Research Request – Thermoregulation Dysfunction and Seizures

Brief	Given the DRHS context we now manage and the increased requests for air conditioning for management of thermoregulation dysfunction and seizures, it would be great to explore this further, particularly around afebrile epilepsy (or other epilepsy presentations) to confirm if managing ambient room temperatures is a valid or reliable strategy to effectively manage/minimise the impact of this disability.
Date	24/03/20
Requester	Karyn [redacted] (Director – TAB)
Researcher	Craig [redacted] Tactical Research Advisor – TAB/AAT)

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Please note:

The research and literature reviews collated by our TAB Research Team are not to be shared external to the Branch. These are for internal TAB use only and are intended to assist our advisors with their reasonable and necessary decision-making.

Delegates have access to a wide variety of comprehensive guidance material. If Delegates require further information on access or planning matters they are to call the TAPS line for advice.

The Research Team are unable to ensure that the information listed below provides an accurate & up-to-date snapshot of these matters.

Related TAB Research . . .

- NED19/222184 : RES AT Air Conditioning Thermoregulation 2019/0042
- NED19/326556 : RES HWB/AT Epilepsy and Seizure Monitoring Pack 2019/0059

Summary

- There is limited quality academic research regarding thermoregulation dysfunction and seizures, including afebrile seizures, and what research is available generally calls for further investigation on the subject.

- Several aspects of thermoregulation play a role in epilepsy, and it appears that the correlation of body temperature and seizures is bidirectional.

- Weather as a risk factor for epileptic seizures, is presented in both academic research, and open source type literature (eg. Epilepsy Action Australia).

- The importance of creating an ambient room temperature to manage seizures triggered by change in temperature is well documented in the open source type / community oriented literature, which also suggests that although air conditioning systems can be useful, they are not the only methods of maintaining such.

- There is plentiful lived experience information available on the internet with regard to weather and thermoregulation as a factor in triggering seizures.

- There appears to be no recommendations or guidelines on the management of thermoregulation dysfunction and seizures.

Air Conditioning and Seizure Management

There appears to be no quality research or guidelines regarding the use of air conditioning as a means of managing seizures. However advice from community action groups, are prolific in disseminating such information.

Epilepsy Action Australia asserts this while making clear the importance of ambient temperature management, but not necessarily with the use of air conditioning systems:

"If hot weather or becoming overheated is a trigger for your seizures it does not mean that you must sit in front of the air conditioner all summer. When inside, keep the house at a temperature that is cool enough to be comfortable. The air conditioner temperature ideally should be set at 24 degrees Celsius. Try not have it too cool as this creates a large difference between the inside and outside temperature. Don't let the house heat up before cooling it down. Keep the air conditioner on a constant temperature all day. Good full thickness or blackout curtains, or tinted windows are another way to keep the house cooler. Ceiling fans and free-standing fans work as a good method to circulate the air as well, and in high humidity, sometimes are more effective in keeping you cool". [1]

Similarly, Epilepsy Durham Region suggests:

"To begin, when inside, it is important to keep the house at a temperature that is cool enough to be comfortable; though, it must not be too cool that there is such a large difference between the inside temperature and the outside temperature. This is because, as mentioned, drastic temperature

changes trigger epileptic seizures. Instead of having the air conditioner on all the time, blackout curtains or tinted windows are a good alternative. Ceiling fans and free-standing fans work as a good method to circulate the air as well. Ultimately, staying indoors in a well ventilated and cool area is a great way to prevent hyperthermia and to prevent seizures from temperatures changes." [2]

Bidirectional Correlation

A prominent 2018 research paper on thermoregulation in epilepsy suggests that the correlation in body temperature and seizures is bidirectional, and further concludes that future research will likely identify numerous genetic etiologies for seizures and provide guidance for targeted interventions:

"Several aspects of thermoregulation play a role in epilepsy. Circuitries involved in thermoregulation are affected by seizures and epilepsy, hyperthermia may be both cause and result of seizures, and hypothermia may prevent or abort seizures. . .

. . . The effect of temperature on neuronal function is well established, and hyperthermia can induce seizures in susceptible patients. This is most notable in febrile seizures in childhood, which have been investigated extensively. Febrile seizures during childhood are a risk factor for the development of epilepsy later in life, but the precise nature of this relationship remains uncertain. The pathophysiologic mechanisms of the effects of body temperature on neuronal activity and seizures are of considerable interest, in particular given the known detrimental effect of ongoing seizure activity on neuronal integrity." [3]

Weather and epileptic seizures

In 2017 a significant study aimed to evaluate the clinical significance of patients' perception that weather is a risk factor for epileptic seizures. The study used a hospital-based, bidirectional case-crossover study, 604 adult patients admitted to a large university hospital in Central Germany for an unprovoked epileptic seizure between 2003 and 2010 were recruited. The effect of atmospheric pressure, relative air humidity, and ambient temperature on the onset of epileptic seizures under temperate climate conditions was estimated.

The study found that:

- Most epileptic seizures occur unexpectedly and independently of known risk factors
- Patients report weather to be a major risk factor for epileptic seizures
- Exposure to low atmospheric pressure and high relative air humidity may increase epileptic seizure risk, whereas high ambient temperatures lower seizure risk
- The exploratory results of the study need further replication across different climate zones and cohorts before reliable clinically recommendations can be made [4]

A 2011 study examined the influence of changes in atmospheric pressure and temperature on the increase in the frequency of seizures and changes in EEG in epileptic patients.

The study included 30 epileptic patients (aged 19-54) reporting the influence of changes in weather conditions on the increase in the frequency of seizures for at least 2 years. EEG was performed twice each season at the time of stable and unstable weather conditions.

The study concluded that in spring, autumn and winter, unstable weather conditions cause an increase in the frequency of seizures in almost half of the epileptic patients but only in 7% in summer. The increase in frequency of seizures in unstable weather conditions did not correspond in all patients with increase of changes in EEG. The higher proportion of epileptic patients with changes in EEG in unstable weather conditions in all seasons suggests an impact of these conditions on subclinical seizure discharges in this period. [5]

In 2015 a retrospective study aimed to evaluate the possible relationships between daily meteorological conditions and the daily incidence of seizures. The study included adult patients who were admitted to the emergency room of a tertiary hospital in Lisbon, with a seizure, between January and December 2015. The influence of temperature, atmospheric pressure, relative humidity, wind, precipitation, sunlight duration, and the seasons on seizure frequency was evaluated.

The study results supported the possible influence of the weather on seizure frequency in the overall admissions of the emergency department of a tertiary hospital. In particular, these findings suggest that winter conditions, such as, lower ambient temperatures, higher atmospheric pressure, higher humidity, and reduced sunlight exposure, may have impact in the occurrence of higher incidence of seizures in patients with epilepsy.

The study highlights that the effect of weather on seizure risk is still controversial, and that further investigation would be important to clarify epileptogenic mechanisms. [6]

Conclusion

The minimal research available on the subject suggests that weather conditions and environmental ambience is a trigger for seizures. However, the majority of research to date also suggests that there is insufficient research on the subject. Hence the lack of clear and substantial available practice guidance.

Reference List

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[6] Brás, Pedro C., et al. "Influence of Weather on Seizure Frequency — Clinical Experience in the Emergency Room of a Tertiary Hospital." Epilepsy & Behavior, vol. 86, Sept. 2018, pp. 25–30. https://www.sciencedirect.com/science/article/abs/pii/S1525505018301768

Version Control

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