

Use of Customized Binaural Beats for the Treatment of Chronic Insomnia

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What was the study about?

The study tested cranial binaural beats delivered via Acoustic Resonance Therapy (ART) to help people with moderate-to-severe insomnia (trouble sleeping). This device uses sound to help people fall asleep. The special sound frequencies are customized for each person based on their facial features, which the device tracks using a phone app (Sonu-sleep)

Who participated in the study?

Participants: 20 adults (5 men and 15 women), aged around 52 years old on average.

Race and Ethnicity: Most of the participants were White (60%), while others were Asian/Pacific Islander (25%) and other races (15%). 35% identified as Hispanic.

What qualified them: They had sleep problems for at least three months, like trouble falling asleep, staying asleep, or waking up too early. They couldn't have used sleep medications recently, and they had to score at least 15 points on a sleep problem scale called the **Insomnia Severity Index (ISI)**, meaning they had serious insomnia.

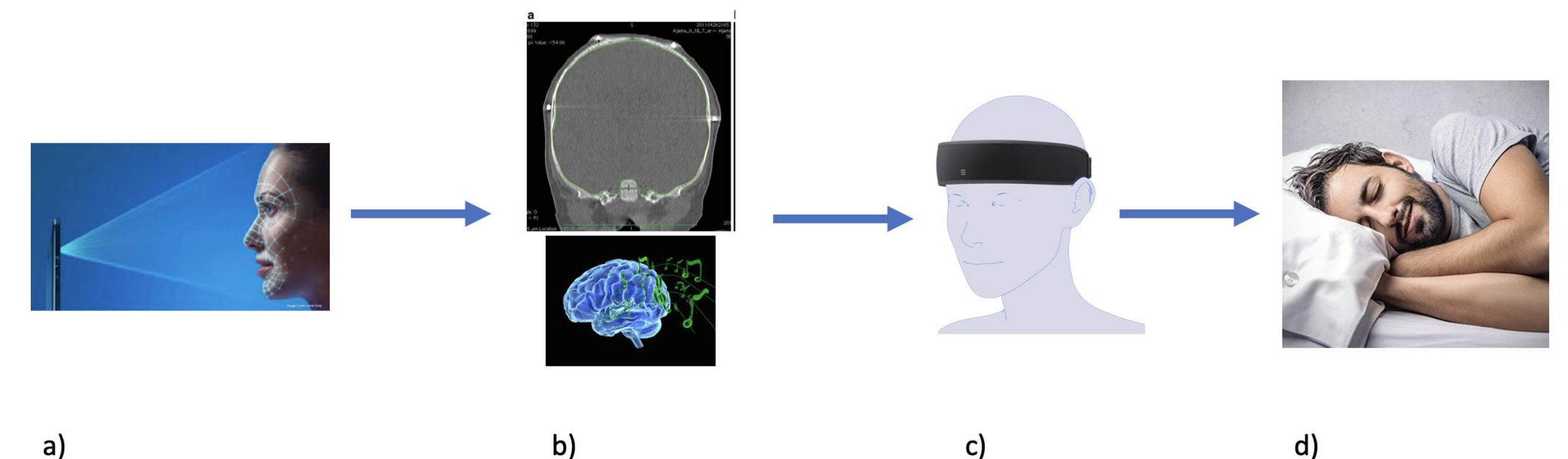
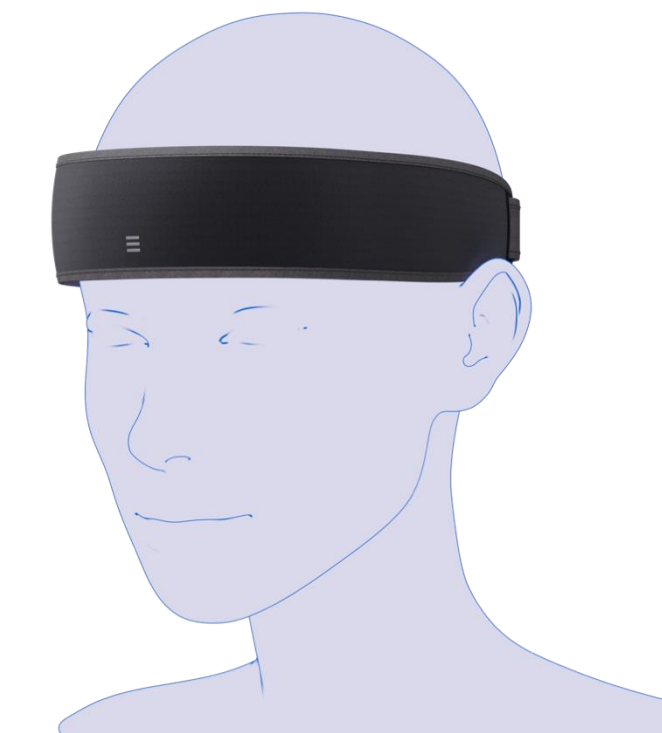
How did the device work?

Participants used the device every night before bed for **45 minutes**. If they couldn't fall asleep after that time or woke up early, they could use it again.

The device played special sound waves directly to their heads through a headband that connected to an app on their phone via Bluetooth.

The sound was customized to each person by analyzing their face and calculating the exact sound frequencies that might help them sleep.

Sonu Acoustic Resonance Band



Process of using facial scanning to develop personalized therapy for each individual participant. a) Phone app uses the front-facing camera on a smart-phone to map multiple anatomical landmarks. b) Machine learning models used to predict sinus volumes and resonant frequencies of participants skull. c) Proprietary algorithm used to generate personalized audio file based on participants calculated bony resonant frequency. d) Sustained use of customized therapy leads to reduction of insomnia symptoms.

What were the results?

•**Major improvement in sleep:** The average ISI score of the participants dropped from **19.8 to 8.5** after four weeks of using the device. This means most people went from having serious sleep problems to mild or no sleep problems.

•The **average drop** in ISI scores was **11.3 points**, which is a big improvement.

•**High response rate:** 75% (15 out of 20) of the participants improved by at least **7 points** on their ISI scores.

•**No differences based on age, race, or gender:** The results didn't change depending on whether someone was older, younger, male, female, or of a different race or ethnicity. Everyone seemed to benefit from the device.

Safety:

•There were zero reports of any adverse effects.

Table 2: Change in Insomnia Severity index (ISI)

	Mean	95% Confidence interval	p-value*
Baseline	19.8	17.5, 22.0	-
Week 4	8.5	5.4, 11.6	-
Change	-11.3	-15, -7.6	<.0001

* p-value is based on paired t-test.

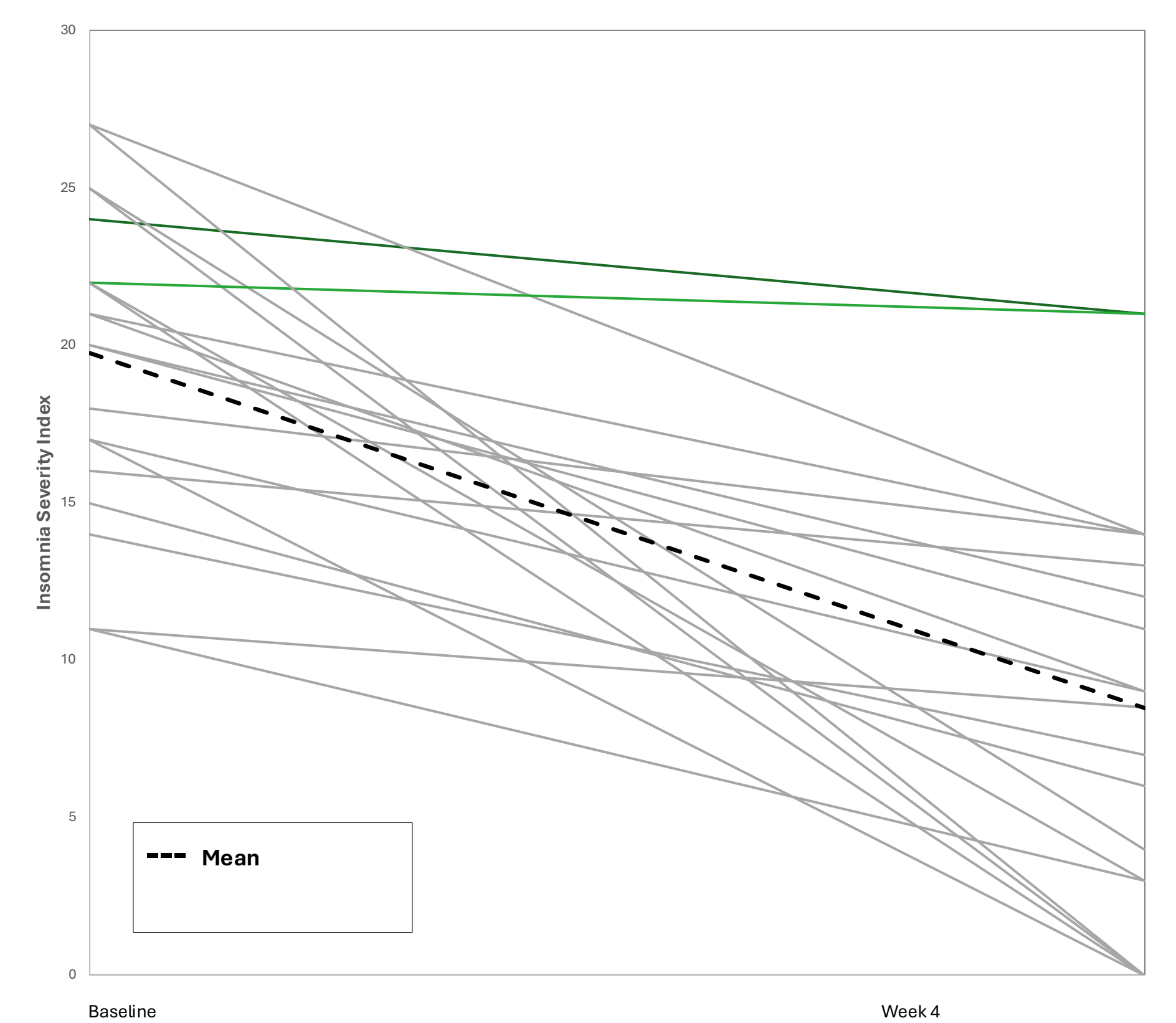
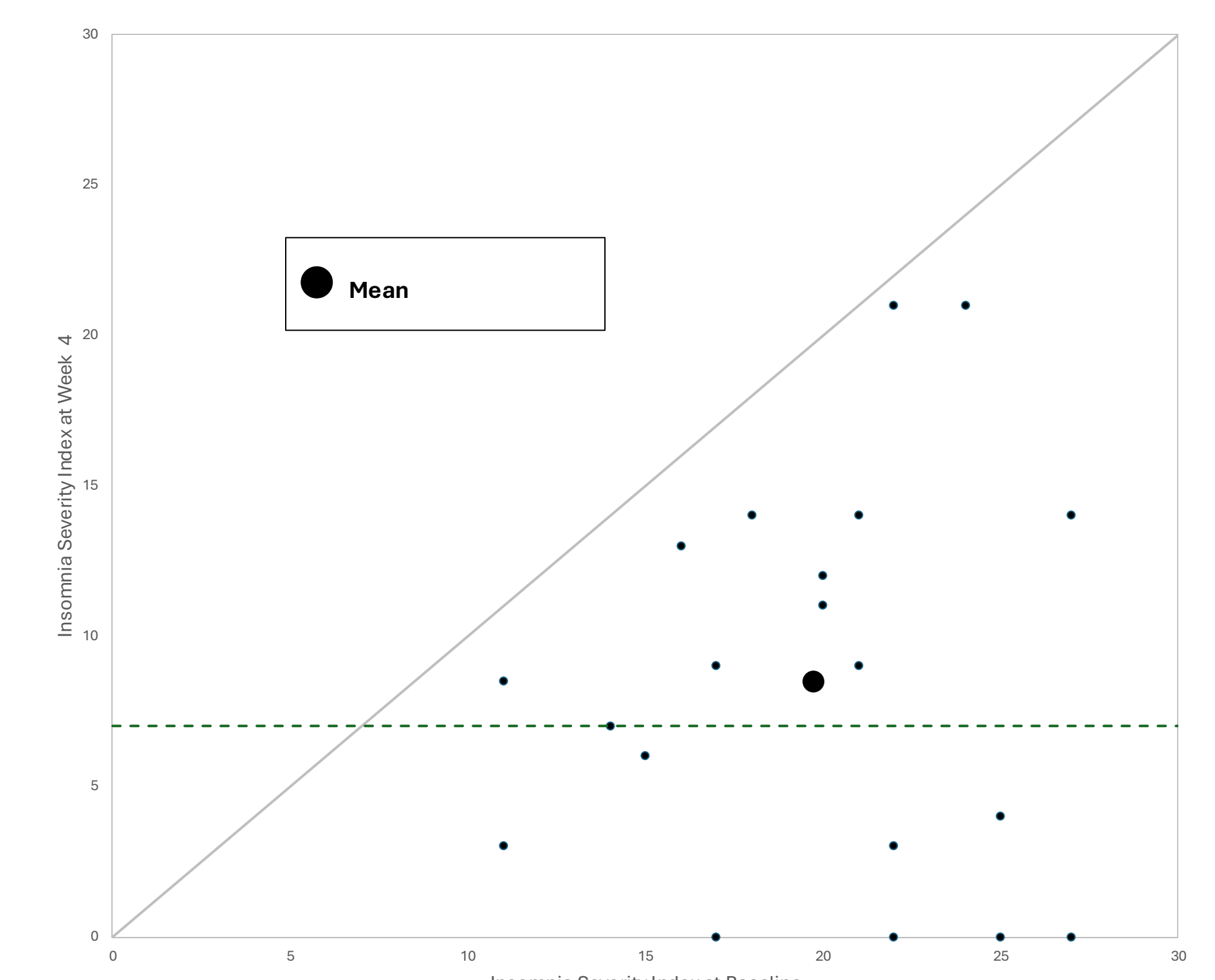


Table 1: Patient Demographics

Variables	N (%)
Age, mean (SD)	51.9 (14.9)
Race	
White	12 (60%)
Asian Pacific Islander	5 (25%)
Others	3 (15%)
Hispanic ethnicity	7 (35%)
Female gender	15 (75%)

Table 3: Linear Regression Models with Repeated Measures for insomnia Severity index

Variable	Regression coefficient (95% CI)	p-value
Week4 vs. Baseline	-11.3 (-15.0,-7.6)	<.0001
Age, per year	-0.03 (-0.18,0.12)	0.679
Male vs. Female	-3.4 (-8.85,2.04)	0.202
White vs. Non-white	-2.8 (-8.89,3.29)	0.342
Hispanic vs. Non-Hispanic	-0.42 (-6.5,1.6)	0.875



Conclusion:

This device, which uses personalized sound waves, is safe, works well, and was easy for participants to use every night. However, more studies are needed to see if it continues to work over a longer time and how it compares to other treatments like therapy or medication.

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