The Relationship Between Rem Sleep And Narcolepsy

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Abstract:

Research was conducted to investigate the question ‘Is there correlation between amount of REM sleep and narcolepsy/narcoleptic symptoms?’ To achieve this, data was collected from a specialised sleep study data base called CAP sleep data base and then analysed using a t-test to find if there is a significant difference in the amount of REM sleep between narcoleptic patients and the control group who have normal sleep. The results from the t-test had a p-value of >0.05, hence there is so significant difference. Consequently, these results point to the conclusion that there is no correlation between the amount of REM sleep and narcolepsy. Future research can be done by sending a survey to willing patients across Sydney which requires a sleep diary to be kept e.g. time taken to fall asleep as well as filling out the Epworth Sleepiness Scale Test to indicate narcoleptic symptoms. This can then be used to compare against data from fit bits as it keeps record of amount of REM sleep to deduct if there is correlation.

Literature Review:

Narcolepsy is characterised as a neurological disorder which affects sleep regulation and causes excessive sleepiness and, in most cases, sleep paralysis, hypnagogic hallucinations and cataplexy (brief attacks of weakness from emotional arousal such as shock). Normal sleep is a structured process, in the first hour of sleep, the brain goes into slow-wave sleep (SWS) before going into rapid eye movement (REM) sleep (Zeman et. al). Narcolepsy has been an area of interest to researchers as it has been increasingly common in major cities such as Japan (Longstreth et. al 2007) also as it has major implications on the quality of life of those affected as it can make them feel as if their lives have unravelled as they lose control over vital aspects of life such as sleep, which consequently effects memory.

REM sleep is characterized by dreams and the paralysis of limbs which prevents a person from acting out dreams and getting injured. In narcoleptics, the regulation of sleep is disrupted and often boundaries between sleep and wakefulness are less separate as well as quickly falling into REM sleep within 15 minutes of falling asleep instead of taking 60-90 minutes to fall into REM sleep. After several experiments it has been revealed that narcolepsy is caused by a lack of hypocretins- small protein molecules that regulates wakefulness and emotional arousal such as shock- being released and those few hypocretins dying off. As a result of the strong correlation between the presence of REM sleep and narcolepsy, narcolepsy has been regarded as a REM sleep disorder.

However, researchers suggest that narcolepsy may actually be an autoimmune disease (Marschall, 2007) as in the narcoleptic’s immune system attacks their hypocretin-producing cells (Mignot et. al 1990). This is supported by research finding that 1-4% of children with narcoleptic parents will also develop the disorder. Research done by Honda et. al 1984 found that all 135 participants who have narcolepsy had the same variation of human leukocyte

antigen (HLA). HLA is responsible for the regulation of the immune system in humans. This was significant as it strongly opposed previous hypothesises that narcolepsy was caused by hereditary (Westphal et. al, 1877) and instead pointed towards the immune system as a cause for narcolepsy. Further evidence that was used as support to back up the autoimmune hypothesis came from Aldrich et. al 1990 who notes similar changes in the brains of human narcoleptics. These similar changes included alterations in neurotransmitter and receptor levels. However, this was debunked as the reported similarities can also result from behavioural changes such as sleep disturbances unrelated to narcolepsy and as a result questions about the reliability of the experiment were raised question as it likely showed that the researchers used confirmation bias during their experiments and when comparing results.

[image:]In order to better understand narcolepsy, 4 narcoleptic dogs of the same breed (Doberman) were studied over a set of a few months in order to see if they reacted in the same way as human narcoleptics (Kilduff 1999). Narcolepsy in dogs in typically caused by a simpler gene mutation hence serving as a model for those studying narcolepsy by analysing their brain and brain chemicals. As stated earlier hypocretin promotes wakefulness. Narcoleptic dogs have defective hypocretin receptors which is hypothesised to cause the narcoleptic symptoms as it would explain the excessive day time sleepiness that narcolepsy is linked with. This strongly supported the hypothesis that narcolepsy is a REM sleep disorder and not an autoimmune disorder as it showed the correlation between REM and narcolepsy.

Based on the conflicting hypothesises, the research question is focused on determining where there is a correlation between Figure 2 shows nighttime brain-wave pattern of a narcoleptic patient compared to a healthy person narcolepsy and REM sleep in order to gain understanding on what the cause of narcolepsy is. Specifically, the research addressed in this report attempts to answer the question ‘is the relationship between REM sleep and Narcolepsy causation or correlation?’.

Scientific Research Question:

Is there correlation between amount of REM sleep and narcolepsy/narcoleptic symptoms?

Hypothesis:

Those with higher amount of REM sleep are most likely to have narcolepsy/narcoleptic symptoms

Methodology

An email including a survey was randomly sent to willing 25 girls and 25 boys from across Sydney as a larger sample size is more reliable. As personal data was used, ethical protocols to remove data that would allow individuals to be identifiable were used, these included confidentiality, right to discontinue and the approval of all involved to publicise personal data. In the email they were required to fill out the Epworth Sleepiness Scale, which uses a series of short questions to gauge degree of their sleepiness (see appendix for Epworth Sleepiness Scale questions). For instance, you indicate on a numbered scale how likely it is that you would doze off in certain situations, such as sitting down after lunch. Other participants were told to keep a detailed diary of their sleep pattern (what time they go to bed, what time they fall asleep-

to gauge how long it took to get to sleep, when do they wake up, how often do they wake during the night) from a sleep the day the before an exam, one from a normal week night and one from a weekend, to compare sleep pattern and alertness are related. All sleep data is recorded on smart watches such as fit bits. The reason behind getting data from a sleep before an exam, one from a normal weeknight and one from a weekend is to gauge if stress or other influences plays a role in REM sleep and narcoleptic symptoms. After data was gathered, the results were compared to see if there is significant difference between REM sleep time in different nights. This was determined as smart watches keep record of REM sleep time as well as results from Epworth test done daily.

Analytic tests such as the P-test and the T-test were used to determine if there was a significant difference in those who responded in the Epworth Sleepiness Scale and narcoleptic symptoms in order to show the relationship between REM sleep and narcoleptic symptoms. This also will specify if there is significant difference in REM for those who indicated narcoleptic symptoms through their Epworth and those who didn’t.