sleep-wake patterns at home and in the laboratory. Additional sensors and more complex scoring algorithms may improve the ability of wearables to assess sleep health.

**Methods:** Thirty-six healthy adults completed assessment while wearing the experimental device (Happy Ring), as well as Philips Actiwatch, Fitbit, Oura, and Whoop devices. Evaluations occurred in the laboratory (Alice 6 polysomnogram). The Happy Ring includes sensors for accelerometry, photoplethysmography, electrodermal activity, and skin temperature. Epoch-by-epoch analyses compared the Happy Ring to lab polysomnography, as well as other sleep-tracking devices. Scoring was accomplished using two machine-learning-derived algorithms: a "generalized" algorithm which was static and applied to all users (like those used for other devices) and a "personalized" algorithm where parameters are personalized, dynamic, and change based on data collected across different parts of the night of sleep.

**Results:** Compared to in-lab polysomnography, the generalized algorithm using data from the Happy Ring demonstrated good sensitivity (94%) and specificity (70%). The personalized algorithm also performed well with good sensitivity (93%) and specificity (83%). Other devices also demonstrated good sensitivity, ranging from 89% (Fitbit) to 94% (Actiwatch); specificity however, was more variable, ranging from 19% (Actiwatch) to 54% (Whoop). Overall accuracy was 91% for generalized and 92% for personalized, compared to 88% for Oura, 86% for Whoop, 84% for Fitbit, and 85% for Actiwatch. Measurement of sleep stage accuracy was 67%, 85%, and 85% for light, deep, and REM sleep, respectively, for the Happy generalized algorithm. For the Happy personalized algorithm, accuracy for sleep stages were 81%, 95%, and 92%, for light, deep and REM sleep, respectively. Post-hoc analyses showed that the Happy personalized algorithm demonstrated better specificity than all other modalities ($p<0.001$). Kappa scores were 0.45 for generalized and 0.68 for personalized, compared to 0.32 for the Oura Ring, 0.32 for Whoop Strap, and 0.37 for Fitbit wristband.

**Conclusion:** The multisensory Happy ring demonstrated good sensitivity and specificity for the detection of sleep in the laboratory. The personalized approach outperformed all others, representing a potential innovation for improving detection accuracy.

**Support (If Any):** Dr. Grandner is supported by R01DA051321 and R01MD011600. This work was supported by Happy Health, Inc.

## 0091

### THE PRACTICALITY OF IMPLEMENTING NIGHTLY REMOTE PATIENT MONITORING (RPM) OF OSA PATIENTS IN CLINICAL PRACTICE

*Jerald Simmons[1], Hesam Sadeghian[2]*

Comprehensive Sleep Medicine Associates, PA / REST Technologies, Inc [1] REST Technologies. Inc [2]

**Introduction:** If Remote Patient Monitoring (RPM) is to become integrated into sleep medicine practices, patient compliance and reliability of data acquisition needs to be determined. We developed the REST Tracker platform to monitor OSA patients nightly, using an oximeter ring with data analyzed by a recognized method (1) to render a sAHI that has been FDA approved (FDA reference number K182618) providing an equivalent to the AHI. The REST Tracker tracks the sAHI along with multiple other parameters, providing the clinician nightly physiologic data to assist in OSA management decisions. Here we present patient compliance and system reliability data.

**Methods:** Data obtained from a ring pulse oximeter worn nightly is transmitted by Bluetooth to a cellular device at the bedside. Nightly data from bedtime to final morning awakening is transmitted to the cloud and retrieved by the REST Tracker system which tabulates and displays the data in a format that assists the clinician in OSA management decisions. Compliance and reliability performance criteria used to assess the REST Tracker system were as follows: Patient Retention Rate (patients were considered a Drop Out if there was no usage within 15 days prior study termination on Dec 15th), Data Acquisition Reliability = percentage of nights with > 3 hours of data on those nights the ring was used. Successful Monitoring Achieved if a patient had over 70% of nights containing > 3 hours of data. Data acquisition was initiated on 1/1/21 and ended 12/15/21 with a minimum of 6 weeks of monitoring.

**Results:** A total 38 patients (28 M / 10 F) Ave age 60 (SD +/-13) enrolled from 1/1/21 to 10/31/21, and acquisition ended 12/15/21. Monitoring ranged from 6 to 50 weeks. 10 patients dropped out, rendering a 74% Patient Retention Rate. Data was collected for a total 4072 nights from all patients, of which 3441 nights had > 3 hrs of data, rendering an overall Data Acquisition Reliability of 84.5%. There were 33 patients that achieved Successful Monitoring (87%) as defined above.

**Conclusion:** In our practice RPM has been well accepted with 74% Patient Retention Rate and 87% achieving Successful Monitoring. This study demonstrated the feasibility of this approach. We are currently implementing methods to achieve higher retention successful monitoring rates. The REST Tracker has been used in our practice for the management of OSA patients undergoing a variety of treatments approaches ranging from PAP, dental appliances and Inspire (HGNS). The REST Tracker has enhanced our ability to assess these patients on an ongoing basis, decreased the need for in lab sleep testing and expedited management decisions. Clinical cases are currently being accumulated and will be presented to demonstrate the utility of the REST Tracker RPM approach.

**Support (If Any):** Reference: (1) Al Ashry HS, Hilmisson H, Ni Y, Thoms RJ, Investigators A. Automated Apnea-Hypopnea Index from Oximetry and Spectral Analysis of Cardiopulmonary Coupling. Ann Am Thorac Soc. 2021;18(5):876-83.

## 0092

### THE EFFECTS OF SLOW-OSCILLATORY GALVANIC VESTIBULAR STIMULATION ON SLEEP PHYSIOLOGY IN HEALTHY HUMANS

*Akifumi Kishi[1], Fumiharu Togo[1], Yoshiharu Yamamoto[1]*

Graduate School of Education, The University of Tokyo [1]

**Introduction:** Recent studies have demonstrated that rocking promotes sleep in animals and humans. The application of an alternating current galvanic vestibular stimulation (GVS) can elicit body sway like rocking sensation. Here, we examined the effects of slow-oscillatory GVS, which can evoke the virtual rocking sensation in the brain, on objective and subjective sleep quality in healthy young adults.

**Methods:** We studied 14 healthy subjects (age: 22.7 p/m 1.4 years) who underwent 3 nap conditions (adaptation, sham [SHAM], and stimulation [STIM]), where SHAM and STIM were randomly allocated with a 1-week interval in general. The polysomnographic recordings were started at 2 pm and time in bed was restricted to 90 min for all subjects. In both conditions, electrodes were placed on both mastoids for GVS; in STIM condition, the slow-oscillatory (0.25 Hz sinusoidal) GVS was applied