

Implausible alternatives paradoxically increase confidence in a perceptual decision

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Introduction. Computational models of confidence in perceptual decisions have been traditionally developed using two-choice tasks. This paradigm led to the notion that confidence reflects the probability of being correct, a proposal known as the Bayesian confidence hypothesis. Despite ongoing debate, this definition predicts that adding implausible alternatives should not affect confidence, since these alternatives do not affect the probability of being correct. However, in the context of line-up identification and likelihood judgements tasks implausible alternatives increase confidence, a phenomenon known as the “dud-alternative effect”. In this work we ask whether this phenomenon is also at play in a perceptual decision making task.

Objectives. 1) Evaluate whether confidence in a perceptual decision increases when implausible alternatives are added. 2) Propose a computational model of confidence that accounts for this phenomenon.

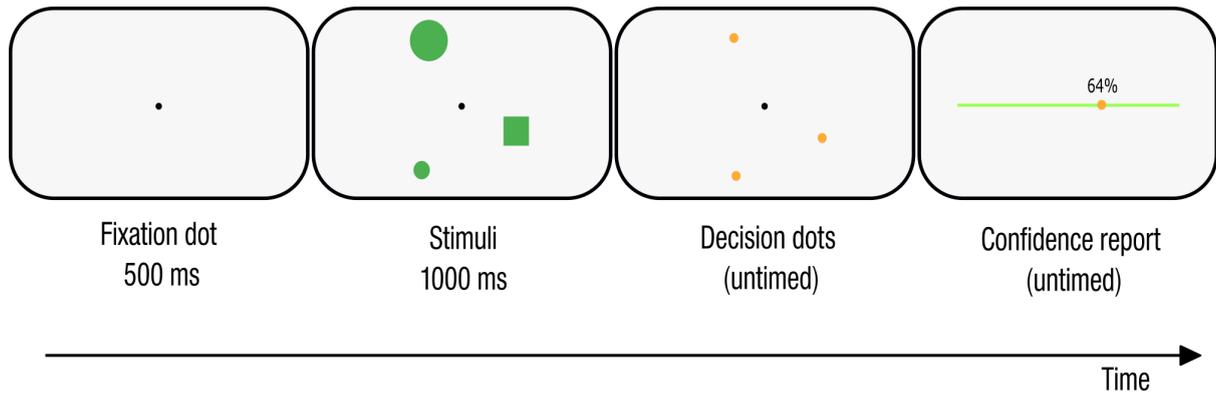
Method. We run a size discrimination experiment in which subjects had to decide which geometric shape had the larger area and then report their confidence on the decision. Some trials had two alternatives and others had three (“dud-alternative” tasks). Results from this experiment and model predictions were further tested in Experiment 2, in which the number of implausible alternatives varied from 2 to 5.

Results. *Experiment 1.* The addition of one implausible alternative did not affect response times nor performance but increased confidence. This effect was present for correct and incorrect trials, but was more pronounced for incorrect trials. *Experiment 2.* We replicated the first experiment: the addition of more implausible alternatives increased confidence but did not have an impact in response times nor performance. Moreover, confidence increased monotonically with the number of “dud-alternatives”. *Computational modeling.* We account for our findings with a computational version of a verbal model described in the literature of the “dud-alternative effect”: the Contrast model. The model implies that people compute confidence by a series of pairwise comparisons between the chosen option and the rest. Following this, we modeled confidence by the sum of the differences between the highest posterior probability and all other posterior probabilities.

Discussion. The main result of the present study is that in the context of our size discrimination task, confidence increases when weak alternatives are present. This implies that confidence deviates from traditional computational models that assumes confidence reflects the probability of being correct. These weak alternatives,

however, do not impact reaction times or performance. Our results constrain computational models of confidence and motivate future studies to build a nuanced picture on how confidence in perceptual decisions comes about.

Size discrimination task:



Models predictions and results:

