

Brain Cooling Device

Client

Dr. Ugo Faraguna

Team Members

Jay Sekhon(Leader)

David Leinweber(BSAC)

Jon Seaton(Communicator)

Mark Reagan(BWIG)

Progress Report 1

January 29 to February 4, 2009

Problem Statement:

Sleep is homeostatically regulated; the more we are awake, the more and more intensively we need to sleep afterward. Despite this common notion, the mechanisms underlying the homeostatic regulation of sleep are still unknown. One key question pertains to which brain activities during waking are relevant for the subsequent homeostatic increase in sleep intensity. In parallel, one could argue what is relevant for the homeostatic decline of sleep intensity across the night. In other words what are the mechanisms underlying the idea that the more we sleep, the less we need to sleep. One option is that just the passage of time is relevant for both aspects of the homeostatic process regardless of any specific brain activity. Another option is that specific activities inducing neuronal or metabolic changes during waking are reflected during subsequent sleep. To distinguish these possibilities, an intriguing approach consists of selectively silencing neural activity in brain areas important for the sleep-wake cycle regulation; in particular of locally and reversibly silencing patches of cerebral cortex (where the homeostatic process most likely occurs). The specific aim of the project consists of developing a miniature cooling device able to reversibly silence neural activity in spatially defined brain areas of freely moving rodents.

Last Week's Goals

- Outline a minimum of three design options to begin analyzing
- Continue reading background literature to see previous work in this area
- Break down design into components for final device
- Begin looking for materials for design
- Write a final PDS

Summary of Accomplishments

- Team meeting to go over design options; currently have three rough design alternatives
- Read background literature
- Wrote a more exhaustive PDS
- Began materials research

This Week's Goals

- Begin detailed analysis of design ideas to determine which will be the most effective to meet the clients needs
- Work on rough schematics for each of the design ideas
- Potentially meet with Ugo to get his input on the designs presented

Individual Goals

- Mark: Brainstormed ideas for using a liquid coolant and for integrating the EEG capturing mechanism into the device.
- Jay: Brainstormed ideas using phase changing to cool a single point. Wrote weekly progress report.
- David: Worked on PDS and looked for materials that would provide good thermal conductivity to absorb heat.
- Jon: Brainstormed ideas using a vortex tube for shooting extremely cold air. Wrote the final copy of the PDS.

Project Difficulties

There have not been any notable difficulties yet.

Activities

- 1-30-09: Met with Dr. Tyler to go over project.
- 1-31-09: Team meeting to go over design options and parts.
- 2-05-09: Jay wrote progress report.

Expenses

Task	January		February				March				April				May	
Papers	23	30	6	13	20	27	6	13	20	27	3	10	17	24	1	8
PDS	X	x	x		x	x	x									
MidSemester Progress Reports				x	x	x	x									
Final Report	X	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
											x	x	x	x	x	x
Prototype																
Preliminary Design	X	x	x													
Actual Design			x	x	x											
Order Parts				x	x	x										
Build					x	x	x	x								
Presentations																
MidSemester End						x	x					x	x	x	x	
Meetings																
Dr. Tyler	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Client	x		x		x		x		x		x		x		x	