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Does a surprising observation facilitate perception of all subsequent sensory input?

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Bayesian theories posit that perception is the result of combining expectations with the sensory input, and that expectations are updated when that sensory input is surprising –i.e., deviates from the expectation. To be adaptive, expectations should only be updated when the surprising observation reveals that the world is actually different from our models, but it is not yet clear how this is estimated nor which processes enable it. A recent theory suggests that surprising observations trigger a reactive gain-increase on all sensory input via noradrenaline release. This process would allow observers to reappraise the entire sensory environment if their model no longer explains their observations.

We present stimuli in semi-predictable positions in a circular array around a central fixation point. Participants are instructed to monitor for contrast changes in the peripheral stimuli as well as changes around the fixation point. Trials are characterised by the surprise generated by the position of the peripheral stimulus and whether it signals environmental change.

We analyse the relationship between surprise and sensitivity (hit rate) to contrast changes at both locations, and characterise the time-course of sensitivity changes. We consider how our findings cast light on perception' s role in model updating and the automaticity of this process.

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