

Modeling the dynamics of suspense

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Motivating question

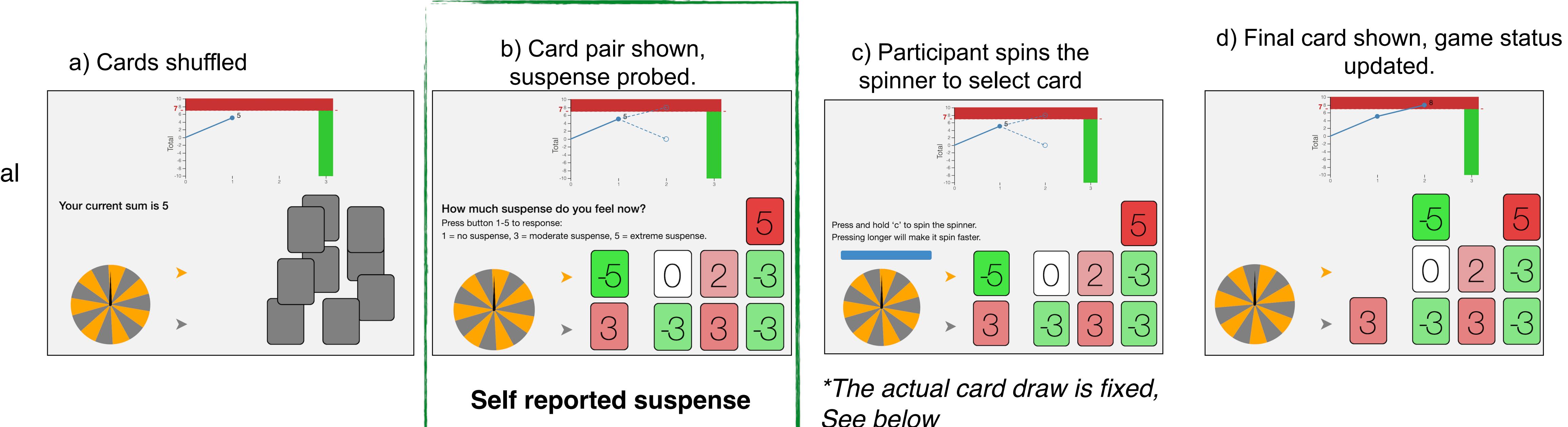
Question

- What makes some games more engaging than others?
- What makes certain moments in a game, movie, or story more engaging than others?



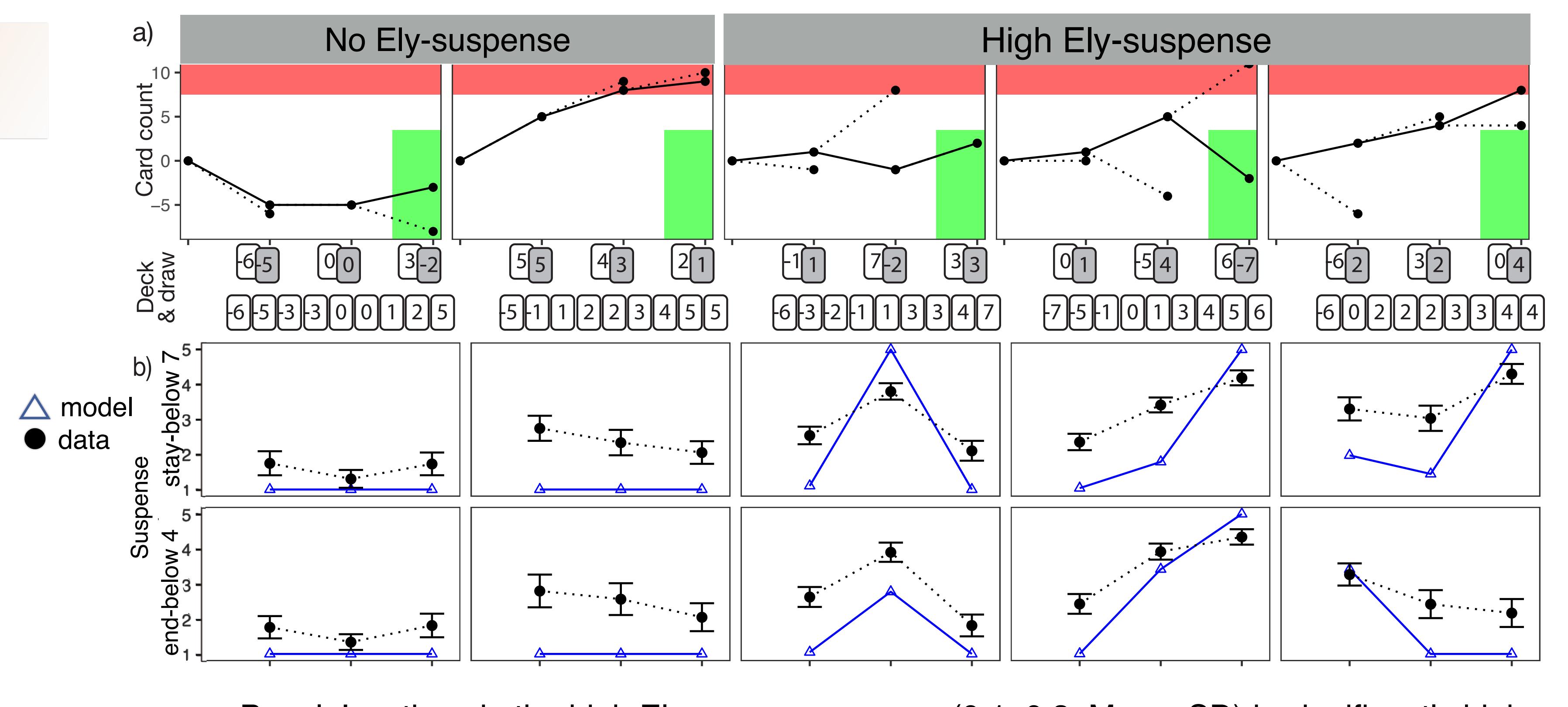
Experiment: Playing card games

Example of drawing a single card:



Results

Q1. How good does our model describes the data overall? n=263 from mTurk



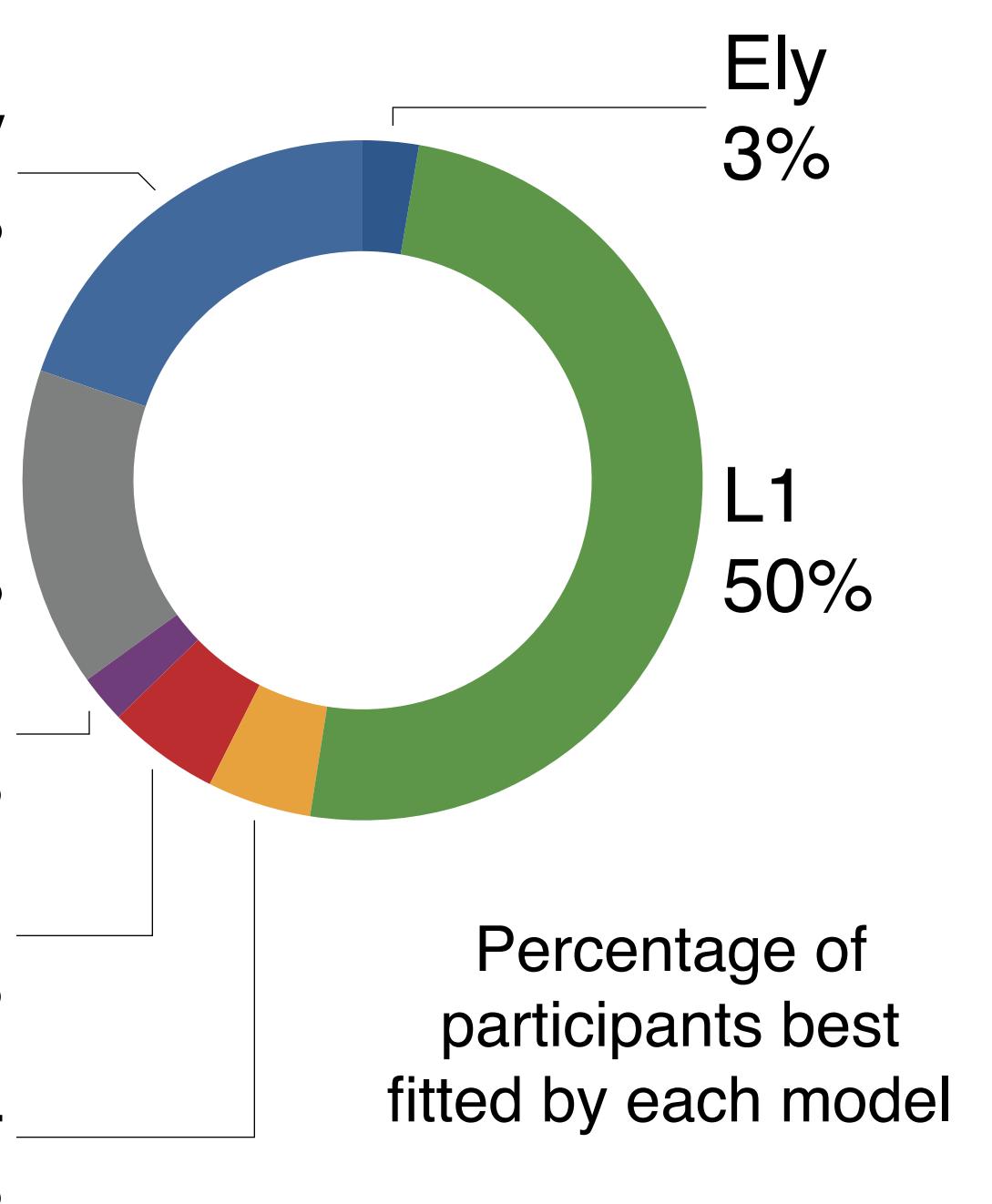
Q3. Do heuristic models explain the data better?

- To compare models we fit into trial-by-trial individual data.
- Continuous predictions transformed a multinomial distribution to generate categorical responses. All models are fitted with the same parameterization.

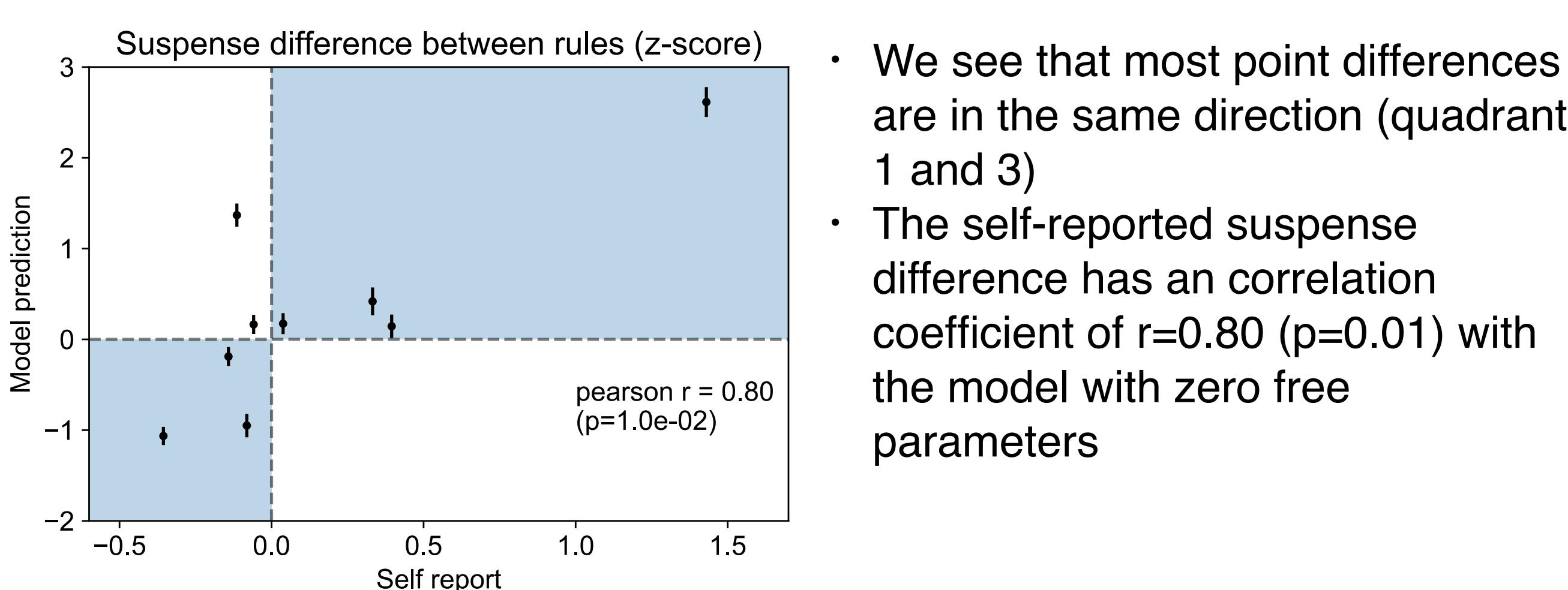
We compare:

- "Close to failure" models: by distance to the boundary ("toBound") or by proper probability inference ("p(lose)").
- Suspense correlation to the current belief entropy ("uncertainty").
- Alternative measures of belief change: absolute difference or L1 distance, information gain (IG) and Kullback-Leibler divergence (KL).

L1 model performs the best with more than half participants are best fitted by it.



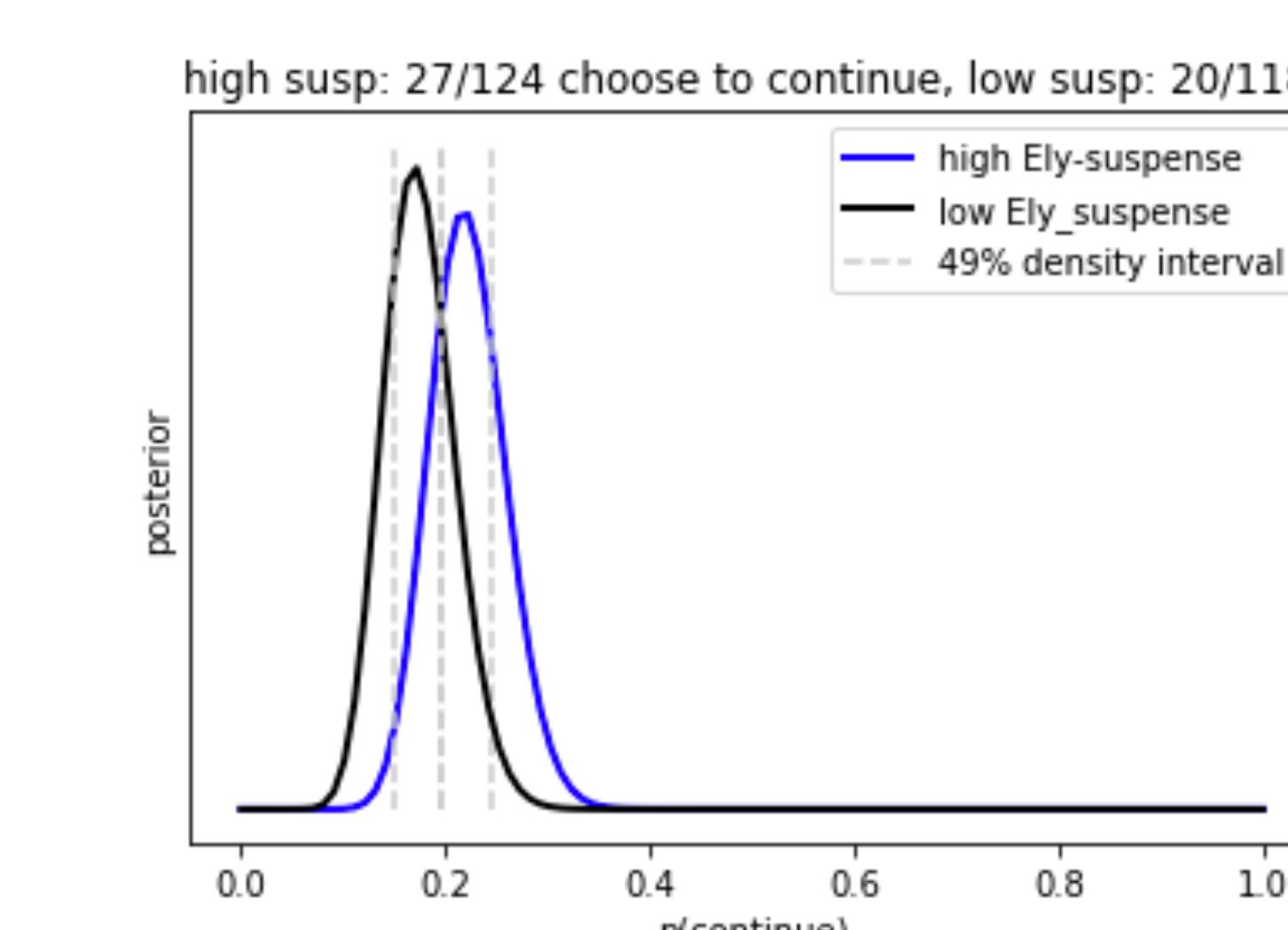
Q2. Does the rule manipulation work? (within-subject suspense difference)



Q4. Modulate people's interest in the game by manipulating suspense?

Beyond subjective report, we hope to detect other behavioral consequence of manipulating suspense.

- Similar task where participants play three rounds of games, after which they can choose whether to play one more game without monetary reward.
- Prediction: More likely to play one more game if the previous games are of "High Ely-suspense" compared to "No Ely-suspense".



No significant difference of the probability to continue for the two conditions. $\chi^2(1, N=242) = 0.62, p=0.43$

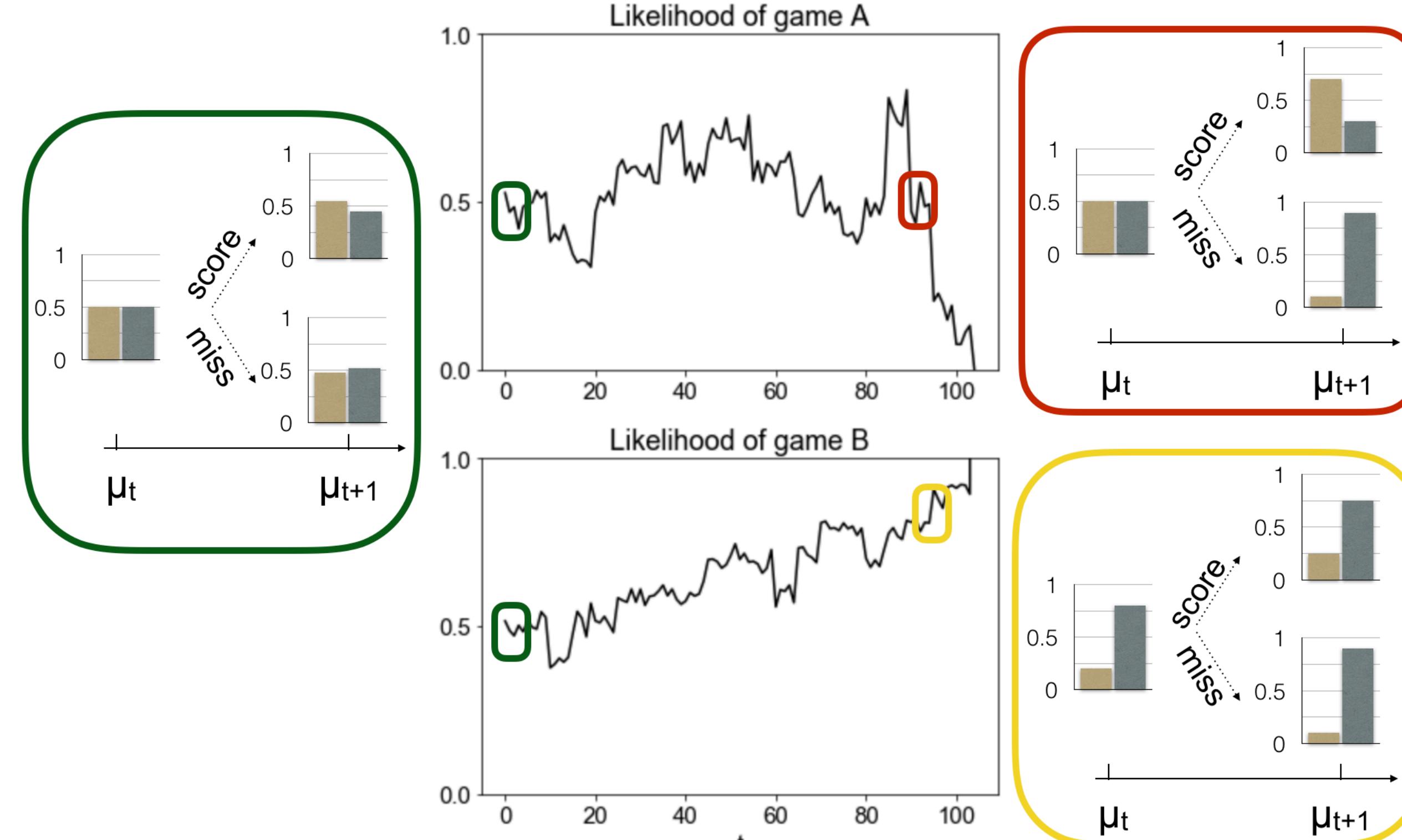
Theory of suspense

Ely et al (2015) proposed:

- Engagement is driven by suspense and surprise.
- Suspense and surprise are derived from the dynamics of belief change. They formalized suspense as:

$$\text{Suspense} = E_s[(\mu_{t+1}^s - \mu_t)^2] = \sum_s p(s)(\mu_{t+1}^s - \mu_t)^2$$

μ : belief of outcome s : what happens at the next step



- Intuition: suspense = expected surprise

Previous studies also proposed other factors:

- Uncertainty drives suspense (Mabley 1972).
- More suspense when close to failure (Cominsky 1982, Knobloch-Westerwick 2009).

What's lacking: empirical paradigm to test the theories quantitatively.

Conclusion

- We designed a paradigm to manipulate the revelation of information about if a player will win a game to modulate participant's subjective feelings of suspense
- Suspense is well-characterized as "expected surprise".
- Heuristic suspense models do not explain the data as well.

Future direction

- Beyond self-report: can we manipulate suspense to make people more likely to play more games, given the same monetary reward?

Ely, J., Frankel, A., & Kamenica, E. (2015). Suspense and surprise.
Mabley, E. (1972). Dramatic construction: an outline of basic principles: followed by technical analyses of significant plays by sophocles... and other.
Cominsky, P., & Bryant, J. (1982). Factors Involved in Generating Suspense.
Knobloch-Westerwick, S., David, P., Eastin, M. S., Tamborini, R., & Greenwood, D. (2009). Sports Spectators' Suspense: Affect and Uncertainty in Sports Entertainment.