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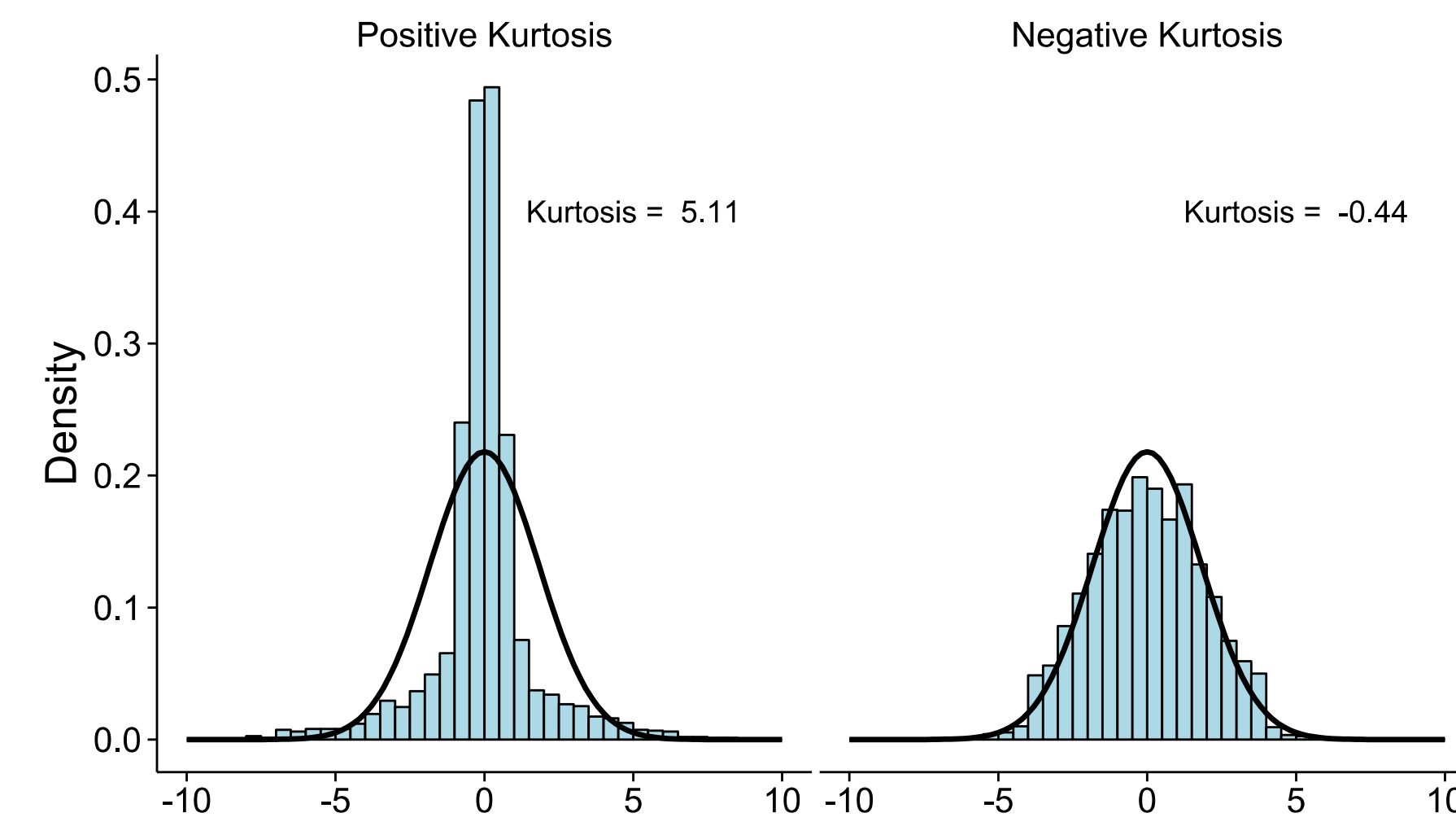
Reward and attention have similar effects

- Attentional cues reduce response time and increase accuracy
- Responses to rewarded stimuli are faster and more accurate

Attention increases response precision¹

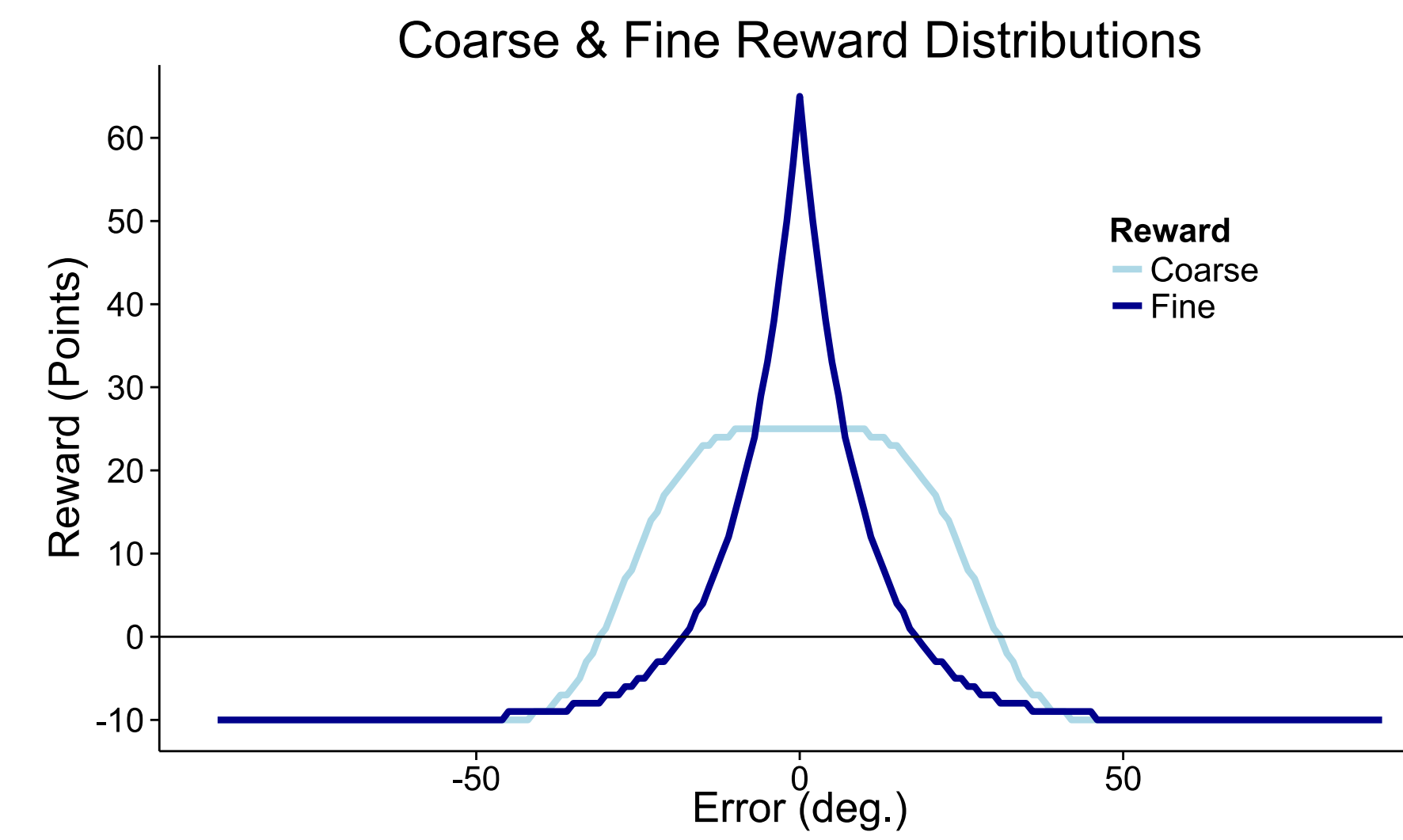
- Uninformative, exogenous spatial cues increase precision, but do not affect the shape of the response distribution
- Informative, exogenous spatial cues increase precision and change the shape of the response distribution

Kurtosis measures the shape of a distribution

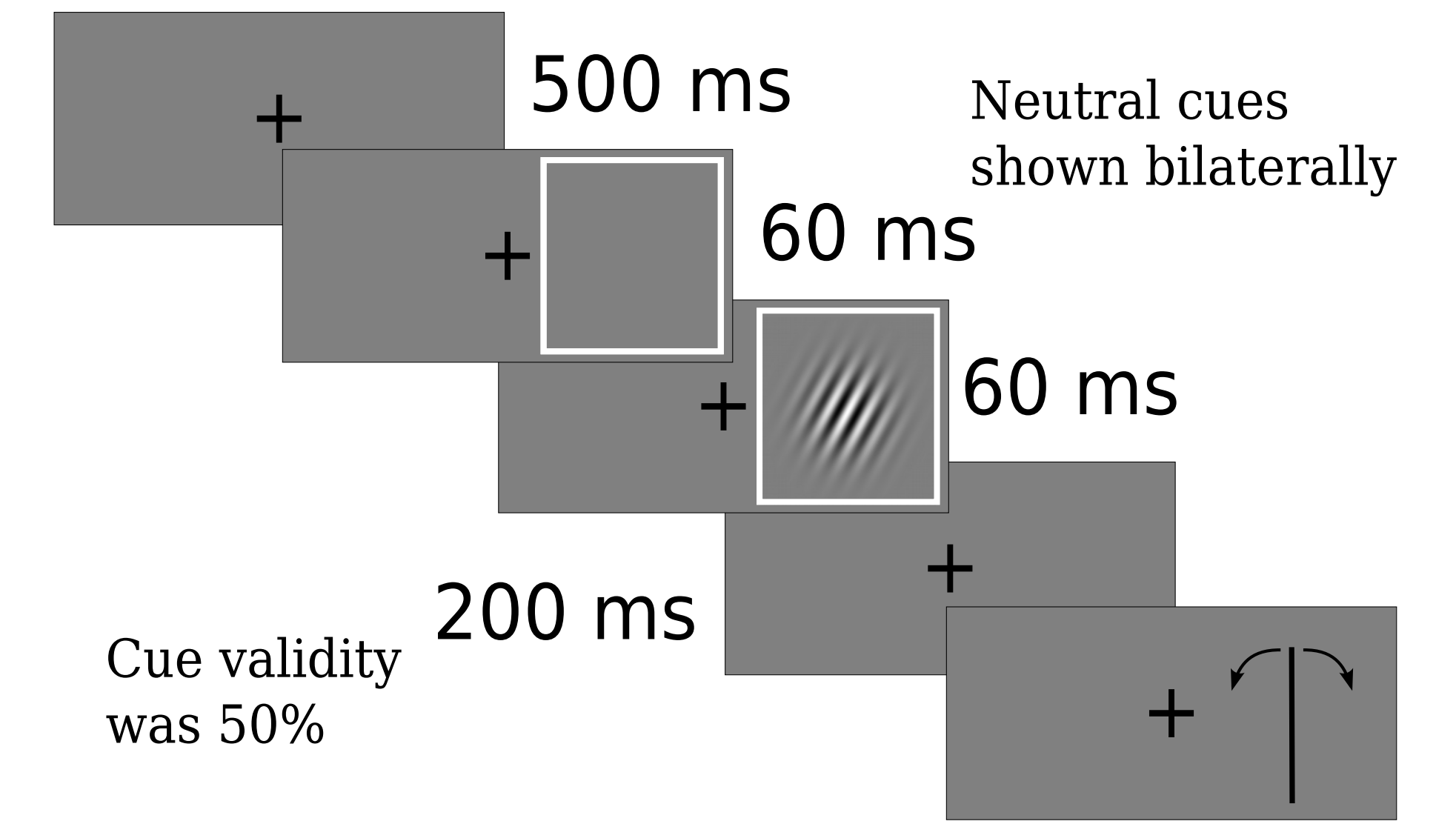


Excess kurtosis defined by the difference between the shape of a normal curve (black) and a distribution (bars). Positive kurtosis (left) is more peaked than a normal distribution. Negative kurtosis (right) is flatter than a normal distribution.

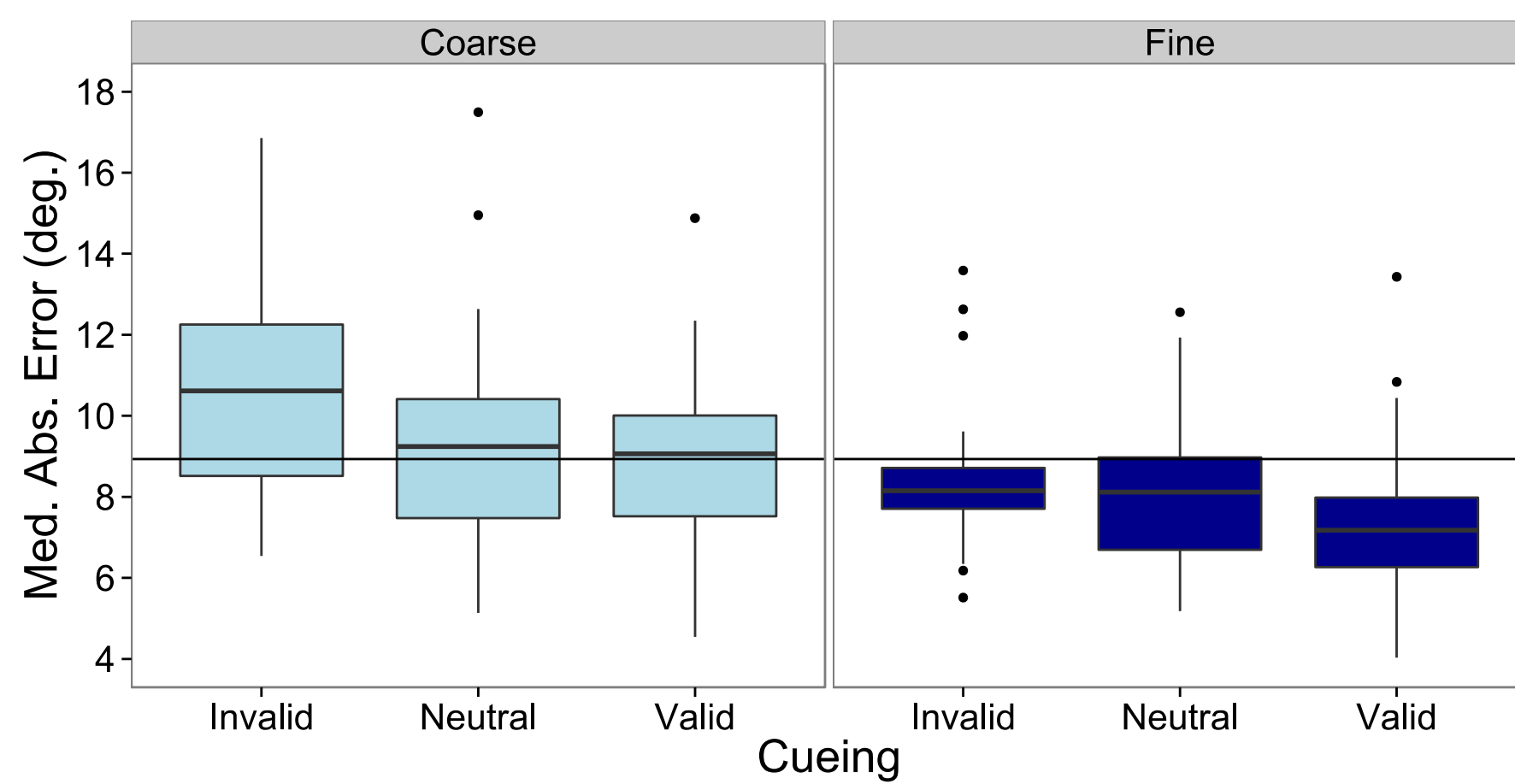
Will the shape of the distribution of performance based rewards change the shape of the response distribution? Will this interact with an uninformative, exogenous spatial cue?



Participants were awarded points based on their error on each trial in one of two conditions (left). Their cumulative score was always displayed above the fixation cross, and the trial points were displayed below it. If overall error was in the top 10% the participant won a chocolate bar and if it was in the top 5% they won \$5.

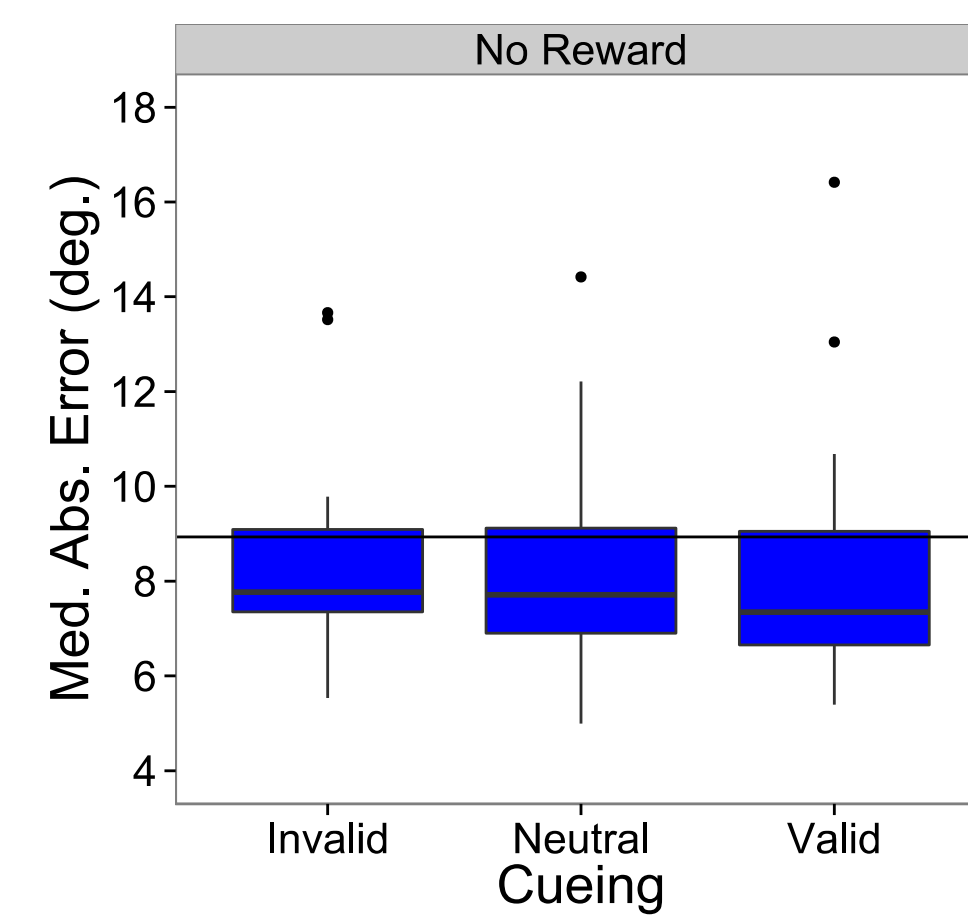


Cueing and reward interact to affect precision



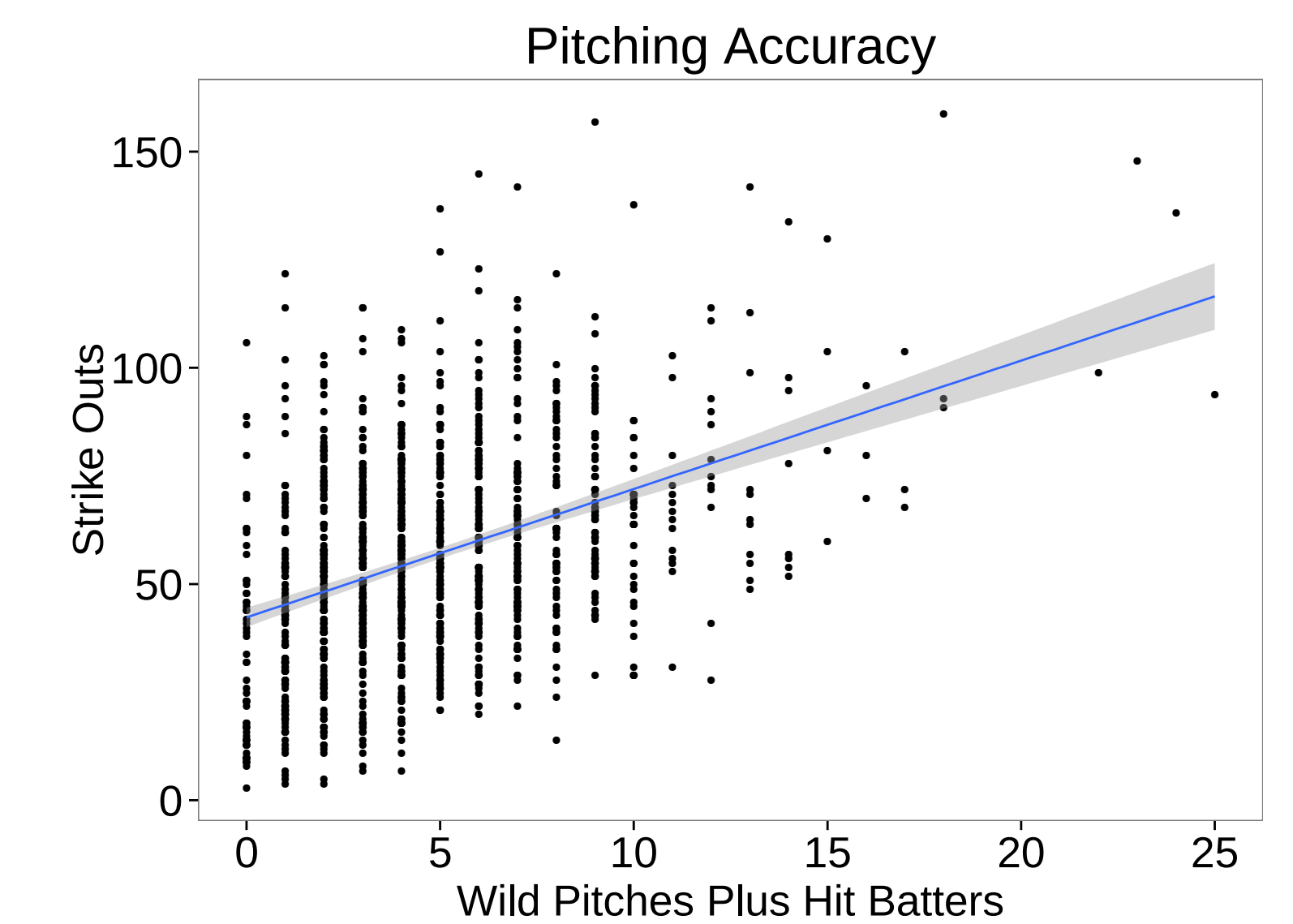
	F-value	p-value
reward	5.47	.02
cueing	26.12	.00
reward x cueing	3.10	.05

Reward and no-reward¹ affect precision equally



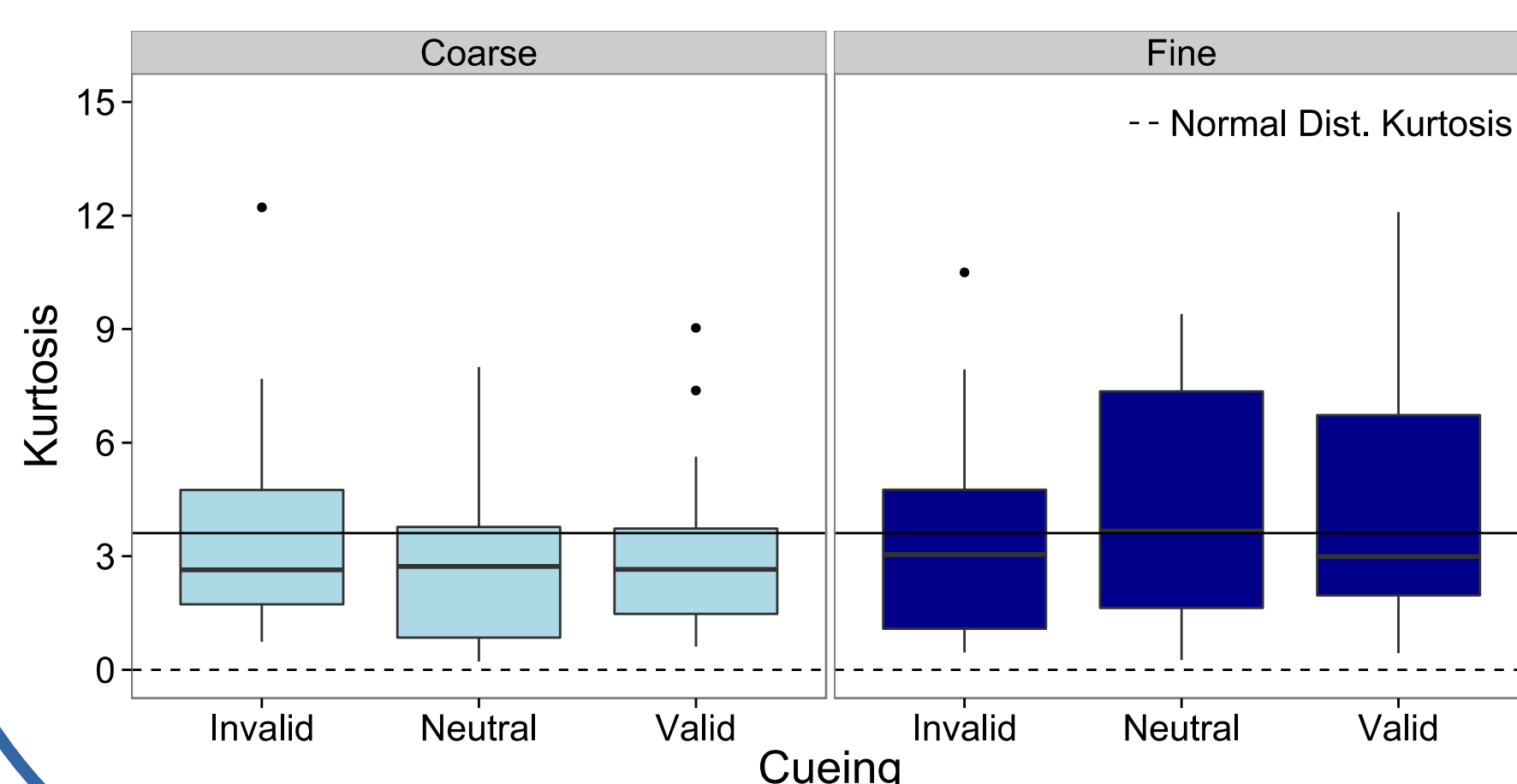
	Coarse vs. No reward		Fine vs. No reward	
	F-value	p-value	F-value	p-value
reward	2.47	.12	0.27	.61
cueing	19.52	.00	15.15	.00
reward x cueing	1.72	.19	1.26	.29

Expert performance comes with more frequent large errors



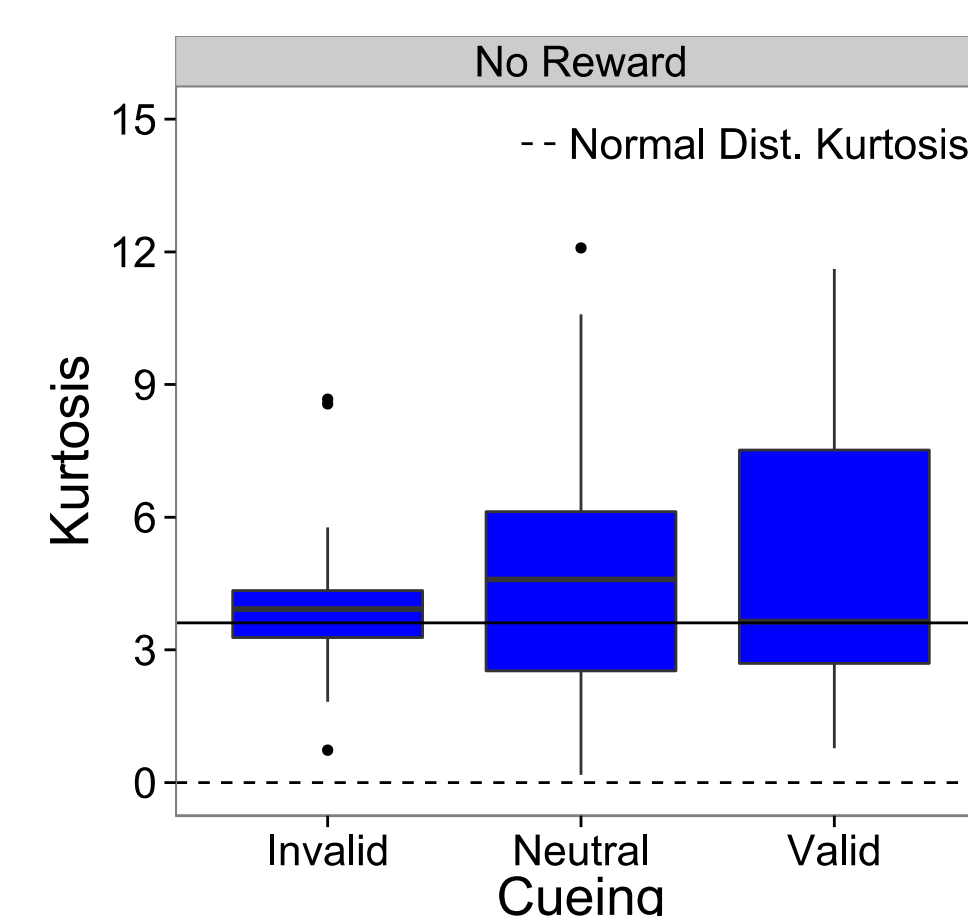
- Error kurtosis increases result from both more frequent very precise responses and more frequent large errors.
- We looked for this effect in real life scenarios, such as high performance athletes
- We found a strong positive correlation between major league American baseball pitchers' ability to get strikeouts and the number of wild pitches (<http://www.seanlahman.com/baseballarchive/statistics/>)

No evidence of an effect of reward or cueing on kurtosis



	F-value	p-value
reward	1.77	.19
cueing	0.37	.69
reward x cueing	1.88	.16

Coarse reward and no reward¹ interact to affect kurtosis



	Coarse vs. No reward		Fine vs. No reward	
	F-value	p-value	F-value	p-value
reward	5.75	.02	0.92	.34
cueing	0.98	.38	4.17	.02
reward x cueing	4.47	.01	2.07	.13

¹Anderson & Druker, 2013, PBR