

EEG Based Biofeedback Device for Meditation

Product Design Specification

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Function: The goal of our project is to design and build an inexpensive, portable electroencephalogram (EEG - brain wave monitor) that teaches meditation practitioners to achieve optimal meditation by indicating the presence of EEG alpha and theta waves. This shall be achieved through a relatively inexpensive, minimally distracting, and potentially portable device intended for commercial use.

Client requirements:

- A device that minimizes complicated user input (simplistic like an iPod)
- Final cost of \$100-200
- A type of biofeedback output that is not distracting to the user during meditation
- Portable
- Aesthetically pleasing
- Pursue patent if possible

Design requirements:

1. Physical and Operational Characteristics

a. *Performance requirements:* Device should be able to be used for a minimum of two hours on a single battery charge, with the possibility of daily use.

b. *Safety:* Device should be free from danger of shock, and be appropriately labeled to warn of this danger as well as damaging interaction with electrical components. Product should meet all underwriter laboratories (UL standards).

c. *Accuracy and Reliability:* Device should produce feedback accurate enough for qualitative analysis for personal use, not clinical applications.

d. *Life in Service:* Device should last a minimum of 5 years.

e. *Shelf Life:* In standard storage conditions, the product should last indefinitely without batteries

f. *Operating Environment:* Device should be able to be operated by one person, in reasonable indoor/outdoor conditions (not extremes such as in rain/bathtub), and be able to withstand the typical wear associated with accidents and everyday use.

g. *Ergonomics:* Circuitry should be contained in a light handheld case with an intuitive user interface. The electrodes should be comfortable for extended periods of use no shorter than 45 minutes. They should be easily placed without necessitating scalp discomfort or hair removal.

h. *Size/Weight*: Device should be portable and easy to transport. The device should weigh no more than 1 pound.

i. *Materials*: Should incorporate a maximum number of reusable parts. The outer case should be made of plastic.

j. *Aesthetics, Appearance, and Finish*: Device should be minimally complicated visually, with an interface similar to that of portable music players (such as an iPod). The shape should be rectangular, and colors should be pleasing to the eye without being distracting.

2. Production Characteristics

a. *Quantity*: The portable EEG will ultimately be mass-produced for consumer delivery; however, the scope of our project requires a single prototype.

b. *Target Product Cost*: \$100 - 200, compared to commercial versions ranging from \$1,000 – 5,000

3. Miscellaneous

a. *Standards and Specifications*: Meets national standards for electronic devices, as well as FDA requirements (Level 1 or 2?).

b. *Customer*: Device should be conducive to a meditative environment (comfortable, a user-friendly, simple interface). The device should be targeted towards a youthful, healthy, mind and body conscious demographic.

c. *Patient-related concerns*: The electrodes may require basic daily maintenance and preparation.

d. *Competition*: Should be able to produce comparable signal quality and feedback for a lower price, smaller packaging, and no necessary training.