

# Validation of an MBAN Electroencephalography (EEG) System for Ambulatory Mental Health Applications

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## Introduction

Psychiatric patients provide a dynamic context for ambulatory monitoring as disruptive symptoms occur frequently throughout the day and can be indexed as abhorrent neurophysiological activity within their environment. Wireless EEG monitoring enables the use of recording brain activity outside of the hospital environment.

## Objective

To evaluate the validity of the portable wireless EEG system compared to a laboratory-based wired system in psychiatric and healthy participants.

## Experimental Methodology

Simultaneously record on wireless and wired EEG systems:

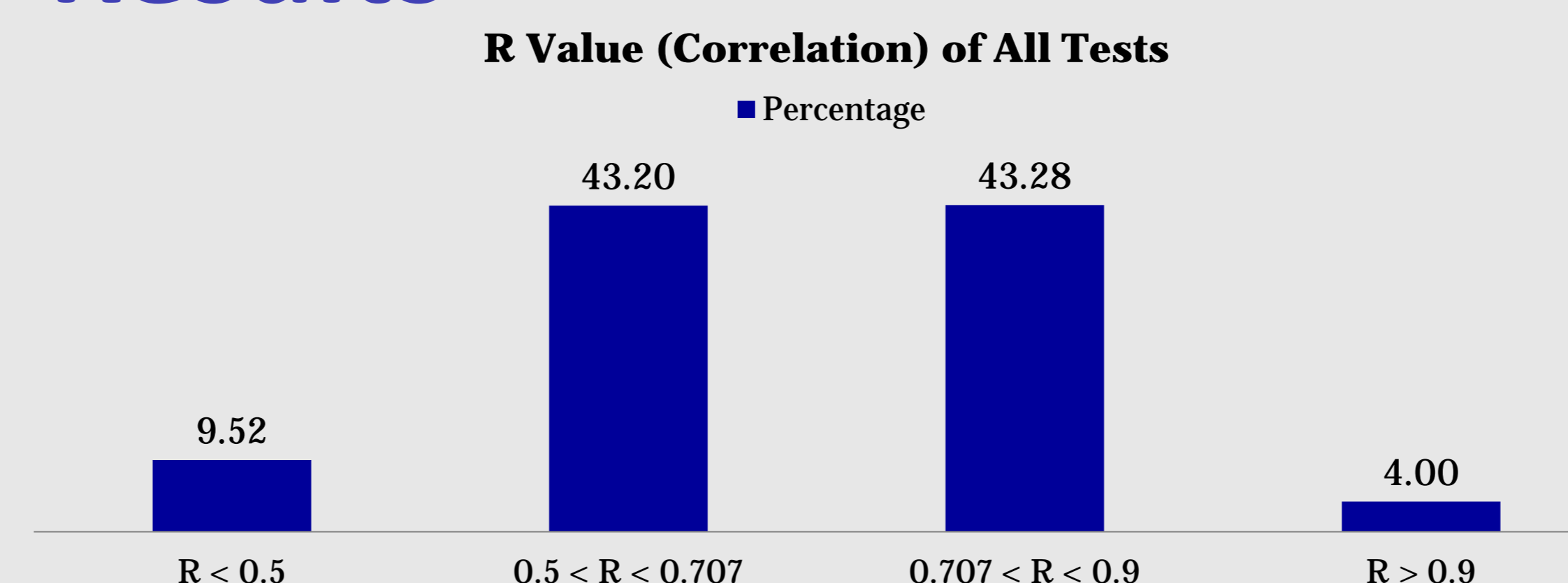
- 1) Ten minutes of resting EEG (Eyes Closed).
- 2) Five minutes of observing an emotionally neutral video
- 3) Working memory paradigm (N-Back Task): 0-, 1-, & 2-Back

## Analysis Summary

- 5 healthy subjects tested with 8 channels
- Time-signal at 1024 Hz sampling rate
- Cut data into 5 second segments
- FFT of 5-second segments
- 0-100 Hz (400 points each) stored
- Correlated wireless frequency data to wired frequency data

Neutral	Resting	0-Back	1-Back	2-Back
2136 seg	4408 seg	5120 seg	7216 seg	6440 seg

## Results



Correlation of FFT segments. Almost all had  $P \ll 0.01$ .

- 9.52% had  $R < 0.5$
- 43.20% had  $0.5 < R < 0.707$
- 43.28% had  $0.707 < R < 0.9$
- 4.00% had  $R > 0.9$ .

By Test Type:

	Open	Closed	0-Back	1-Back	2-Back
R < 0.5	18.2	15.0	8.6	5.8	5.8
0.5 < R < 0.707	34.5	68.9	35.9	36.8	38.3
0.707 < R < 0.9	39.4	16.1	49.8	52.5	52.7
R > 0.9	7.8	0.0	5.7	4.9	3.2

Note: 44 of 200 channels were rejected for artifacts affecting the signal.

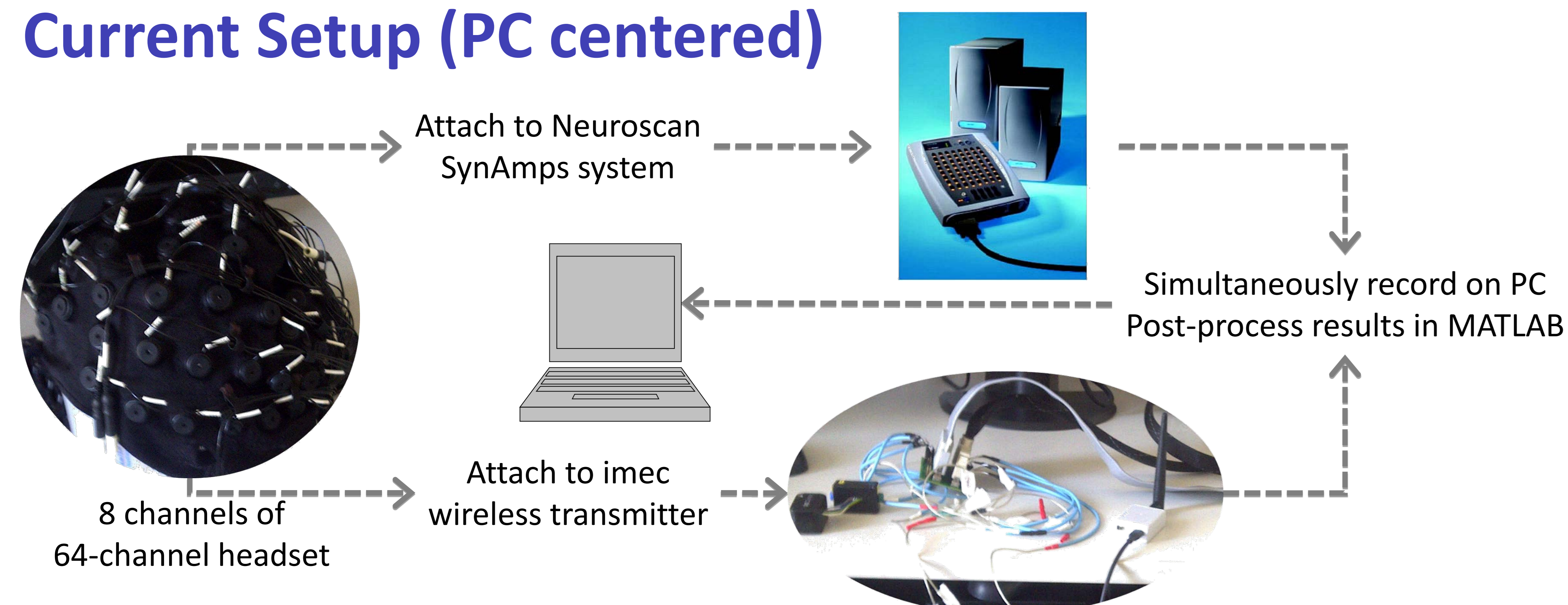
## Conclusions and Future Work

Thus far, the wireless system is able to reliably acquire EEG data. In its present form, a full EEG headset and a computer are required, which precludes ambulatory monitoring. A full mobile solution will be required.

Future work will include:

- Developing a comfortable wireless EEG cap
- Developing a Body Area Network system using Smartphone as central node
- Testing healthy participants and compare to psychiatric patients

## Current Setup (PC centered)



## Future Plans (Smartphone centered)

