

EPILEPSY, POST TRAUMATIC EPILEPSY & SPORTS (PRACTICAL CONSIDERATIONS)

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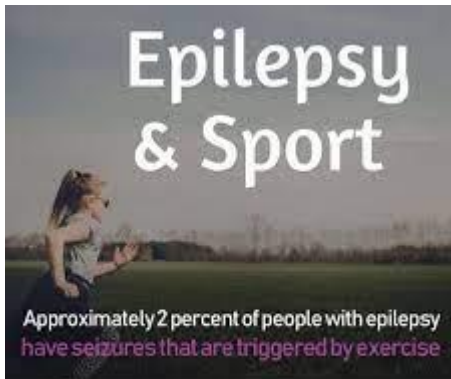
Diplomate American Board of Psychiatry and Neurology (ABPN)

Diplomate American Board of Clinical Neurophysiology (ABCN) with added competency in Central Clinical Neurophysiology, Epilepsy Monitoring, Intraoperative Monitoring

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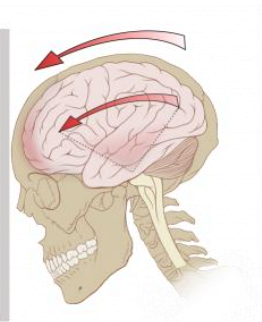
- Editor-in-Chief, ARP Journal of Combat Sports Medicine
- Associate Editor The Eastern Journal of Medicine
- Vice-Chairman AAN Sports Neurology Sub-Section
- Chief Medical Officer, New York State Athletic Commission
- Ringside Physician, New York State Athletic Commission
- Unaffiliated Neurotrauma Consultant, National Football League

SPORTS RELATED POST TRAUMATIC SEIZURES

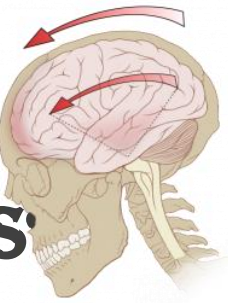
- One concern for people with epilepsy (PWE) who play sports and especially contact/combat sports (soccer, American Football, boxing, karate, football, wrestling, judo) is that of head impact exposures (HIEs) resulting in mild to severe TBI and resultant neurological sequelae such as seizures (PTE).
- *Question-can repeated concussions and HIEs during some sports potentially cause seizures and lead to epilepsy?*
- *Question-can repeated concussions and HIEs during some sports **potentially** exacerbate pre-existing seizures? (MAKE EPILEPSY WORSE)*

SOME IMPORTANT QUESTIONS THAT NEED ANSWERS (AREAS OF POTENTIAL RESEARCH)

- Are these concerns actually based on scientific evidence or are they unfounded?
- Can vigorous physical exercise provoke seizures?
- Can/do mild TBI/concussions sustained while playing contact sports lead to post traumatic seizures/emergence of epilepsy?
- Can/do mild TBI/HIEs/concussions make pre-existing epilepsy worse?
- DEBATE with respect to PWE-Can indulgence in some sports make seizures/epilepsy potentially worse Vs could some sports actually be beneficial for PWE (physically and psychologically)?
- Which sports are safe and which are not?



TO ANSWER THESE QUESTIONS WE SHOULD FIRST OURSELVES WHY “CURRENTLY” PWE ARE RESTRICTED FROM SOME SPORTS:



- First rationale---occurrence of an untimely seizure during sporting event has the potential for causing substantial injury both to the person with epilepsy as well as fellow athletes.

Examples:

- *A PWE suffers a seizure while taking part in a swimming meet-risk of drowning.*
- *A PWE suffers a seizure while bicycling or while horse riding-risk of fall and head injury*
- Second rationale-exercise especially aerobic exercise may exacerbate seizures in some PWE.
- Third rationale--injury sustained while playing sport shall make pre-existing epilepsy worse.

LINK BETWEEN EXERCISE AND SEIZURES

- some studies have shown an increase in interictal discharges during or after exercise (mostly in generalized epilepsies).
- Simpson et al. (1989)--three healthy adults who presented with generalized seizures shortly after jogging. Each person had previously been asymptomatic, and each had a normal neurologic examination after the seizure. In all three patients CT revealed small frontal cortical SOLs
- Strum et al (2002) reported 2 patients with exercise induced temporal lobe epilepsy. A 16-year-old had consistent precipitation of complex partial seizures with behavioral arrest, automatisms and post ictal confusion usually 5 to 20 minutes after running, playing soccer or tennis. More likely if exercise was strenuous. With reduction in exercise and AED therapy a marked reduction in seizure frequency occurred.
- Seizures not related to emotional state (meaning the degree of competitiveness).

Simpson RK Jr, Grossman RG. Seizures after jogging. N Engl J Med. 1989;321:835.

Sturm JW, Fedi M, Berkovic SF, Reutens DC. Exercise-induced temporal lobe epilepsy. Neurology. 2002;59:1246-8.

EXERCISE AND SEIZURES-EXERCISE IS BAD--THE FACTS!!!

- at least some frontal and temporal lobe seizures are clearly precipitated or at times solely occur during exercise suggesting that these are a ***form of reflex epilepsies***.
- a number of physiologic mechanisms by which seizures may be provoked by exercise: hyperventilation with resultant hypocarbia and alkalosis, exercise induced seizures may occur due to hypoglycemia (especially in diabetic patients), physical and psychological stress of competitive sports and potential changes in anti-epileptic drug metabolism.
- Exercise is a complex behavior; involves not such the motor system and motor cortex but also other domains such as attention, concentration, vigilance and some limbic networks which mediate motivation, aggression and competitiveness. So possible that patients who have temporal or frontal lobe epilepsy may on rare occasions have seizures triggered by exercise. ***(EPILEPTIC NEURONAL NETWORK ACTIVATION)***
- Simpson et al (1989)--a seizure after jogging may be an early warning sign of the presence of a underlying cerebral-mass lesion before it has reached a size sufficient to produce mass effect. ? ***Exercise lowers the seizure threshold of the epileptogenic cortex surrounding the mass lesion.***



EXERCISE AND SEIZURES-EXERCISE IS GOOD—THE FACTS!!!

- limited evidence that exercise may in fact be protective and have physical, physiological and psychological benefits in PWE.
- EEG studies show that inter-ictal epileptiform discharges either remain unchanged or decrease during exercise so some suggestion that exercise may actually raise the seizure threshold.
- animal studies suggest that exercise can modulate neuronal vulnerability to epileptic insults (exercise before a precipitating brain insult demonstrated reduced susceptibility in the kindling model of epilepsy).
- increased attention and vigilance during exercise may partially explain the reduced number of seizures in patients with chronic epilepsy who exercise on a regular basis. (*EPILEPTIC NEURONAL NETWORK ACTIVATION*)
- regular exercise may influence neuronal and hippocampal plasticity by upregulation of neurotropic factors.
- evidence to suggest that regular physical exercise can improve the quality of life, reduce anxiety and depression and improve seizure control in patients with chronic epilepsy.



EXERCISE AND SEIZURES-TIMING AND ROLE OF EEG IN PROGNOSTICATION?



- Both during and after exercise.
 - usually heavy strenuous exercise precipitates the seizure.
 - seizure may occur at the peak of exercise when the heart rate goes up and the patient hyperventilates.
-----Example: a child playing football. Heart rate goes up → hyperventilates → absence seizure/ complex partial seizure → unable to defend himself from a rough tackle → serious injury.
- Seizures may occur after exercise (due to continued hyperventilation and hypocarbia).
- Study from Norway (Epilepsia) 26 children with intractable partial and generalized epilepsy were exercised during video-telemetry recording, aiming at exhaustion after 10 min.
 - Results: during the exercise, epileptiform discharges decreased in 20 of 26 children and showed a rebound increase after the exercise.
 - five patients had either unchanged or increased epileptiform activity while exercising. These 5 children had experienced frequent clinical seizures during or immediately after exercise in their leisure time.
 - So “**Exercise-EEG**” may be a helpful diagnostic tool to identify patients who are disposed to have exercise-induced seizures.



CONCUSSION, SEIZURES AND PTE: WHAT IS THE LINK?

- link between concussion (closed head trauma/ mild TBI) and seizures has been and continues to be closely looked at .
- fear of concussions (minor head trauma) making seizures worse is the prime reason why PWE are currently discouraged from some sports such as tackle football, ice-hockey, boxing, mixed martial arts and wrestling.
- FACT: the human skull is quite resilient and closed head trauma has to be significant to cause seizures.
- **HIGH LIKELIHOOD:** minor bumps and bruises to the head do not cause seizures, do not increase the risk of future seizures and more importantly do not make chronic epilepsy worse.
- **POST-TRAUMATIC SEIZURES/POST-TRAUMATIC EPILEPSY:**
 - seizures may occur immediately following a severe closed head trauma. Immediate post traumatic seizures by definition occur within 24 hours of the injury. They have also been referred to as impact seizures.
 - early post traumatic epilepsy refers to seizures which occur about a week to 6 months after the injury.
 - seizures may occur as far out at 2 to 5 years after head trauma (late post traumatic epilepsy).
 - Factors which increase the risk of post traumatic seizures/ epilepsy include **severity of trauma**, **prolonged loss of consciousness (more than 24 hours)**, **penetrating head injury**, **intra or extraaxial hemorrhage**, **depressed skull fracture** and **early post traumatic seizures**.

SHOULD PWE PLAY SPORTS? MY TAKE....

- PWE should be encouraged to exercise and participate in sports.
- No sport is **completely** off limits to them with the exception of maybe combat sports such as boxing, mixed martial arts. (BALANCE-RISKS Vs. BENEFITS)
- Key is proper supervision and playing sports safely.
- Walking, running, cycling and yoga are great exercises with little to no risks.
- Low risk recreational sports such as walking or running usually do not need a 1:1 supervision if seizures well controlled by history.
- Team sports such as volleyball, basketball, football carry low risk of injury.
- For cycling advise to wear a helmet and have bikes fitted with lights and reflectors.
- Swimming-many are discouraged from swimming due to an irrational fear of caregivers and physicians of drowning.
 - Advise not to swim alone.
 - Swim in a pool which has life guards. Swimming in the open seas is more risky.
 - Wear a life jacket.
- PWE (especially those with poorly controlled epilepsy) should wear a Medic Alert bracelet or carry a card in their wallet.



Education is the key...

CAN MY CHILD DO SPORTS?

Every child's epilepsy is different, but once appropriate plans are in place, it's important they are not unnecessarily restricted from taking part in sports

Tips

- The school/club should have a plan in place and understand the individual's triggers e.g. over heating, over exertion or hyperventilation
- Frequent seizures? The use of high bars and climbing equipment might be restricted.
- Swimming? - Swim in a pool with close supervision or an assistant on hand, who can handle seizures in water. (Frequent seizures? - check with your specialist first)
- Many track and field sports are safe, once usual safety measures are followed.
- Be more cautious of contact sports e.g. rugby, some martial arts. In such cases it's best to be guided by your neurologist.



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What we fear....



What inspires us...



- Vinay Jani resides in the heart of India, New Delhi-an Ultra Randonneur, 4 Times Super Randonneur, a Marathoner and attempted Paris-Brest-Paris in 2019.
- In July 2005 diagnosed with focal seizures due to a cyst in the left temporal region of my brain.
- gave input of Virtual Walkathon to Samman Association - Mumbai during 50 Million Steps for Epilepsy campaign
- Raised funds for Child Raise Trust through participation in Tata Mumbai Marathon 2021 which were utilized for medicines for underprivileged children with epilepsy.
- ***“Endurance sports taught me discipline, patience, hard work, learning from own mistakes but interacting with people taught me joy of giving”.***

FINAL THOUGHTS (ATHLETE'S PERSPECTIVE)

"I have always been a very active person and love playing sports such as Tennis, Yoga, Running etc, and I always try to pursue my dreams and not let things get in the way, but being epileptic, it is sometime hard to not worry about things happening. Whenever I play sports I get hot easily (face turns purple) and in the back of my head I find myself always hoping that nothing happens that would cause me to have a seizure. I ran my first half marathon two years ago, and in the back of my head there is always the thought of something happening, so I started to motivate myself by saying "I can do this, you will be fine." My father taught me when I was younger that I can choose to let it hold me back or make the most of life! Many people consider epilepsy a disability, but I try not to because I don't let it hold me back."