

ReAwaken

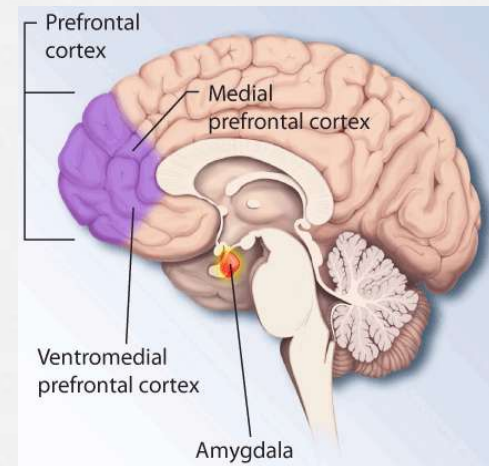
Andrew Logan
NeuroSky

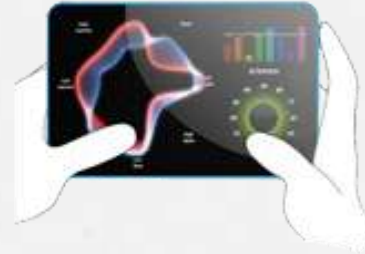
Agenda

- NeuroSky's Technology
- Problem
- Personal Connection
- Brainstorming and Design
- Work Plan

NeuroSky

- Affordable, portable EEG headsets
- EEG = electroencephalography
 - Recording of electrical activity of the brain
- Interactions between neurons make tiny, almost immeasurable signals
- Different brain states are the result of different patterns of neural interaction.
 - Concentration: Beta Waves and Waves between 12 - 30 Hz
 - Calm: Alpha Waves and Waves between 8 - 12 Hz





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Narcolepsy



Symptoms

- Extreme Drowsiness
- Sleep Attacks
- Dream-like Hallucinations
- Sleep paralysis
- Cataplexy – Sudden muscle weakness
 - %75 of narcoleptics



Socio-Economic Impact

- Perhaps the most serious consequence of narcolepsy is the high risk for accidents.
- 75% of patients with narcolepsy reported falling asleep while driving
 - 56% reported nearly having accidents.
- Other common hazards include burns from touching hot objects, cuts from sharp objects, and breaking things.

Table 2

Sources of Information and the Average Annual Health Cost (in Euros) per Person Year by Cost Categories in Denmark

Category of data	Sources	Annual costs narcolepsy	Annual costs controls	p Value^a
Direct health costs				
The primary sector	The National Health Insurance Security System	285	197	< 0.0001
Inpatient cost	Danish Ministry of Health	2,646	705	< 0.0001
Outpatient cost	Danish Ministry of Health	411	191	< 0.0001
Drugs	Danish Medicines Agency	821	257	< 0.0001

Treatment

- Goal: reduce symptoms and number of attacks
- Lifestyle Adjustments
 - Avoiding alcohol and drugs
 - Light or vegetarian meals
 - Nap in the middle of the day
- Medicine
 - Amphetamines
 - Antidepressants
- Devices
 - Medical Life Alert Bracelet
 - Bands

Medical ID Band

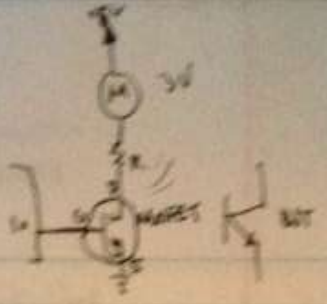
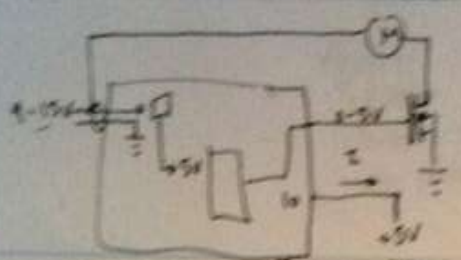


Medical Alert Tag



Brainstormed Topics

- Stimuli
 - Horns
 - Vibration Motors
 - Light
 - Circadian rhythms
 - Flashing / Strobe
- Packaging
 - One piece? Attachment to headset?
Separate?



Motor control → 3V, 75 mA
 Packaging Power

$$V = IR$$

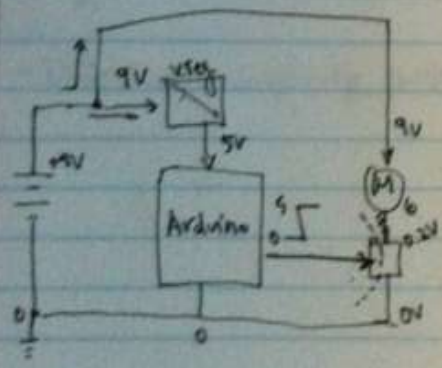
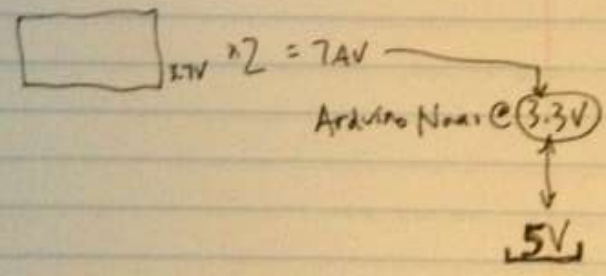
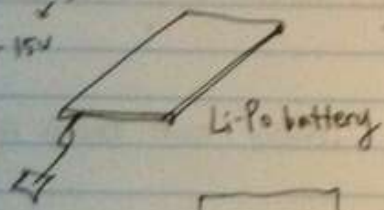
$$P = W = (75 \text{ mA})(2 \Omega) = \frac{1}{2} \text{ W}$$

$$P = I^2 R = (75 \text{ mA})^2 (2) = \text{W}$$

[12 safety factor]



← 9-15V



Selected Design

- \$99 Mindwave mobile
- \$30 Arduino Uno V3
- \$35 Bluetooth Low Energy (BTLE) Arduino Shield
- \$4.95 Vibration Motor x 2
= \$9.90
- Total Cost = \$173.90



WorkPlan

- **Overall deliverable: A headpiece that can determine when the user is in the process of falling asleep, or sleeping, and wake them up**
- Week 7: Acquire all necessary materials. Create first prototype.
- Week 8: Continue interviews with professionals and users. Refine prototype.
- Week 9: Aesthetic value, packaging, and more user testing
- Week 10: Completion of final product