

Abstract

Non-Contact Measurement of Electrocardiogram in Neonates and Infants Using Sheet-Type Fabric Electrodes with Modified Driven-Seat Ground [†]

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This study was aimed at developing a non-obtrusive and non-contact measuring device for the electrocardiogram (ECG) of neonates and infants by using sheet-type fabric electrodes placed under a bed-sheet. The electrodes form two capacitive couplings via clothing to the dorsal skin of the laid subject, and derive alternating biopotential difference of ECG in a non-contact manner through the couplings. Neonates and infants, however, have such a light weight and a small dorsal area that their non-contact ECG (NcECG) is likely to bear an unstable baseline and a deteriorated common-mode rejection ratio (CMRR). We therefore introduced modified driven-seat ground (mDSG) to improve baseline stability and the CMRR of NcECG. In an evaluation test of three adults, we confirmed both shortening of baseline restoration time and improvement of the CMRR of NcECG in all subjects after introduction of the mDSG. In NcECG recording experiments for neonates (24, 26 days) and infants (69, 104 days), we could observe distinct R waves and P waves during sleep or at near-complete rest. Detection sensitivity was 88.7% for R wave and 60.2% for P wave, respectively. These results infer that the proposed device with mDSG is capable of detecting NcECG of neonates and infants at near-complete rest.

Conflicts of Interest: The authors declare no conflict of interest.



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