



Neurocognitive assessments in emergency care environments are valid

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Military Health System Research Symposium

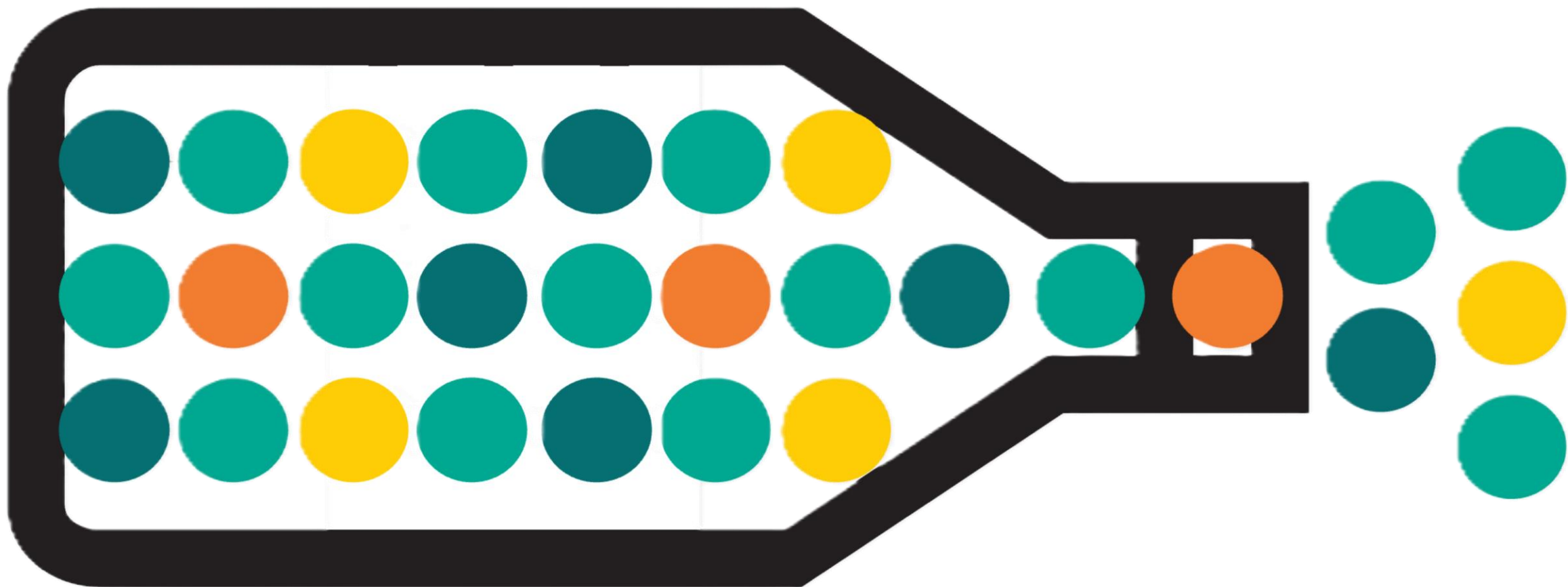
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Disclosures

- No conflicts to report



Important bottleneck in the most rapid development of ASR interventions for warfighters is lack of ability to screen and validate candidate interventions in military-relevant environments, at high-throughput and low cost



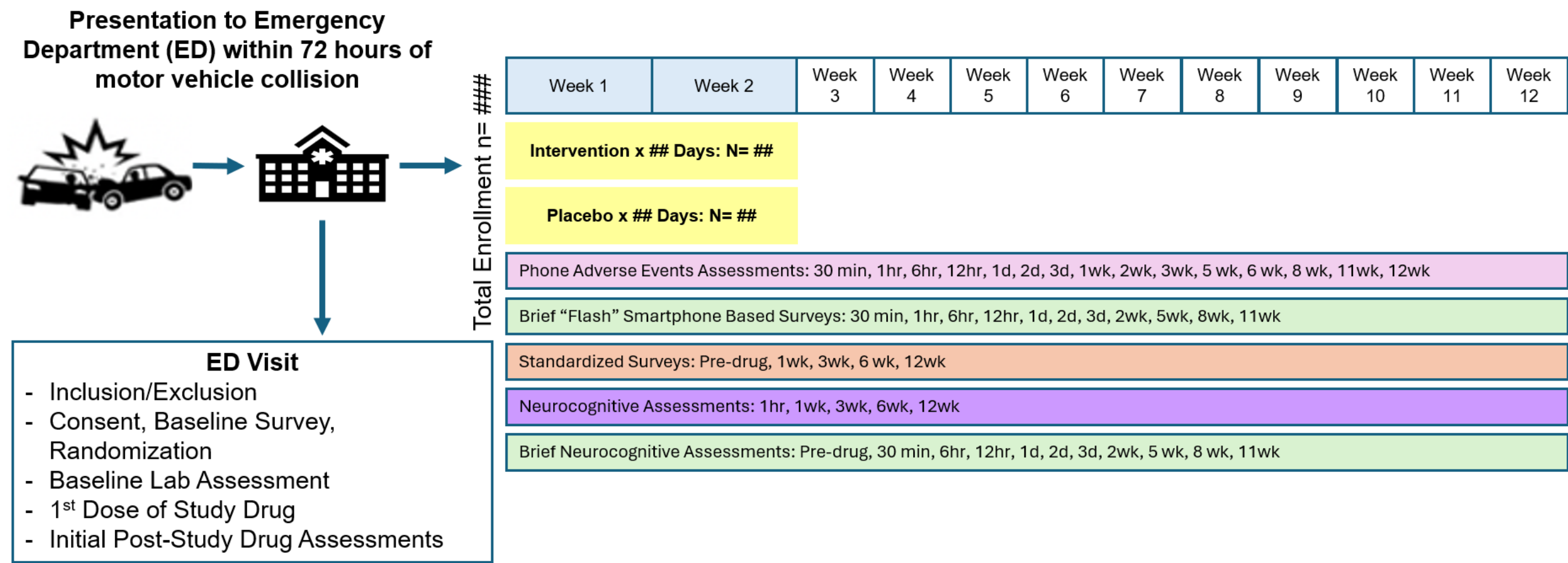


AURORA Research Network



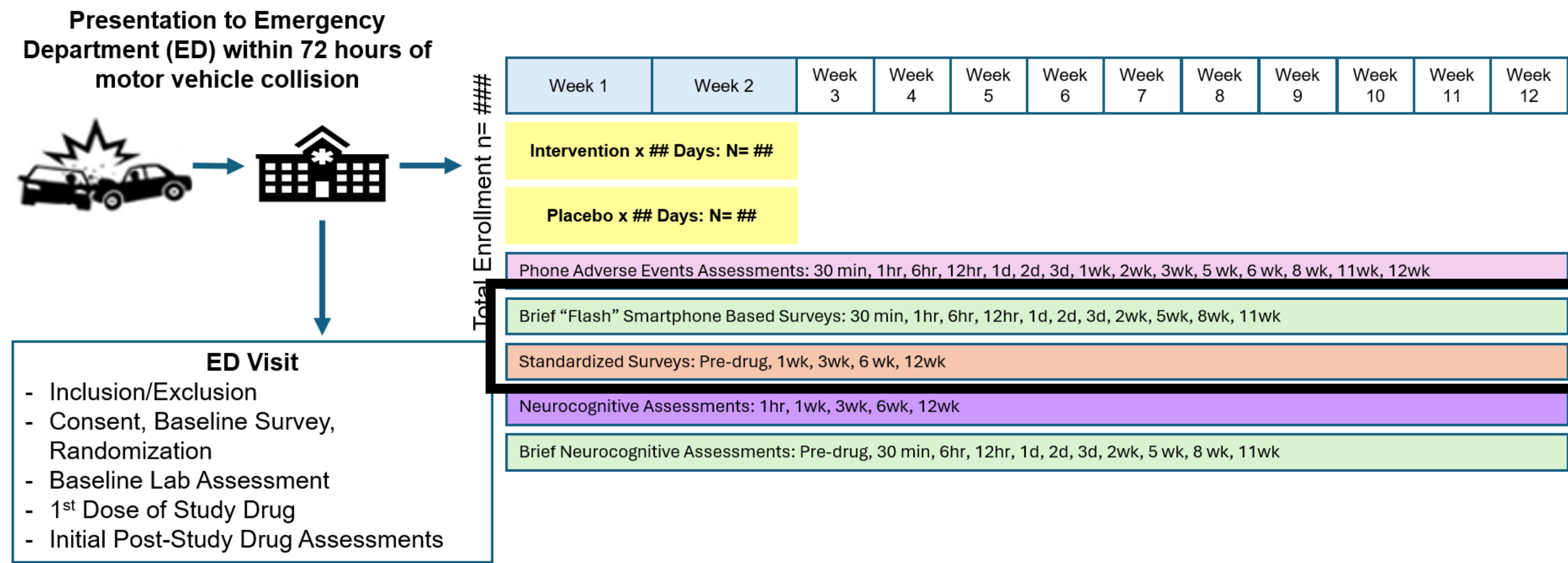
- > 20 U.S. ED trauma centers
- Enrolls trauma survivors experiencing ASRs into intervention trials
- Interventions (e.g., psychological, medication) initiated in the hours, days, or weeks after trauma depending on intervention type/goal

Common platform assessment battery across interventions to maximize comparability



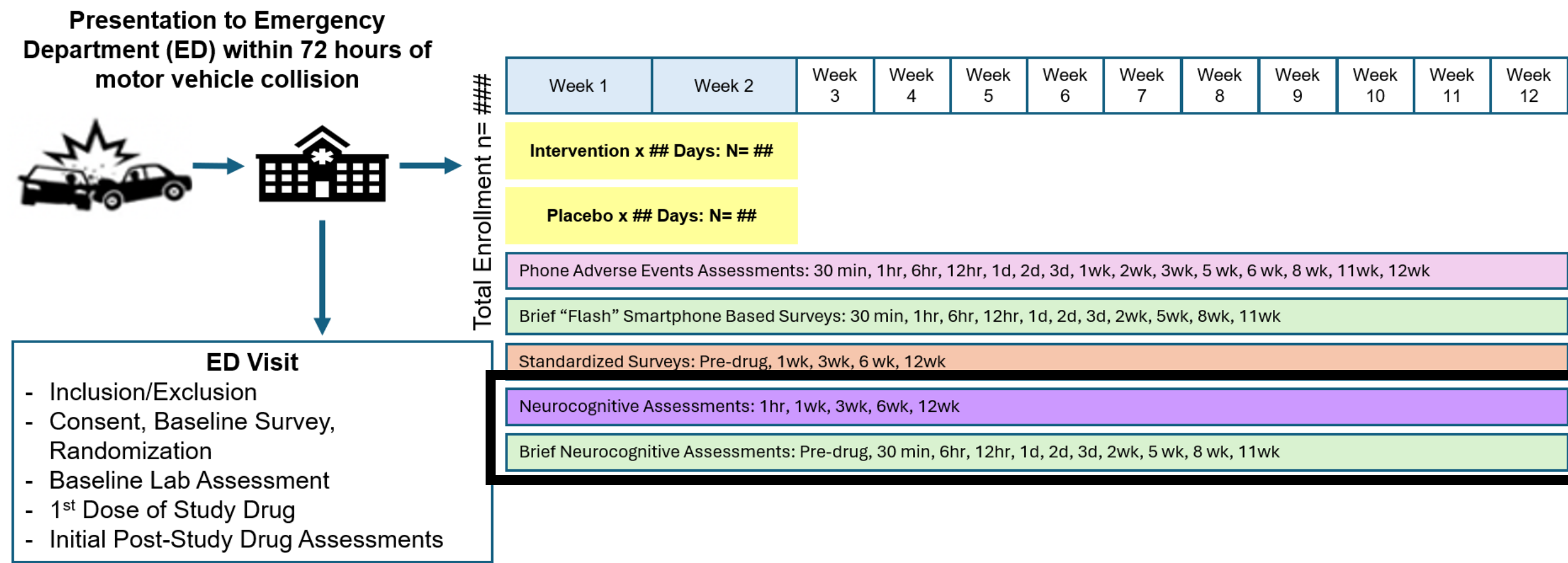
Current interventions being tested: sublingual dexmedetomidine, sublingual cyclobenzaprine, IM ketamine, IM hydrocortisone, IM morphine, transcutaneous vagal nerve stimulation, written exposure therapy, behavioral therapy for sleep, iCOVER

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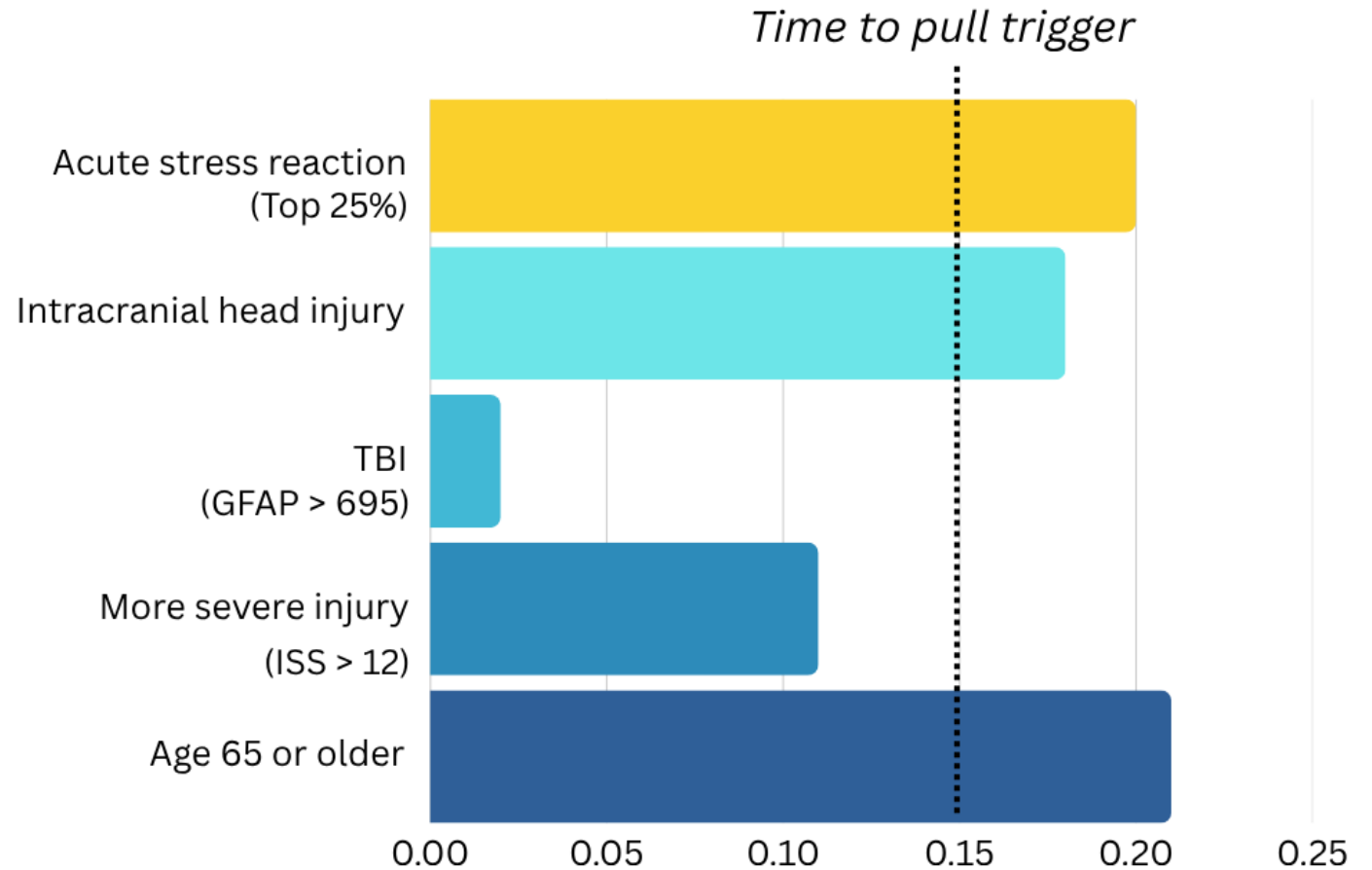
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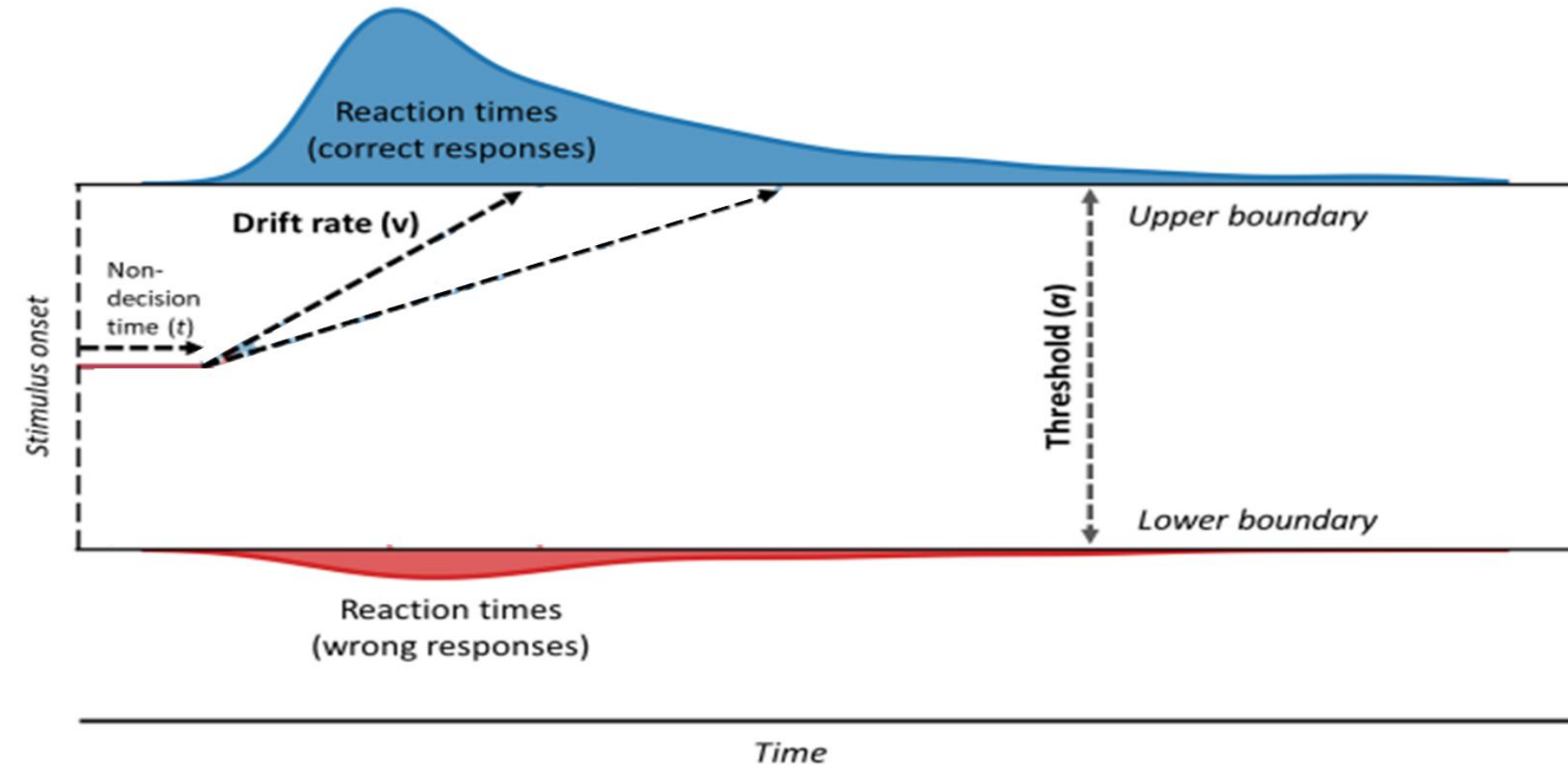
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***ASRs markedly
reduce information
processing speed,
and reaction times that
are critical for lethality***

Slowing in reaction times (measured in seconds)



Drift Diffusion Model (DDM)



What are the underlying processes that led to the response (speed, accuracy)?

Drift Diffusion Model (DDM)

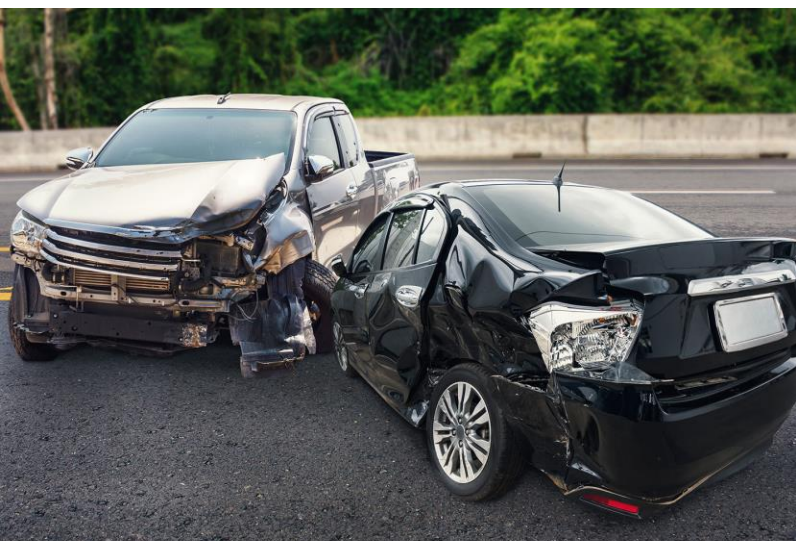
Drift rate: *Speed and quality of information processing*

Threshold: *Amount of information required to make a decision*

Non-decision time: *Other aspects that affect reaction time (e.g., motor speed)*

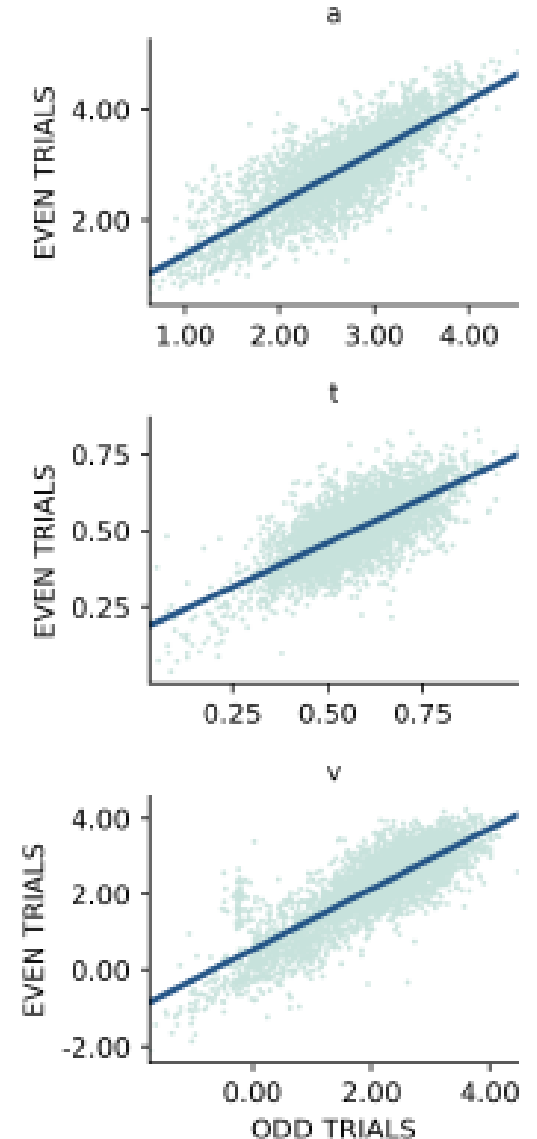
Method:

- Civilian trauma survivors (n = 3,826, 75% motor vehicle collision) using AURORA Research Network
- Completed cognitive tasks:
 - In emergency department
 - 24-48 hours post-enrollment
 - Multiple follow-ups (monthly, then quarterly)



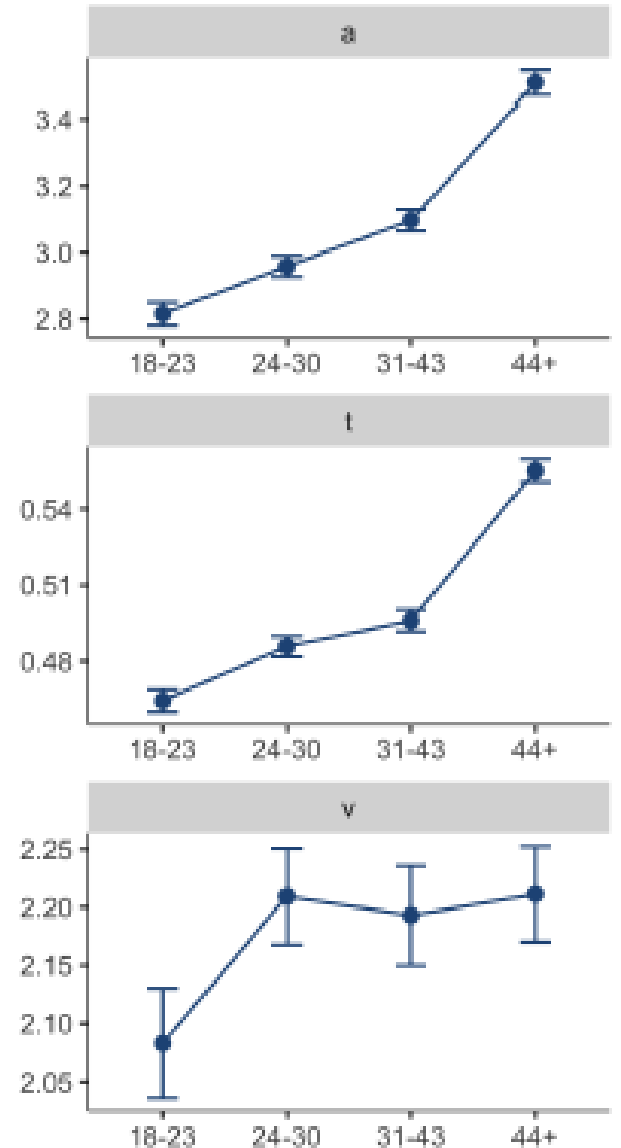
DDM processes are reliable

- Split-half reliability for all three DDM processes had strong internal reliability.
 - Information processing (“drift rate”): .90
 - Amount of information (“threshold”): .89
 - Other aspects of performance: .84



We see expected age and practice effects

- Cognitive efficiency (v) increased into early adulthood, then plateaued
- Older adults showed more cautious responding (a) and slower motor movements (t)
- Repeated testing reduced cautious responding (a) and led to faster responses (t)



Acute and chronic stress reactions disrupt specific decision processes

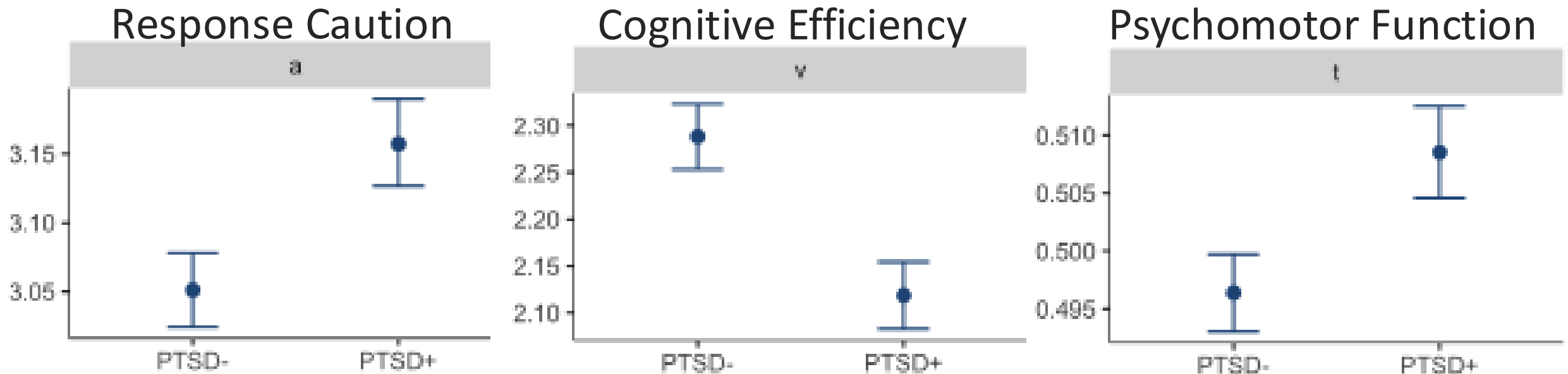
- Acute stress reactions impaired the ability to make efficient, accurate decisions*, even when responding more cautiously*
 - *Reduced performance among those with ASRs reflected specific cognitive changes; not simply inattention or careless responding*
- Decision quality remained impaired through 2 months ($p_s < .0001$)

* 95% Bayesian credible interval excluded 0



Brief cognitive assessments administered soon after trauma may have value as objective biomarker for PTS risk.

DDM-derived processes from the ED predicted 12-month PTSD diagnosis:



In conclusion:

- Brief, web-based cognitive assessments provide rapid, reliable, scalable measures of mission-critical cognition
- DDM identifies specific cognitive processes underlying changes in warfighter performance
 - Support triage, readiness assessment, return-to-duty decisions, and mechanism-based interventions among service members
- AURORA Research Network provides an established platform to rapidly evaluate neurocognitive biomarkers, interventions, and outcomes in operationally-relevant populations

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