

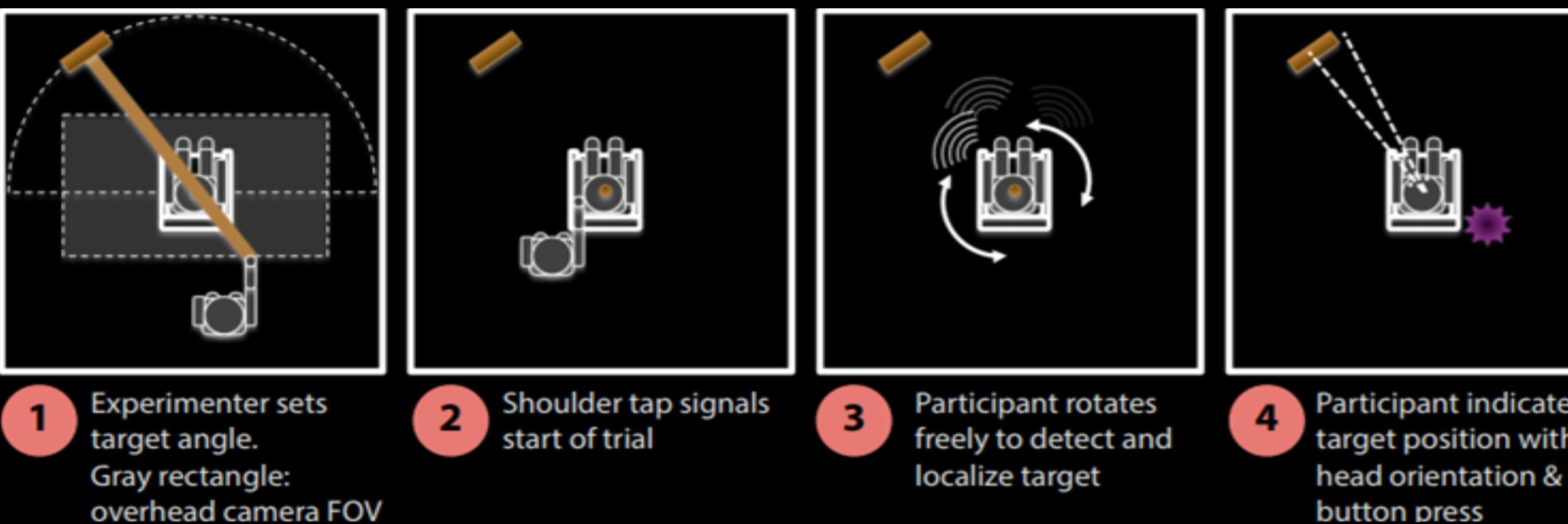


MODELING TARGET SEARCH IN BLIND ECHOLOCATORS USING A KALMAN FILTER WITH REALISTIC EXPLORATORY BEHAVIOR SIMULATIONS

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BACKGROUND

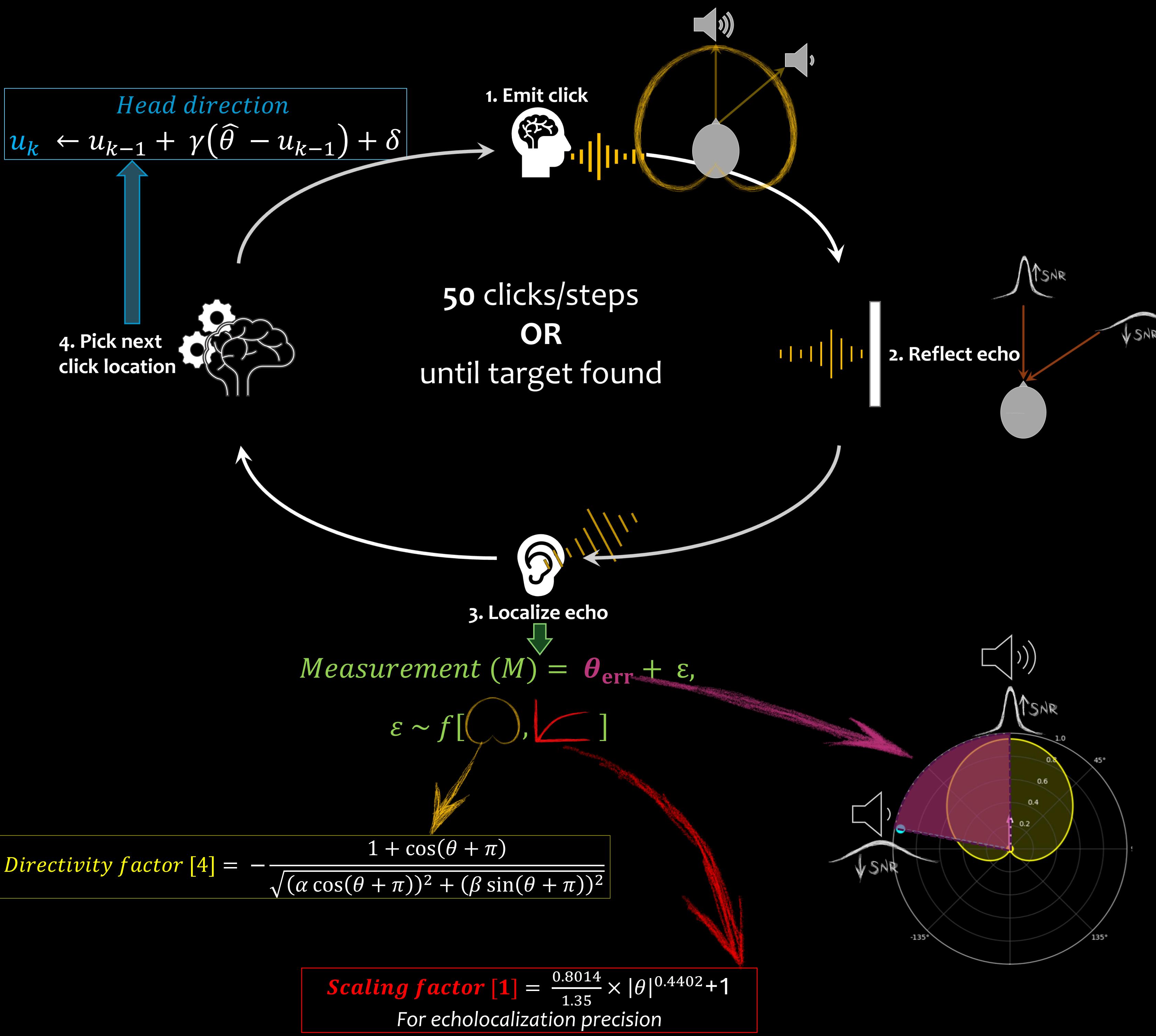
How do humans learn to localize objects using echolocation alone?



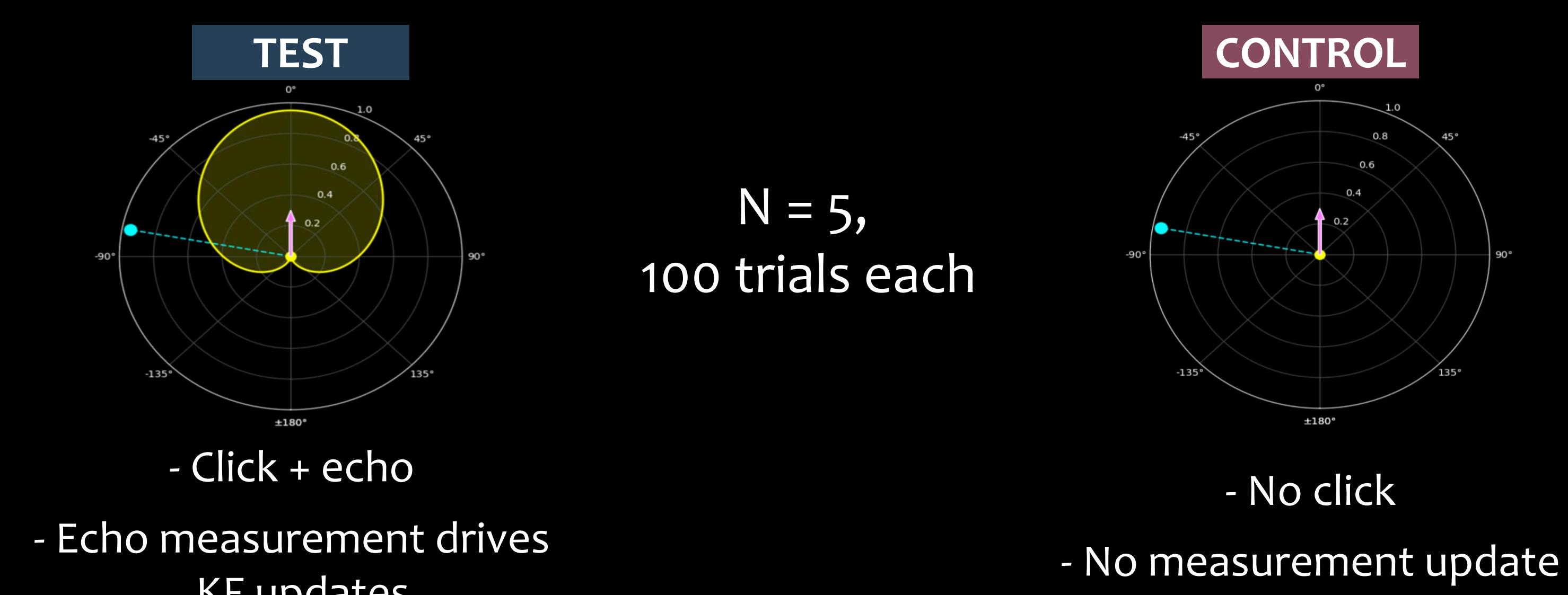
- Some blind individuals use series of clicks and echoes to guide perception and action
- We simulate this using a predictive model that learns to orient based on echo feedback

MODEL CONCEPT

Model estimates azimuth and updates head position based on simulated echo cues

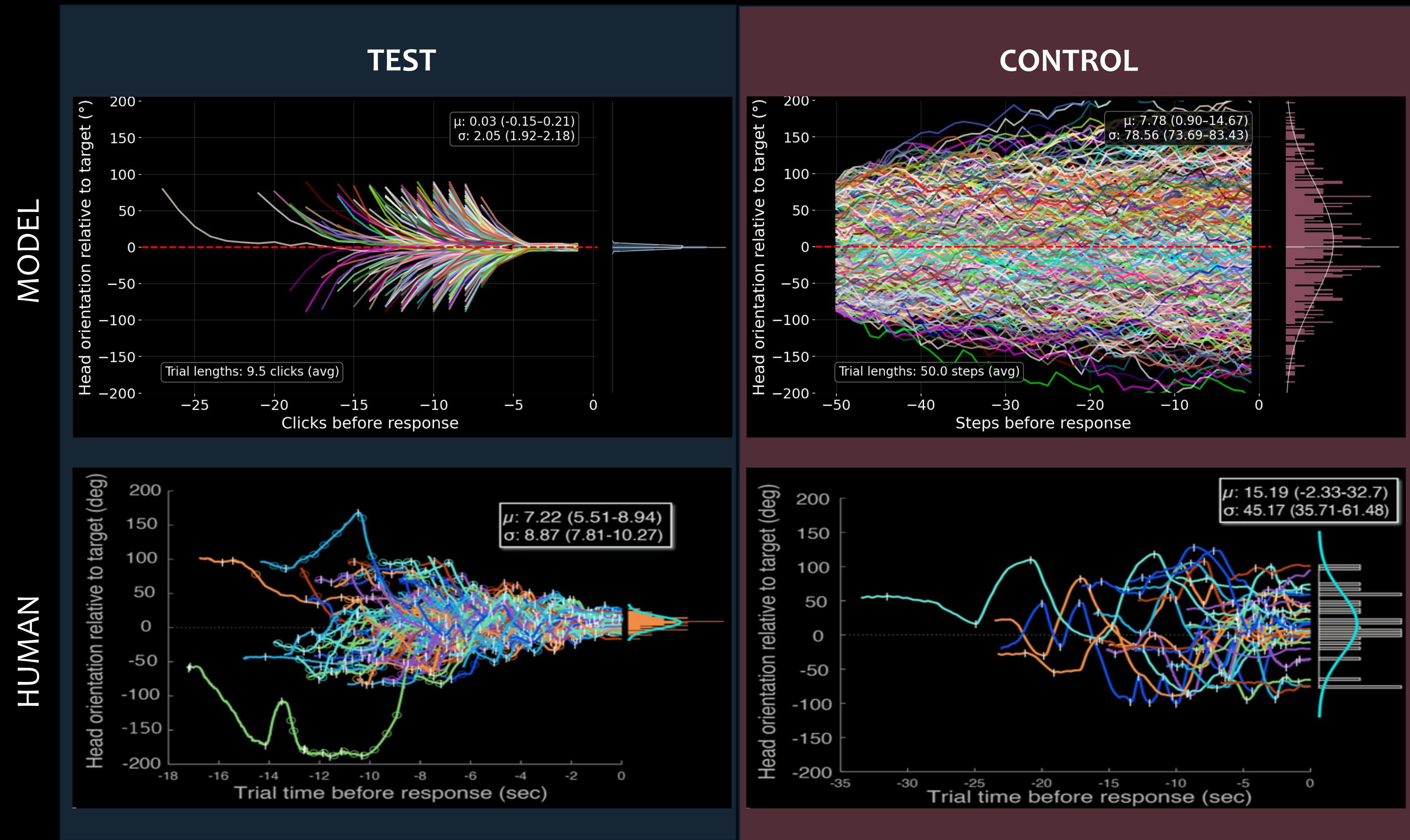


2 CONDITIONS



COMPARISON WITH HUMAN PERFORMANCE:

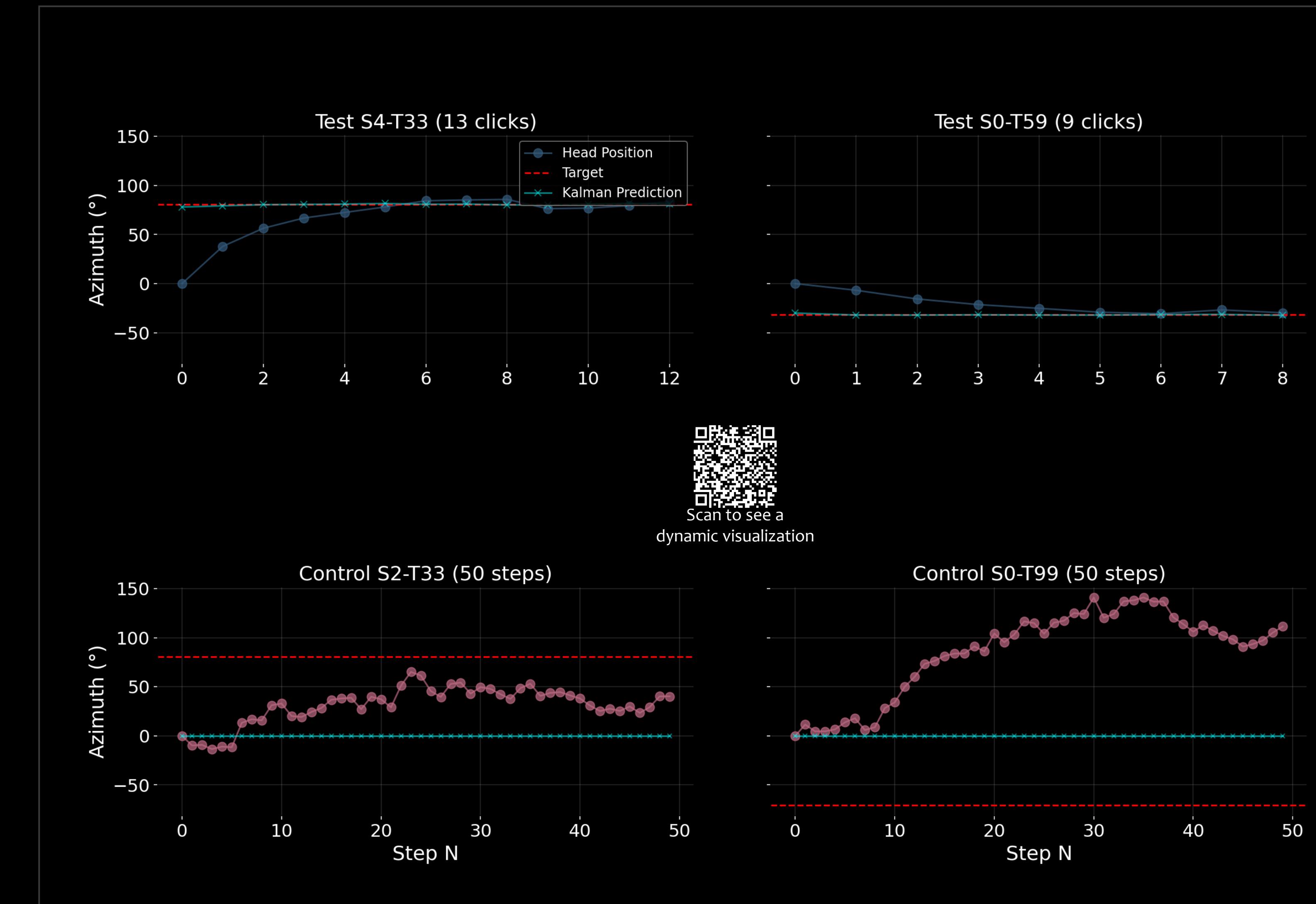
Model approximates blind expert human echolocator behavior at the same task



KEY RESULTS

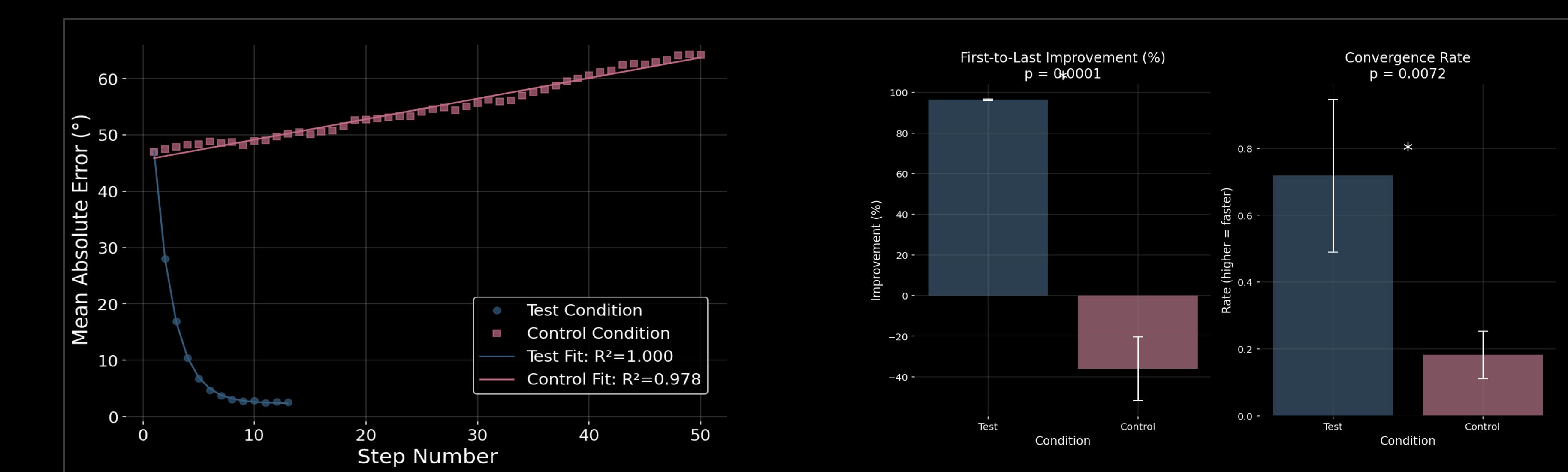
INDIVIDUAL TRIAL DYNAMICS:

KF has no updates → model does not converge in control



CONVERGENCE:

Error decreases with feedback. No convergence without it.



SUMMARY

- Simple predictive model → Realistic learning behavior.
- Generated behavior patterns generally similar to human behavior patterns.
- However, human behavior is smoother and more integrated over clicks VS. click-move-click model search pattern.
- Next step: RNNs for better temporal dynamics integration.

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ACKNOWLEDGMENTS

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