A single-center validation of the effectiveness of photoplethysmography-based smart device for screening obstructive sleep apnea

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Abstract

Background: Obstructive sleep apnea (OSA), the most common upper-airway disease, is closely associated with cardiovascular risk. However, the early screening of OSA is challenging, relying on polysomnography (PSG) or home sleep apnea test (HSAT) in hospitals. Photoplethysmography (PPG) has been developed as a novel technology for OSA screening, but the validation of PPG-based smart devices is limited as compared to that for PSG or HSAT. Objective: This study aimed to investigate the feasibility and validity of PPG-based smart devices in the screening of OSA. Methods: A total of 119 consecutive outpatients were recruited from the Chinese PLA General Hospital and assessed for a whole-night sleep using a smartwatch, PSG, or HSAT. Results: 17/119 patients were excluded from the study due to the poor quality of PPG signals. Among the remaining, 83 patients were diagnosed with OSA. Compared to HSAT devices, the accuracy, sensitivity, and specificity of PPG-based smart devices in predicting moderate-to-severe OSA patients (apnea-hypopnea index, AHI[?]15) were 87.9%, 89.7%, and 86.0%, respectively. Compared to PSG, the accuracy, sensitivity, and specificity in predicting sleep apnea in patients (AHI[?]5) were 81.1%, 76.5%, and 100%, respectively. Moreover, for moderate-to-severe OSA patients (AHI[?]15), the predictive ability of PPG-based smart devices in OSA did no differ significantly as compared to HSAT (P=0.75) or PSG (P=0.52). Conclusions: The PPG-based smart devices performed adequately in detecting OSA; nevertheless, validation in a large-scale population is imperative.

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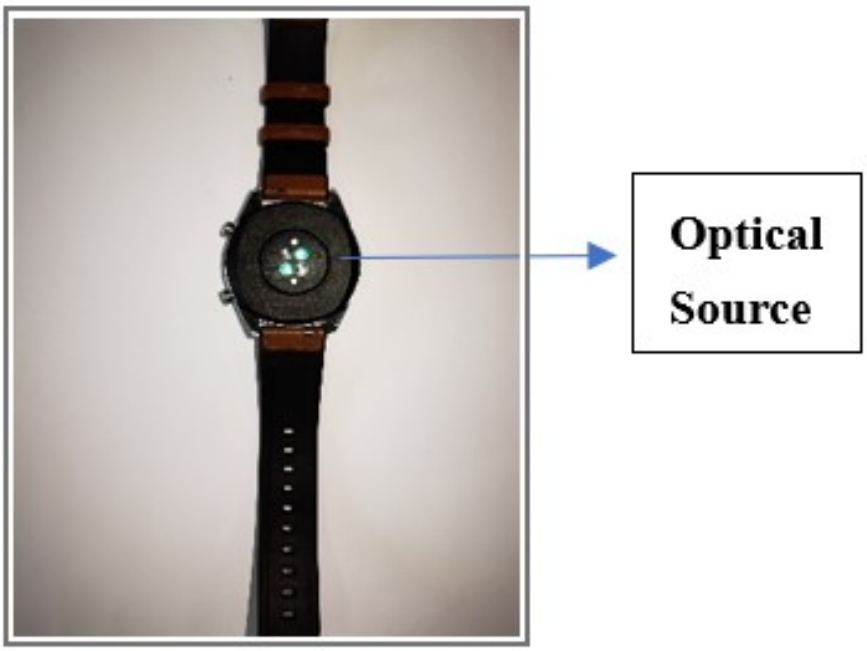

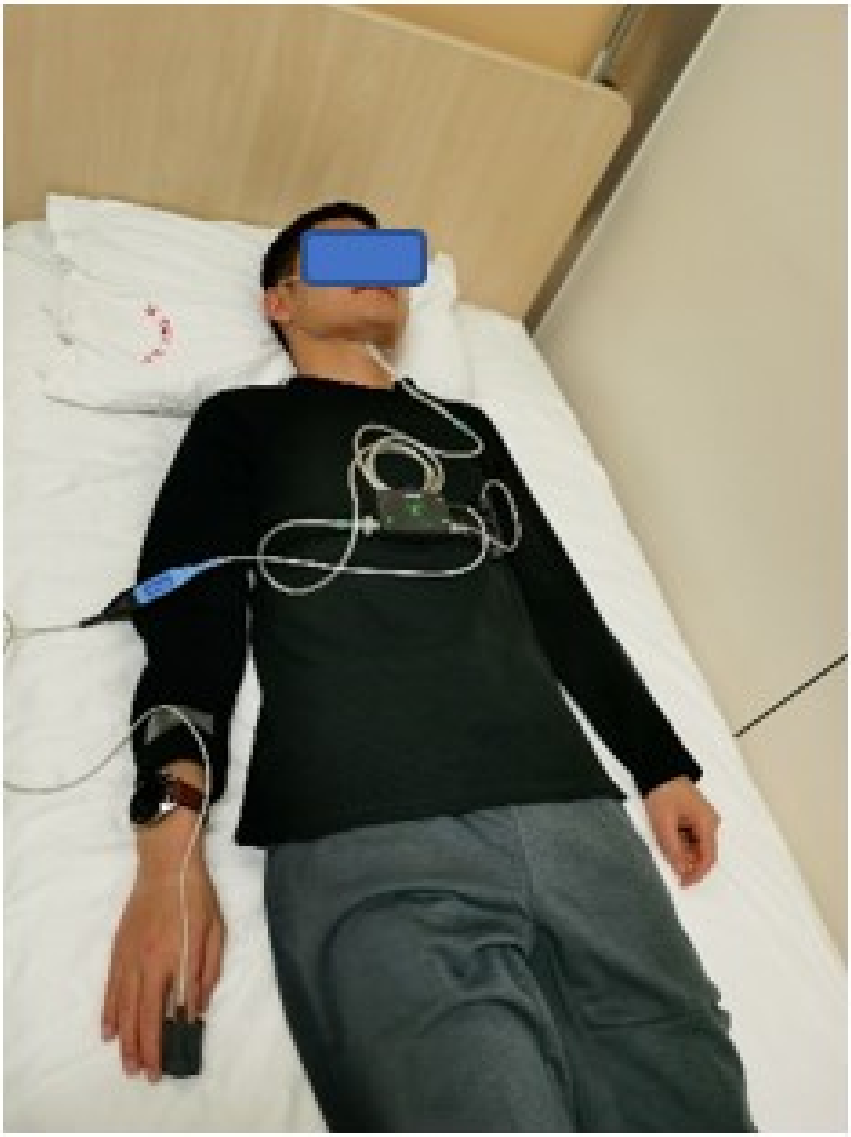

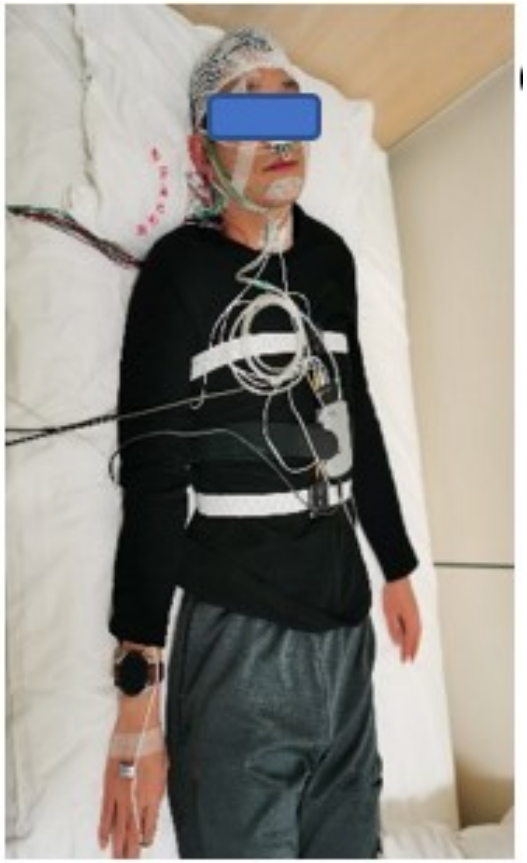

Figure 6 Flowchart of the study