



Sensate:
An Innovation in Wellness Technology
Neuroscience Study

Innovations in Wellbeing Technology

The intersection of science, technology and sound has given rise to new and groundbreaking ways to care for our health. As more individuals today understand the need for self-care, technological innovation opens new possibilities of the ways to do so.

At the forefront of this rising field are technologies that integrate the power of infrasonic vibration to tap deeply into our nervous system and allow recovery from stress.

Modern Mental Health

Our always-on society creates unnecessary stress and can create a negative impact on our mental and physical health. Anxiety is now the leading mental health concern globally, affecting an estimated 275 million people (1) with physical and cognitive results (2;3;4).

Access to mental health providers varies geographically. While clinically diagnosed populations are considered (5), there is a growing number of subclinical populations that struggle with day to day anxiety and mental health considerations that may find it difficult to utilise self care tools to support themselves (6). For these groups, finding daily self care solutions that they can both enjoy and stick to on an ongoing basis are vital to ensure they can become active agents in support of their own wellbeing (7).

There is a growing need for easy, effective and engaging wellbeing rituals that can cater to a wider variety of people.

Wellbeing Technology

Recent advancements in technology have given new rise to engaging and effective self care solutions. Specifically, the rise of sonic technologies which utilise the power of sound for health is proving highly effective (8). Research continues into the therapeutic and restorative power of sound for wellbeing (9; 10). In response to this new wave of sound and health research, treatments using specific frequencies, melodic components, healing and nature sounds are proving to be effective treatments for people to care for and support themselves (11).

The power of low frequency sound in specific is a rising field with initial research demonstrating its impact in helping to rebalance the body's nervous system (12; 13), while other elements are more widely proven including the frequencies, tones and beats per minute and their direct impact human on physiology (14), brainwaves (15), as well as mood (16), emotion (17) and stress levels (18).



Vibroacoustics

One of these is infrasonic vibration, or what is often referred to as vibroacoustic therapy. Initial research into this proves its benefits on vagal tone (19;20), sleep (21) and chronic pain (22). One way infrasonics are being used is through stimulation of the vagus nerve (23). As the longest cranial nerve in the body, it is vital in managing the sympathetic nervous system, and stimulating it has been shown to improve negative mood and decrease anxiety (24). Improving vagal tone is shown to support mental health and internal physiology (25). The main assumption of this is that the higher the vagal tone, the better executive cognitive performance, and better emotional and health regulation (26;27)

Research Question How does Sensate drive relaxation to support health in daily and at-home practises?

Study 1 Using HRV, EEG and behavioural data, we sought to better understand the wellbeing impacts of Sensate during a single use session.

Study 2 A follow up study explored the impact of daily use of Sensate over a 3-week period on subjective well-being and its ease of adoption as a wellbeing protocol.

About Sensate

The Sensate technology is a unique approach to wellbeing, focusing on vagal toning through a combination of sound, vibration and resonance

Infrasonic Resonance

Sensate taps into the phenomenon of bone conduction. Your chest resonates sound, sending out a frequency that signals the vagus nerve to relax.

Comforting Hum

With Sensate on your chest, the comforting hum engage into your ancient instincts of safety and relaxation.

Soundscapes

Developed using Sensates proprietary process, mixing engineered frequency harmonics with auditory stimuli and frequency following responses.

Study One: A Neurophysiological Investigation

Methodology

Participants:	10
Measurements:	EEG, HR, Anxiety, Mood, Enjoyment Self Assessment Mannikin (SAM), State-Trait Anxiety (STAIS), Positive Negative Affect Scale (PANAS), Perceived Stress Scale(PSS)
Environment:	Custom designed wellbeing space

The custom-designed listening room was recreated to mimic a relaxing spa-like environment.

10 participants visited the space in individual time slots. They filled in a self-report survey tracking their mood, anxiety and wellbeing metrics. A 40-minute session saw them relax in a chair, while EEG and Heart Rate data was collected as they experienced 4 different conditions: baseline rest, noise, sensate music and sensate with device.

*EEG data was collected from 10 participants using the Emotiv EpocX 14-channel headset. All EEG data of participants were pre-processed (Butterworth filter 0.5-50 Hz, Re-ref to the average, ICA to detect Eye and Muscle artefacts), then transformed into frequency dimension to look at the power (squared amplitude) at different brainwave rhythms (method used: fast Fourier transform (FFT)). We looked at the boost of Power (squared amplitude) in Alpha brainwave rhythm (8-14 Hz) as a measurement of relaxation, mindfulness, and restoration.

Key Finding

Sensate is a groundbreaking innovation in wellness technology, Sensate is proven to induce deep states of relaxation, and support stress and emotional recovery, quickly and easily in only 10-minutes of daily use.

Key Finding

Sensate is proven to be an easy, engaging and effective way to induce deep states of relaxation in only 10-minutes of use. Reaching deep states of rest can require long term training, and Sensate allows individuals to access these states quickly and easily.

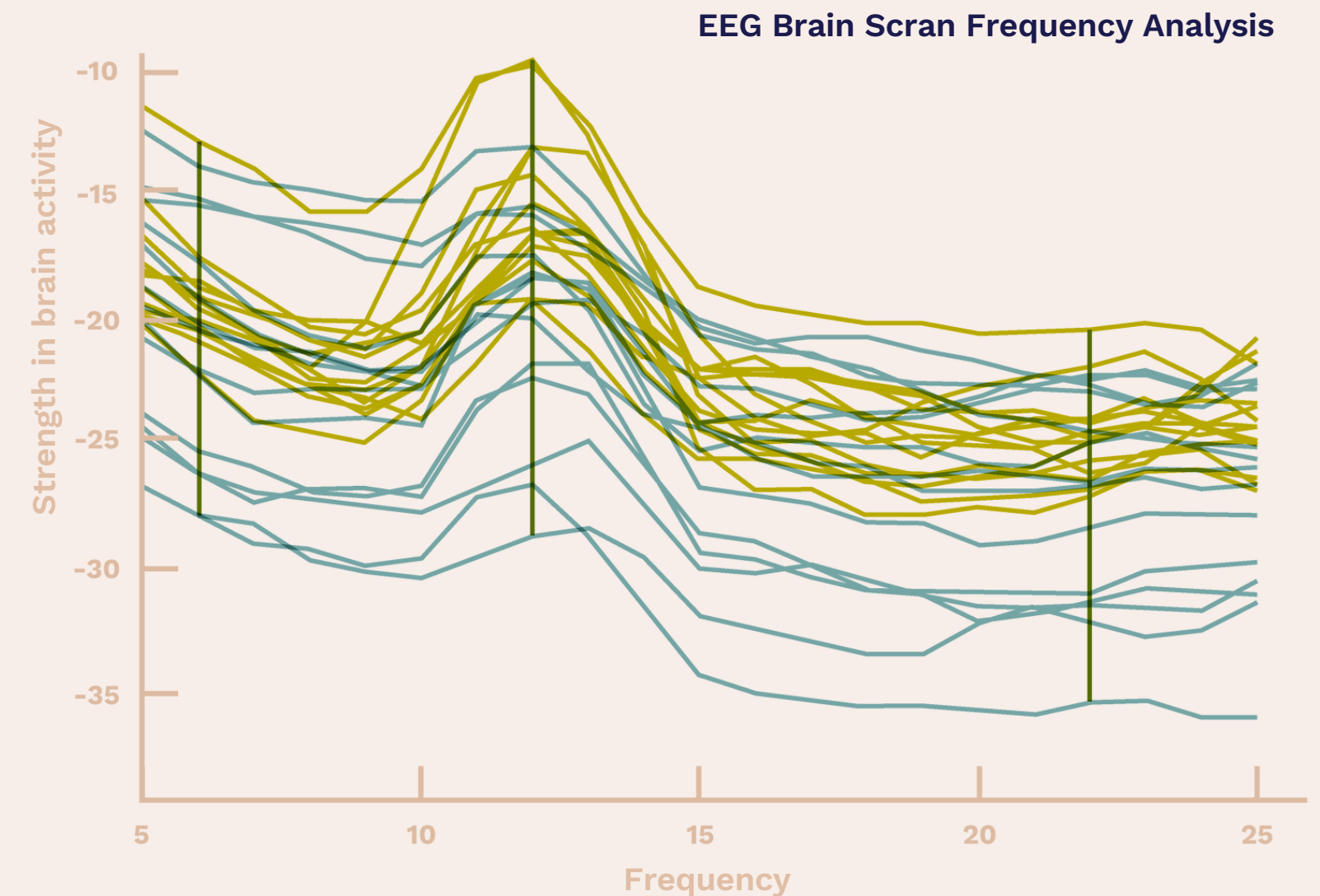


Key Finding

Sensate was shown to induce whole-brain synchronisation, which is often experienced in deep states of rest and meditation. This effect was shown in participants immediately after using Sensate, and was demonstrated by a higher entrainment in alpha power (8-14 Hz) across the whole brain, as compared to baseline measures.

As seen in the figure below, where green lines represent the resting right after a Sensate experience with the device, and blue lines represent the resting state before the experiment. The benefits of any relaxation technique increase with experience, Sensate can help individuals fast-track to the same benefits of deep states of rest in a passive, and simple experience.

This means the whole brain was working in greater synchrony, and harmony, reducing information processing, a state often seen in deep states of rest.

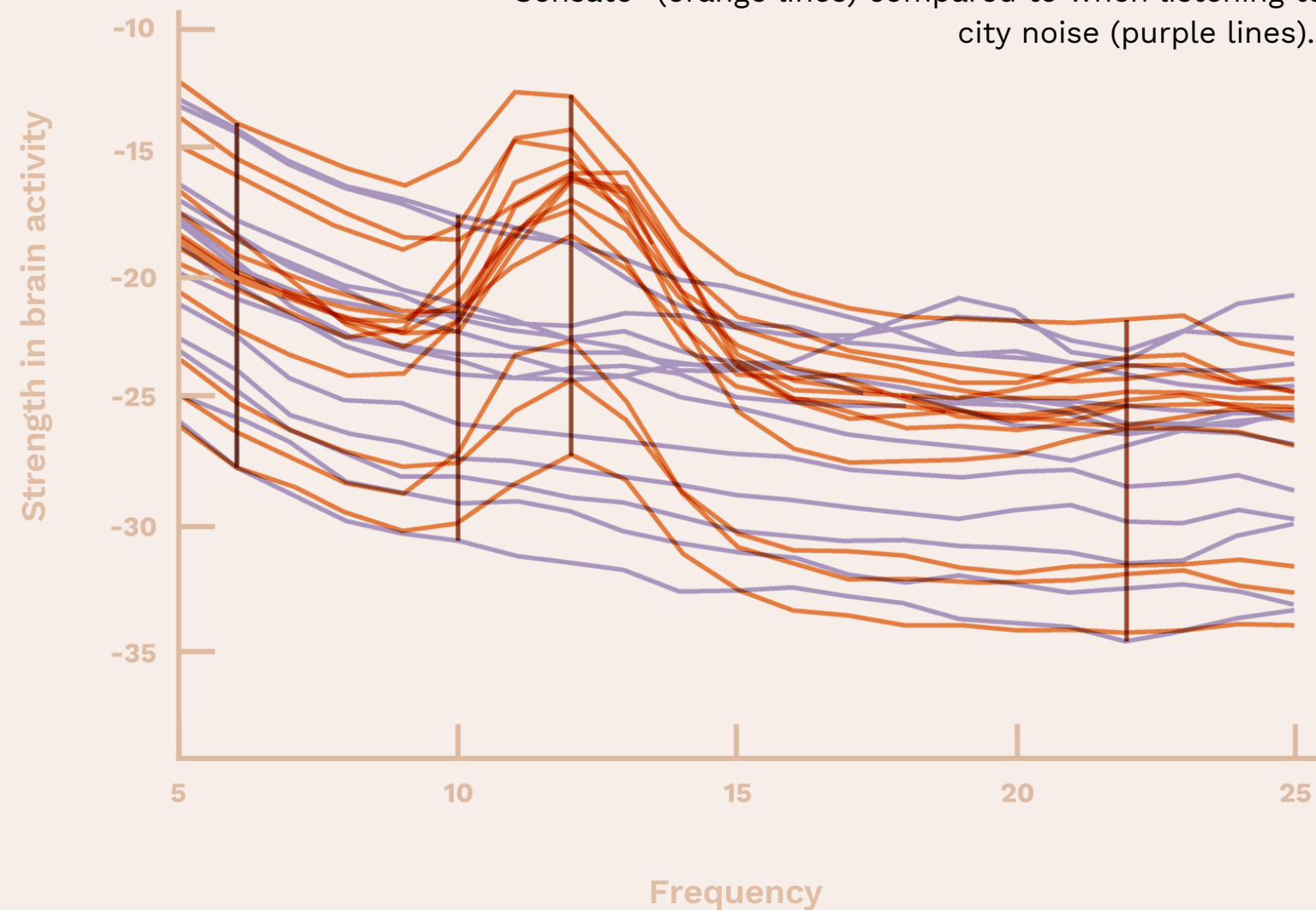


Key Finding

These findings continue even when looking at the music-only component of the Sensate technology. When looking at individuals listening to Sensate music (“Be Sensate” track) without the vibration component, there was still a significant boost in Alpha power. This is best demonstrated in comparison to some of the normal urban sounds many are surrounded by in their daily environments.

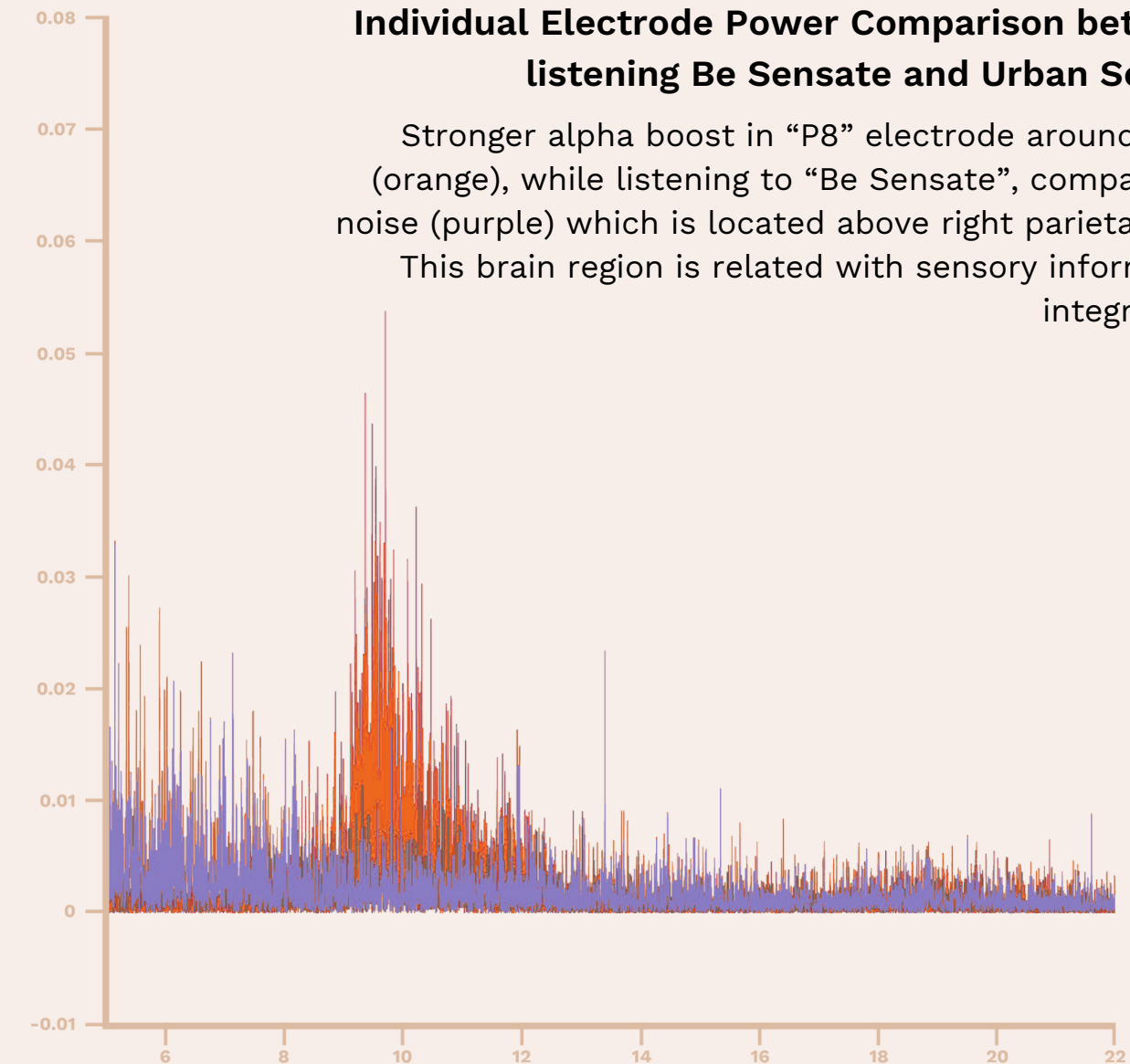
EEG Brain Scran Frequency Analysis

As shown in participant 6, there is a significantly higher boost in alpha power when listening to “Be Sensate” (orange lines) compared to when listening to city noise (purple lines).



Individual Electrode Power Comparison between listening Be Sensate and Urban Sounds

Stronger alpha boost in “P8” electrode around 10 Hz (orange), while listening to “Be Sensate”, compared to noise (purple) which is located above right parietal lobe. This brain region is related with sensory information integration.



Key Finding

Sensate reduced the heart rate of individuals during the sound treatment. This reduced in heart rate was even more significant when compared to average heart rates of those in normal urban environments ($t=3.56$, $p=.052$, p significant at $.05$).

Average of HR data collected at the 3 group intervals:

Sensate Device

63.49

Be Sensate Music

64.71

Baseline

66.43



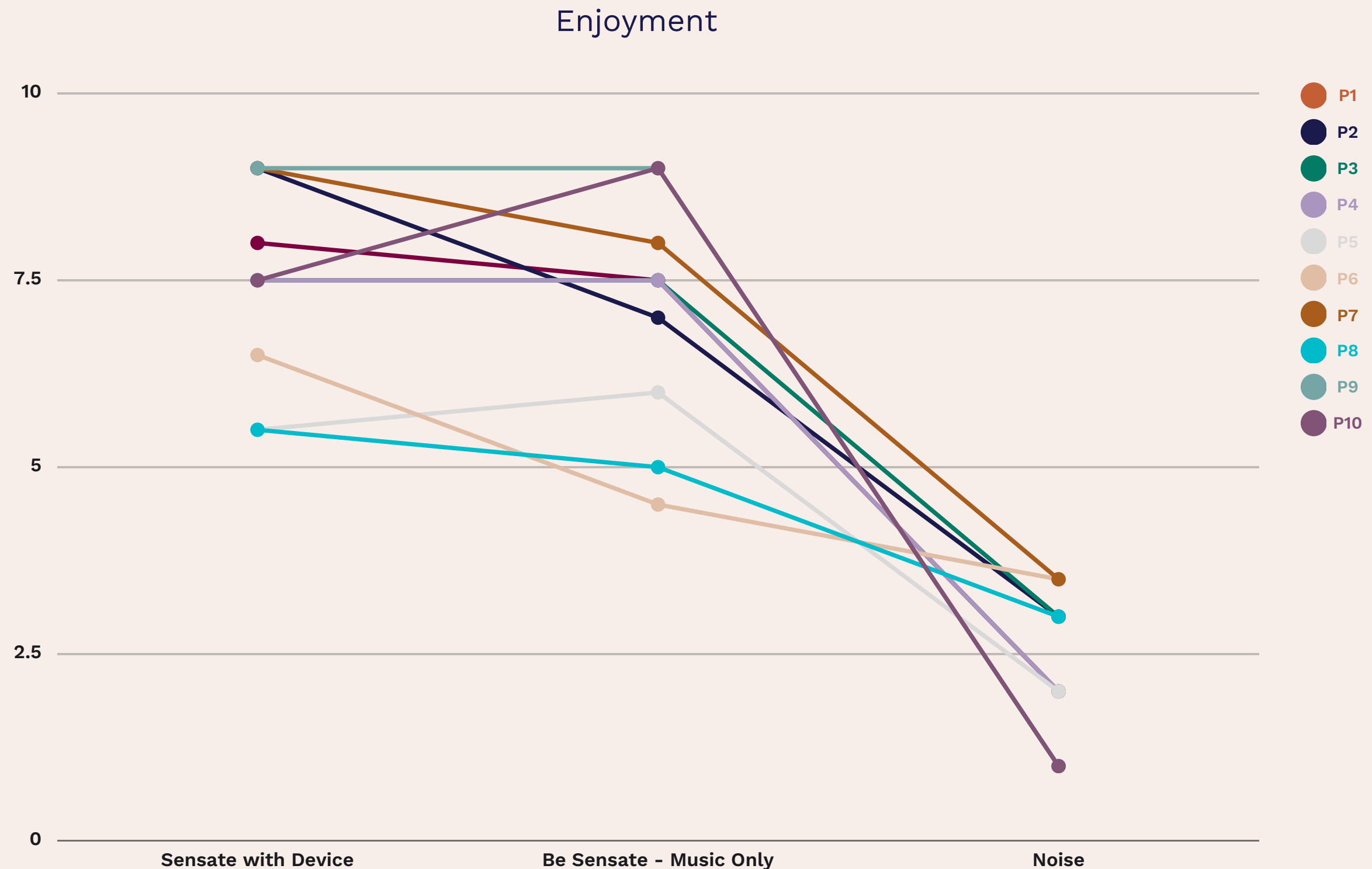
Key Finding

People's self reported experiences with Sensate also reflect the neurophysiological findings, demonstrating that Sensate not only reduces self-report anxiety, increased happiness, but they also enjoyed the experience and are also keen to continue using the device on a consistent basis.

Enjoyment

ANOVA revealed significant mean differences at different timepoints in people's self reported Enjoyment. $F(1.3, 11.69) = 53.03, p < .00001, \eta^2 = .78$

Study 1

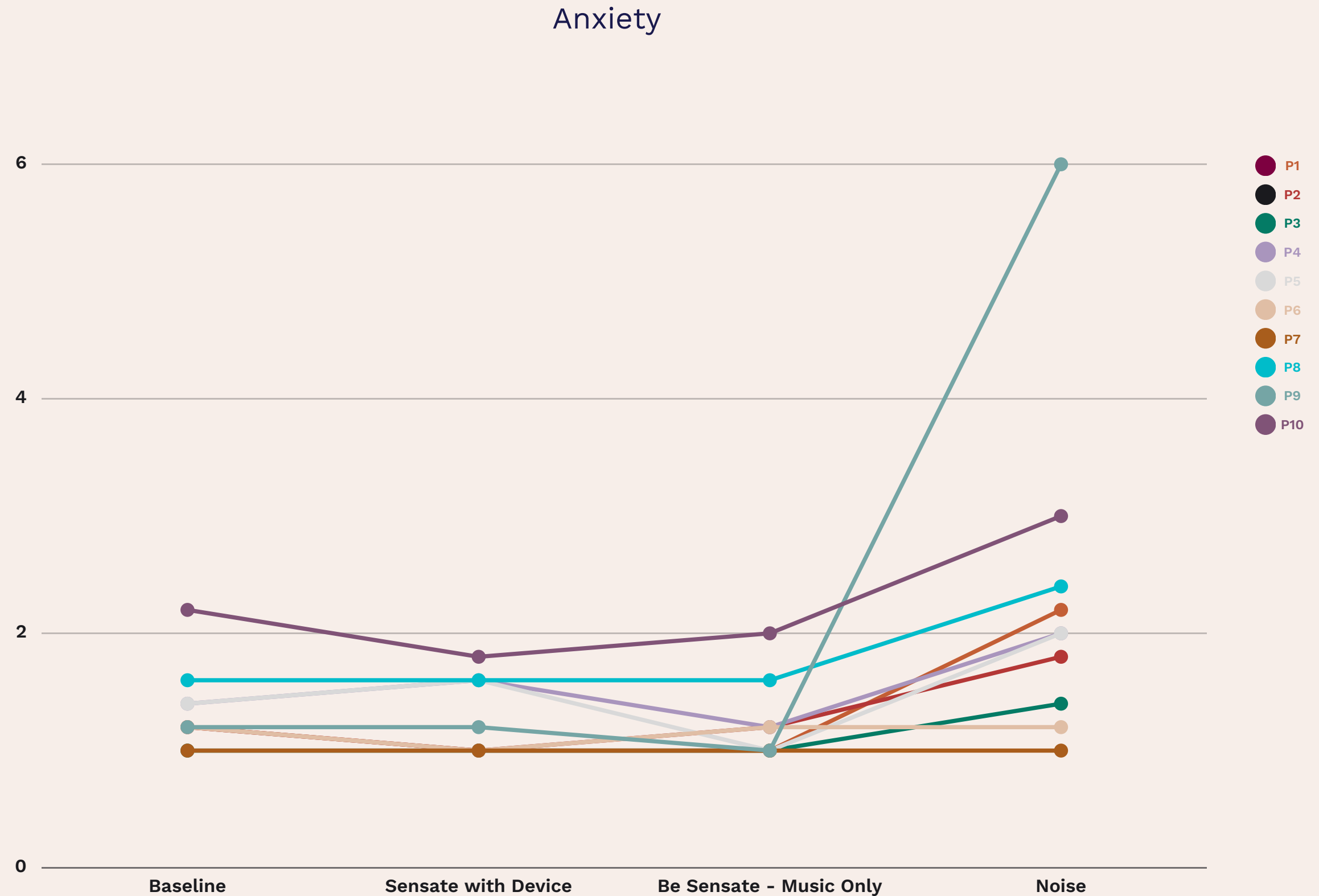


*Participants where asked a series of self report 1-5 scales

Anxiety

ANOVA revealed significant mean differences at different timepoints in people’s self reported Anxiety.
 $F(1.06,9.6) = 5.21, p = .045, \eta^2 = 0.27.$

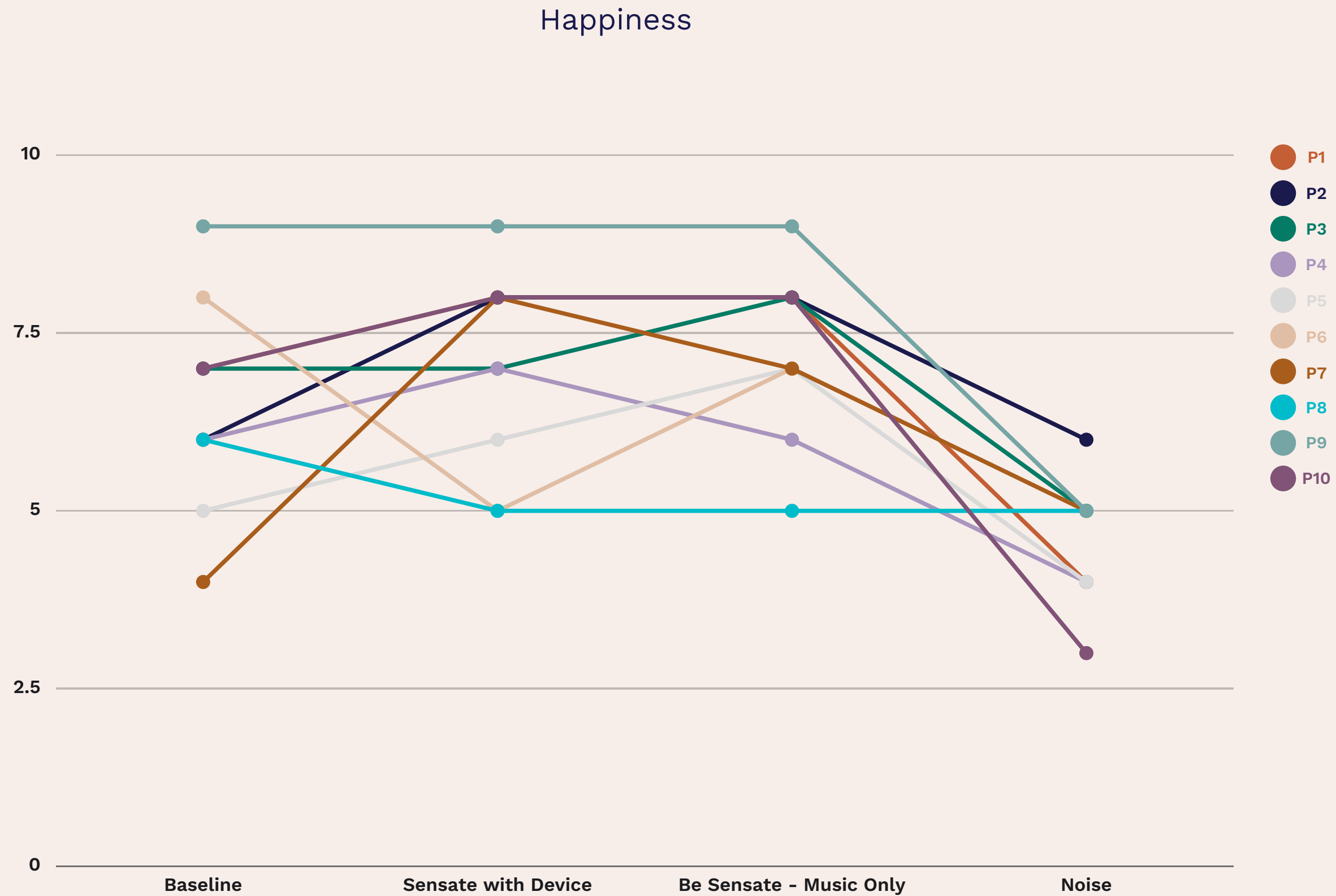
Further comparative analysis revealed a trend that the Be Sensate sound was more effective at reducing anxiety than resting in silence. [t=2.71, p=.024, p.adj=.14]. This was also shown to a weaker degree in Sensate with Device and “Be Sensate” track as compared to city noise.



Happiness

ANOVA revealed significant mean differences at different time points in people’s self-reported Happiness. $F(3, 27) = 13.52, p = 0.000014, \eta^2 = 0.46$.

This was further shown as a small trend of an increase of change in “Be Sensate” Soundtrack compared to Baseline rest [($t=1.92, p_{adj}=.52, p=.09$)].



Study Two: A Daily Behavioural Intervention

Methodology

Participants:	28
Measurements:	State-Trait Anxiety (STAIS), Positive Negative Affect Scale (PANAS), Perceived Stress Scale (PSS), Daily Activity, Mood
Environment:	At home environments

Participants participated in a 10-minute wellbeing task daily in their home environments.

Participants were divided into 3 groups, and instructed to follow a selected daily task for 10-minutes daily, for 3 weeks, at any time in the day they would like. Group 1 (sensate, n=10) were given a Sensate device, and paired the device with the “Be Sensate” track, receiving the full Sensate experience of music paired with the vibration component. Group 2 (music only, n=9) were given the “Be Sensate” track to listen to on it’s own. Group 3 (control, n=9) were instructed to rest for 10-minutes daily.

A self-report survey was given to them at the start of their experience, and at weekly intervals to track their states of mood (PANAS), anxiety (STAI-S) and stress (PSS) across the total duration.

Key Finding

Sensate is a useful daily tool to support stress and emotion. It is easy to use and integrate into daily routines for a range of different individuals to support everyday wellbeing.

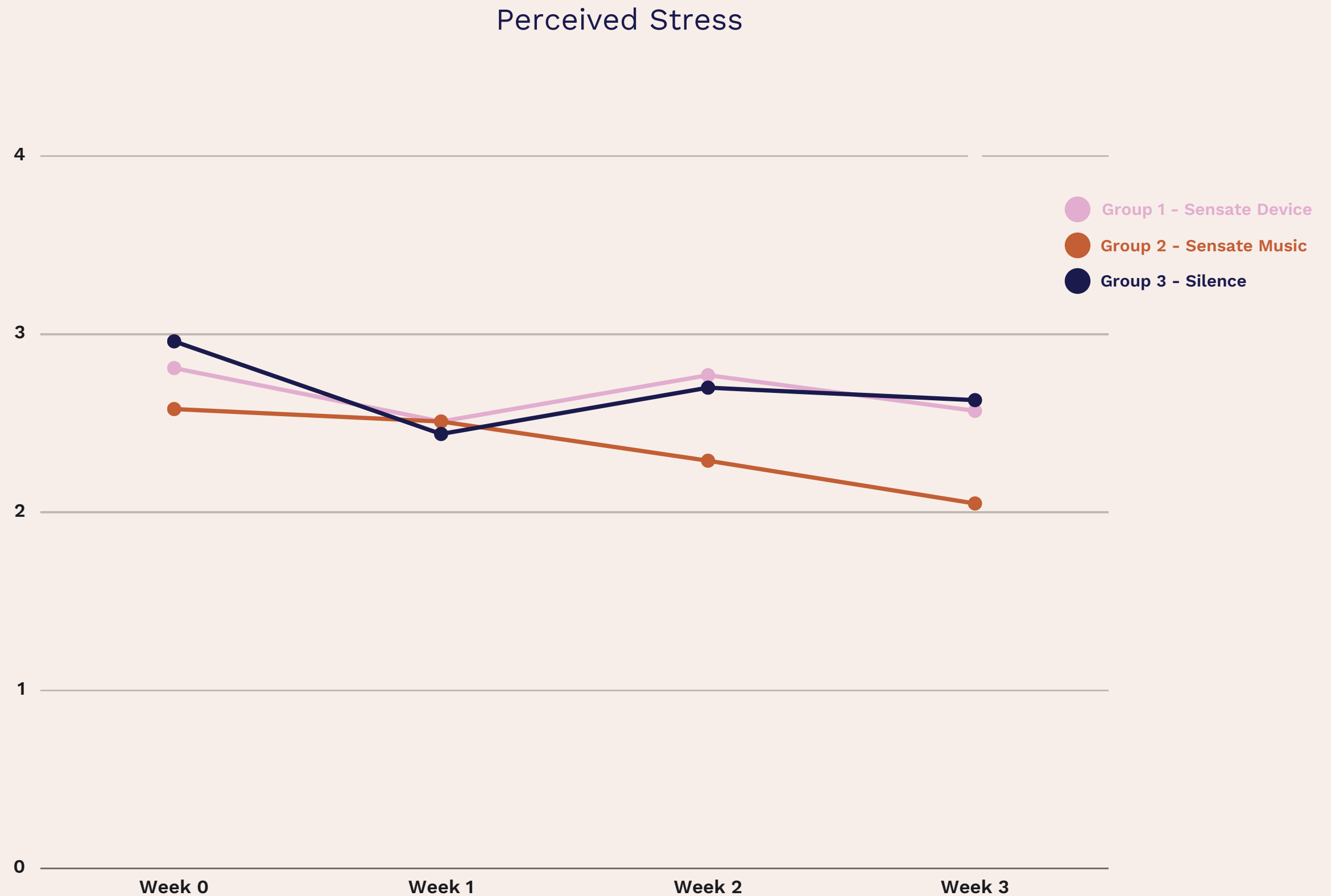
Key Finding

"Be Sensate" showed highly effective at reducing stress and negative affect throughout the 3 weeks



Perceived Stress

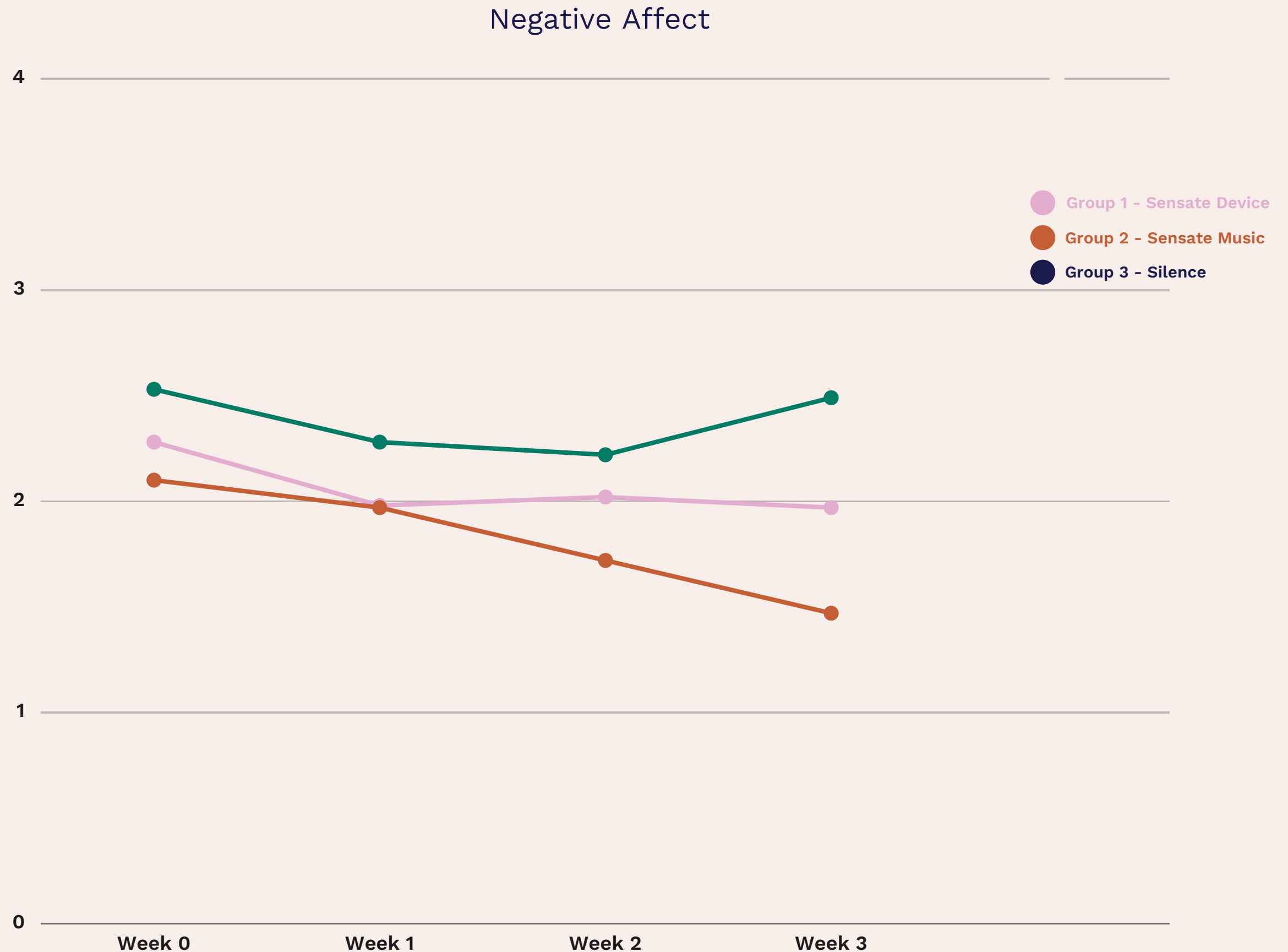
There was a significant reduction in Perceived Stress in Week 3 across groups [$F(4,60) = 3.4, p = .01, \eta^2=.1$], ($p.adj = 0.10$). In specific, Music (group 2) significantly reported lower Perceived Stress than controls ($p.adj = .0.13$).



Negative Affect

There was a significant reduction in Negative Affect in Week 3 across groups [F(2,25), eta2= .27]. In specific, Music (group 2) significantly reported lower Negative Affect than controls (p.adj = .02).

Visually, we see that Music group shows most reduction in Negative Affect, while Sensate group shows moderate reduction, and Silence group shows highest self-reported Negative Affect.



Sensate helped participants create and sustain daily wellbeing rituals

Overall, those who participated in the longitudinal study, the experience and impact of integrating Sensate (Group 1 + Group 2) as a new self-care routine in their lives reported strong evidence of continued use and long term benefits:

79% — Found Sensate easy to use

43% — Experienced immediate effects of using Sensate

79% — Plan to continue using Sensate or other daily self-care practices

35% — Found Sensate easier than other meditation practises

Here's what some of our participants said about their experience

“I used Sensate every evening before turning out the lights. On nights when I used it and was undisturbed I felt I slept better, deeper and woke more rested.”

“I have enjoyed using Sensate in the evening as I felt that it has helped me relax before I go to sleep. Time to be present. I found that the vibrations were super relaxing.”

“I found it really useful to use at times when feeling low or knowing that I had a particularly challenging situation coming up. I wonder if using at a set time would change my experience. I did find it worked to being a sense of calm in the moments I used it and overall a good coping mechanism over other things.”

Applications & Outcomes

1

Sensate is a self-care intervention that is easy to use, keeps users engaged and helps people commit to a daily routine

Participants quickly and easily adopted the technology with instant impact across both their behavioural and neurophysiological measures. Sensate had a strong impact which was felt most strongly in the period just after the 10-minute use period.

Sensate is easy to use and requires minimal effort. As a passive experience, users can lay back and relax with no learning experience required. There is no wrong way or time to use it, and usage provided an instant feeling of agency which itself can encourage further self-care and reflection practises. This is an important factor for routine uptake as compared to techniques such as meditation which have many barriers to uptake and routine adoption (30)

Sensate can be used at any time of the day, even worn around the neck for environments like the office, where other self care interventions might be more disruptive or disrupted by a populated environment.

2

Even just 10-minutes of Sensate provides similar benefits to deep states of rest experienced in meditation practises

Sensate has similar benefits of deep states of relaxation, often seen in experienced and long term meditation. Meditation and daily practise can be difficult to keep up with, and Sensate offers an alternative solution for those short on time or who want to passively engage. EEG data indicated that following one 10 minute session with Sensate there was increased connectivity in the brain. A state seen after meditation, providing needed recovery from daily stress (31; 32).

Dropping into a state of relaxation and switching off the mind can be a challenge with modern stresses. During the experience, an increase of alpha waves was noted even on first use and short, ten minute, session. Alpha waves increase can indicate relaxation and can be a precursor to creative and flow states. (33) This impact was demonstrated even with the music only group and reflected in the self-report findings from the in-situ testing.

3

The Sensate soundscape elicits a positive response that impacts subjective wellbeing measures.

After three weeks there was a significant reduction in measures of negative affect, and perceived stress from the “Be Sensate” music track. Results indicated impact across both the device and music, but it is clear the music delivered more consistent results. This shows that both the vibration and music component of the Sensate technology support deep states of rest and stress recovery, but perhaps in differing ways. Together, they further promote the use of a multisensory, integrated approach of technology as a self care intervention.

People’s self-reported experiences with Sensate also reflect the neurophysiological findings of reduced anxiety, but indicated they also actively enjoyed the experience and were keen to continue using the device on a consistent basis.

Sensate harnesses the power of infrasonic technology, sound and science to provide a fully integrated, new wellbeing experience for a range of individuals to integrate into new daily self care rituals.

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Thank You



Kinda Studios
