What is photosensitivity? What does flicker-rate mean? Can television and computers trigger seizures? In this article Dr Saul Mullen, from Austin Health in Melbourne explains the relationship between epilepsy and light and suggests some strategies that can help reduce the risk of triggering seizures.

epilepsy and light

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The tendency to suffer seizures triggered by seeing flicker or patterns is known as photosensitivity.

Although flicker is a widely known cause of seizures the proportion of people with epilepsy who are photosensitive is reasonably small (5%). This is mainly among those with idiopathic generalised epilepsy.

Photosensitivity can be relatively easily seen on an electroencephalogram (EEG) as bursts of epileptic activity triggered by patterns or strobe light. The ability to test what is and is not likely to cause seizures in the laboratory means much is known about the things that are a risk to people with photosensitive epilepsy. This is important as although medication can help a great deal, for some people avoidance of flicker is still required.

Flicker and patterns

Flicker frequency, usually measured in flashes per second or Hertz (Hz), has the strongest effect on whether a sight is likely to cause a seizure. The frequencies most associated with seizures are 10Hz to 25Hz. Faster and slower frequencies are a problem in occasional people.

Patterns can also precipitate photosensitive seizures. The main issue is fine patterns, particularly stripes and checkers, or the combination of pattern and flicker. The most common combination of flicker and pattern would be sunlight through the trees as seen from a moving car. Escalators and occasionally fly-screens can also be an issue for some people. Brighter lights and patterns with greater contrast are more likely to induce photosensitive seizures than those that are dim or faint. In addition, the more of the field of vision taken up by a pattern or flickering light, the more likely it is that a seizure will be triggered.

The earliest descriptions of photosensitivity focused on seizures triggered by sunlight, usually shining off the water or filtered into a pattern by trees. Sunlight is quite difficult to avoid but sunglasses, particularly those with polarised lenses, can be of help. Thankfully, sunlight is a problem for only a few people, even among those who suffer photosensitive epilepsy.

Television and video games

In the last decades the focus has switched to television and video games.

This was brought to public attention in 1997 when an episode of the cartoon "Pokemon" was aired in Japan. This episode contained a brief sequence where the whole screen flashed at 12Hz for a period of four seconds. Over 700 people nation-wide, mostly children, suffered a seizure provoked by this cartoon. There was a similar but less wide-spread problem caused by an advertisement in the United Kingdom. There are now careful guidelines in place to make sure that programs shown do not have the kinds of flicker or patterns that can produce seizures.

Despite the sensible design of programs, television is still the commonest cause for photosensitive seizures due to how the picture is produced.

Televisions are divided into hundreds of vertical lines, known as the raster. Although in standard definition broadcasts the screen is said to refresh at 50Hz (50 times a second), in fact, only every second line is changed each time. This produces a 25Hz flicker when viewed from up close. This is within the range of frequencies that is commonly a problem and, when viewed from a short distance, a television is usually both bright and filling the field of vision. Console games, usually played via a television screen, have the same problems.

Computer screens do not have a raster and usually refresh at 60Hz or more, therefore not flickering at the critical frequency. Although computers, particularly when playing games, are not completely without risk, the absence of the hardware-related flicker makes them less of a trouble then television.

The risk from television can usually be reduced by sitting further back, making the raster invisible and eliminating the flicker. If approaching the screen, to insert a DVD for instance, covering one eye with a hand will usually reduce the risk. Unfortunately, **closing both eyes** can make things worse as the act of eye closure while looking at flicker can itself trigger photosensitive seizures. More modern televisions, particularly LCD or plasma screens, with high definition pictures and fast (100Hz) refresh rates are less likely to cause photosensitive seizures.

Electric lighting

Electric light, particularly fluorescent light, is a cause of much concern. Incandescent bulbs, those that heat a filament to produce light, are being phased out and replaced by small, energy-saving fluorescent bulbs. Older fluorescent tubes do have a subtle flicker. This is at 50Hz or 100Hz and is due to the alternating current used in mains electricity. This is just perceptible by the human eye but outside the critical frequency range for photosensitive seizures. Modern, energy-saver bulbs are designed to eliminate this flicker. Even with the older tubes, although many people find them unpleasant, the light does not produce EEG changes as are seen with the types of flicker described above.

Strobe lighting

Other sources of flicker are comparatively uncommon. The strobe lights used in night clubs occasionally precipitate seizures but they are usually relatively slow (<5Hz). It is also often difficult to separate the risks posed by alcohol and sleep deprivation from that of the strobe light.

Emergency services also use relatively slow strobe lights but, when multiple vehicles are parked together, these can combine together to produce frequencies in the critical range.

Managing photosensitivity

Photosensitivity is uncommon but for those who suffer it can be very troublesome. For many, medication is sufficient but for those who need to avoid lights and patterns the main offender is television. Keeping at least two metres from the set as well as considering a modern screen can be helpful. When presented with flicker that is uncomfortable looking away or covering one eye is most useful. Closing both eyes can worsen the situation, particularly with very bright lights.

For those who have suffered photosensitive seizures it is best to discuss these issues with your treating specialist. There is great variability between people with this condition and individual advice is very important. ■

Practical ways to reduce risk

- Sit at least 2 metres from TV screen
- Cover one eye when approaching the TV screen eg to insert a DVD, or when unexpectedly confronted with flicker that is uncomfortable
- Wear sunglasses with polarised lenses