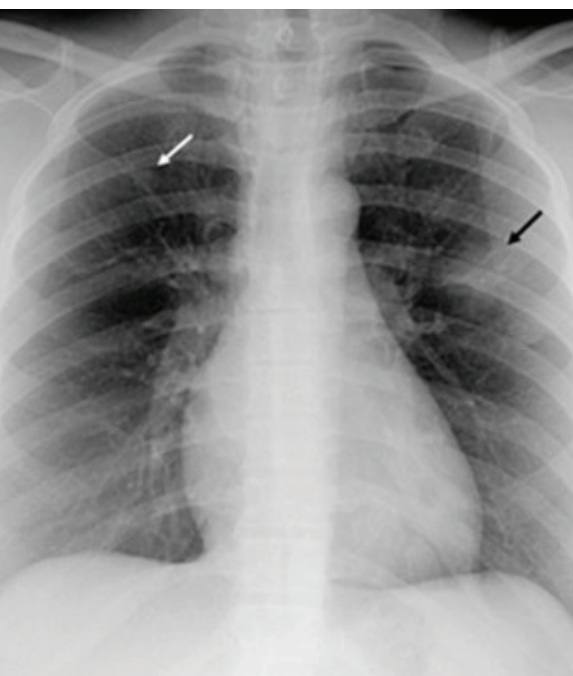


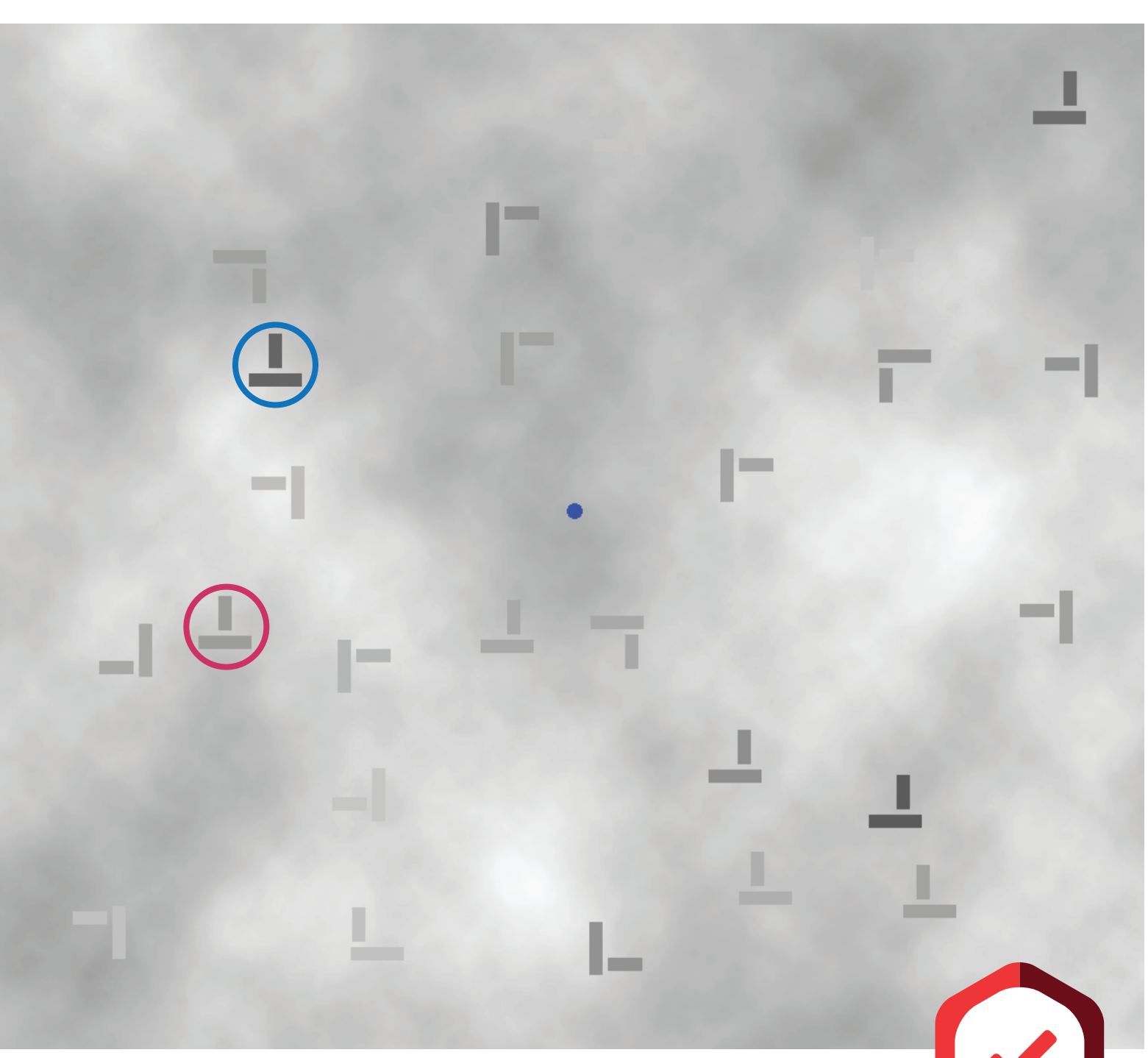
Background

- Associations between visual search performance and individual differences in traits and abilities rapidly emerging (Wagner et al., 2024)
- Test-retest (T-RT) reliability: consistency at distinguishing individual's performance over time
 - Good reliability essential to explore individual differences (Clark et al., 2022; Hedge et al., 2018)
 - T-RT reliability of multiple-target search (MTS) and associated measures/eye tracking unknown
- MTS significant for practically important tasks, e.g., radiology
 - MTS produces subsequent search miss (SSM) effect - decrease in second-target accuracy (Cain et al., 2014; Fleck et al., 2010)



Participants and testing

- Participants: 75 psychology undergraduates; 63 women; mean age = 20 years
- Multiple-target search task: Search for target 'T' amongst distractor 'L's; click with mouse within 15-second time limit
 - No-, single- and dual-target trials
 - High- and low-salience targets
- Eye-tracking: EyeLink 1000 Plus (SR Research)
- Two testing sessions, separated by 1-3 weeks



High-salience (easy to spot) and low-salience (difficult to spot) targets

Test-retest reliability

Intraclass Correlation Coefficient (ICC) =
$$\frac{\text{Variance between individuals}}{\text{Variance between individuals} + \text{Error variance} + \text{Variance between sessions}}$$

ICC	Classification
0.8-1.0	Excellent
0.6-0.79	Good
0.4-0.59	Moderate
0.25-0.39	Fair
<0.25	Poor

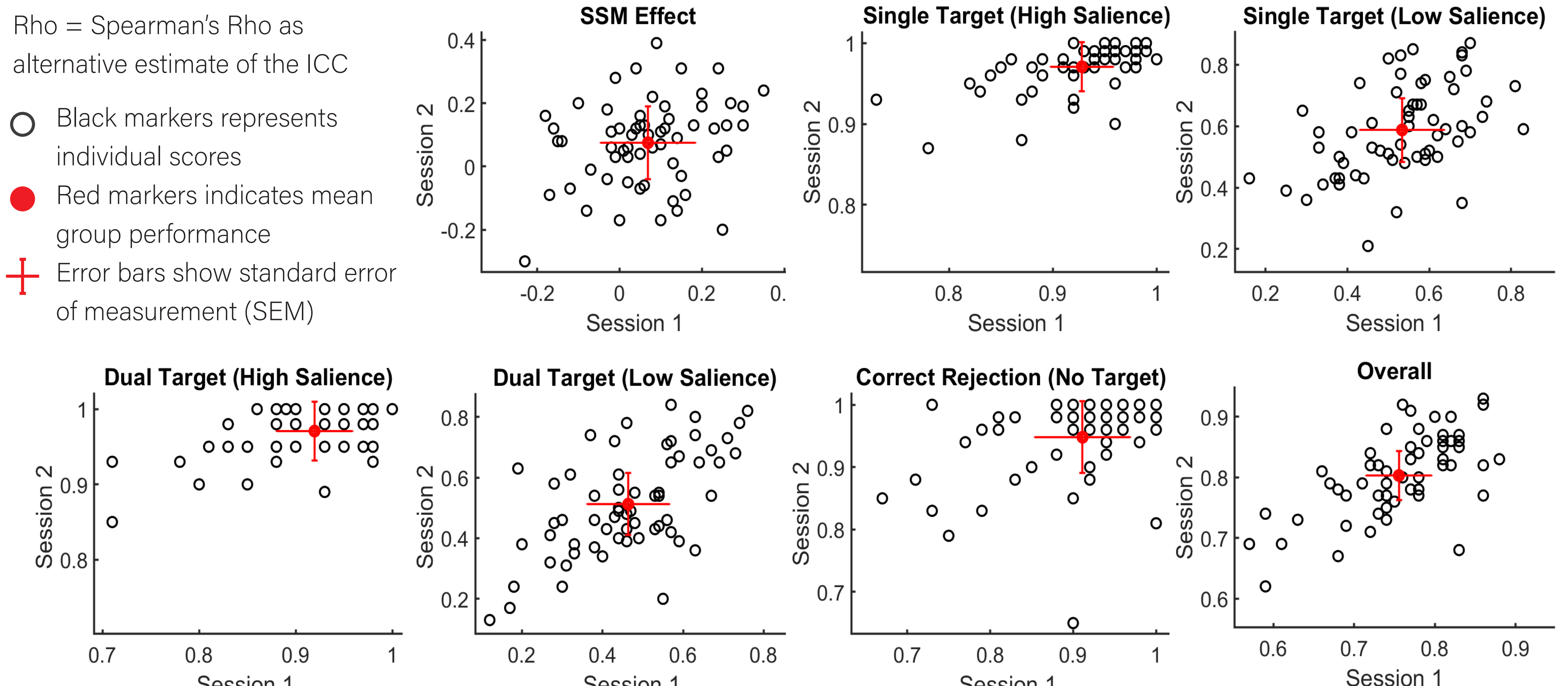
Measure	ICC	Rho
Accuracy (%)		
SSM effect	0.27	0.25
Single Target (High Salience)	0.36	0.67
Single Target (Low Salience)	0.45	0.50
Dual Target (High Salience)	0.34	0.52
Dual Target (Low Salience)	0.58	0.55
Correct Rejection (No Target)	0.38	0.49
Overall	0.53	0.62
Response Time (s)		
Single Target (High Salience)	0.63	0.75
Single Target (Low Salience)	0.53	0.59
Dual Target (High Salience)	0.61	0.71
Dual Target (Low Salience)	0.57	0.52
Correct Rejection (No Target)	0.74	0.79
Overall	0.72	0.76
Eye Tracking		
Fixation Duration (ms)	0.82	0.86
Fixation Count	0.80	0.78
Saccade Duration (ms)	0.52	0.80
Saccade Rate*	0.87	0.88
Saccade Amplitude (deg)	0.75	0.75
Initiation Time (ms)	0.77	0.83

*Number of saccades per second

Aim: Establish test-retest reliability of MTS accuracy, response time, and eye-tracking metrics

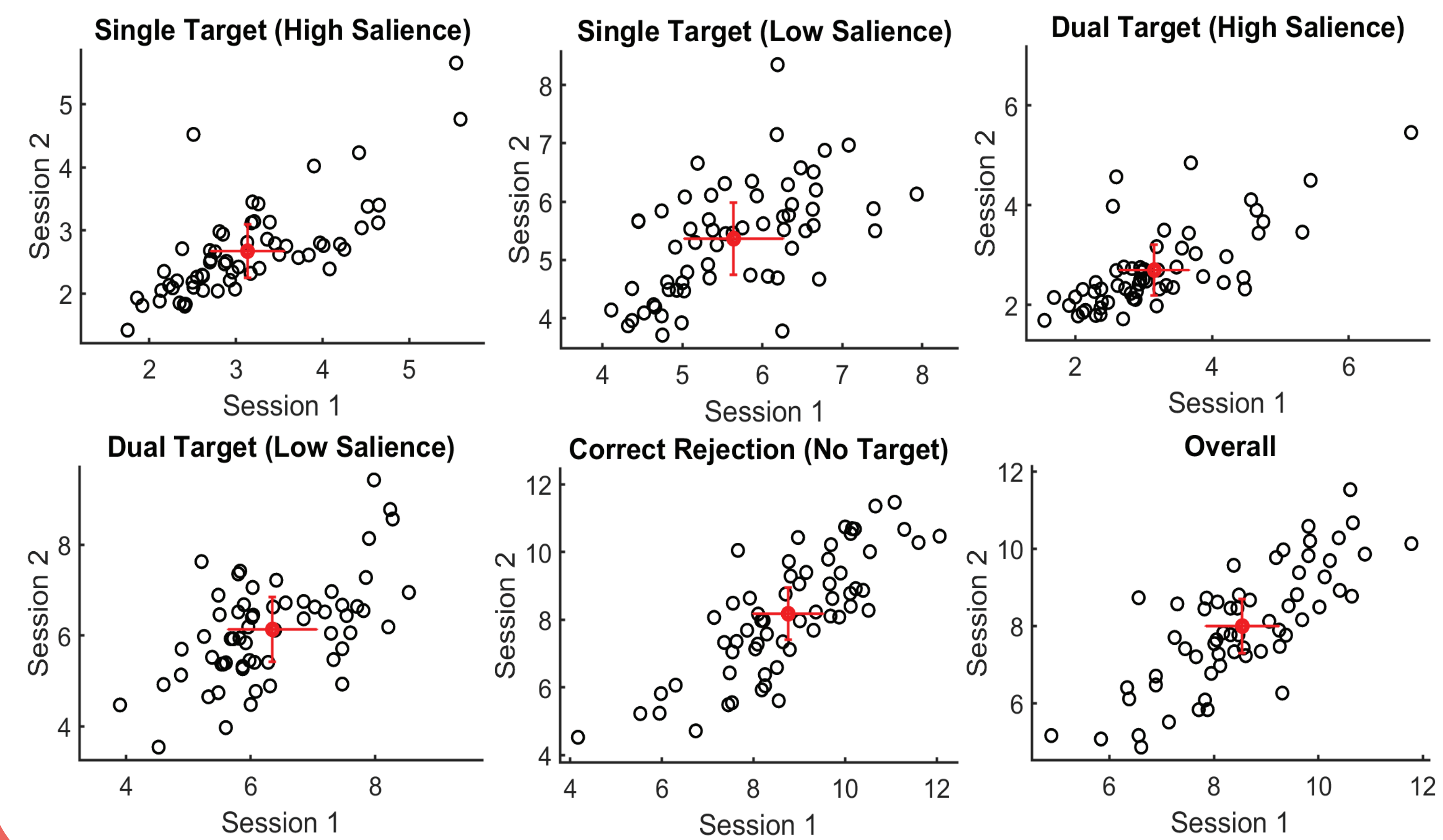
Rho = Spearman's Rho as alternative estimate of the ICC

- Black markers represents individual scores
- Red markers indicates mean group performance
- Error bars show standard error of measurement (SEM)

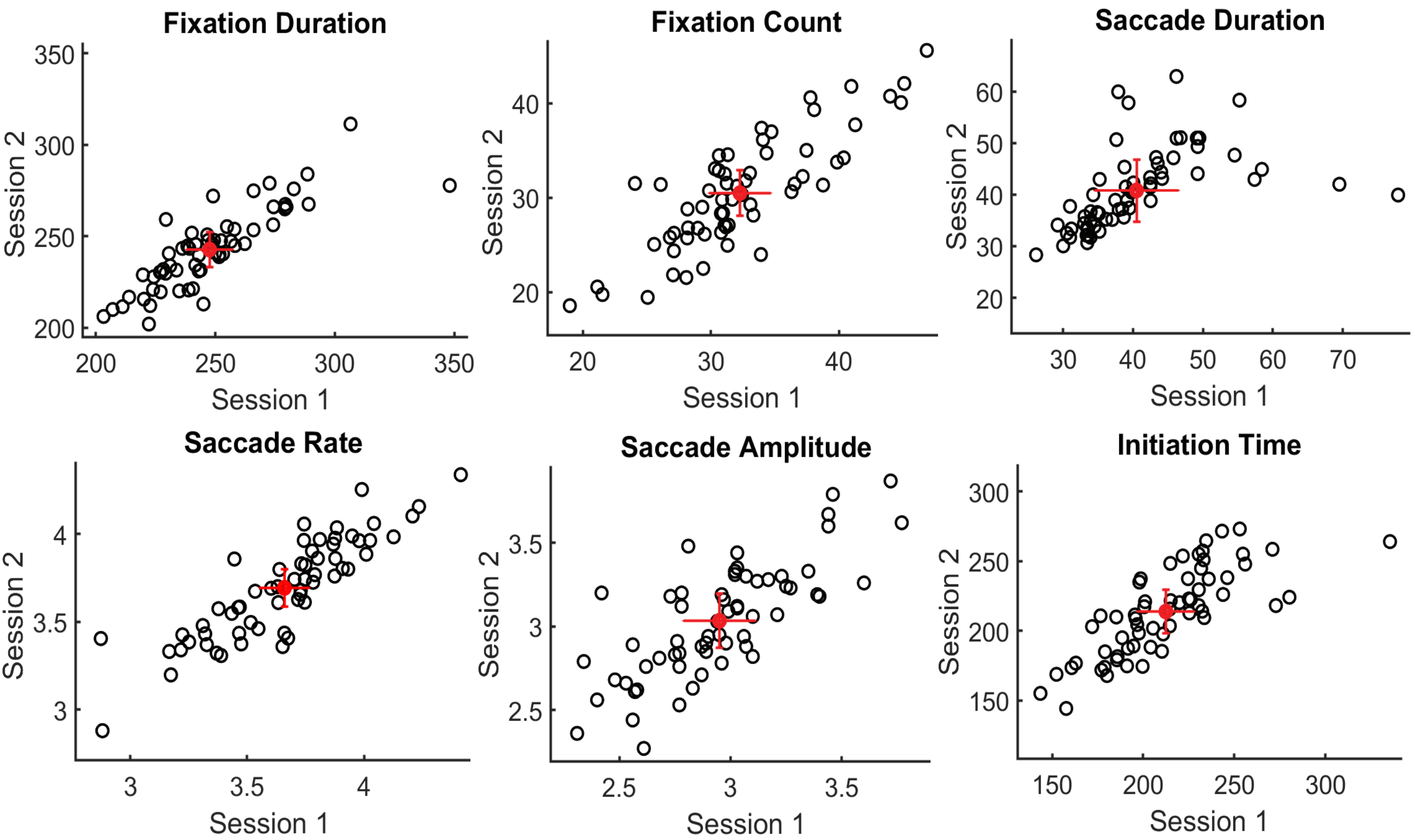


Accuracy measures

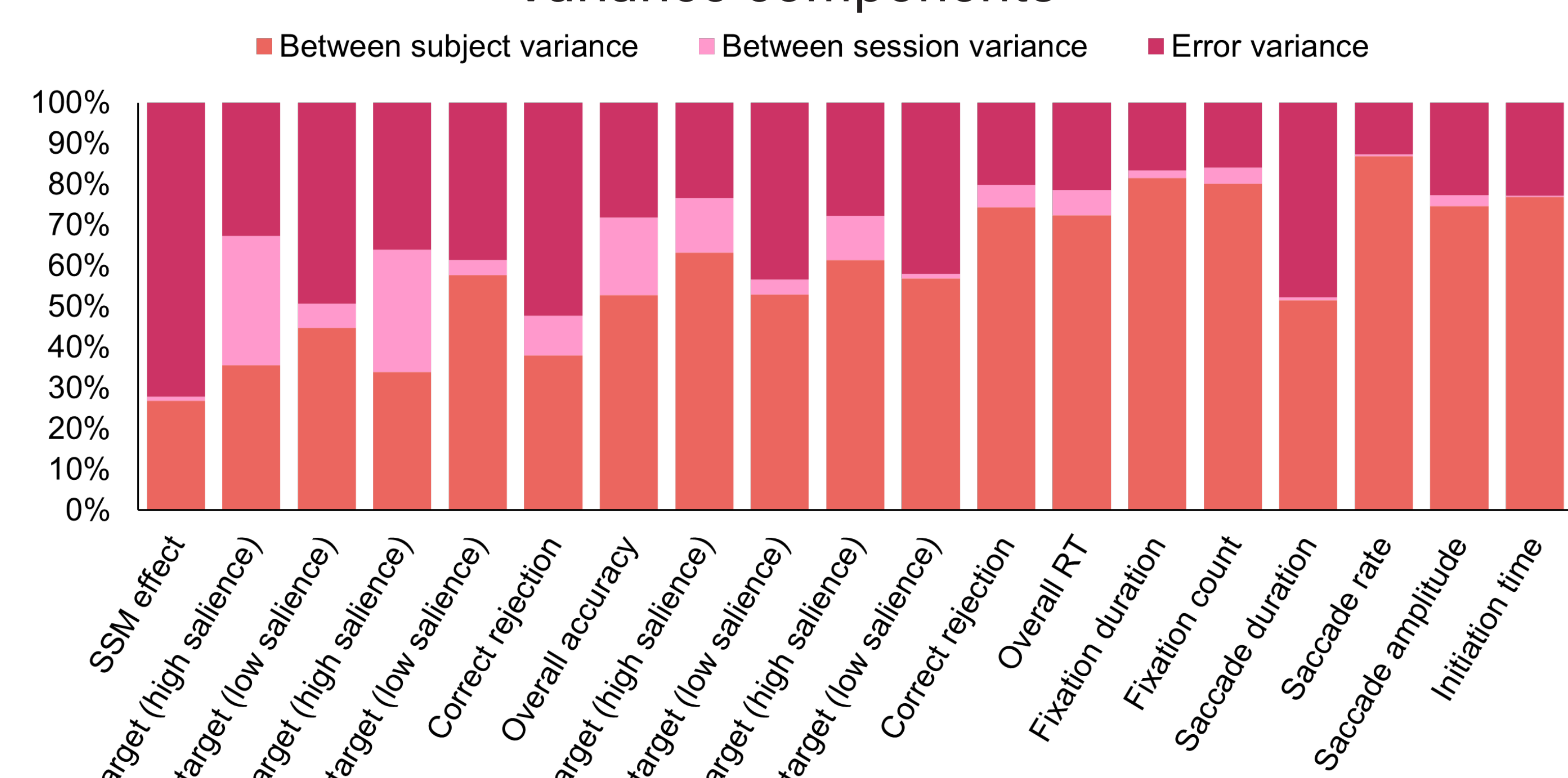
Response time measures



Eye-tracking measures



Variance components



High ICC = Greater between subject variance relative to between session variance and error variance

Summary and implications

- Some MTS performance measures are more reliable than others, and reliability is influenced by target salience (i.e., difficulty)
- MTS induces the SSM effect, but same measure is unable to reliably discriminate between individuals who are more or less susceptible to second-target misses
- Establishing individual differences in MTS serves theoretical and practical importance (Wagner et al., 2024)
- Take-home message: Can reliably discriminate between individuals based on search approach (search speed, eye movements), but outcome measures not as reliable
- Current work: Individual differences in MTS in laypersons (Birch-Hurst et al., 2023) and radiologists in training using eye tracking

Biggs, A. T., Clark, K., & Mitroff, S. R. (2017). Who should be searching? Differences in personality can affect visual search accuracy. *Personality and Individual Differences*, 116, 353–358. <https://doi.org/10.1016/j.paid.2017.04.045>

Birch-Hurst, K., Jones, A. M., Ong, A., Stoker, K. M., Smith, M. L., Zhang, W., & Clark, K. (2023, August). Predicting multiple-target search performance using eye movements and individual differences. Poster presented at European Conference on Visual Perception, Paphos, Cyprus.

Cain, M. S., Biggs, A. T., Darling, E. F., & Mitroff, S. R. (2014). A little bit of history repeating: Splitting up multiple-target visual searches decreases second-target miss errors. *Journal of Experimental Psychology: Applied*, 20(2), 112–125. <https://doi.org/10.1037/xap0000014>

Clark, K., Birch-Hurst, K., Pennington, C. R., Petrie, A. C. P., Lee, J. T., & Hedge, C. (2022). Test-retest reliability for common tasks in vision science. *Journal of Vision*, 22(8), 18. <https://doi.org/10.1167/jov.22.8.18>

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Hedge, C., Powell, G., & Sumner, P. (2018). The reliability paradox: Why robust cognitive tasks do not produce reliable individual differences. *Behavior Research Methods*, 50(3), 1166–1186. <https://doi.org/10.3758/s13428-017-0935-1>

Wagner, J., Zurlo, A., & Rusconi, E. (2024). Individual differences in visual search: A systematic review of the link between visual search performance and traits or abilities. *Cortex*, 178, 51–90. <https://doi.org/10.1016/j.cortex.2024.05.020>