

Sleep Lab Monitor - Progress Report 10

4/4/09-4/10/09

Project Title:

A combined Thermistor, Pressure, and CO₂ device for use in the Sleep Laboratory

Team Members:

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Problem Statement:

There are three measurements taken from each breath during polysomnography. The following devices are used: a thermistor to detect temperature difference between inhaled and exhaled air, pressure sensors that show a flattening pressure profile during upper airway narrowing, and CO₂ sampling tubes to sense End Tidal CO₂. These three measurements are taken from two different devices placed under the child's nose, with two prongs going into each nostril. This method can be inaccurate if a nostril was to become obstructed, and each device may not sample from both nostrils as well as the mouth. Moreover, the current apparatus may be uncomfortable for the child as well as insecure on the child's face. This could cause a disruption of sleep and a possibility of the devices becoming unfastened during the night. To solve these problems, the goal is to design and develop a prototype that combines these three measuring devices into one apparatus that samples from both of the nostrils as well as the mouth, and attaches to the child in both a durable and comfortable fashion.

Reinstatement of Team Goals from Last Week:

1. Continue to contact sleep labs
2. Once thermistors come in the mail, we will build new prototype next week
3. Get in contact with Dr. Green or Linda to schedule our sleep lab testing

Summary of Team Accomplishments:

1. Each member has been contacting pediatric sleep labs
 - a. We have had to extend the deadline for response because each sleep lab's hours of operation and availability of technicians is limited so many call's are required
 - b. The New deadline is April 24, 2009
2. Preparation of prototype building
 - a. Nicole e-mailed Frank Bayer for help soldering the thermistors because of their small size
 - b. Lindsey and Nicole visited Frank Bayer and received help soldering the thermistors
 - i. It was discovered the leads were platinum iridium and determined to be unsolderable
 - ii. Frank Bayer suggested we use conductive epoxy
 - c. Lindsey visited Michael Morrow to discuss the possibility of using conductive epoxy
 - i. He thought we would have difficulty getting any type of epoxy to stick to the medical tubing of the cannula
 - d. Lindsey and Nicole did research on other alternatives for building prototype
 - i. Lindsey contacted her father, Jeff Carlson at Seagate, he talked with the electrical technicians who provided him with a solder that would work
 - ii. Nicole contacted the Glue doctors who suggested an expensive epoxy that would work
3. Prototype was built on Friday, April 10th 2009
 - a. The thermistors wire's leads are made out of platinum-iridium so a special solder was obtained from Seagate (connections with Lindsey's father)
 - b. Small 0.5 cm pieces were inserted between thermistors because the leads were not long enough to extend from the nasal prong's to oral extension
 - c. The wires were heat shrunk to the canulla using a heat gun
 - d. Before soldering and during construction the thermistors were tested using a digital multimeter.
 - e. The thermistors were connected in series
4. Nicole contacted Dr. Green and Linda to schedule a sleep lab testing visit
 - a. The available dates are April 22 and 23rd
 - b. We plan on going on April 22nd from 1:30pm-4:30pm
5. We also ordered free samples from QTI and expect delivery sometime this week

- a. New heat shrink will need to be ordered because we used the rest on the 2nd prototype

Statement of Team Goals for Upcoming Week:

1. The temperature test will be performed on Monday, April 13th
2. Assembly of the 3rd prototype will take place if QTI samples are received this week
3. Continue to contact sleep labs

Project Schedule

1/23/09-1/30/09: First client meeting, background research for modifying current prototype
1/31/09 – 2/6/09: Perform background research
2/7/09 – 2/13/09: Background research, modification alternatives
2/14/09 – 2/20/09: Continue to brainstorm for modification ideas, test current prototype
2/21/09 – 2/27/09: Work on design and choose design modification alternatives
2/28/09 – 3/6/09: Complete Mid Semester Presentations
3/7/09 – 3/27/09: Develop modifications and build new prototype
3/28/09 – 4/24/09: Test modified prototype
4/25/09 – 5/1/09: Complete and give Final Presentation, submit notebooks and paper

Team Difficulties:

After the visit with Frank Bayer, it was determined that the platinum-iridium leads of the new thermistors were not able to be soldered and conductive epoxy is expensive and may not adhere to the medical-grade tubing.

Expenses:

Honeywell 112-103FAJ-B01 Thermistor: \$43.56

Activities and Individual Accomplishments:

Prototype Assembly-3 hours: Lindsey assembled prototype at home in Minnesota after receiving the appropriate solder from Seagate

Nicole – 7 hours: Contacted Dr. Green and Linda to schedule our sleep lab visit, contacted Frank Bayer for suggestions on soldering very small wire leads, visited Frank Bayer with Lindsey with prototype materials, contacted Glue doctor to discuss our epoxy options, continuing to contact sleep labs

Jason – 3 hours: continuing to contact sleep labs

Lindsey – 7 hours: Visited Frank Bayer to discuss when he could help us solder our new thermistors and visited him with Nicole with materials, visited Michael Morrow to

discuss the use of conductive epoxy, contacted father, Jeff Carlson for suggestions from electrical technicians, continuing to contact sleep labs

Robyn – 3 hours: continuing to contact sleep labs

Total hours for this week: 23

Cumulative hours to date: 173.5

Sleep Lab Monitor Gantt Chart Spring 2009												Completed:			
												In Progress/Planned:			
	1/23	1/30	2/6	2/13	2/20	2/27	3/6	3/13	3/20	3/27	4/3	4/10	4/17	4/24	5/1
Background research	Completed	Completed	Completed	Completed											
Test Current Prototype					Completed										
Client Meetings	Completed		Completed		Completed	Completed				Completed			In Progress		
Meetings with Professors/Tech															
Brainstorm design		Completed	Completed	Completed											
Design Modification alternatives/mat				Completed	Completed										
Midsemester presentation					Completed	Completed	Completed								
Finalize design ideas							Completed								
Ordering materials							Completed	Completed	Completed						
Construct modified prototype								Completed	Completed	Completed					
Test modified prototype & Materials									Completed	Completed	Completed	In Progress			
Plan final poster presentation													In Progress	In Progress	
Write final paper												In Progress	In Progress	In Progress	
Final advisor meeting															In Progress

