

# Sensory (but not decisional) uncertainty controls information seeking

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## Background

Humans and other animals perform actions to elicit information from the outside world. Metacognitive theories suggest this behaviour depends on introspection about our decisions – such that we seek information when we think a choice is likely to be incorrect (*decision uncertainty*) [1,2]. However, it is possible that information seeking is controlled by simpler cognitive computations that track the strength of incoming signals (*sensory uncertainty*). Decision difficulty and signal strength are typically confounded in natural environments [3].

Here we investigated whether information seeking is truly driven by uncertainty about our decisions, or by uncertainty about the evidence provided by our senses.

## Methods

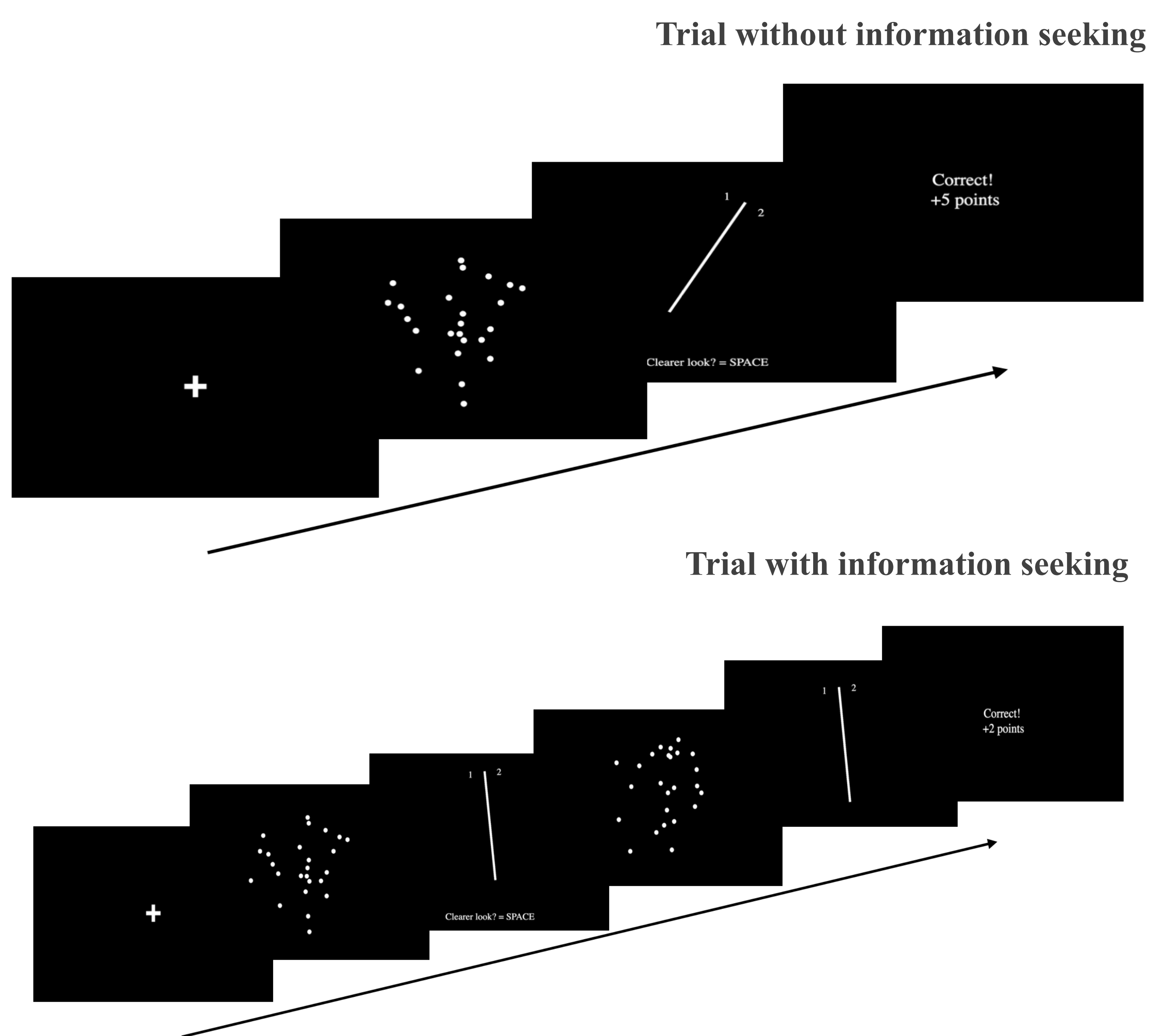


Fig. 1: Trial sequence.

Ps completed a perceptual decision making task, where they judged the direction of a moving dot cloud against a reference line.

**We independently manipulated sensory uncertainty (motion strength – weak/strong) and decision uncertainty (probability correct – easy/hard)**

On some trials, Ps had the option to get a ‘clearer look’ at the stimulus before making their decisions. We analysed these decisions to ‘look again’ as a measure of **information seeking behaviour**.

## Experiment 1 – Lab-based

We found **more information seeking when signals were weaker** -  $F(1,14) = 8.615, p = .011$ . Crucially, there was **no effect of decision difficulty** -  $p = .092$  - but also a **marginally significant interaction** -  $p = .043$ . This means that Ps sought to disambiguate weak signals, and this different was most pronounced when decisions were easy.

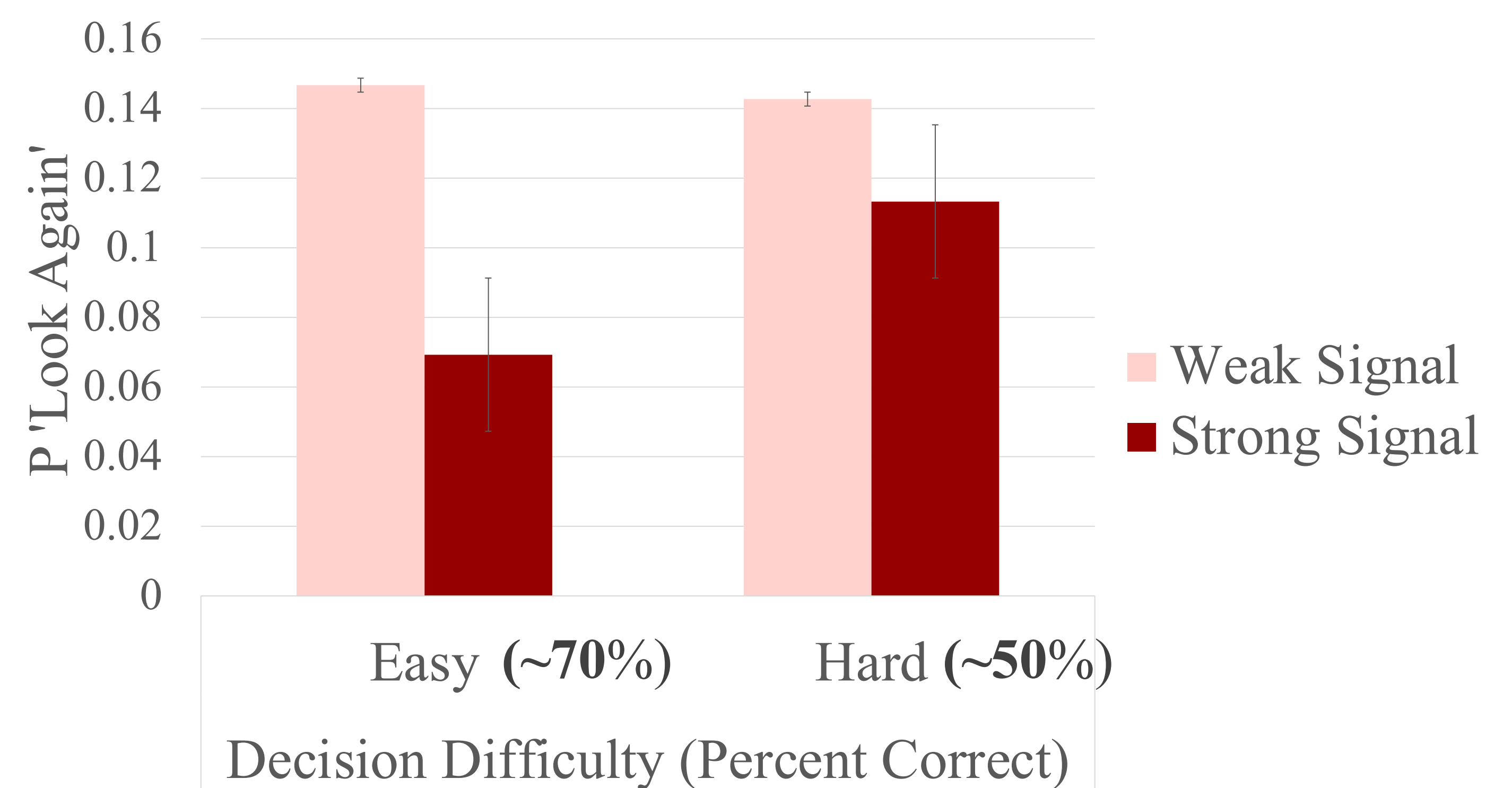


Fig. 2: Ps showed more information seeking when signals were weaker.

## Experiment 2 – Online

We replicated the study online with a larger sample. This revealed the same pattern of results, with **more information seeking when signals were weaker** -  $F(1,37) = 2.053, p < .001$ . Crucially, there was **no effect of decision difficulty** -  $p = .160$  - and **no interaction** -  $p = .346$ . This again suggests that **information seeking is driven by estimates of signal quality**, rather than how difficult decisions are likely to be.

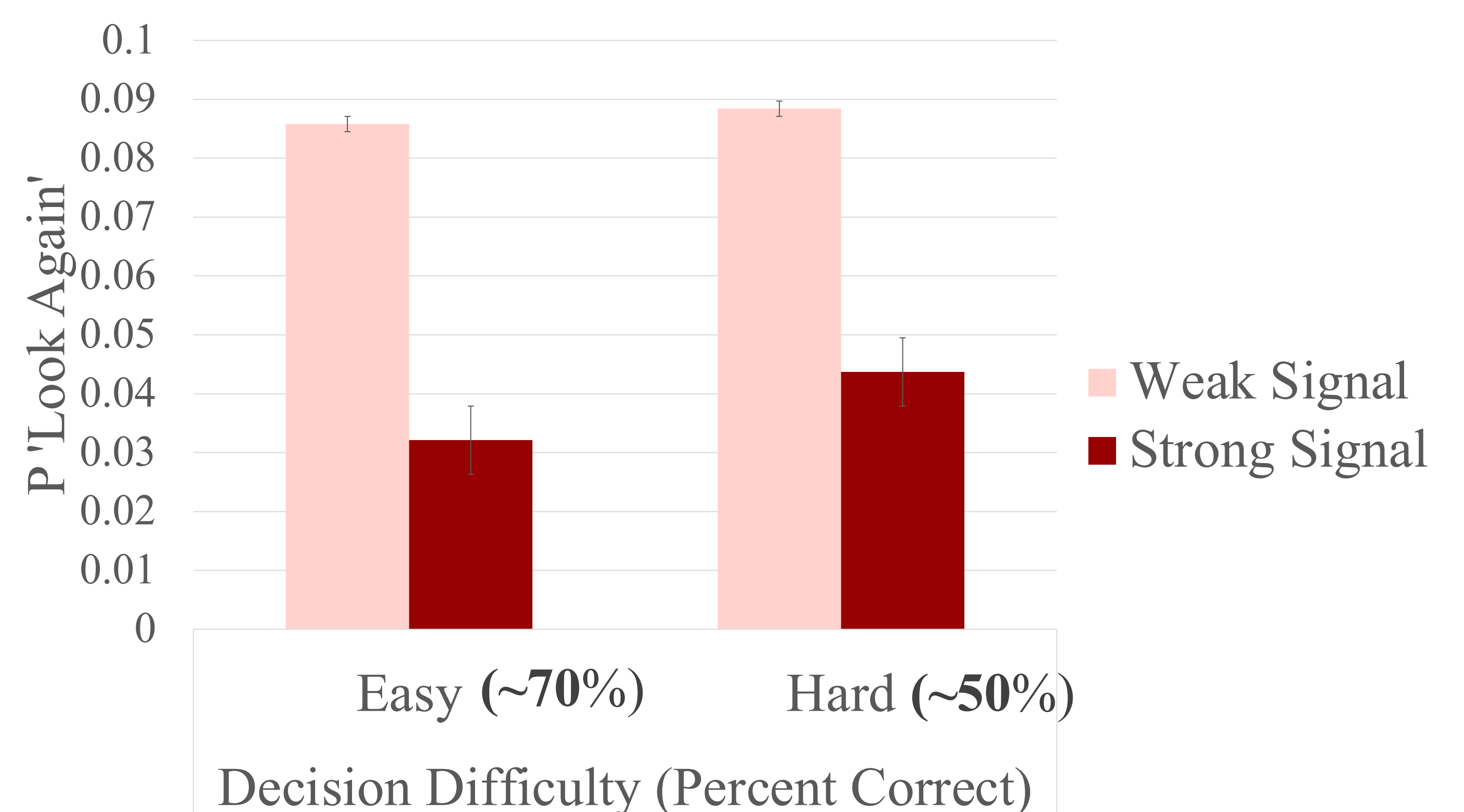


Fig. 3: Ps showed more information seeking when signals were weaker.

## Conclusion

Here, information seeking seems driven by computations of signal quality rather than estimates of choice accuracy. **This questions the idea that information seeking (always) depends on the ability to introspect about the accuracy of decisions.**