Decreasing Sensory Noise Lowers Metacognitive Efficiency

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Submitter Dobromir Rahnev

Affiliation Georgia Institute of Technology

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Presentation Abstract Summary Visual metacognition is the ability to employ confidence ratings in order to predict the accuracy of one's perceptual decisions. Researchers have developed a number of paradigms to manipulate observers' overall confidence, independent of overall accuracy, but it is unclear how visual metacognitive efficiency can be affected. Here we show that a hierarchical model of confidence generation makes a counterintuitive prediction: metacognitive efficiency has a positive relationship with the level of sensory noise. In other words, decreasing trial-to-trial sensory noise is predicted to lower metacognitive efficiency. To test this prediction, we used a perceptual learning paradigm to decrease the amount of sensory noise. In Experiment 1, seven days of training led to significant decrease in noise but also a decrease in metacognitive efficiency. Experiment 2 showed the same effect in a brief 100-trial learning in each of two different tasks. Finally, in Experiment 3, we experimentally manipulated stimulus contrast to increase sensory noise and observed a corresponding increase in metacognitive efficiency. Our findings demonstrate the existence of a robust positive relationship between sensory noise and visual metacognition. These results provide strong support for our hierarchical model of confidence generation and demonstrate that one can directly manipulate metacognitive efficiency.

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Co-author Information

* Presenting Author

First Name	Last Name	Affiliation	E-mail
Dobromir *	Rahnev *	Georgia Institute of Technology	drahnev@gmail.com
Ji Won	Bang	Georgia Institute of Technology	ji.bang@psych.gatech.edu

Medha	Shekhar	Georgia Institute of Technology	medha@gatech.edu

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