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Smartphone motor testing to distinguish idiopathic REM sleep behavior disorder, controls, and PD

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Study objective

To determine whether a customized smartphone application can be used to distinguish participants with idiopathic REM sleep behavior disorder (iRBD) from healthy controls (HCs) and patients with Parkinson disease (PD).

Summary results

The customized smartphone application can be used to differentiate patients with iRBD from HCs and patients with PD.

What is known and what this paper adds

Research into iRBD is hindered by the lack of a robust outcome measure. This study shows that a smartphone application can be used to quantify the distinctive motor signs of iRBD.

Participants and setting

This study examined 104 patients with polysomnography-confirmed iRBD (mean REM sleep behavior disorder screening questionnaire score 9.9, standard deviation 2.7), 334 patients with PD (mean REM sleep behavior disorder screening questionnaire score 4.6, standard deviation 3.2 and mean Hoehn and Yahr scale score 1.8, SD 0.5), and 84 HCs. These participants were enrolled in the Oxford PD Centre Discovery cohort study.

Design, size, and duration

The test protocol involved 7 tasks that were administered via smartphone to evaluate voice, balance, gait, finger-tapping, reaction time, resting tremor, and postural tremor. The participants completed this test protocol both in a clinical setting and at home. Statistical features extracted from the 7 tasks were used to distinguish participants from separate groups using a statistical machine learning method (random forests).

Table Discrimination accuracies for different pairwise comparisons

Comparison	Mean sensitivity (SD)	Mean specificity (SD)
HC group vs PD group	84.6% (4.1%)	88.3% (3.3%)
HC group vs iRBD group	91.9% (3.5%)	90.0% (3.7%)
iRBD group vs PD group	87.5% (2.8%)	90.1% (2.7%)

Primary outcome measures

The primary outcomes were the sensitivities and specificities of the smartphone test in differentiating the participant groups.

Main results and the role of chance

The results from the smartphone tests allowed the iRBD, PD, and HC groups to be differentiated with mean sensitivities ranging from 84.6% ± 4.1% to 91.9% ± 3.5% and mean specificities ranging from 88.3% ± 3.3% to 90.1% ± 2.7%.

Bias, confounding, and other reasons for caution

Women were underrepresented in the iRBD group, and participants with optimally controlled PD might have been overrepresented in the PD group dataset.

Generalizability to other populations

The large participant sample favors the generalizability of the results, but the results may not be generalizable to parkinsonian and tremulous conditions not examined in this study.

Study funding/potential competing interests

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A draft of the short-form article was written by M. Dalefield, a writer with Editage, a division of Cactus Communications. The authors of the full-length article and the journal editors edited and approved the final version.

