Genetics of individual differences in chronotype and circadian rhythms

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Abstract

Introduction: Chronotype refers to the behavioural manifestation of underlying circadian rhythms of various physical processes. We can describe it as a propensity to sleep at a particular time during a 24 hour period. 'Eveningness' (delayed sleep period) and 'morningness' (advanced sleep period) are the two extremes but most individuals have some flexibility in the timing of their sleep period. Interindividual differences in morningness–eveningness are believed to manifest into extreme cases classified as primary circadian rhythm sleep disorders, with altered phase relationships of the biological clock to the light–dark cycle, including alterations in sleep timing.

Objectives and Methods: By the review of the literature we tried to understand the knowledge about genetics of individual differences in chronotype and circadian rhythms and how it can be useful in our psychiatric patient’s future life. Sources of data: Pubmed; keywords: chronotype; circadian rhythms; clock genes.

Results: The causes and regulation of chronotypes aren’t clear but there are some candidate genes - clock genes - that exist in most cells of the body, referred to as the circadian system that regulate physiological phenomena. There are also important environmental cues (zeitgebers) include light, feeding, social behaviour and daily schedules that can influence it. Morningness–eveningness is estimated to be about 50% heritable. The genetic basis in the general population has been investigated by targeting several core circadian genes but the results are inconsistent. The 3111C allele of the clock gene 5'-UTR region has been associated with eveningness and delayed sleep timing in some studies, but not others. Also, the variable numbertandem repeat (VNTR) polymorphism in PERIOD3 (PER3), another core clock gene, has been linked to diurnal preference, but not consistently. Both the 111G polymorphism in the 5'-untranslated region of PERIOD2 (PER2) and the T2434C polymorphism of PERIOD1 have been associated with morning preference, though not consistently too.

Discussion and Conclusions: This area of research has promising implications to detect differential vulnerability to circadian disorders and lifestyles that adversely affect alertness, performance and sleep duration.

Supplementary material: Complete presentation available at http://ijcnmh.arc-publishing.org

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