# DEVELOPING A SEIZURE PROTOCOL FOR RETURN TO PLAY

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**Abstract**

A seizure or epilepsy is a constellation of symptoms resulting from abnormal rhythmic discharges from a portion of the brain or the entire brain. Seizures occur in 5-10% of the population.[7, 9] Seizure which a single occurs of an electrical discharge in the brain causing alterations in behavior, sensation, or consciousness.[16] Epilepsy is two or more unprovoked seizures.[16] Patients diagnosed with epilepsy only a few incorporate exercise into their lifestyle due to limitations, education, and resources. Evidence shows that patients with good seizure control can participate in both contact and non-contact sports without adversely affecting seizure frequency. Sports medicine specialist like athletic trainers come in contact with a population of epileptic patients during participation in sports. Athletic trainers work a long side the epileptic or seizure athlete to establish safe participation in the involved sport. Athletic trainers are defined as highly qualified, multi-skilled health care professionals who collaborate with physicians to provide preventative services, emergency care, clinical diagnosis, therapeutic intervention and rehabilitation of injuries and medical conditions.[10] The purpose of this research project is to create an analysis of how athletic trainers return athletes to play after they suffer from a seizure. Conducting a generalized survey to collect data from a wide variety of athletic training professionals. In the end the goal is to produce a consensus of returning an athlete post seizure to play protocol while educating health care

professionals. Further research is needed to develop a protocol for athletic trainers who work with patients that suffer seizures.

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## Introduction

Epilepsy is a common illness in the world that is characterized by unprovoked seizures, that present with neurological conditions.[1-3] A seizure is a constellation of symptoms resulting from rhythmic discharges from a portion of the brain or the entire brain.[7] Epilepsy is a common disease that occurs in 2-10 % of the population, affecting people from all ages.[7, 9] Of those affected, 75% of seizure patients experience their first seizure before the third decade of life, which is a critical time for one to develop athletic abilities, and partake in physical activity.[8] In the general population, regular physical activity contributes to mood-related benefits. Studies suggest that individuals with epilepsy can also receive similar mood-related benefits from regular physical activity when compared to the general population.[2] The evidence shows that patients with good seizure control can participate in both contact and non-contact sports without harmfully affecting seizure frequency.[3] Controlled epilepsy refers to status of having a treatment regimen including medications, knowledge of athletes seizure history, symptoms, triggers, and frequency.[7] Now doctors are trying to encourage patients with epilepsy to partake in any form of physical activity. Studies have revealed that physical activity can decrease seizure frequency as well as lead to improved cardiovascular and psychological health in people with epilepsy.[3] An investigation of a 4 week controlled, regular, intense physical exercise on patients with epilepsy of 21 participants, only half had never experienced a seizure during exercise.[8] In that same work 36% of patients claimed to have better seizure control as a result of regular exercise.[8] Several studies have also reported that exercise did not increase epileptiform discharges and seizure frequency.[2,8]

From the above study the patients experienced at baseline their $VO_{2max}$ was only 77% of the normal population. After the 4 week intervention epileptic patients improved their $VO_{2max}$ to an average value of 95% of the normal population.[8] Other works have suggested that exercise raises seizure threshold and may confer a protective effect on epileptic patients.[4] In a more recent work evaluating a cardiopulmonary exercise test with generalized epilepsy, more than 75% of the participants showed a decrease in the number of epileptiform discharges on electroencephalography during physical effort, indicating that exercise was not a seizure-inducing component.[2] One study found that epileptic patients exercised 25% regularly, 44% occasionally, and 31% never exercised. [8] A research involving 70 rats who were induced with Scopolamine methylnitrate to induce seizures.[4] The rats were then put on a treadmill to generate physical exercise and only three presented seizures during the physical activity.[4] The work by Stanuszek collected data over a 2-year period from 2009 to 2010 of 407 children who were hospitalized due to simple or recurrent epileptic seizures.[1] In 14 of the 407 patients (3.4%), physical activity was reported as a seizure-triggering factor.[1] 33 patients (8.1%) were documented to have received a specific recommendation to avoid sport and other physical activities, (Table 4).[1] After Stanuszek work demonstrates that 91.9% of the patients observed could participate in physical activity. Results with academic literature reported that sport may trigger seizures in as many as 3.1% of patients.[1] Further data confirmed the prevalence of physical exercise as a factor triggering seizures are limited.[1] Seizures occur shortly after the exercise, not in the middle of it due to metabolic acidosis.[1] This evidence supports that physical exercise can be a benefit for seizure patients. The attitude by health professionals to allow epileptic patients to participate in sports has changed overtime.

During the year 1968, doctors began to discourage patients who sustained seizures from participating in sports or physical activity until 1974.[1, 8] After 1974, patients gained permission to take part in sports.[1] The American Medical Association Committee on the Medical Aspects of Sports, (AMAC) believed the same of many doctors did in 1968 that, "Contact sports such as boxing, tackle football, ice hockey, diving, soccer, rugby, lacrosse, and other sports involving chronic reoccurring head trauma should be avoided."[8] In 1974, AMAC stated that, "There was no statistical proof that repetitive physical contact, even of the head as in football, causes a greater frequency of seizures in the epileptic that might occur when the same patient was asleep."[8] During 1983, permission to sport involvement was in full effect if patient's seizures were well controlled.[1,8] The statement from 1983 reads as follows: "Proper medical management, good seizure control and proper supervision are essential if children with epilepsy are to participate fully in physical education programs and interscholastic athletics. Common sense dictates that situations in which a seizure could cause a dangerous fall should be avoided… Epilepsy per se should not exclude a child from hockey, baseball, football, basketball, and wrestling."[8] This statement comes from The American Academy of Pediatrics Committee on Children with Handicaps and Committee on Sports Medicine.[8] Doctors are still limiting patients with disabilities even though several studies have pointed that physical activity for this population is beneficial. Wong in 2006, compared physical activity in normal children and teens with seizure disorders to their siblings without epilepsy.[7] From Wong's work looked at body mass index of the children. Overall, patients with epilepsy had a significantly higher BMI percentile for age than did their siblings without seizures.[7] The authors encourage participation in recreational or

physical activity programs to reduce the obesity and to improve self-esteem and social integration and lessen anxiety and depression.[7] The general public and doctors are missing a common factor of education set forth for epileptic populations, and individuals who are involved with the care of an epileptic patient. Younger respondents indicated that they lacked knowledge about forms of physical activity appropriate for them.[3] The International League Against Epilepsy (ILAE) Executive Committee has defined priorities. Their purpose is to educate health professionals, health authorities, social workers, and sports instructors about the benefits of physical activity for people with epilepsy.[1] The ILAE include factors for the benefit and risks of exercise in patients with epilepsy that include the likelihood of effective supervision by family members or other personnel, the willingness of the informed patient or parents, a careful medical history including the frequency and characteristics of seizures, but also any previous seizure-related accidents or injuries.[5] According to the ILAE people with epilepsy can participate in specific activities that include the type of sport, the probability of a seizure occurring, the type and severity of the seizures, seizure precipitating factors, the usual timing of seizure occurrence, and the person's attitude in accepting some level of risk.[5] The American Academy of Pediatrics created recommendations (see table 3) to help coaches, athletes, parents, and health professionals determine special considerations that should be taken for those who suffer medical conditions.[6] For most sports, there are no precise regulations that govern issuance of fitness certificates for patients with epilepsy in relation to specific seizure types or other clinical features.[5] This is why we need to encourage a protocol for patients with epilepsy who participate in physical activities. The USA gymnastics in 1994 produced an article for coaches on epilepsy.[15] This article

addresses the participation of epileptic athletes by defining epilepsy, coaching strategies, and how to handle the athlete during a seizure.[15] ILAE created grouping of categorization of sports by level of risk of injury or death for patients with epilepsy, or for bystanders, should a seizure occur during the event, (table 1, & 2).[5] In the end patients who suffer a seizure should be encouraged to engage in physical exercise and sport activities which provide positive medical and psychosocial effects including increased self-esteem, socialization, and improvement in long-term general health.

**Research**

In order to design a set protocol for athletic trainers to utilize as a resource to educate coaches, athletes, and parents more research needs to be conducted. According to National Athletic Trainers Association, (NATA) protocols are in place for illnesses like concussions, asthma, and heat illnesses.[10] Some of the protocols stated previously occurred after laws were created, or after a high enough demand was put in place for a change. Research was demonstrated to help prove the need for a set guideline to that specific condition. An example is Texas House Bill 2038 or also called Natasha's Law that is, "relating to prevention, treatment, and oversight of concussions affecting public school students participating in interscholastic athletics."[11] When searching under databases like Google Scholar, University Interscholastic League, (UIL), National Collegiate Athletic Association, (NCAA), and NATA for terms like "epilepsy", "epilepsy protocol", and "epilepsy athletes" limited searches come up that apply to this specific set of athletes. After searching for "epilepsy" under NATA website only article that shows is an Emergency Health and Safety: Best Practice Recommendations for Youth Sports Leagues…[10] After further reading of the article epilepsy is only noted under potentially life threatening medical conditions. None of this points to what to do with an athlete after they have had a seizure and want to return to play. When searching under the NCAA nine articles pop up of the term "epilepsy".[13] None of those articles are specific to a return protocol for athletes. The NCAA does put out articles of encouragement of athletes who have sustained seizures and are still competing in their sport.[13] Of the nine articles under the NCAA, they do acknowledge epilepsy in sports occurring. The NCAA still does not help to establish a set of guidelines to integrate athletes into their sport. Much less

provide a resource for coaches, a sports medicine team, and or parents to utilize for the athlete with epilepsy. The NCAA only has "seizure" stated in their 2014-2015 Sports Medicine Handbook under first aid for heat illness specific to exertional heat stroke.[12] Continuing to look through the NCAA Sports Medicine Handbook 2014-2015 we search for "protocol". This term comes up 22 times. Protocol is associated with return to play for concussion, disposing of needles, cleaning supply storage, emergency considerations, neck stabilization, set up of health care teams, documentation, hydration, and body composition protocols.[12] None of these protocols are associated with returning an athlete who has epilepsy to play. After searching under Google Scholar of "epilepsy athletes", 15,100 articles pop up.[14] By narrowing down articles with guidelines of year published from 2012-2017, the search yields 5,590 articles. By changing the search from all in title: "epilepsy protocol", 2012-2017 then we generate 38 results.[14] By reading the title of the 38 articles we discovered that there is still no set protocol to return athletes to play. The search of 38 yielded that those articles are specific to epilepsy but the protocols are for MRI, epilepsy surgery, or protocol for self-management of epilepsy.

**Future**

Looking into the future the development of a primary survey for secondary and collegiate athletic trainers with the intent purpose to find out if athletic trainers have any protocols set in place for athletes with history of a seizure, (attachment 1). Athletic trainers are defined by NATA as health care professionals who collaborate with physcians.[10] Services provided by AT's comprise prevention, emergency care, clinical diagnosis, therapeutic intervention and rehabilitation of injuries and medical conditions.[10] Secondary setting is defined as high school grades 9th through 12th in a school district. Collegiate setting is defined as public or private college of divisions III to I recognized by NCAA. By establishing what athletic trainers are doing for a population of athletes who have a history of seizures will help to see what is being done. This then will help with the creation of a generalized protocol. UIL and NCAA go through a committee process to make a protocol happen that involves a wide variety of input. Just like how a bill is passed the protocol would go through a checks and balance system. After a committee sees the importance of a new proposed protocol then further actions are taken in order to implement such protocols. With the survey data collected we would observe what sports seizure athletes are participating in whether male or female. The sport participation would emphasize whether athletes are in contact or non-contact sports. When asking about the athlete having restrictions on their sport participation this will help to see if the restrictions are by physician's orders, or trial and error of participation in the sport itself. Taking a collection of data of what athletic trainers are doing for a set protocol will launch a generalized consensus of how to approach returning the athlete to play after sustaining a seizure. Categorizing where the athletic trainers are receiving information

from for their protocol will point us in the direction to help create an understanding of what other medical personal are associated with epileptic athletes. As well as begin a list of medical personal to consider in the consensus protocol. Medical personal who are collected from the survey data will help create an educational resource for the community consisting of the athlete, parent, coach, team physician, and athletic trainer. In the end of collecting a brief primary survey from the initial surveyors they will be contact again once qualification is determined for a brief secondary survey, (attachment 2). Qualification for the secondary survey is determined if in the primary survey the answer to the first question is yes that the athletic trainer has an athlete who has medical history of seizures. The goal of the secondary survey is to collect information that athletic trainers have or do not have a seizure protocol team in place. Along with how effectively or not effectively the athletic trainer is communicating with others who come in contact with these athletes. By finding out if a seizure team is in place this will expand the list of resources to include for the overall consensus to return seizure athletes to play. Once communication is established then athletic trainers can educate coaches, nurses, team physicians, parents, and any other member of the seizure protocol team on the specific actions needed to work with epileptic populations who participate in sports.

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**Table 1: Categorization of sports by level of risk of injury or death for PWEs, or for bystanders, should a seizure occur during the event [5]**

| Group 1 sports (no significant additional risk) | Group 2 sports (moderate risks to the PWEs but not to bystanders) | Group 3 sports (high risk for PWEs, and, for some sports, also for bystanders) |
|---|---|---|
| Athletics (except for sports listed under group 2)<br>Bowling<br>Most collective contact sports (judo, wrestling, etc).<br>Collective sports on the ground (baseball, basketball, cricket, field hockey, football, rugby, volleyball, etc)<br>Cross-country skiing<br>Curling<br>Dancing<br>Golf<br>Racquet sports (squash, table tennis, tennis, etc) | Alpine skiing<br>Archery<br>Athletics (pole vault)<br>Biathlon, triathlon, modern pentathlon<br>Canoeing<br>Collective contact sports involving potentially serious injury (e.g., boxing, karate, etc)<br>Cycling<br>Fencing<br>Gymnastics<br>Horse riding (e.g., Olympic equestrian events-dressage, eventing, show jumping)<br>Ice hockey<br>Shooting<br>Skateboarding<br>Skating<br>Snowboarding<br>Swimming<br>Water skiing<br>Weightlifting | Aviation<br>Climbing<br>Diving (platform, springboard)<br>Horse racing (competitive)<br>Motor sports<br>Parachuting (and similar sports)<br>Rodeo<br>Scuba diving<br>Ski jumping<br>Solitary sailing<br>Surfing, wind surfing |

The categorization was done by consensus, taking into account the most common conditions that are likely to apply when PWEs practice these sports. We recognize that some sports fall in a gray zone, and that there are specific individual characteristics or circumstances for which a different categorization would be indicated, based on the judgment of the physician.[5]

**Table 2: Suggestions of physical activities/sports participation for PWEs or with other seizure disorders [5]**

| | One or more symptomatic seizures | Single Unprovoked seizure | Seizure-free (12 months or longer) | Sleep-related seizures only | Seizures without impaired awareness | Epilepsy resolved (no seizures > 10 years and off AED > 5 years) |
|---|---|---|---|---|---|---|
| Group 1 Sports | ± | ± | ± | ± | Permitted at neurologist's discretion when seizures are precipitated by specific activities | ± |
| Group 2 Sports | * | ≥ | ± | * | * | ± |
| Group 3 Sports | * | ≥ | * | º | º | ± |

*= Permitted at neurologist's discretion, with restrictions

± = Permitted

≥ = Permitted after 12 months of seizure freedom

º = Generally barred, but may be considered, with restrictions, at neurologist's discretion for sports posing no risk to bystanders

**Table 3**[6]

## Medical Conditions that may Rule Out Sports Involvement [6]

| Condition Description | Is Participation Permitted? | Recommendations |
|---|---|---|
| **Fever** | No | Fever adds to the workload of the heart and lungs, and increases the chances of suffering heat exhaustion or heatstroke. |
| **Heat Illness**, *history of* | Conditional yes | Because of the increased likelihood of recurrence, the athlete needs individual assessment to determine the presence of predisposing conditions and to establish a prevention strategy. |
| **Liver**, *enlarged* (*hepatomegaly*) | Conditional yes | If the liver is acutely enlarged, participation should be avoided because of risk of rupture. If the liver is chronically enlarged, evaluation needed before collision/contact or limited contact sports are played. |
| **Musculoskeletal Disorders** | Conditional yes | Evaluation needed. |
| **Neurologic Disorders** | | |
| **History of (1) Serious Head or Spinal Trauma, (2) Severe or Repeated Concussions, (3) Brain Surgery** | Conditional yes | Evaluation needed for collision/contact or limitedcontact sports, and also for noncontact sports if there are deficits in judgment or cognition. Recent research supports a conservative approach to management of concussion. |
| **Convulsive Disorder** *well controlled* | Yes | If disorder is well controlled, the teen faces little risk of having a seizure while participating in sports. |
| **Convulsive Disorder** *poorly controlled* | Conditional yes | If disorder is poorly controlled, evaluation needed for collision/contact or limited contact sports. The teen should avoid the following noncontact sports: archery, riflery, swimming, weight or power lifting, strength training, sports involving heights. In these sports, a convulsion, though unlikely, could pose a risk to the patient or to others. |

*Source: Caring for Your Teenager (© 2003 American Academy of Pediatrics)*

**Table 4.** Relation Between Physical Activity as a Seizure Precipitant and Specific Recommendation to Avoid Sport Even During Physical Education at School.[1]

| | Seizures claimed to be precipitated by physical activity | Permanent excuse from physical education |
|---|---|---|
| Patients with recurrent seizures (n = 154; 100%) | 5 (3.5%) | 13 (8.4%) |
| Patients with a single seizure (n = 253; 100%) | 9 (3.5%) | 20 (7.9%) |
| Total | 14 | 33 |

**Attachment 1:**

1. Do you have any athletes that have a history of seizures?

   Yes No

2. If yes, what sport(s) do they participate in?

3. Were the athletes given restrictions/guidelines from the physician for clearance to participate?

   Yes No

4. If yes, what were those restrictions/guidelines?

5. Do you have a protocol in place if an athlete suffers a seizure for return to activity?

   Yes No

6. If yes, what is that protocol?

7. Where did you get your information for the protocol?

**Attachment 2:**

1. Do you have a seizure protocol team in place?
   Yes No

2. If yes, then who makes up that team? (positions only)

3. Do you communicate with coaches, other faculty, or staff on the athlete's protocol?
   Yes No

4. If yes, then how do you communicate to them?