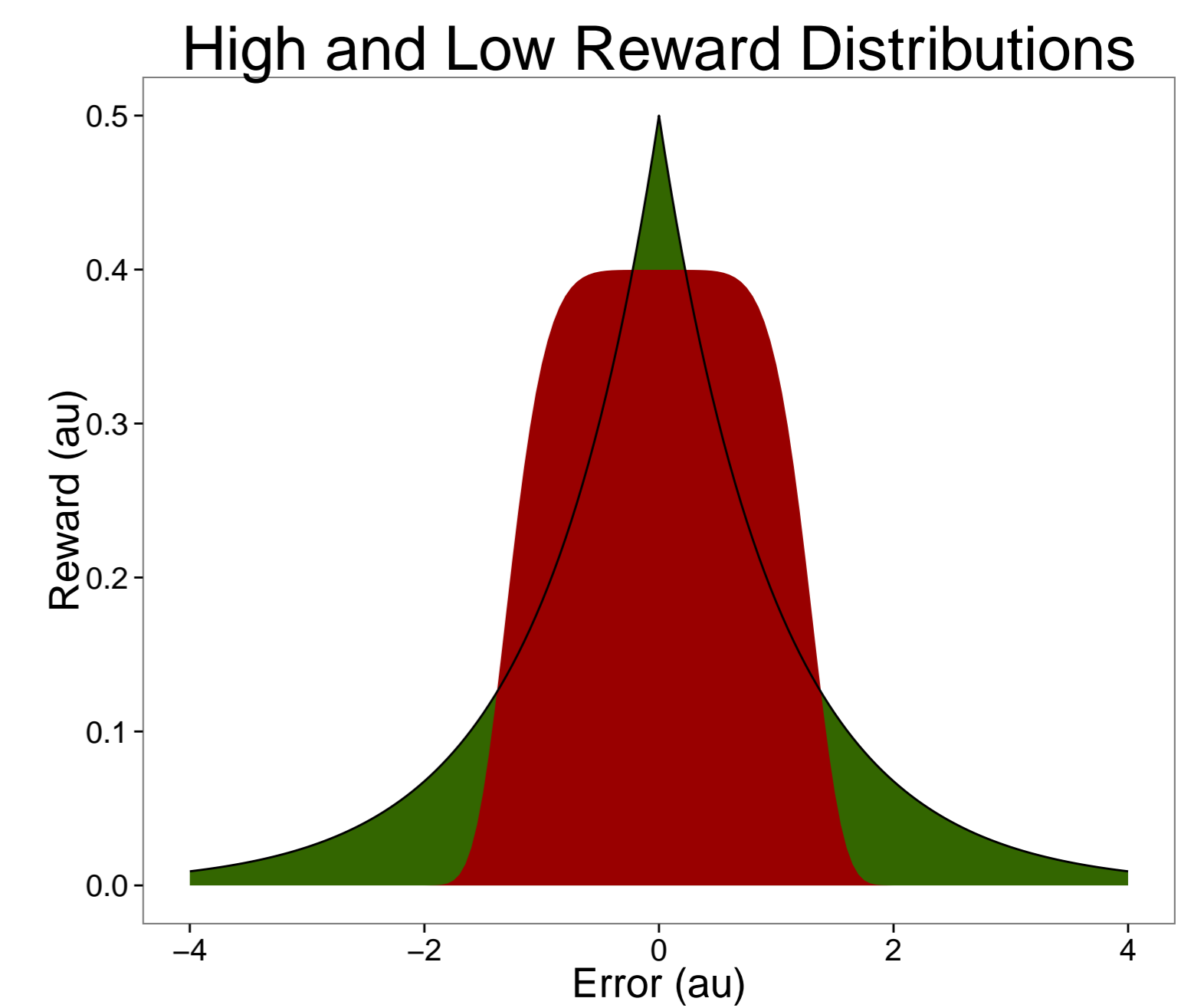
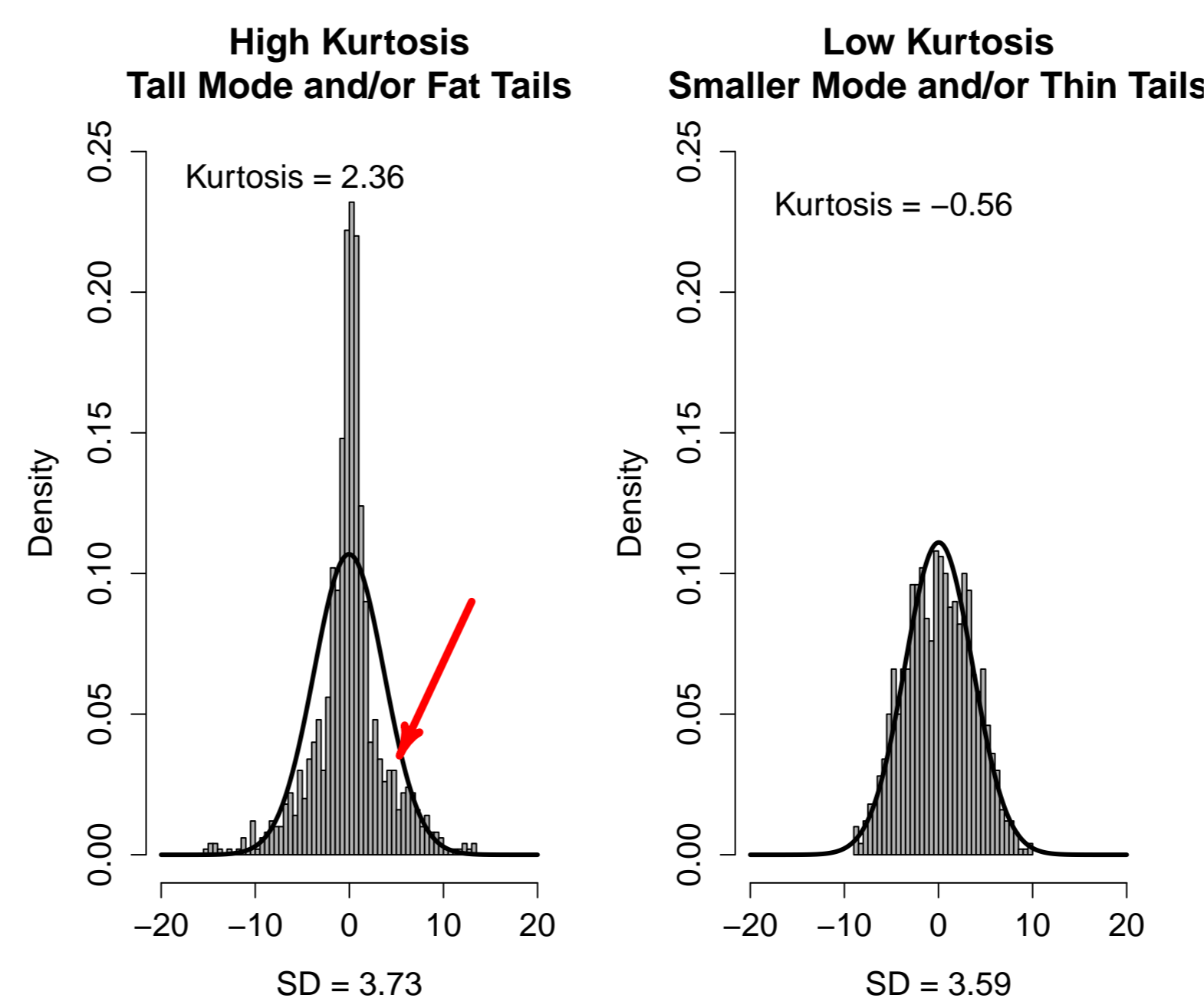


Attention can be seen as a decision process Kurtosis as a metric of a distribution's "shape"

- Similar factors influence attention and decisions
 - Valid cues provide information about *prior probabilities*
 - Expectations are produced by tracking *stimulus history*.
 - In attentional tasks *reward* acts similar to *probability* and *cues*.
- Attention improves the precision of perceptual judgments
 - Uninformative exogenous cues increase precision without changing response distribution shapes
 - Increasing the probability of some stimuli increases precision and changes response distribution shape
- Is the precision of a perceptual judgment also affected by the shape of a reward distribution?



General methods

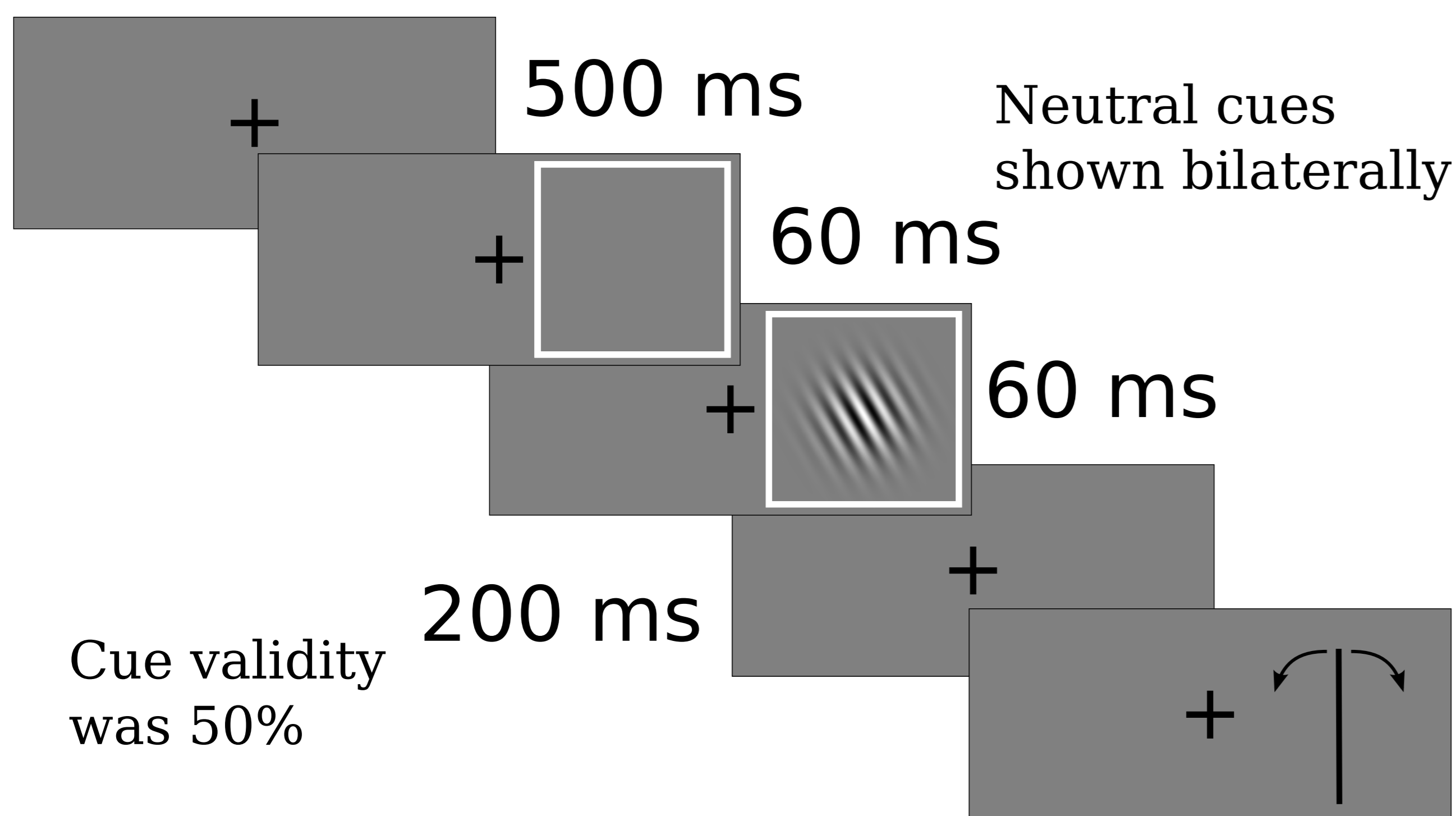


Figure: Two Examples of "Excess Kurtosis". All normal distributions have a constant excess kurtosis equal to zero. Intuitively, kurtosis indexes the probability mass at the shoulders (see red arrow left panel). Formally, kurtosis is a function of the fourth central moment. For context, the variance is a function of the second central moment. When excess kurtosis is positive (left) the shoulders are smaller, and vice versa for negative excess kurtosis (right). All distributions have the same mean and variance. The solid lines are Normal Distributions for comparison.

Figure: Reward Shapes. For pitch, time, and points we used the following reward shapes. Pitch reward used tones to signal reward. Time used the inter-trial delay to enforce a reward, and points used an arbitrary score where 10% of participants won a candy bar, and 5% won 5 Canadian Dollars.

Reward Communicated by Pitch

Reward Communicated by Time (Intertrial Timeout)

Reward Communicated as "Points" with Incentives

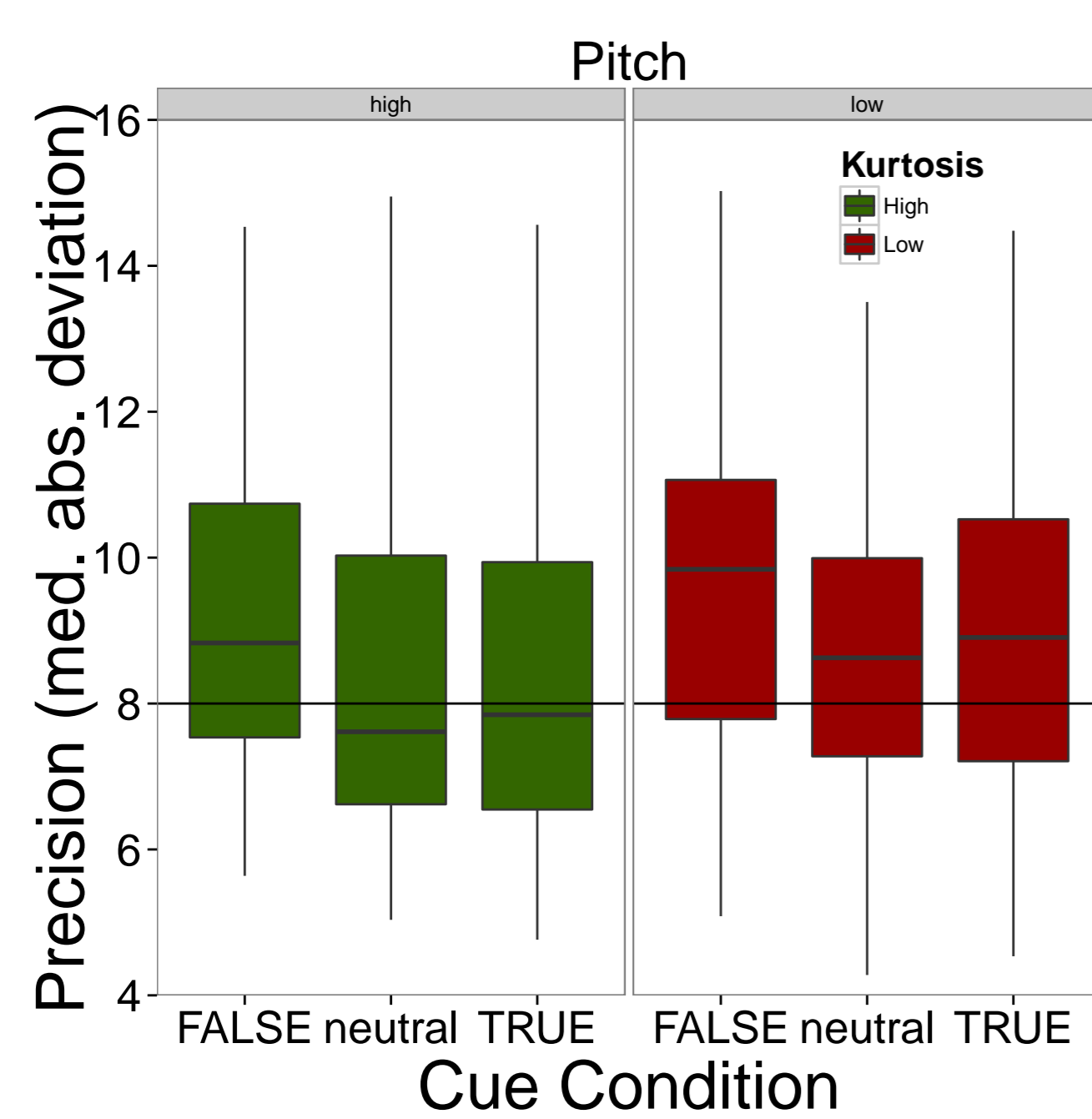


Figure: Cues Affect Precision

	F value	Pr(>F)
reward	0.58	0.4491
validcue	28.58	0.0000
reward:validcue	0.28	0.7532

Table: ANOVA: Reward Category 'x' Cue Type

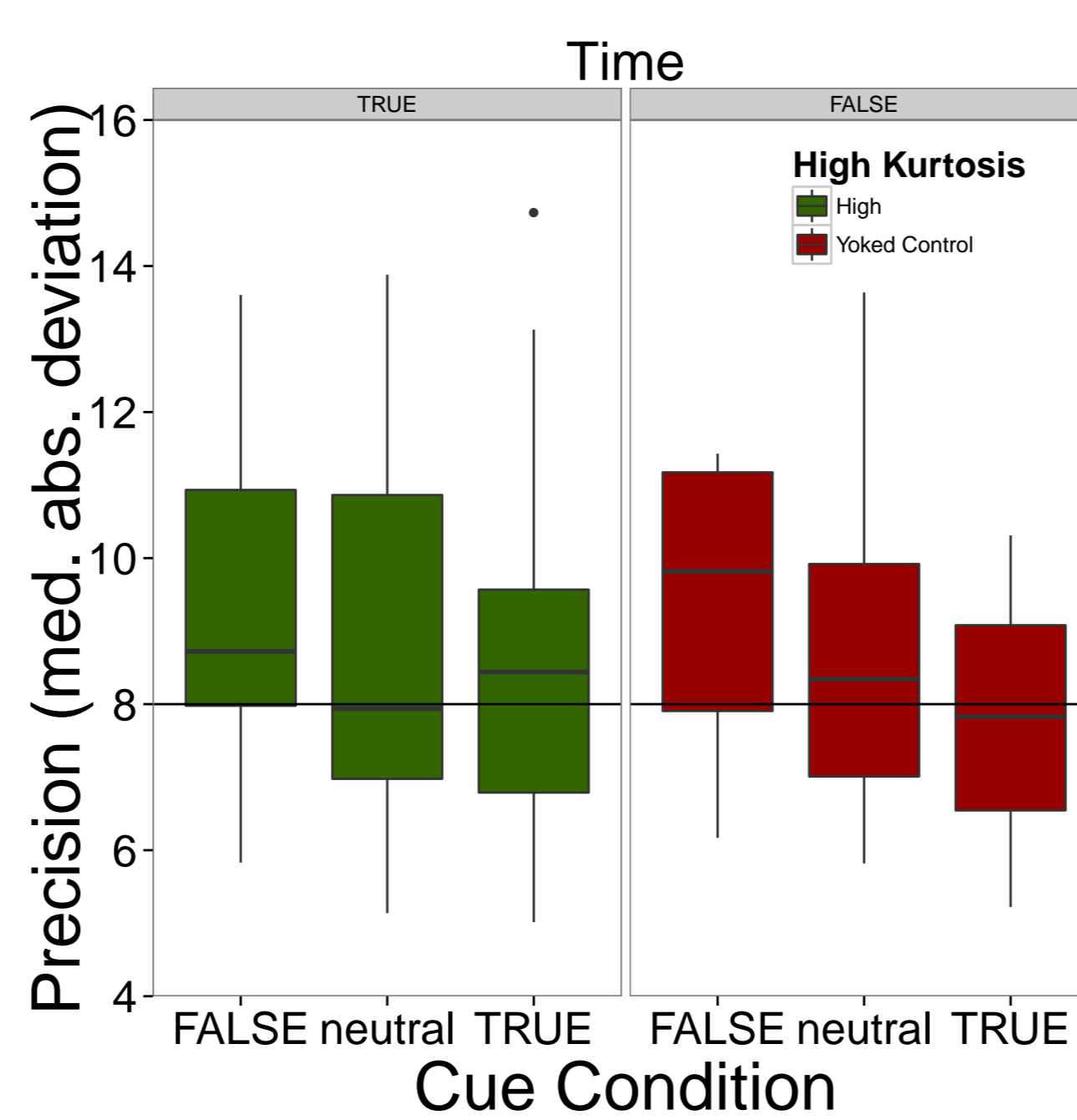


Figure: Cues Affect Precision

	F value	Pr(>F)
validRewF	0.00	0.9617
validcue	11.28	0.0001
validRewF:validcue	1.78	0.1761

Table: ANOVA: Reward Category 'x' Cue Type

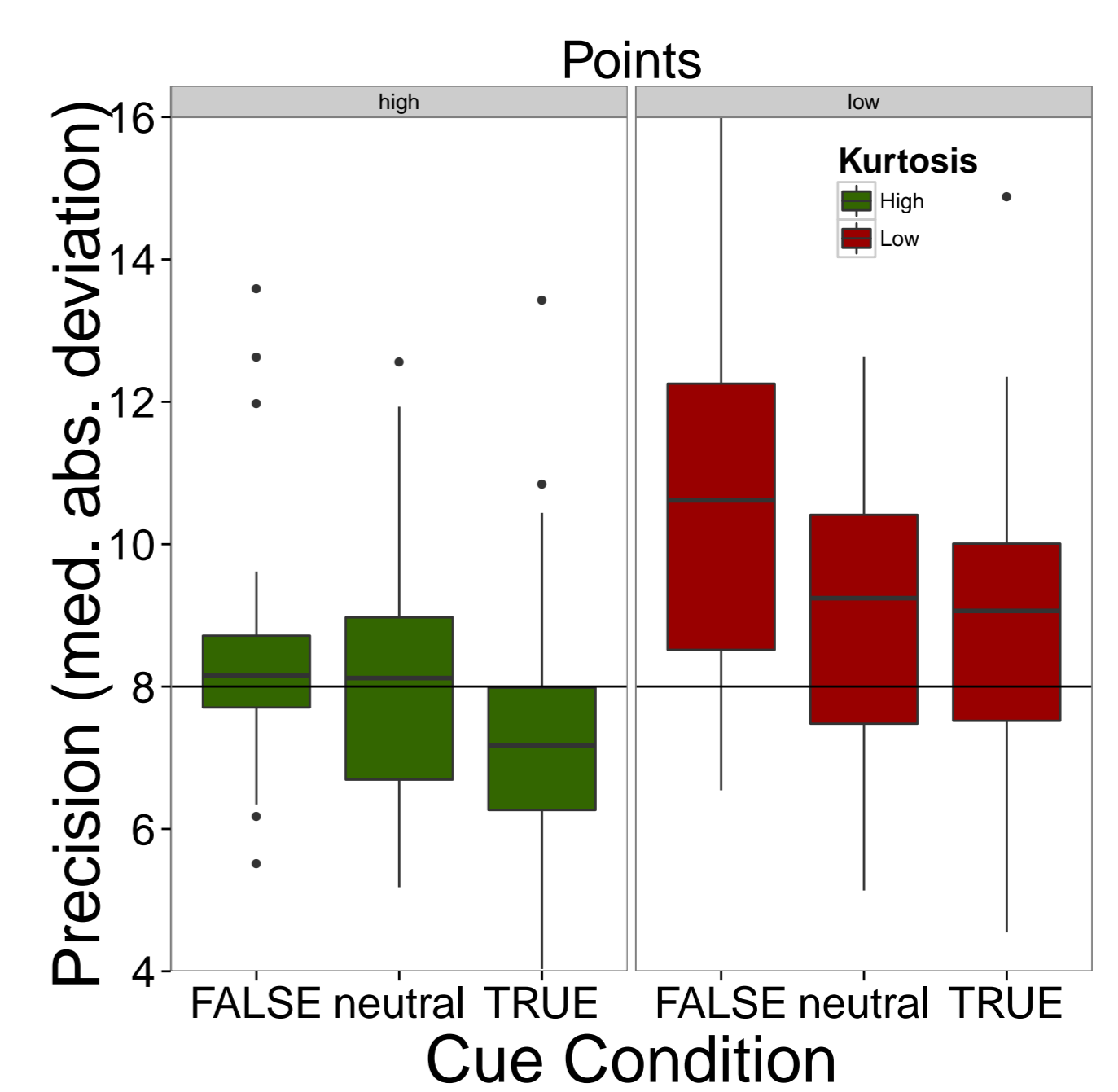


Figure: Cues and Reward Interact to Affect Precision

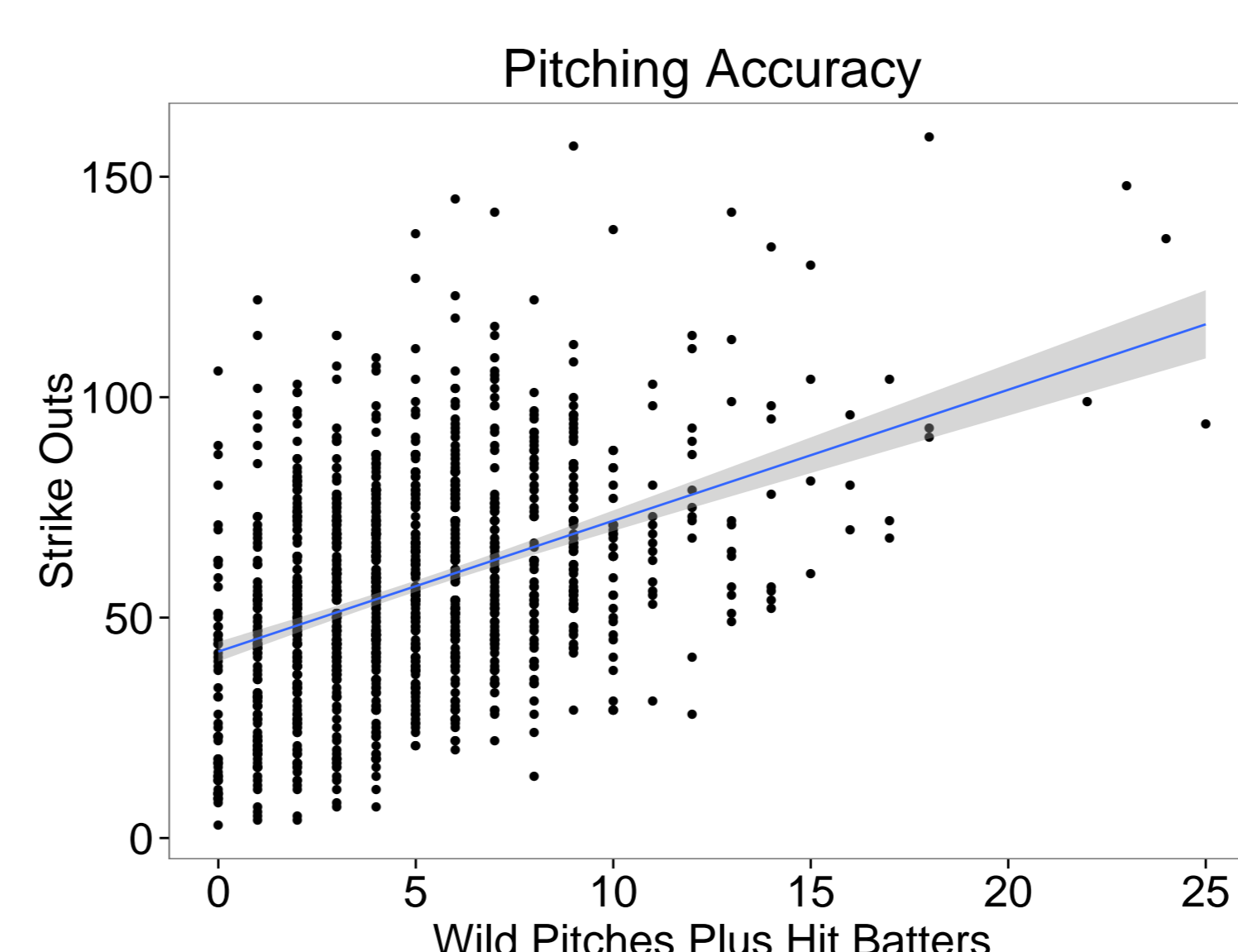
	F value	Pr(>F)
reward	5.47	0.0245
validcue	26.12	0.0000
reward:validcue	3.09	0.0510

Table: ANOVA: Reward Category 'x' Cue Type

Does the Shape of the Reward Distribution Matter?

Excess Kurtosis in Expert Performance?

- Reward shape effects are more subtle than cuing effects
- Probability effects emerge faster than reward effects
- When rewards are obvious and salient the shape of the reward function may interact with conventional attentional cues.
- However, so far, we have not seen the changes in error functions with reward shape that we have previously seen with feature probability or informative cues.



Does an increased proportion of very small errors come at the cost of an increased proportion of very large errors? It seems to with major league American baseball pitchers. Using data for major league baseball pitchers since 2000 with at least one recorded save <http://www.seanlahman.com/baseball-archive/statistics/> there is a strong positive correlation between their ability to get strike outs (highly accurate pitch placement) and wildness.