

Clock gene sleep research has implications for workforce

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People differ markedly in their response to sleep deprivation but biological markers of these differences have remained elusive. In findings published in this week's issue of *Current Biology*, researchers at the University of Surrey's Sleep Research Centre report their discovery that a genetic difference in the body clock gene PERIOD3 makes some people particularly sensitive to the effects of sleep deprivation.

There are two variants of this gene in humans, which produce either a long or short protein variant. The multidisciplinary research team, consisting of biological scientists and psychologists, compared how individuals with just the longer variant and those with just the shorter one coped with being kept awake for two days and the intervening night. According to Dr Antoine Viola, lead author on the research paper: "The differences between the individuals were striking. Some participants were experiencing no problems staying awake and others were really struggling".

The results were most pronounced during the early hours of the morning (between 4 and 8 am). Individuals with the longer variant of the gene performed very poorly on tests for attention and working memory. Cognitive Psychologist Professor John Groeger, says: "the early morning performance problems of those with the long variant have important implications for safety and efficiency at work". Research team leader, Professor Derk-Jan Dijk, explains: "This is exactly the time of night when shift workers struggle to stay awake and many sleepiness-related accidents occur.

This experiment was conducted in the laboratory and whether the PERIOD3 gene also predicts individual differences in the tolerance to night shift work remains to be demonstrated". Another member of the team, Dr Malcolm von Schantz, adds: "Approximately 10% of the UK population carries just the longer form of this gene. The possibility that they may be genetically predisposed to perform poorly late at night is a cause for concern".

An additional finding was that the effects of this gene on performance may be mediated by its effects on sleep. When the volunteers were allowed to sleep those with just the longer form of the gene spent about 50% more of their time in slow-wave sleep, the deepest form of sleep. Slow-wave sleep is a marker of sleep need, and it is known that carrying a sleep debt makes it very difficult to stay awake and perform at night.

Dr Simon Archer, who previously discovered that variation in this gene is associated with morning and evening preference, concludes: "We know that variation in PERIOD3 is linked to whether an individual is a "lark" or an "owl", so we expected that this could have an influence on body clock function. What we weren't expecting was such a dramatic impact on sleep and performance". Professor Debra Skene, adds: "The possible role of clock genes in human sleep physiology opens up an exciting new avenue of research".

Source: University of Surrey

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