Utilizing Multisensory Integration to Improve Monitoring and Alarm Management

Society for Technology in Anesthesia

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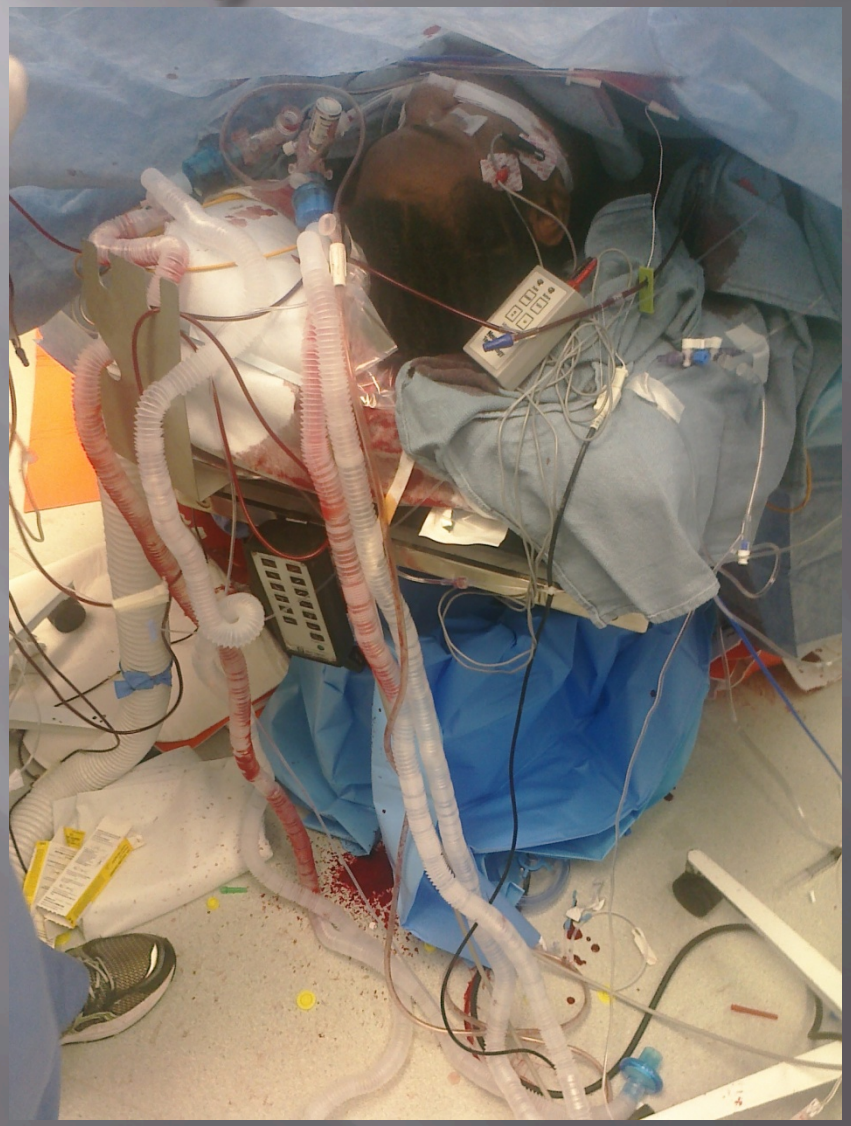
Our office

Sometimes things get messy

Sometimes we get distracted or busy with one task

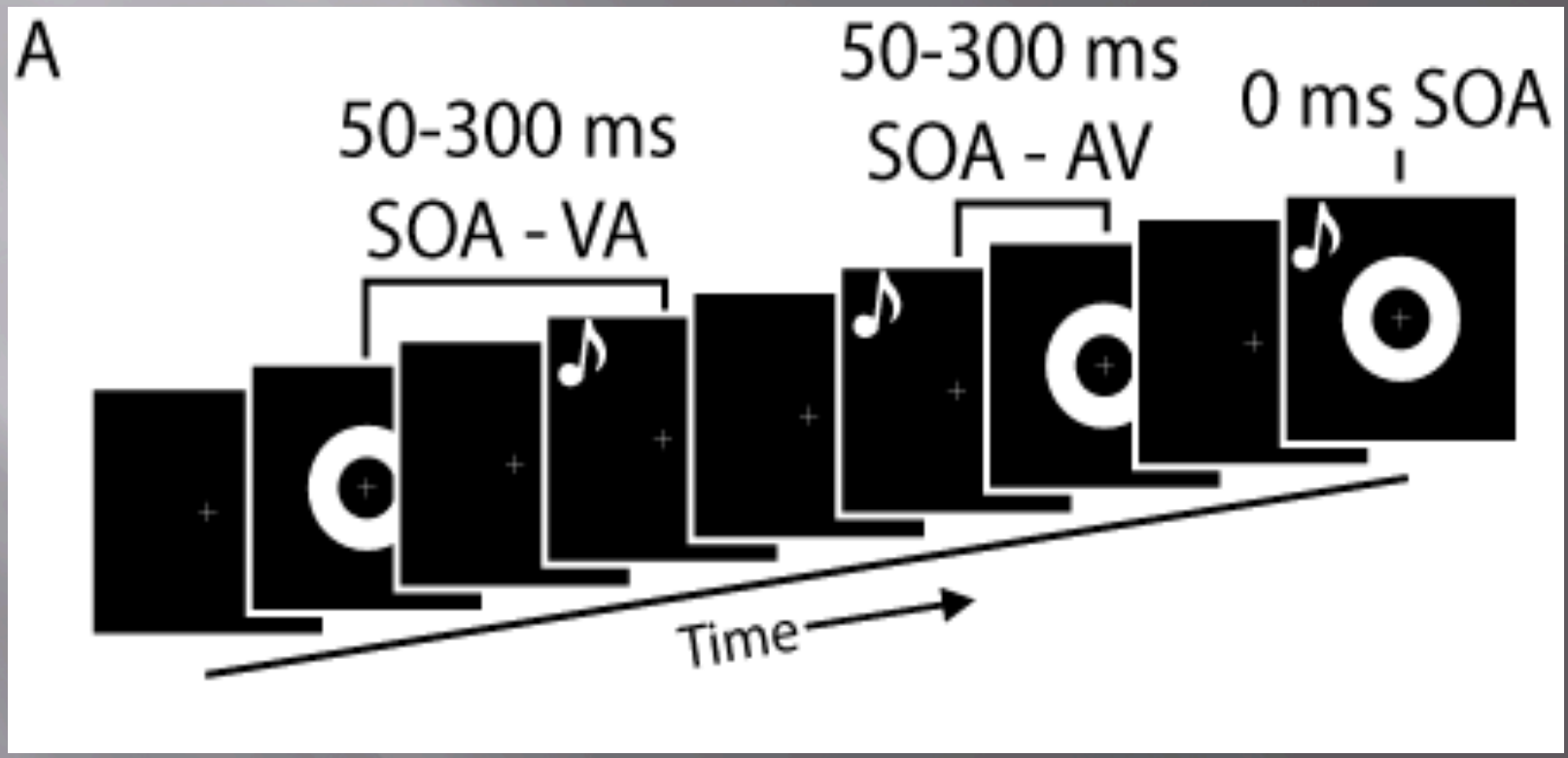


Temporal Binding Window

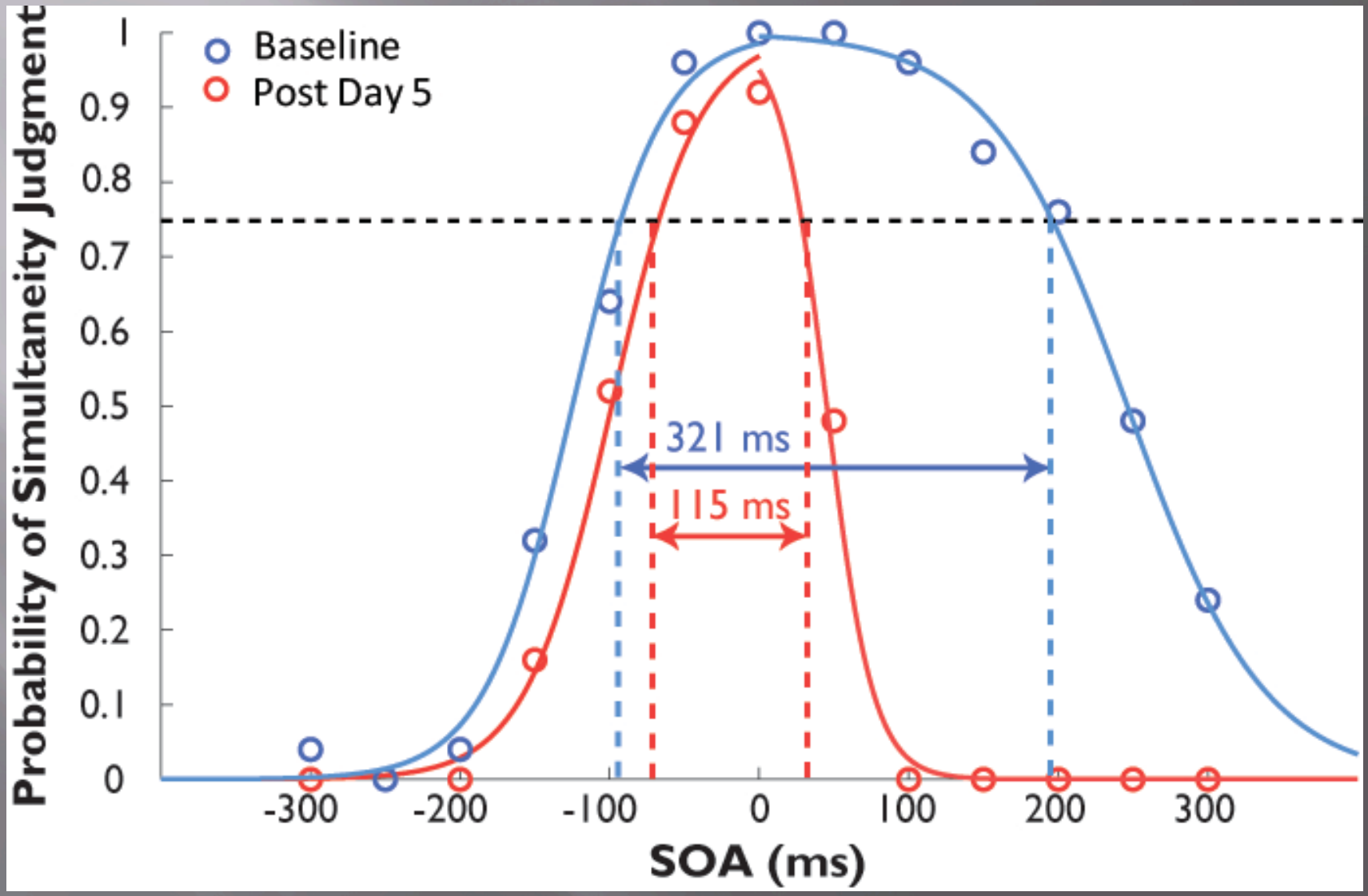
Window of time within which two stimuli from different sensory modalities may be offset and still perceptually bound into a single, unified perception.

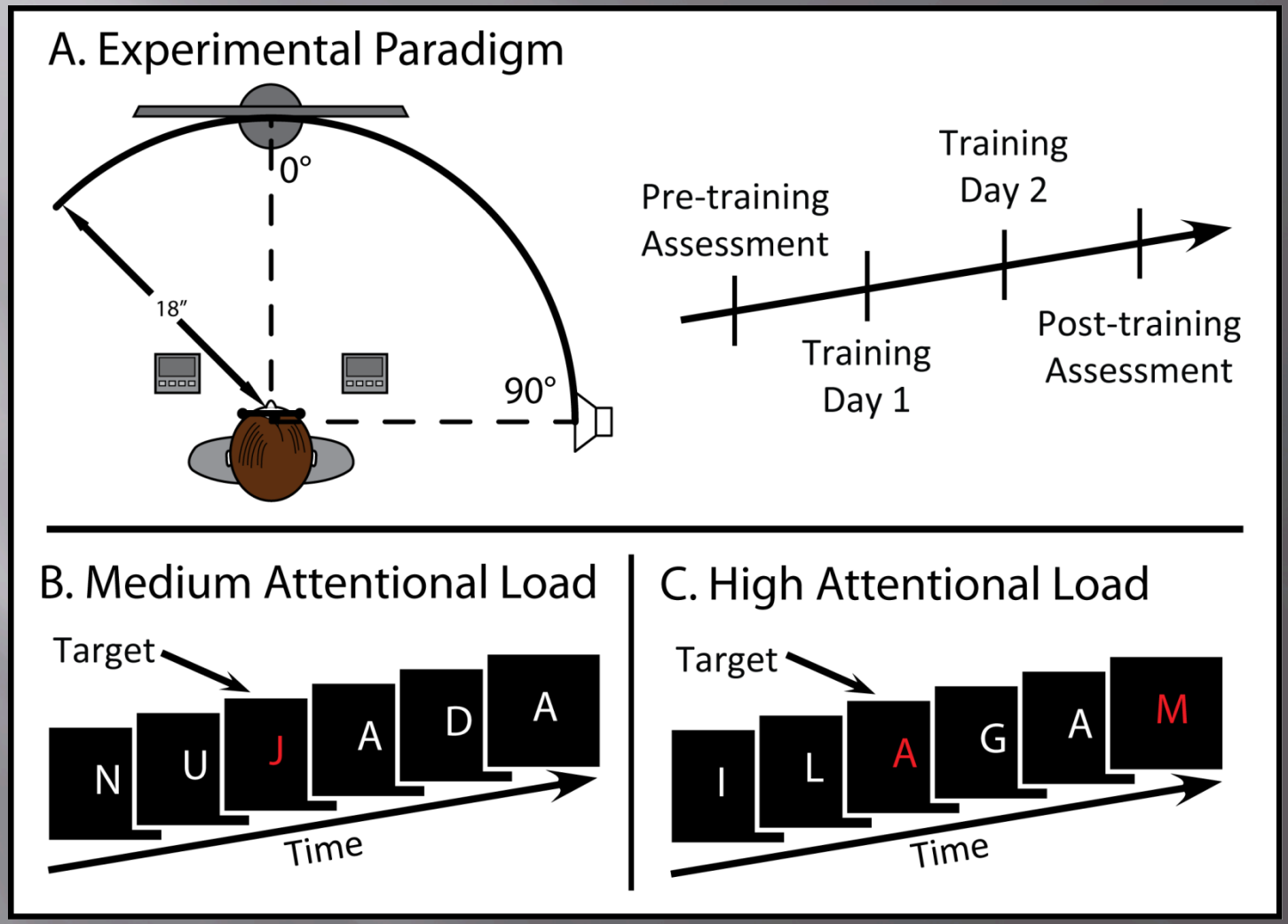
Example: Speech

Simultaneity Judgment



Window Size Narrowing




A. Experimental Paradigm
0°
18″
90°
Pre-training Assessment
Training Day 1
Training Day 2
Post-training Assessment
B. Medium Attentional Load
Target
N
U
J
A
D
A
Time
C. High Attentional Load
Target
I
L
A
G
A
M
Time

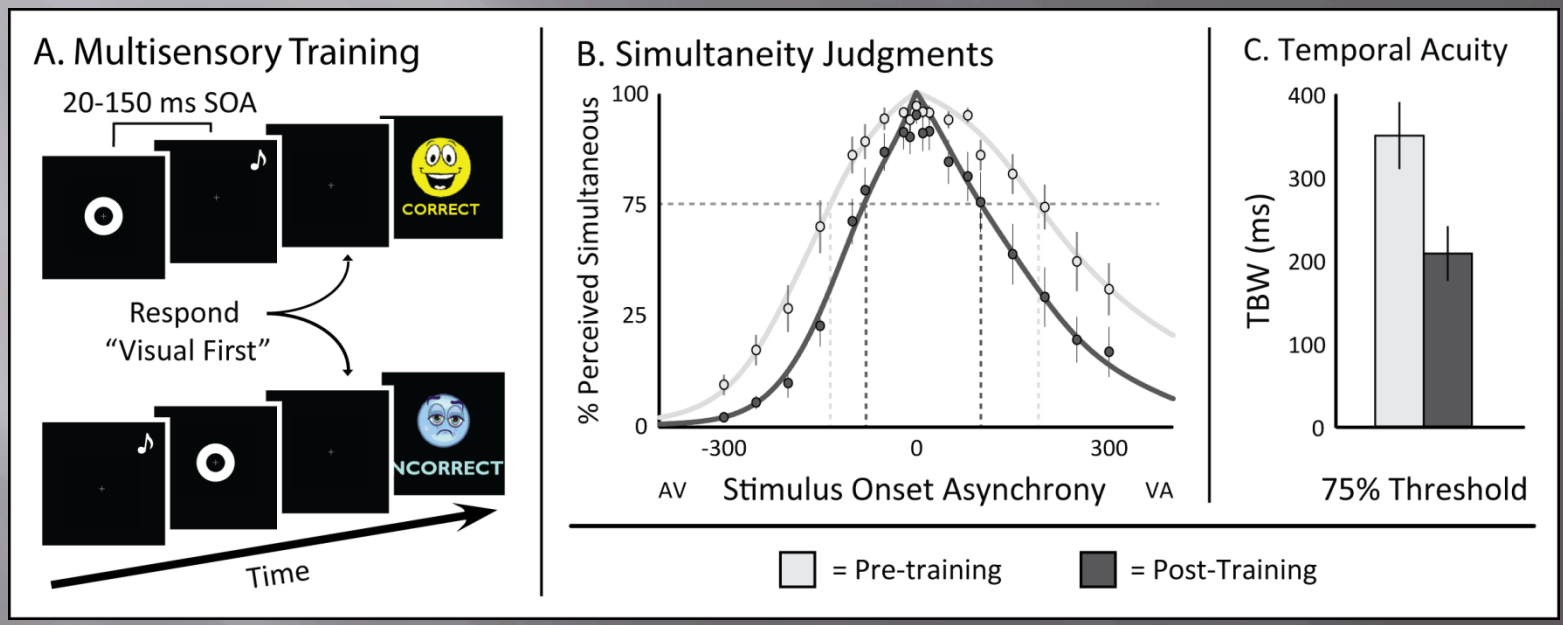
Pulse Oximetry

- Investigate perception of Pulse Oximetry
  - Pitch/frequency
  - Under different attentional loads
  - Across levels of experience

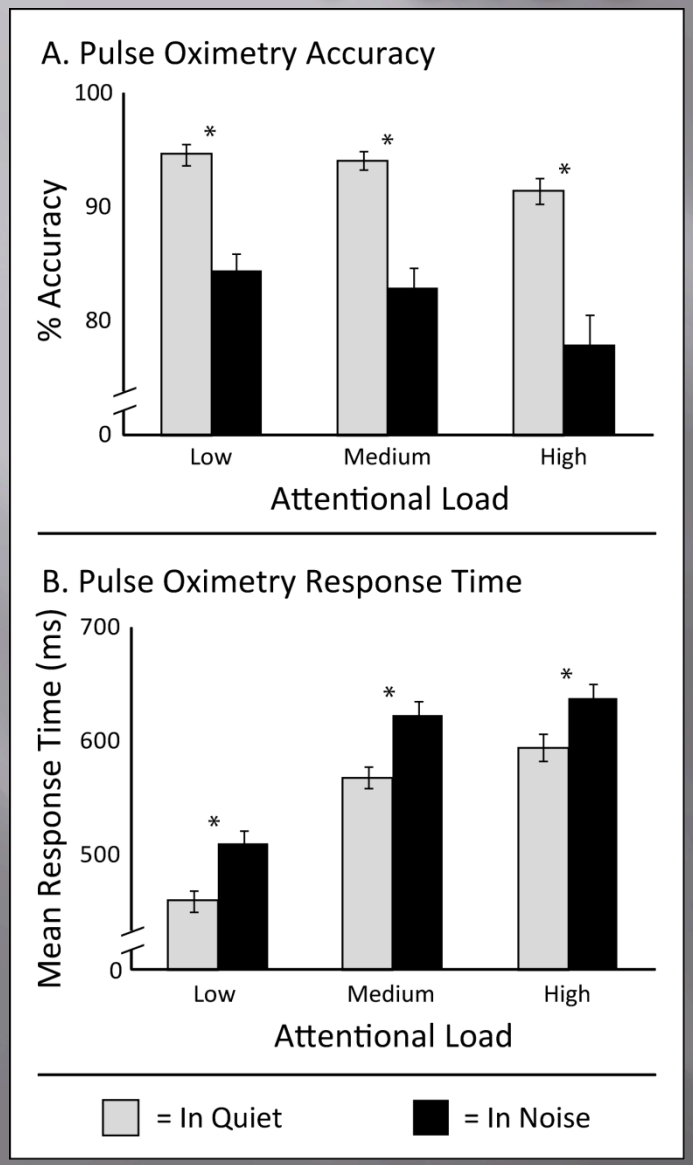
- 100 ms, sine-wave gated pure tone beeps at levels matching the 99% and 98% arterial oxygen saturation levels on a Philips patient monitor (Model MP70) at a rate of 75 beats per minute

- 90% of the beeps (675) presented at the 99% saturation pitch and 10% at the 98% saturation pitch (75), for a total of 750 trials lasting 10 minutes

TBW Narrowing



Pulse Ox – Baseline



Accuracies -

attentional load (F =11.90, p = 4.43e^{-5})

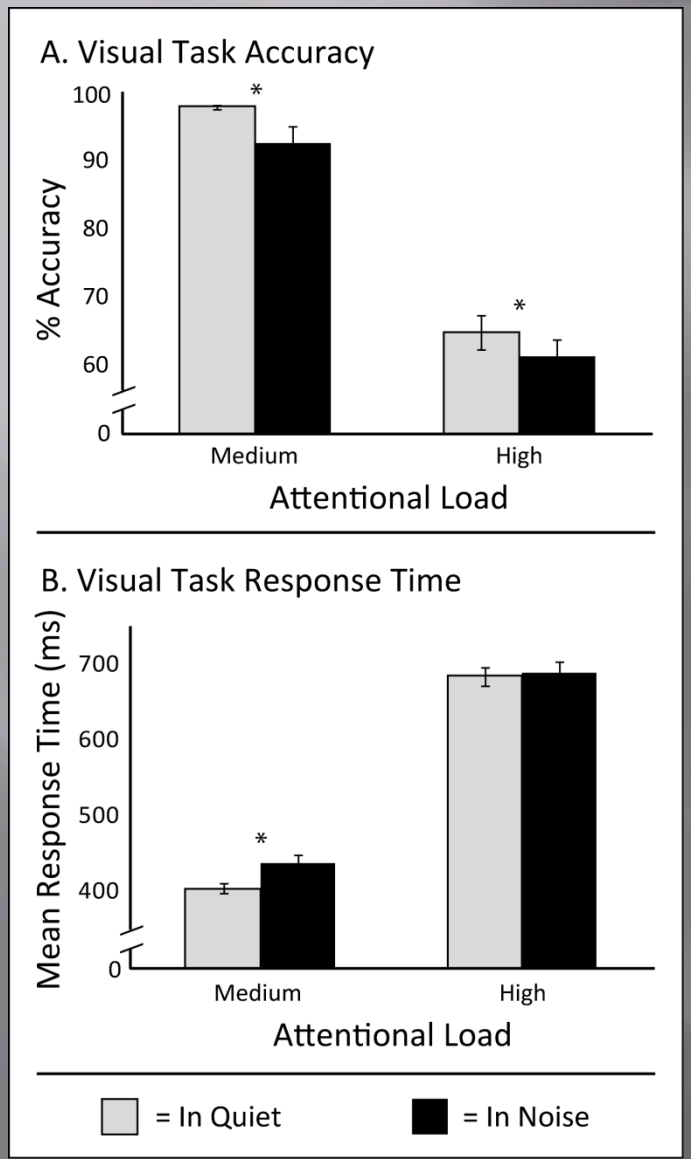
noise level (F = 56.51, p = 2.22e^{-8})

Reaction/Response Times -

attentional load (F = 123.86, p < 1.00e^{-15})

noise level (F = 56.45, p = 2.24e^{-8})

Pulse Ox – Visual Task Baseline



Accuracies –

attentional load (F = 168.46, p =7.67e^{-14})

noise level (F = 7.64, p = 0.01)

Reaction/Response Times –

attentional load (F = 462.91, p < 1.00e^{-15})

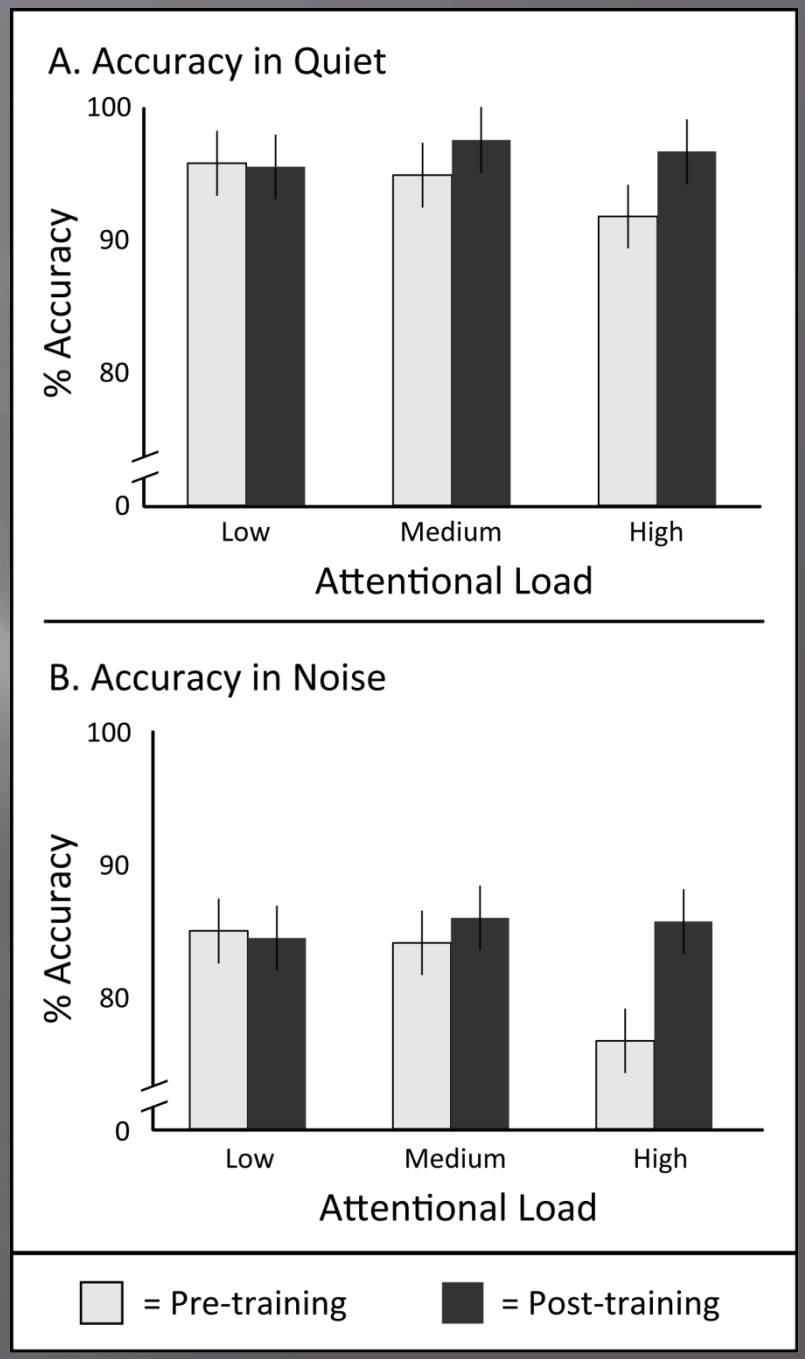
noise level (F = 4.04, p = 0.053)

Accuracy – Main effects of:

attentional load ($p < 0.02$, $F_{(2,14)} = 5.16$)

noise ($p < 0.0001$, $F_{(1,14)} = 27.29$)

training ($p < 0.04$, $F_{(1,14)} = 5.34$)

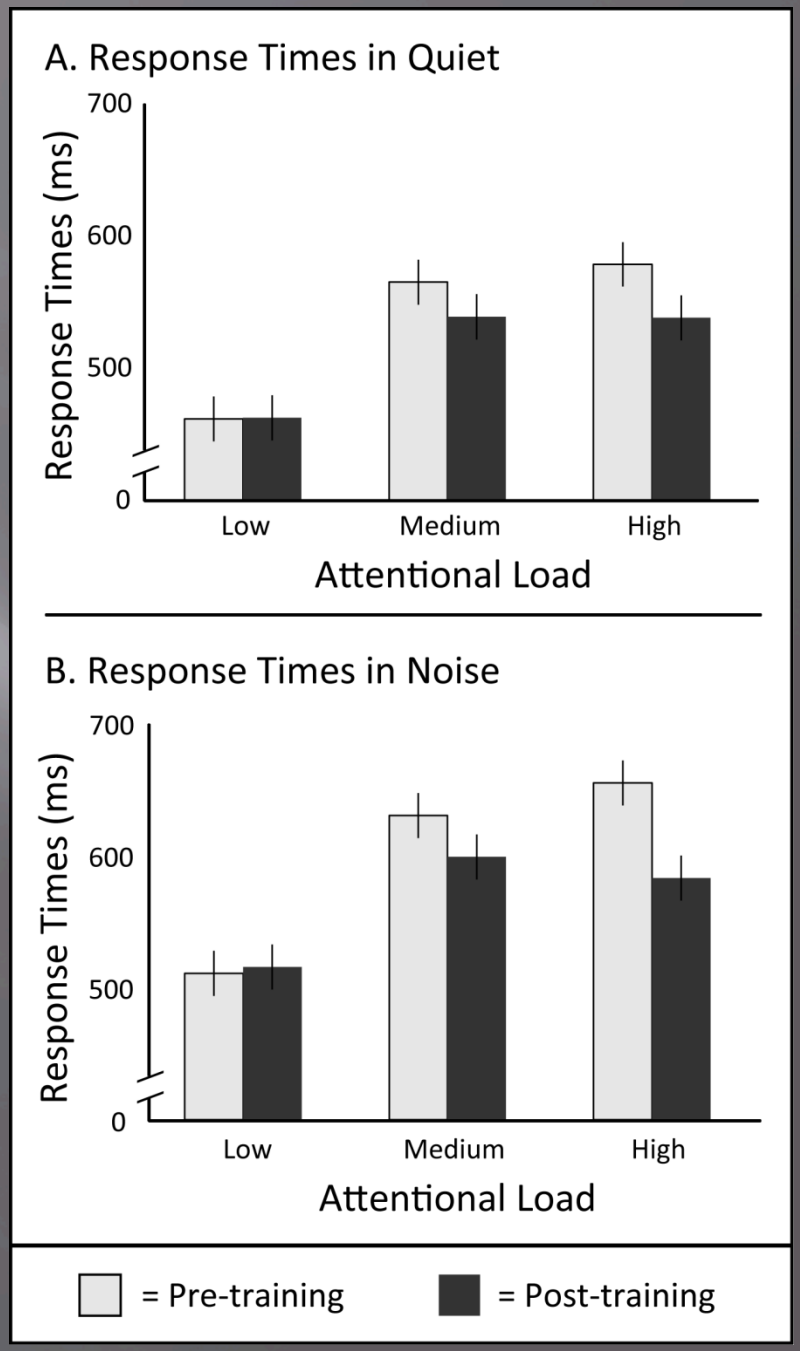


Reaction Times - Main effects of:

attentional load ($p < 1.00e^{-20}$, $F_{(2,14)} = 83.06$)

noise ($p < 0.0001$, $F_{(1,14)} = 28.60$)

training ($p < 0.008$, $F_{(1,14)} = 9.81$)



Future Directions…