

# HOPPS: ANAM Reaction Time and Composite Outcome

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## Disclaimer

*Any opinions, findings and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the US Army or its subordinate activities.*

# HOPPS Methods

- Double-blind, sham-controlled randomized trial
- Active duty military, 3 months to 5 years after mTBI, with persistent symptoms
- Three arms:
  - Hyperbaric oxygen, 40 sessions, 1.5 ATA, 60 minutes, 100% oxygen
  - Sham chamber sessions, 1.2 ATA, room air
  - Local control, standardized testing, but no chamber intervention
- Symptom inventory, neuropsychological testing, and functional outcomes

# HOPPS Baseline Characteristics

- 72 participants (3 female)
- Army and Marine Corp (4 study sites)
- Mean age 31 years
- Mean 3 lifetime concussion events

Most recent mTBI 23 months prior to enrollment.

Outcomes were at baseline and 13 weeks.

# ANAM4

(Automated Neuropsychological Assessment Metric)

- Assesses general cognitive function in a number of domains relevant to TBI
- More accurate in differentiating brain injury than most traditional neuropsychological tests
- DoD sponsored and developed
- Computer based test
- Administered in HOPPS at baseline, after 20 and 40 chamber sessions



# Components of the ANAM

## Tests list

Sleepiness scale

Mood Scale

*Simple reaction time*

Code substitution

*Procedural reaction time*

Mathematical processing

Matching to Sample

Code substitution-delayed

*Simple reaction time-delayed*

## Domain /Function

Fatigue

Mood State

*Basic neural processing*

Associative Learning

*Processing speed*

Working memory

Visual Spatial Memory

Memory delayed

*Basic neural processing*



**Simple Reaction Time:** A series of \* symbols is presented on the display. The user pushes a button as quickly as possible each time the \* appears.



**Procedural Reaction Time:** A dot matrix number is presented. The user presses the right or left mouse button to indicate whether the number is "low" (2 or 3) or "high" (4 or 5).



# Mean [95% CI] SRT and PRT Throughput (correct responses per minute) Standard Scores (mean 100, SD 15)

Test	Interval	Local Care (no chamber)	HBO2 (1.5 ATA)	Sham (1.2 ATA air)	Total
SRT	Baseline	85 [72,98]	79 [64,94]	85 [71,100]	83 [75,91]
	6 Weeks	76 [61,90]	80 [65,96]	87 [73,100]	81 [73,89]
	13 Weeks	70 [55,85]	81 [66,97]	87 [73,101]	80 [71,88]
PRT	Baseline	86 [74,97]	81 [68,94]	87 [76,99]	84 [78,91]
	6 Weeks	88 [75,100]	90 [77,102]	94 [82,106]	91 [84,97]
	13 Weeks	81 [68,94]	88 [76,100]	79 [65,92]	83 [76,90]

Range of individual scores:

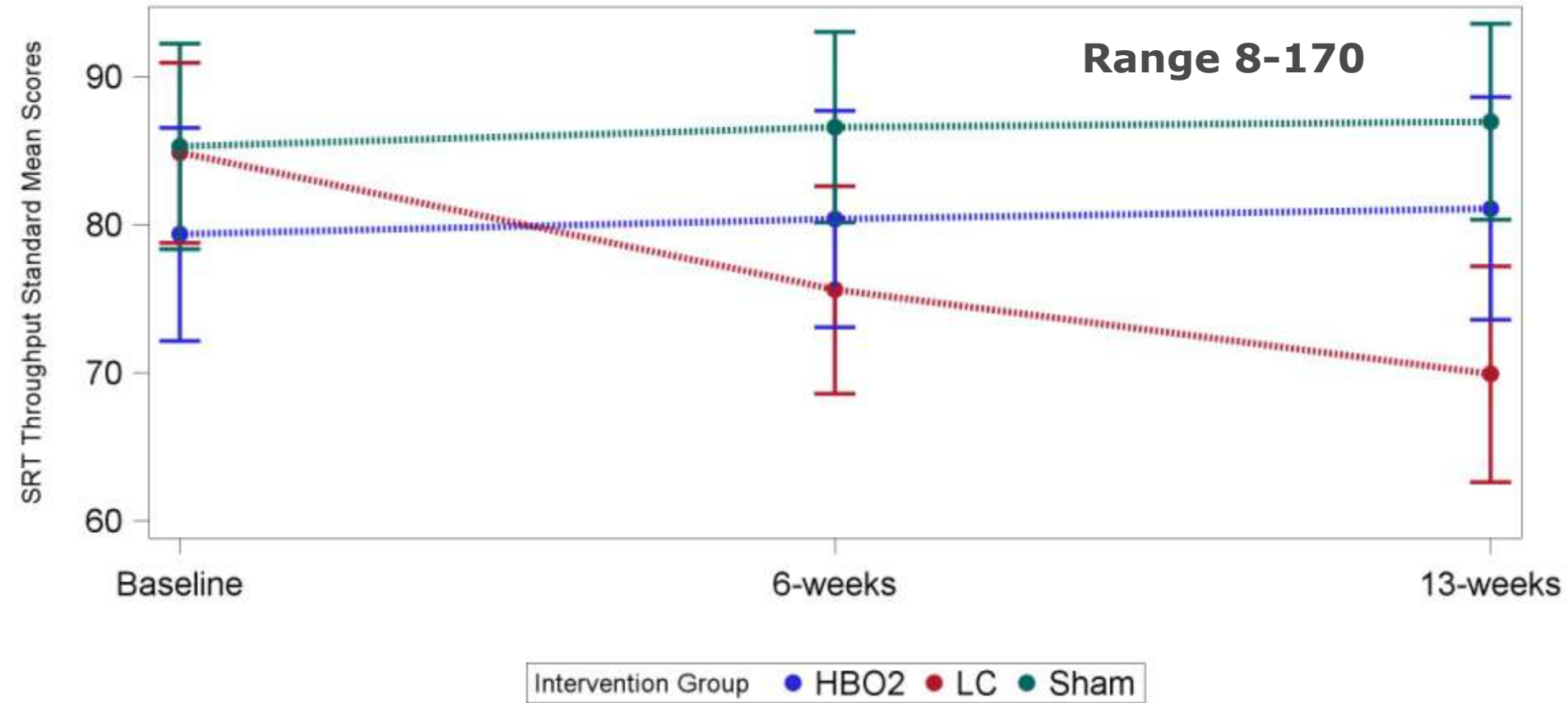
SRT: 8-170

PRT: 23-141



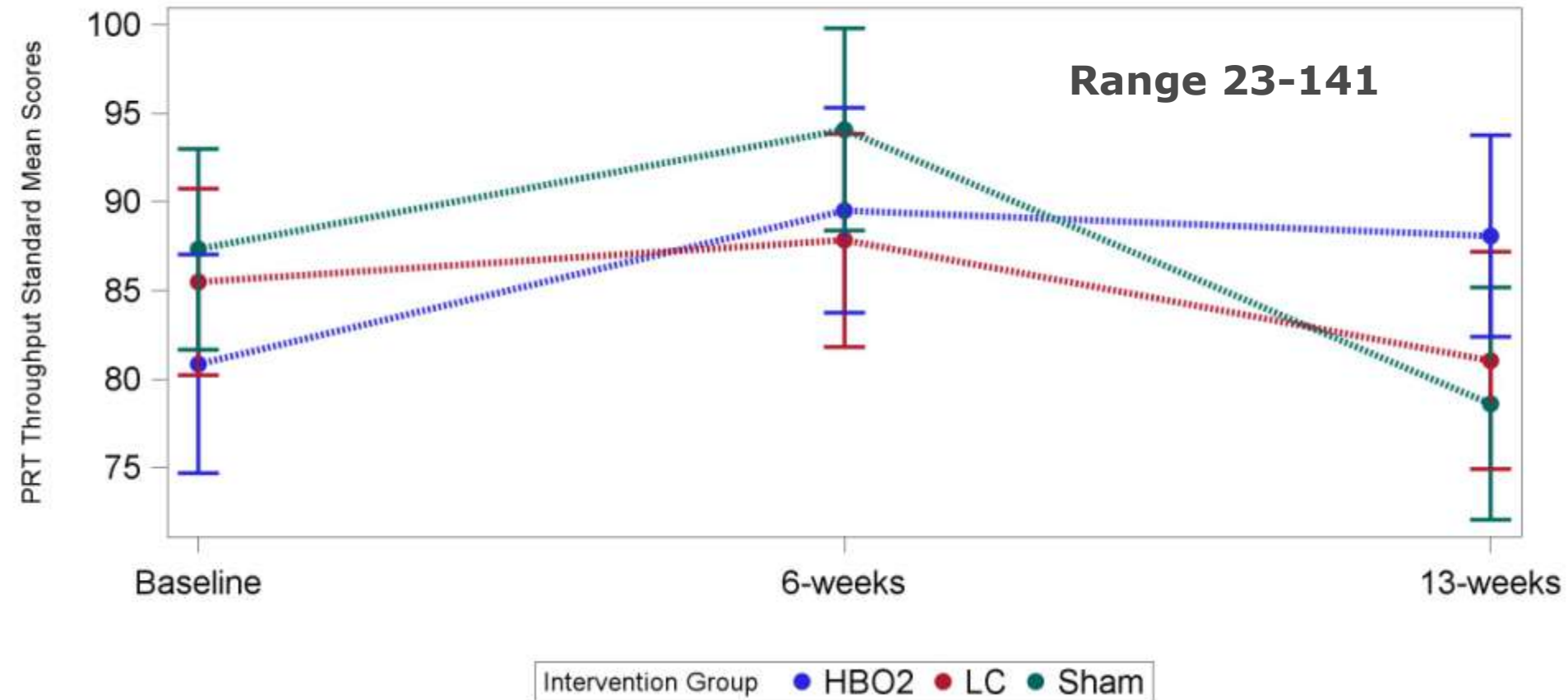
## ANAM SRT Score with Standard Error Bars

Range 8-170

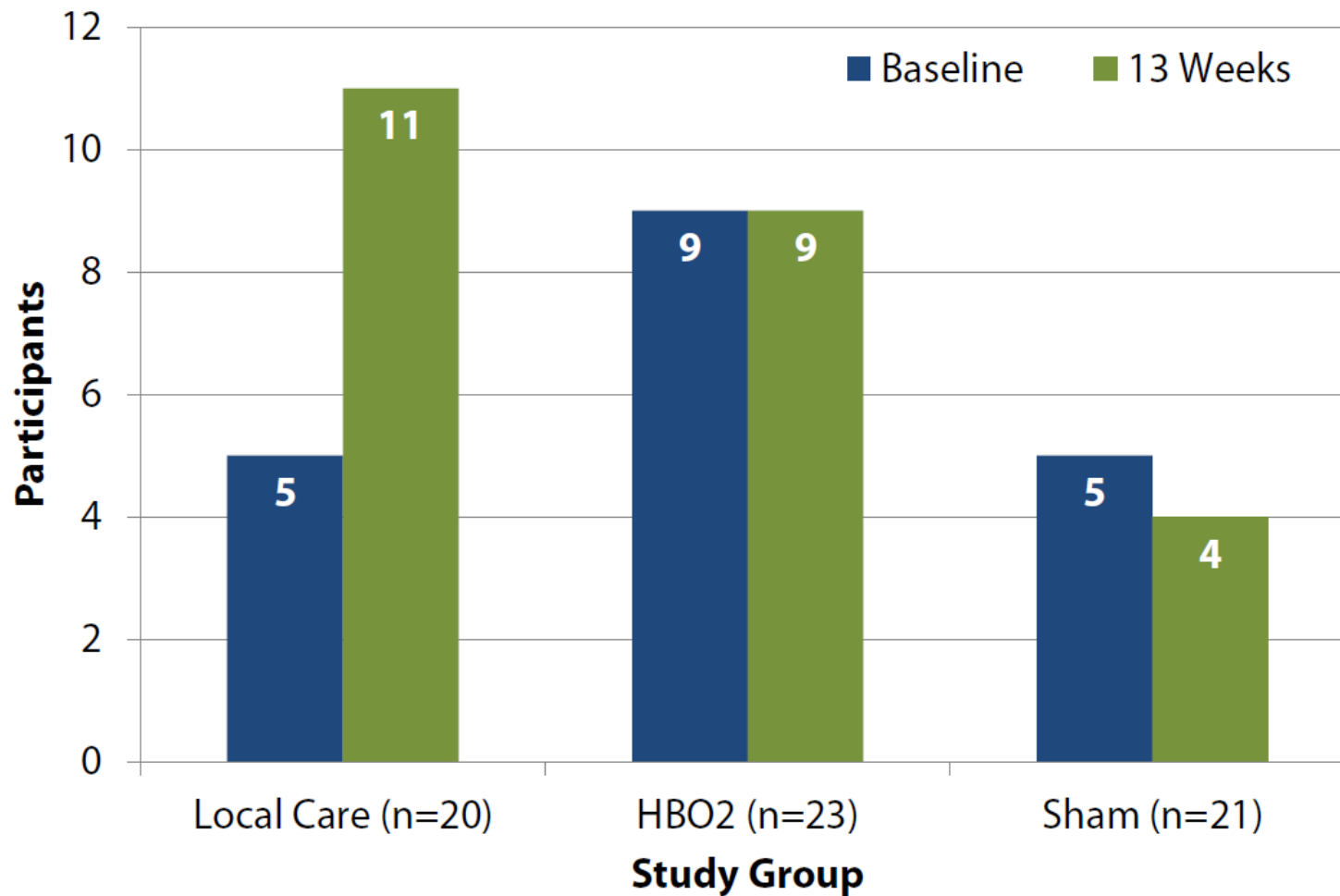


## ANAM PRT Score with Standard Error Bars

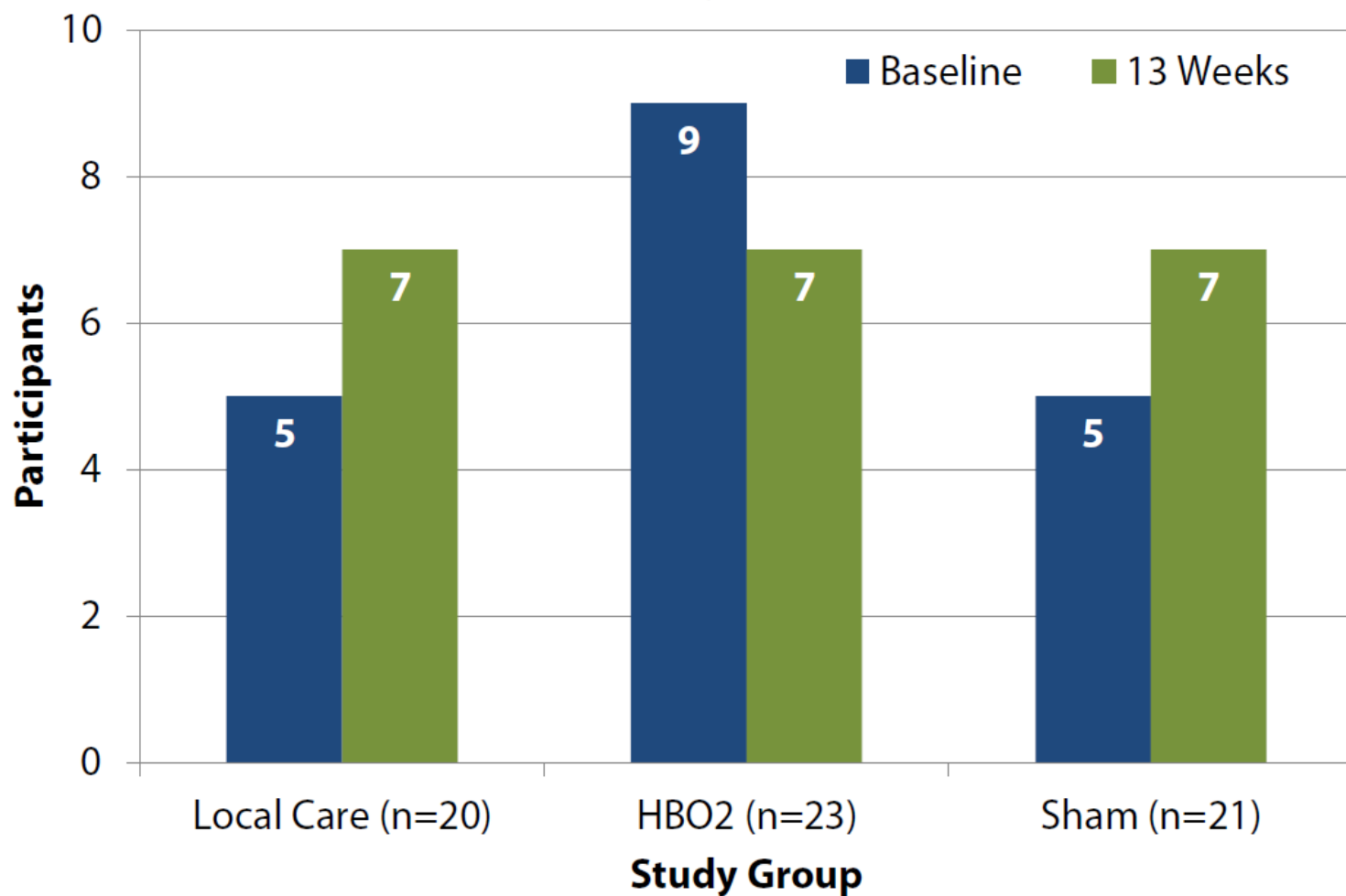
Range 23-141



**Simple Reaction Time:  
Participants meeting "Clearly Impaired" Criteria ( $SS \leq 70$ )**



**Procedural Reaction Time:  
Participants meeting "Clearly Impaired" Criteria ( $SS \leq 70$ )**



# Conclusion

- Group mean standard scores were below average
  - Underlying SRT and PRT dysfunction
  - Comparable across groups at baseline
- SRT: no change in HBO<sub>2</sub> or sham groups, decrease in local care across time
- PRT: local care and sham scores fell, and for HBO<sub>2</sub> the scores went up, yet no statistical difference between groups.