

## **Sleep Lab Monitor - Progress Report 5**

2/21/09-2/27/09

### **Project Title:**

A combined Thermistor, Pressure, and CO<sub>2</sub> device for use in the Sleep Laboratory

### **Team Members:**

Lindsey Carlson– Team Leader

lcarlson2@wisc.edu

Nicole Daehn – Communicator

daehn@wisc.edu

Jason Tham – BSAC

jtham@wisc.edu

Robyn Hrobsky – BWIG

hrobsky@wisc.edu

### **Client:**

Christopher G. Green, MD

Dept of Pediatrics

School of Medicine and Public Health

cggreen@wisc.edu

608.263.9608

### **Advisor:**

Willis Tompkins

Dept. of Biomedical Engineering

University of Wisconsin - Madison

tompkins@engr.wisc.edu

608.263.1581

### **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 CO<sub>2</sub> sampling tubes to sense End Tidal CO<sub>2</sub>. 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. Solder connectors on once we get the samples in the mail
2. Finish writing up our testing procedure
3. Attend sleep lab visit
4. Start working on our mid-semester presentation
5. Plan our out-of-lab testing procedures

### **Summary of Team Accomplishments:**

1. Soldering connectors on
  - a. We did not receive samples in the mail so we used the infant airway sensors connectors
  - b. We tested the device on our LabVIEW program with the connectors on and made sure it still worked properly
2. Wrote test protocols
  - a. Nicole wrote up the test protocols to do in the sleep lab
    - i. This included the EtCO<sub>2</sub> dilution test in which we get a baseline CO<sub>2</sub> measurement and compare the EtCO<sub>2</sub> values from each airway passage
    - ii. The thermistor comparison test, we changed breathing rates for each thermistor and compare the waveforms
    - iii. The sleep lab technicians reviewed our protocols and determined the dilution test would not be possible because its difficult to control tidal volume
  - b. Nicole, Robyn, and Lindsey wrote up the protocols for the two other tests we will perform on our own
    - i. The temperture test: we will collect the resistance/voltage data for varying temperatures and compare to the calibration data
    - ii. The distance test: we will compare the waveforms of the thermistor at different distances from the nose
    - iii. These will be performed on Saturday, Feb. 28<sup>th</sup>
3. Attended the sleep lab testing visit on Wednesday, Feb. 25<sup>th</sup> from 2:00-4:30p
  - a. We performed the thermistor comparison test, we hooked up both thermistors are the same time so they could be simultaneously compared
  - b. We performed the distance test to replace the dilution test
  - c. We collected the waveform captures for each test as well as the data in EDF (European data format)
4. Lindsey and Jason met over the weekend to enhance labVIEW program
  - a. Downloaded a newer version of labVIEW and added data logging into excel features
  - b. Found calibration data for the thermistors we are using

### **Statement of Team Goals for Upcoming Week:**

1. Perform the temperature test on Saturday, Feb. 28<sup>th</sup>

2. Try to obtain a EDF reader to look at actually numbers of data
3. Analyze our results from the sleep lab testing
4. Complete mid-semester presentation

### **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:**

We obtained the data from our lab testing but it is EDF format and we will need to investigate how to read it.

### **Expenses:**

None

### **Activities and Individual Accomplishments:**

Sleep Lab Testing-2.5: Ran thermistor comparison and distance tests  
Nicole – 4.5: Wrote dilution, thermistor comparison, and distance comparisons protocols and results  
Jason – 5: Reviewed all protocols, worked on LabVIEW program and calibration data  
Lindsey – 5 hours: Wrote the temperature/calibration comparison protocol, e-mailed Tharkson's about getting samples of thermistors, wrote up results for thermistor comparison test, worked on LabVIEW program  
Robyn – 4 hours: Wrote the temperature/calibration comparison protocol, e-mailed Plastics1 about the shipped samples

**Total hours for this week: 21**

**Cumulative hours to date: 73.5**

<b>Sleep Lab Monitor Gantt Chart Spring 2009</b>												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	In Progress				In Progress			In Progress		
Meetings with Professors/Tech															
Brainstorm design		Completed	Completed	Completed											
Design Modification alternatives/mat				Completed	Completed										
Midsemester presentation					Completed	In Progress	In Progress								
Finalize design ideas							In Progress								
Ordering materials							In Progress	In Progress	In Progress						
Construct modified prototype								In Progress	In Progress	In Progress					
Test modified prototype & Materials								In Progress	In Progress	In Progress	In Progress				
Plan final poster presentation													In Progress	In Progress	
Write final paper												In Progress	In Progress	In Progress	
Final advisor meeting															In Progress

