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Areti Pappa

Department of Physiotherapy,
Faculty of Health Sciences
International Hellenic
University - Alexander
Campus P.O. Box 141, 57 400
Sindos, Thessaloniki, Greece

Anastasios Kottaras

Department of Physiotherapy,
Faculty of Health Sciences
International Hellenic
University - Alexander
Campus P.O. Box 141, 57 400
Sindos, Thessaloniki, Greece

Dimitrios Lytras

Department of Physiotherapy,
Faculty of Health Sciences
International Hellenic
University - Alexander
Campus P.O. Box 141, 57 400
Sindos, Thessaloniki, Greece

Paris Iakovidis

Department of Physiotherapy,
Faculty of Health Sciences
International Hellenic
University - Alexander
Campus P.O. Box 141, 57 400
Sindos, Thessaloniki, Greece

Andreas Fotios Tsimerakis

Department of Physiotherapy,
Faculty of Health Sciences
International Hellenic
University - Alexander
Campus P.O. Box 141, 57 400
Sindos, Thessaloniki, Greece

Georgios Chasapis

Department of Physiotherapy,
Faculty of Health Sciences
International Hellenic
University - Alexander
Campus P.O. Box 141, 57 400
Sindos, Thessaloniki, Greece

Corresponding Author:

Areti Pappa

Department of Physiotherapy,
Faculty of Health Sciences
International Hellenic
University - Alexander
Campus P.O. Box 141, 57 400
Sindos, Thessaloniki, Greece

The effect of different physiotherapy approaches on the treatment of epileptic seizures

Areti Pappa, Anastasios Kottaras, Dimitrios Lytras, Paris Iakovidis, Andreas Fotios Tsimerakis and Georgios Chasapis

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Abstract

Epilepsy is one of the most common diseases of the central nervous system, with significant effects on the health of individuals and especially in their daily activities, due to the fear of a possible seizure. The aim of this review was to collect data based on research that has been done on physiotherapy interventions, such as aerobic exercise and Yoga exercises, in the treatment of seizures. Th Scopus, PubMed, ScienceDirect, Google Scholar and EBSCO databases were searched. The results of the review led to the conclusion that physical exercise, whether intense or specific exercises such as Yoga, significantly help to reduce the incidence of seizures in both children and adults, while also being positively associated with reduced duration of seizures and recovery time at rest. Discussion- Conclusions: Other areas that have been studied in relation to the effect of exercise on epilepsy include the reduction of depression levels in people with epilepsy. Research in this area should be continued, with various diagnostic tools such as the electroencephalogram (EEG) during exercise, with the aim of introducing physical exercise and other physiotherapeutic methods in the treatment protocols.

Keywords: Epileptic seizure, epilepsy, physiotherapy, exercise, aerobic exercise, therapy

Introduction

Epileptic seizures (ESs) are a condition of the central nervous system, which according to the International League Against Epilepsy is defined as “the transient clinical appearance of signs and/or symptoms, due to abnormal or excessive concurrent neuronal function and activity in the brain” [1]. As noted by Fisher *et al.* [1,2], this continuous predisposition of the brain to create concurrent neural function through the multiple neuronal depolarizations of nerve cells, causes significant implications with neurobiological, cognitive, psychological and social consequences. More specifically, epilepsy can be considered to exist when an individual meets the following conditions: (a) have at least two unpredictable seizures over 24 hours, (b) a non-provocative ES with a probability of other crises occurring in the next 10 years less than 60%, and (c) the diagnosis of this epileptic syndrome [3].

Roughly, ESs can be classified according to the area of the brain that appears to be involved in this concurrent neural depolarization. More specifically, they are distinguished in generalized epilepsies - such as tonic-clonic, typical, tonic, clonic, myoclonic, etc. – and localized (local or focal), which originate from a single point of the brain, constituting 60% of the total ESs recorded. Some of the localized ESs can start from a focus of the brain and lead to general neuronal stimulation, resulting in a generalized ES [3].

Epidemiologically, epilepsy affects approximately 65 million people worldwide, making it the most common, chronic, serious neurological disease. Although individualized medications depending on the body and the type of epilepsy significantly control the onset of ESs, this disease has a significant impact on the lives of individuals and especially on the control of their daily lives, with the risk of a seizure [4]. Along with medications, there are other treatments that focus on controlling the neuronal function of the body, such as neurostimulation, adapted diet, etc. [5].

The aim of this review is to search, analyze and list the information that exists about the physiotherapy treatment of epilepsy, through the effect of exercise or specific exercises, in order to control the disease.

Method

For this review, an extensive literature search was performed in the PubMed (<https://pubmed.ncbi.nlm.nih.gov/>), Scopus (<https://www.scopus.com/home.uri>), ScienceDirect (<https://www.sciencedirect.com/>), EBSCO (<https://www.ebsco.com/products/research-databases/cinahl-database>) and Google Scholar (<https://scholar.google.com/>) databases with the following keywords: “epileptic seizures AND physiotherapy”, “rehabilitation AND epilepsy”, “therapy”, “physiotherapy”, “physical activity AND epileptic seizures”.

Literature review

Nakken *et al.* [6] studied 21 adult patients with epilepsy, who had not controlled the disease with any treatment. More specifically, the study included 11 women and 10 men, aged 18 to 39 years, who participated in an intense physical exercise program for a total of four weeks. The program included exercise for 45 minutes, three times a day, for six days per week. This intervention led to a significant increase in the maximum oxygen volume of the participants (with an average increase of 1%). The mean ES incidence was compared both during the four-week exercise period and two weeks before and after this program. The researchers concluded that there was no significant difference between patients in the total of eight weeks of ES frequency recording. Specifically, only six patients exhibited ES during exercise, while the incidents were noted to show no positive correlation with the type of exercise, pulse rate, etc. Finally, exercise did not appear to be associated with ES onset, and in most people, it appears to have a positive effect on other parameters.

In another study by Nakken *et al.* [7], the effects of exercise on the electroencephalogram (EEG) were examined. In more detail, a total of 26 children with partial (focal) or generalized form of epilepsy were examined, specifically during their video recording, with the aim of exhausting them over a period of 10 minutes. During exercise, neuronal discharges decreased in 20 of the 26 participating children, while post-exercise recovery increased in 17 of the 26 children, compared with normal resting conditions. Five children showed either zero fluctuation in condition or increased epileptic activity during exercise, and these children were noted to have had frequent ESs during or immediately after exercise. In conclusion, in the majority of children, exercise contributed to the reduction of ESs, while it is noted that monitoring neuronal function with EEG during exercise is a useful diagnostic tool in assessing its effect on ES appearance.

Furthermore, Arida *et al.* [8] studied the effects of exercise on reducing the frequency of ESs in laboratory animals. More specifically, to evaluate the effects of the aerobic program, a total of 29 rats, which had had ESs, were collected and were monitored on a 24-hour basis for 135 days after the first ES. The rats were divided into three groups, with the first group (14 animals) undergoing an aerobic exercise program, the second group (seven animals) exercising on the treadmill without further exercise and the third group (eight animals) being the control group. The observations of the researchers were made over three 45-day periods, with the first phase of evaluation identifying the number of ESs before the exercise program, the second phase identifying the same number during exercise and the

third analyzing the frequency of ESs after exercise. The researchers concluded that the frequency of ESs did not change significantly between these three periods and that exercise was not a limiting factor for the number of ESs in laboratory animals.

In their review, Arida *et al.* [9] gathered clinical and experimental data from various studies that showcase the positive correlation between exercise and epilepsy. The total number of studies analyzed by the researchers amounts to 24, with some of the conclusions drawn according to Setkiewicz and Mazur [10], is that exercise increases the latency to the onset of the first ES, reduces the intensity and increases the onset and duration of ESs.

According to Lundgren *et al.* [11], exercise or Yoga (12 hours) in a total number of 18 patients with ESs, reduced their incidence, while improving their quality of life.

Sathyaprabha *et al.* [12] also studied the effects of Yoga exercises, for a total of 40 epileptic patients, for 10 weeks of exercise. They concluded that Yoga contributes significantly to reducing the incidence of ESs, while at the same time it was noted that it improved the parasympathetic activity of individuals, the mechanism that enhances the de-escalation of neural function that can lead to ES.

Moreover, McAuley *et al.* [13] in a 12-week exercise program, examining a total of 23 patients with epilepsy, concluded that mild exercise can improve the physiological variables of these individuals.

Lastly, Vancini *et al.* [14] studied the effects of intense exercise on 38 participants, half of whom were diagnosed with epilepsy, while the others were the control group. The EEG and electrocardiogram (ECG) tools were used for the evaluation of the participants. The researchers concluded that in 82% there was a decrease in ESs during rest and exercise, as well as between rest and recovery period (74%). They also concluded that epilepsy may be related to sedentary lifestyle, while exhausting exercise is not a risk factor for ES induction.

Discussion – Conclusions

The literature search, and especially the most up-to-date data, supports the positive effect that physical exercise has on controlling the appearance of ESs. More specifically, aerobic exercise in both animals, but mainly in children and adults with epilepsy, has positive effects on reducing the incidence of seizures, reducing the duration of seizures when they occur, and reducing the recovery time. In conclusion, other studies should be done regarding the effect of physical exercise and other exercises such as Yoga [11, 12], as both mild and intense physical activity can make a significant contribution to the therapeutic treatment for ES control of patients.

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