are some factors (for example, related to lifestyle and side effects of antiepileptic drugs) that could negatively impact the health status of people with epilepsy. Health authorities point out that “those whose seizures are well controlled may not be at any greater risk than the general population, but those with uncontrolled seizures, and particularly seizures triggered by infection, may be more vulnerable” to CoVID-19 infection [3]. However, there are other factors that can put people with epilepsy at higher risk compared with healthy people (even if seizures are controlled), such as the lack/impairment of medical assistance in the course of the pandemic, the presence of comorbidities [4,5], and possible weakening of the respiratory and cardiovascular systems in the course of the disease [3,6–10].

In relation to medical assistance, the health systems are currently focused on combating the CoVID-19 pandemic, and routine medical consultations for patients with other chronic diseases, in general, have been postponed. This could increase the level of emotional stress and uncertainty, as people with epilepsy use multiple controlled medications that require the presentation of medical prescription and authorization [3,6,7]. It is important to point out that sudden unexpected death in epilepsy (SUDEP) represents the most common epilepsy-related cause of death of people with epilepsy (1 to 2 per 1000 patient-years) and some associated factors are the presence of respiratory and cardiac complications due to seizures [11]. In this context, it is possible to hypothesize that this would already be a factor in “turning on the warning signal” in relation to these patients. Another risk factor is that people with epilepsy are more sedentary and have worse levels of physical fitness [10–15], which could be worse in this scenario.

Considering the current perspective and the recommendation from local and global health authorities for social isolation and quarantine,

the aim of this article is to present the practice of physical activity as an alternative strategy with which to cope with the pandemic of CoVID-19 for people with epilepsy and the health professionals who take care of them.

CoVID-19 vs. epilepsy

The pandemic of CoVID-19 is frightening the world because of its potential for transmission-dissemination-hospitalization-lethality among more vulnerable populations, such as elderly people [6,16–19]. This could include people with epilepsy because the prevalence of epilepsy is higher in elderly people. Furthermore, many people with epilepsy have other comorbidities (depression, anxiety, hypertension, and obesity) and risk factors (low levels of physical activity) associated or not with the side effects of antiepileptic drugs [20]. In addition, quarantine and social isolation, associated with the CoVID-19 pandemic, could impact negatively on the lifestyles (physical activity and diet) and health status (mental health) of health people and those with chronic diseases/morbidities [21].

Li et al. [22] conducted a study with the aim of exploring the impact of CoVID-19 on people's mental health. To this end, the posts of 17,865 active Weibo users were analyzed using the approach of *Online Ecological Recognition* based on machine-learning models. The authors observed many negative psychological, emotional, and mood states during the quarantine period associated with the CoVID-19 pandemic, such as anxiety, depression, indignation, increased sensitivity to social risks, unhappiness, and life dissatisfaction.

Therefore, it is reasonable to assume that the CoVID-19 pandemic is a bad scenario for people with epilepsy, since psychological and emotional stress is a known factor that induces seizures and depression among them. Additionally, epilepsy-related stress — the burden of epilepsy — explains depression in many people with epilepsy [23]. Although there are still no longitudinal studies in this area, it is possible to suppose that the period of social isolation and quarantine, indicated by the global and local health authorities, would negatively impact mental health and the levels of physical activity, and increase sedentary behavior, such as watching TV, sitting, staying on cell phones and social networks, and spending longer time on the computer, both in the general population and in people with epilepsy.

Recently, an interesting article was published on this topic entitled “A tale of two pandemics: How will CoVID-19 and global trends in physical inactivity and sedentary behavior affect one another?” In this article, Hall et al. [21] highlight that the drastic change in people's daily lives (due to the recommendation for social isolation and quarantine) around the world, associated with the pandemic caused by CoVID-19, could

negatively impact physical activity habits and emphasize sedentary behaviors.

It is clear that there is a need for a change in the way that health systems are conducted and in strategies for health/education promotion that include changes in lifestyle (encourage the practice of physical exercise) around the world in order to face and cope better with scenarios of this type. In this regard, a physical inactivity pandemic is a real fact, and the practice of physical activity by people with epilepsy could improve their physical and mental health [24–28].

Coping strategies vs. epilepsy vs. COVID-19

Coping with the COVID-19 pandemic and the great emotional stress would make society (individually and collectively) stronger. Coping is described as behavioral efforts (positive and/or negative) to deal with situations of harm and problem-solving techniques that are utilized to reduce psychological and emotional burden. Strategies of coping may include emotional support, meditative techniques, and religiosity/spirituality and physical exercise practice [29–31].

Emotional and psychological stress before, during, and after the COVID-19 pandemic could include fear, change in sleep patterns, eating, physical inactivity, difficulty in concentration, worsening of chronic health problems and mental health conditions, and increased use of alcohol, tobacco, or other illicit drugs [16,17]. In such a situation, people with epilepsy are going through two extremely important and impactful situations (COVID-19 vs. epilepsy) at the same time. Following the same line of reasoning as Hall et al. [21], people with epilepsy may be facing three risk factors at the same time: COVID-19 vs. epilepsy vs. physical inactivity. This scenario in the short, medium, and long terms could produce even more negative effects on the physical, mental, and general health of people with epilepsy. Thus, it is necessary to draw up plans for minimizing scenarios like this.

Coping vs. COVID-19 vs. physical (in)activity

“Physical exercise is medicine” for many diseases [25–27], such as neurological (dementia), metabolic (obesity), cardiovascular (hypertension), pulmonary (asthma), and musculoskeletal disorders (osteoporosis) and psychiatric (depression) conditions, and also for epilepsy [25–28]. However, people with epilepsy are known to have low levels of physical activity [32], which can negatively impact their overall health status, physical fitness, and mental health [32–36].

In this period of necessary social isolation and quarantine, it is likely that the already low level of physical activity in people with epilepsy will further deteriorate, and sedentary behaviors will increase. Therefore, strategies are needed to at least maintain mental health and physical fitness in a safe way, such as practicing light and home-based physical exercises. This practice needs to be adapted to the home environment and directed by skilled health professionals; people with epilepsy should be guided/advised in practicing home-based exercise, which should include aerobic exercises, muscle strength exercises, and flexibility exercises [21,37].

Indeed, physical exercise in times of the COVID-19 pandemic has gained great relevance. For instance, the article by Jiménez-Pavón et al. [37] entitled “Physical exercise as therapy to fight against the mental and physical consequences of COVID-19 quarantine: Special focus on older people” proposed some home-based physical exercise strategies to face the pandemic of COVID-19 and to maintain and eventually improve health-related physical fitness components in older people, which could be used safely by other populations in this period of uncertainty.

Thus, it is necessary to outline effective education and health strategies [37,38] in the short, medium, and long terms in order to minimize the negative impact of social isolation and quarantine caused by COVID-19 for the general population and people with epilepsy.

Final remarks

“Physical exercise is medicine and recommended for people with epilepsy” [27,28] and the general population. There are sufficient evidences that physical exercise produces positive effects on physical fitness, mental health, and lifestyle. The advice of the Epilepsy Society [2020] is to “Try to keep healthy by following a nutritious diet and taking light exercise” during the COVID-19 pandemic. The most prudent thing to do is to respect social isolation and quarantine and seek alternative strategies, such as home-based physical exercise, which may include popular social networks (Instagram) and video and information search sites (YouTube) for health promotion among the general population and people with epilepsy.

Declaration of competing interest

Authors have no competing interests to declare.

Acknowledgments

To all health professionals and scientists who donate their knowledge and experience to save lives. To all people, victims, patients, families, parents, and friends who have lost loved ones. RLV receives a productivity fellowship at the Fundação de Amparo à Pesquisa e Inovação do Espírito Santo (FAPES) agency (Edital No. 18/2018-Bolsa Pesquisador Capixaba).

References

- [1] Fisher RS, Acevedo C, Arzimanoglou A, Bogacz A, Cross JH, Elger CE, et al. ILAE official report: a practical clinical definition of epilepsy. *Epilepsia*. 2014;55:475–82.
- [2] Nature Reviews Disease Primers. Epilepsy. *Nat Rev Dis Primers*. 2018;4:18025.
- [3] Epilepsy Society. Epilepsy and the coronavirus (COVID-19) FAQs. Available from: . <https://www.epilepsysociety.org.uk/epilepsy-and-coronavirus-covid-19-faqs#XouB1YhKhPZ>; 2020. [Accessed 6 April 2020]. .
- [4] Keezer MR, Sisodiya SM, Sander JW. Comorbidities of epilepsy: current concepts and future perspectives. *Lancet Neurol*. 2016;15:106–15.
- [5] Hamed SA. Atherosclerosis in epilepsy: its causes and implications. *Epilepsy Behav*. 2014;41:290–6.
- [6] World Health Organization (WHO). Coronavirus disease (COVID-2019) situation reports. Available from: . <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/situation-reports>; 2020. [Accessed 17 March 2020]. .
- [7] World Health Organization (WHO). Mental health and psychosocial considerations during the COVID-19 outbreak. Available from: . <https://www.who.int/docs/default-source/coronaviruse/mental-health-considerations.pdf>; 2020. [Accessed 8 April 2020]. .
- [8] Godhwani N, Bahna SL. Antiepilepsy drugs and the immune system. *Ann Allergy Asthma Immunol*. 2016;117:634–40.
- [9] Beghi E, Shorvon S. Antiepileptic drugs and the immune system. *Epilepsia*. 2011;3:40–4.
- [10] Duncan JS, Sander JW, Sisodiya SM, Walker MC. Adult epilepsy. *Lancet*. 2006;367:1087–100.
- [11] Maguire MJ, Jackson CF, Marson AG, Nevitt SJ. Treatments for the prevention of sudden unexpected death in epilepsy (SUDEP). *Cochrane Database Syst Rev*. 2020;4:CD011792.
- [12] Eriksen HR, Bjørn E, Grønningsaeter H, Nakken KO, Løyning Y, Ursin H. Physical exercise in women with intractable epilepsy. *Epilepsia*. 1994;35:1256–64.
- [13] McAuley JW, Long L, Heise J, Kirby T, Buckworth J, Pitt C, et al. A prospective evaluation of the effects of a 12-week outpatient exercise program on clinical and behavioral outcomes in patients with epilepsy. *Epilepsy Behav*. 2001;2:592–600.
- [14] Nakken KO, Bjørholt PG, Johannesen SL, Løyning T, Lind E. Effect of physical training on aerobic capacity, seizure occurrence, and serum level of antiepileptic drugs in adults with epilepsy. *Epilepsia*. 1990;31:88–94.
- [15] Heise J, Buckworth J, McAuley JW, Long L, Kirby TE. Exercise training results in positive outcomes in persons with epilepsy. *Clin Exerc Physiol*. 2002;4:79–84.
- [16] Center for Disease Control and Prevention (CDC). How to protect yourself. Available from: . <https://www.cdc.gov/coronavirus/2019-ncov/prepare/prevention.html>; 2020. [Accessed 18 March 2020]. .
- [17] Center for Disease Control and Prevention (CDC). Stress and coping. Available from: . <https://www.cdc.gov/coronavirus/2019-ncov/daily-life-coping/managing-stress-anxiety.html>; 2020. [Accessed 9 April 2020]. .
- [18] Cascella M, Rajnik M, Cuomo A, Dulebohn SC, Di Napoli R. Features, evaluation and treatment coronavirus (COVID-19). Book chapter. Available from: . <https://www.ncbi.nlm.nih.gov/books/NBK554776/>. [Accessed 17 March 2020]. .
- [19] Phua J, Weng L, Ling L, Egi M, Lim CM, Divatia JV, et al. Asian Critical Care Clinical Trials Group. Intensive care management of coronavirus disease 2019 (COVID-19): challenges and recommendations. *Lancet Respir Med*. 2020;S2213–2600:30161–2.

- [20] Zaccara G. Neurological comorbidity and epilepsy: implications for treatment. *Acta Neurol Scand.* 2009;120:1–15.
- [21] Hall G, Laddu DR, Phillips SA, Lavie CJ, Arena R. A tale of two pandemics: how will COVID-19 and global trends in physical inactivity and sedentary behavior affect one another? *Prog Cardiovasc Dis.* 2020;30077 S0033–0620. 3.
- [22] Li S, Wang Y, Xue J, Zhao N, Zhu T. The impact of COVID-19 epidemic declaration on psychological consequences: a study on active Weibo users. *Int J Environ Res Public Health.* 2020;17:E2032.
- [23] Elger CE, Johnston SA, Hoppe C. Diagnosing and treating depression in epilepsy. *Seizure.* 2017;44:184–93.
- [24] Althoff T, Sosič R, Hicks JL, King AC, Delp SL, Leskovec J. Large-scale physical activity data reveal worldwide activity inequality. *Nature.* 2017;547:336–9.
- [25] Arida RM, Cavalheiro EA, Scorza FA. From depressive symptoms to depression in people with epilepsy: contribution of physical exercise to improve this picture. *Epilepsy Res.* 2012;99:1–13.
- [26] Arida RM, Cavalheiro EA, da Silva AC, Scorza FA. Physical activity and epilepsy: proven and predicted benefits. *Sports Med.* 2008;38:607–15.
- [27] Pedersen BK, Saltin B. Exercise as medicine - evidence for prescribing exercise as therapy in 26 different chronic diseases. *Scand J Med Sci Sports.* 2015;3:1–72.
- [28] Vancini RL, Andrade MS, de Lira CA. Exercise as medicine for people with epilepsy. *Scand J Med Sci Sports.* 2016;26:856–7.
- [29] Vancini RL, de Lira CA, Arida RM. Alternative medicine as a coping strategy for people with epilepsy: can exercise of religion and spirituality be part of this context? *Epilepsy Behav.* 2014;31:194–5.
- [30] Cairney J, Kwan M, Veldhuizen S, Faulkner GEJ. Who uses exercise as a coping strategy for stress? Results from a national survey of Canadians. *J Phys Act Health.* 2014; 11:908–16.
- [31] Livneh H, Wilson LM, Duchesneau A, Antonak RF. Psychosocial adaptation to epilepsy: the role of coping strategies. *Epilepsy Behav.* 2001;2:533–44.
- [32] Arida RM, Scorza FA, de Albuquerque M, Cysneiros RM, de Oliveira RJ, Cavalheiro EA. Evaluation of physical exercise habits in Brazilian patients with epilepsy. *Epilepsy Behav.* 2003;4:507–10.
- [33] Vancini RL, Andrade MS, Lira CAB. Could physical activity practice minimize the economic burden of epilepsy? *Arq Neuropsiquiatr.* 2018;76:209.
- [34] Vancini RL, Lira CA, Andrade Mdos S, Cd Lima, Arida RM. Low levels of maximal aerobic power impair the profile of mood state in individuals with temporal lobe epilepsy. *Arq Neuropsiquiatr.* 2015;73:7–11.
- [35] Vancini RL, de Lira CA, Arida RM. Physical exercise as a coping strategy for people with epilepsy and depression. *Epilepsy Behav.* 2013;29:431.
- [36] Vancini RL, de Lira CA, Arida RM. Physical exercise: potential candidate as coping strategy for people with epilepsy. *Epilepsy Behav.* 2013;28:133.
- [37] Jiménez-Pavón D, Carbonell-Baeza A, Lavie CJ. Physical exercise as therapy to fight against the mental and physical consequences of COVID-19 quarantine: special focus in older people. *Prog Cardiovasc Dis.* 2020;30063 S0033–0620.
- [38] Oni T, Unwin N. Why the communicable/non-communicable disease dichotomy is problematic for public health control strategies: implications of multimorbidity for health systems in an era of health transition. *Int Health.* 2015;7:390–9.

Rodrigo Luiz Vancini

Centro de Educação Física e Desportos, Universidade Federal do Espírito Santo, Vitória, Brazil

*Corresponding author at: Centro de Educação Física e Desportos (CEFD), Universidade Federal do Espírito Santo (UFES), Campus Universitário - Av. Fernando Ferrari, 514, Goiabeiras, 29075810 Vitória, ES, Brazil.

E-mail address: rodrigoluizvancini@gmail.com

Claudio Andre Barbosa de Lira

Setor de Fisiologia Humana e do Exercício, Laboratório de Avaliação do Movimento, Humano, Faculdade de Educação Física e Dança, Universidade Federal de Goiás, Goiânia, Brazil

Marília Santos Andrade

Ricardo Mário Arida

Departamento de Fisiologia, Universidade Federal de São Paulo, São Paulo, Brazil

25 April 2020