



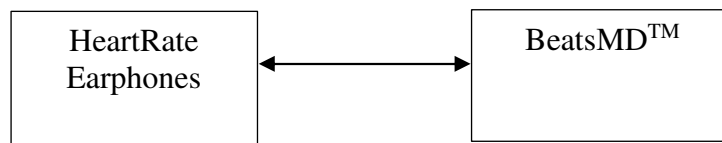
BeatsMD™

Enhance Your Calm™

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## Executive Summary

### BeatsMD™ – Enhance Your Calm™



BeatsMD™ is your “killer app” for fighting stress. We constantly monitor your stress level based on your Heart Rate Variability (HRV) using heartbeat data received from one of many commercially-available fitness headphones. When you are stressed, we let you know – and empower you to make your stress disappear. BeatsMD™ employs binaural beats, a proven medical technology that reduces stress, as part of an extraordinarily user-configurable system to provide ideal stress reduction on a highly individualized basis. Users can not only maximize the effectiveness of the binaural beats by selecting the base tone and beat tone that work best for them, but can also construct a Sound Package™ that includes individually selectable Overlays, Backgrounds, and Affirmations for a truly engaging and empowering experience.

With BeatsMD™ in your corner, stress doesn’t stand a chance!

## Background

An understanding of some basic principles may be helpful before we explore BeatsMD™.

### Heart Rate Variability (HRV) and Stress

Heart rate variability (HRV) is the physiological phenomenon of variation in the time interval between heartbeats. It is measured by the variation in the beat-to-beat interval. In a nutshell, the interaction of the sympathetic and the parasympathetic nervous system (PSNS), which respond to stress, influences the variation of heart rate from one beat to the next. For example, in a non-stressed person, heart rate may vary due to factors such as breathing. Conversely, it has been determined that a person experiencing stress has a lower HRV than a relaxed person. That is, for stressed people, their heart beats more uniformly – too uniformly! An accessible introduction to understanding HRV is available through Wikipedia.<sup>1</sup>

The use of HRV as a measure of physiological stress is well established and accepted.<sup>2 3</sup>  
4 5 6

### Wireless Heart-Rate Monitoring Earphones

There are several brands of wireless heart-rate monitoring earphones currently available on the market such as the Jabra Elite Sport Earbuds,<sup>7</sup> Bose SoundSport Pulse,<sup>8</sup> Philips Action Fit,<sup>9</sup> and others.<sup>10</sup> These can track heartbeat data in real time and wirelessly transmit it to a fitness-tracking app on a runner's phone. These earphones use the Bluetooth Heart Profile (HRP)<sup>11</sup> which enables a Collector device (such as a smartphone) to connect and interact with a Heart Rate Sensor for use in fitness applications.

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<sup>1</sup> [https://en.wikipedia.org/wiki/Heart\\_rate\\_variability](https://en.wikipedia.org/wiki/Heart_rate_variability)

<sup>2</sup> <https://bmcpyschology.biomedcentral.com/articles/10.1186/s40359-021-00551-4#>

<sup>3</sup> <https://my.clevelandclinic.org/health/symptoms/21773-heart-rate-variability-hrv>

<sup>4</sup> <https://www.wellandgood.com/anxiety-heart-rate-variability/>

<sup>5</sup> <https://therapyinanutshell.com/measure-anxiety-in-your-nervous-system-with-heart-rate-variability-vagal-tone/>

<sup>6</sup> <https://www.health.harvard.edu/blog/heart-rate-variability-new-way-track-well-2017112212789>

<sup>7</sup> <https://www.amazon.com/Jabra-Wireless-Waterproof-Fitness-Activity/dp/B072ZH4NTR/>

<sup>8</sup> <https://www.amazon.com/Bose-SoundSport-Headphones-Heartrate-Refurbished/dp/B07J51RN3W/>

<sup>9</sup> <https://www.amazon.com/Philips-Wireless-Bluetooth-Earphones-Monitoring/dp/B07Z89RVTM/>

<sup>10</sup> <https://www.amazon.com/Monitoring-Ergonomically-Connection-Headphones-Waterproof/dp/B0B6SZGDNV?th=1>

<sup>11</sup> <https://www.bluetooth.com/specifications/specs/heart-rate-profile-1-0/>

### Binaural Beats

Binaural beats are an auditory illusion created by the brain when a listener is exposed to tones at different frequencies in each ear. For example, if a person hears a tone at 100 Hz in their left ear and a tone of 110Hz in their right ear, then after a while their brain also appears to “hear” a tone at 10Hz, the difference between the two tones in each ear. Treatment with binaural beats also helps the listener’s brain waves synchronize to the beat frequency – and when the beat frequency is chosen to be the same as one of the frequencies that the brain adopts during meditation, binaural beats can produce or help enhance meditation-related physiological impacts in the listener, such as reduced stress. Binaural beats in the theta range (4 to 8 Hz) or the alpha range (8 to 13 Hz) have especially been shown to reduce anxiety.<sup>12 13 14</sup>

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<sup>12</sup> <https://www.healthline.com/health/binaural-beats#instructions>

<sup>13</sup> <https://www.webmd.com/balance/what-are-binaural-beats>

<sup>14</sup> <https://www.psychologytoday.com/us/basics/binaural-beats>

## BeatsMD™ – Enhance Your Calm™

We live in a world of ever-increasing stress and we could all use some help recognizing when stress is becoming an issue and then de-stressing! BeatsMD™ is your partner to identify and combat stress! In a nutshell, BeatsMD™'s smartphone application receives heartrate data from your wireless earbuds, calculates your HRV, determines when you are stressed, and sends binaural beats to your earbuds to help you relax. The binaural beats can be part of a Sound Package™ you select based on your preferences for your most enjoyable and effective experience.

The two parts of the BeatsMD™ system are the earphones and the smartphone application.

### Earphones

Any of the popular brands of earphones that measure heartrate will work with BeatsMD™, including the Jabra Elite Sport Earbuds, Bose SoundSport Pulse, Philips Action Fit, and others. Our application uses the popular Bluetooth HRP what is widely used in fitness applications to receive heart rate data, so any device that uses that protocol is fine.

### BeatsMD™

Once the heartrate data is received at the application, BeatsMD™ converts the heartrate data to HRV. The HRV is then compared to a stress threshold HRV to determine when the user is experiencing stress. When the user is stressed, BeatsMD™ displays an alert on the smartphone screen and also sends an alert warning to the earphones. The user can then initiate BeatTherapy™ and BeatsMD™ will start playing the user's Sound Package™.

In terms of determining the stress threshold, BeatsMD™ leverages the fact that the earphones are already being worn by the user, typically for long periods of time. Consequently, BeatsMD™ obtains a rich dataset of HRV readings throughout the user's day and in a variety of stress conditions. The stress threshold is automatically determined by monitoring the user's HRV over 10 hours of earphone data and selecting the 25<sup>th</sup> percentile HRV measurement as the threshold.

However, if we don't have 10 hours of data yet, we just use an initial set value based on age. HRV declines as people get older,<sup>15</sup> so to establish an initial HRV threshold, we ask the user's age. For 20-30 we use a 50 HRV, for 30-40 we use a 40 HRV, and over 40 we use a 30 HRV.

- Also, the HRV threshold is displayed for the user and is adjustable by the user in integer increments from 20-100. Thus, the user has complete control over their stress threshold and can set it at a level where they prefer.

- We also have a "sample" mode where we ask a user to relax and provide a guided breathing for 1 minute and then measure the HRV and display it to the user. The user then has the option to adopt that HRV as their threshold – or to manually enter an HRV threshold.

- The user may also select different HRV targets based on time of day on a per-hour basis.

All of the threshold data is stored on our servers in the user's account and can be instantly download or transferred when the user upgrades to a new phone.

### Sound Package™

The user's Sound Package™ provides the user with tremendous power for personalization and is designed to be able to be constantly expanded to keep the BeatsMD™ experience novel and engaging. The Sound Package™ includes the user's Base Tone and Beat Tone selection – as well as any Overlays, Backgrounds, an/or Affirmations. Additionally, the user can also construct a listing of Sound Packages™ which can then be played for the user either sequentially or randomly.

### Base Tone and Beat Tone Selection

The specific Base and Beat Tones that are most effective can vary from user to user. This includes both the base tone frequency and the offset frequency that sets the binaural beat. For example, the user may select a base tone anywhere in the range of 100Hz-800Hz and an offset of anywhere from 4-13Hz (the theta and alpha ranges). So a user selecting a base tone of 200Hz and an offset/beat frequency of 10Hz will have tones of 200Hz and 210 Hz played in opposite ears in order to produce the 10Hz binaural beat.

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<sup>15</sup> <https://www.whoop.com/us/en/thelocker/what-is-a-good-hrv/>

The initial configuration uses a base tone frequency of 432 Hz. 432 Hz has been identified as a tone frequency that may be capable of producing relaxation on its own, so we want to leverage that to increase the effectiveness of our system.<sup>16 17 18</sup> Consequently, we initially structure our binaural beats to include a lower tone at 432 Hz. Also, our initial offset is 10Hz, which we find usually works pretty well for most people. Of course, the user can personalize their experience by adjusting both the base tone and the offset.

### Overlay

Just playing the base and offset tones through the headphones would result in a very boring experience for the user. Consequently, we offer a number of user-selectable overlays that can be combined with the base and offset tones. We can also add new overlays constantly to keep the experience fresh for the user.

The currently available overlays are grouped in the categories of Synth, Piano, Asian, and Country. Each category includes multiple overlays in that style that can be selected by the user. The user can also choose a category and have a random overlay play. To give you an understanding of what this sounds like, here is a sample of a pre-recorded binaural beats session in the alpha range with a synth overlay.<sup>19</sup>

Users can select any overlay (or none) or select a random Overlay or select a random Overlay in a specific Category. Whatever the user chooses gets added to their Sound Package™ for transmission to the smartphone and then to the earphones.

Additionally, the relative volume of the Overlay compared to the Base/Beat Tone selection can be controlled by the user. We call this the “emphasis” of this portion of the sound package. The default emphasis of the Overlay is twice the amplitude of the Base/Beat Tone.

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<sup>16</sup> <https://pubmed.ncbi.nlm.nih.gov/31031095/>

<sup>17</sup> <https://www.aurahealth.io/blog/unlocking-the-benefits-of-the-432-hz-frequency>

<sup>18</sup> <https://meditativemind.org/healing-benefits-of-music-tuned-to-432-hz-music-of-nature/>

<sup>19</sup> <https://www.youtube.com/watch?v=62yWpuNrSgI&t=1608s>

## Background

The user may optionally select to include a Background in their Sound Package™. Backgrounds are typically calming tones that are more constant and less music-like than Overlays. Current Backgrounds include ocean, rain, thunderstorm, brook, and white noise, but we are constantly adding new ones.

Just like with Overlays, the user can select any Background or none – and can use both an Overlay and a Background if desired. Also, the emphasis of the Background relative to both the Overlay and the Base/Beat Tone is configurable.

Here is an example of binaural beats session with a synth Overlay and a rain Background.  
<sup>20</sup> Unfortunately, the Background seems over-emphasized, which would be adjustable using our system.

## Affirmations

Speech-based affirmations are also available for selection by the user and can be added to the Sound Package™ that we construct. Affirmations are categorized into Feel Good, Relax, Guided Meditation, and AI Generated. Affirmations in the Feel Good and Relax categories include a sequence of phrases that are focused on that concept and that lasts for at least 5 minutes and is repeated while the Sound Package™ is being played. The Guided Meditations focus on directing the user's breathing and/or visualization in order to reduce stress. All of the Affirmations are offered in a wide variety of voices (male, female, different voice characteristics, accents).

To give you an example of what this might sound like, here is a binaural beat with a Country Overlay and an Affirmation that is a Guided Meditation. <sup>21</sup> Unfortunately, the emphasis between the Overlay and the Affirmation is not very good. Most users would likely want the Affirmation to be deemphasized relative to the Overlay – and our system would allow them to do that.

For the AI Generated Affirmations, we leverage the power of AI to enable the user to have a completely individualized experience. The user can choose any of our currently available voices (currently 6, 3 male, 3 female). We then include a text box where we ask the user what

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<sup>20</sup> [https://www.youtube.com/watch?v=Sr8oSv\\_gVRU](https://www.youtube.com/watch?v=Sr8oSv_gVRU)

<sup>21</sup> <https://www.youtube.com/watch?v=4edAM-79wDU>



they would like the focus of their affirmations to be. That gets passed back to our server and we query a ChatGPT model to generate 30 affirmation phrases associated with the text entered by the user. We then run those text phrases through the voice model selected by the user and save it to their account as a selectable Affirmation with a name chosen by the user. Once saved to their account, the user can select that AI Generated affirmation for inclusion in their Sound Package™ that is then generated and sent to the user.

### Self-Diagnostics

One piece of data that we want to give users is to let them know which Sound Package™ was most effective in reducing their stress. Thus, whenever a user starts a Sound Package™, we record their HRV during the first 30 seconds and then compare it with their HRV starting 5 minutes later. We then keep track of the change in HRV and display it for the user on request. If a user employs a specific Sound Package™ for more than 5 minutes, we save the HRV increase for each 5 minute increment and then average them to find the average HRV improvement using that Sound Package™. All Sound Packages™ including date and time of use, total time, and HRV improvement are available to users through their History.

### Continuous HRV display

So that users can be constantly informed of their status, while the Sound Package™ is playing the app display screen shows the identifier of the Sound Package™, the currently listen time, the initial HRV, the current HRV, and the user's stress threshold. Once the user is satisfied with the improvement in their HRV, they can simply cease playing the Sound Package™.

## Upcoming BeatsMD™ Improvements

### Heartbeat From Any Device

Although BeatsMD™ currently uses fitness headphones because they allow us to both receive heartbeat data and transmit the Sound Package™, we can receive the heartbeat data from any fitness device – and then just initiate play of the Sound Package™ through regular earphones. For example, the Oura ring <sup>22</sup> FitBit <sup>23</sup> and Apple Watch <sup>24</sup> all provide heartbeat data using the Bluetooth HRP. We can use the input from those devices just like the input from the fitness headphones. The difference is that we would be providing the Sound Package™ to the smartphone to be played over separate wireless headphones that are also attached to the phone.

### Premium Overlays and Backgrounds

Although access to all Overlays and Backgrounds is currently provided as part of the monthly subscription, we can offer additional Premium Overlays or Backgrounds for an additional charge – either one-time or subscription. For example, this would allow us to offer Overlays that were either directly created for BeatsMD™ by a popular artist or for Overlays that we designed ourselves in the style of a popular artist and thus had to license. For example, a Beatles overlay or a Lady Gaga overlay.

### Celebrity Affirmations (Premium)

Several of our beta users have already expressed interest in having Affirmations based on celebrity voices including Morgan Freeman and Ana de Armas (Bladerunner 2049 “You look like a good Joe”). These would be AI Generated affirmations that simply use a voice model based on the celebrity. We would have to license these, of course. Additionally, we could construct our voice model based on their theatrical works, but the model would be improved if we can also have them in for a recording session.

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<sup>22</sup> <https://ouraring.com/>

<sup>23</sup> <https://www.fitbit.com/global/us/home>

<sup>24</sup> <https://www.apple.com/watch/>

## Other Patents

The CEO passed on your recommendation to search the PTO's website, so I did. I made a list of the patents that I found below. The CEO says that all of these patents look pretty close to what we came up with. However, the CEO says that you are the best patent attorney around and that you will be able to find a way to get us our patent without infringing on these other patents.

Patents:

US 20200138299 A1

US 20190387998 A1

US 11540759 B2

US 20210353904 A1