The heritability of the human K-complex: a twin study

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Abstract

Sleep electroencephalogram (EEG) has a trait-like nature. Several findings highlighted the heritability of spectral power in specific frequency ranges and sleep spindles during nonrapid eye movement (NREM) sleep. However, a genetic influence on the K-complex (KC), one of the electrophysiological hallmarks of NREM sleep, has never been assessed. Here, we investigated the heritability of the KC detected during NREM stage 2 comparing 10 monozygotic (MZ) and 10 dizygotic (DZ) twin pairs. Genetic variance analysis (GVA) and intraclass correlation coefficients (ICCs) were performed to assess the genetic effect and within-pair similarity for KC density, amplitude, and for the area under the curve (AUC) of the KC average waveform at Fz, Cz, and Pz scalp locations. Moreover, cluster analysis was performed on the KC average waveform profile. We observed a significant genetic effect on KC AUC at Cz and Pz, and on amplitude at Pz. Within-pair similarity (ICCs) was always significant for MZ twins except for KC density at Fz, whereas DZ twins always exhibited ICCs below the significance threshold, with the exception of density at Pz. The largest differences in within-pair similarity between MZ and DZ groups were observed again for AUC at Cz and Pz. MZ pairs accurately clustered for the KC average waveform with a higher frequency (successful clustering rate for MZ pairs: Fz = 60%; Cz = 80%; Pz = 90%) compared with DZ pairs (successful clustering rate for DZ pairs: Fz = 10%; Cz = 10%; Pz = none). Our results suggest the existence of a genetic influence on the human KC, particularly related to its morphology and maximally observable in central and parietal locations.

K-complex, EEG, sleep, twins, heritability, genetics

Topic:

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