Learn to pay attention

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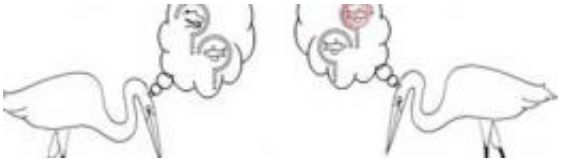

(Medical Xpress) -- A new scientific theory on what we learn to pay attention to and what we learn to ignore could turn 30 years of research on its head.

Research by Dr Mark Haselgrove from The University of Nottingham (UK), and Dr Guillem Esber from the University of Maryland (USA), challenges two long held and contradictory theories on which cues our brains use to predict events of significance.

The theory, published today (Wednesday June 8 2011) in the journal Proceedings of the Royal Society B, has important implications for the psychology and neuroscience of attention. It has implications for our understanding of how uncertainty, such as the uncertainty surrounding a risky investment, may bias our attention. Furthermore, by advancing the theoretical basis of how learning influences attention, this research may inform our understanding of what happens when the allocation of attention is inappropriate, such as occurs in mental illnesses such as schizophrenia.

Dr Haselgrove said: “Animals, and that includes humans, spend a great deal of their waking hours learning about and using cues to predict events of significance — such as food, danger, or the opportunity to have sex. One question that has long captivated the imagination of psychologists is how animals come to attend to the appropriate cues. Decades of research have singled out two variables — predictiveness and uncertainty — as key factors in determining how much attention animals and humans pay to a cue.”

It turns out that existing theories that have tried to explain the influence of these two variables on attention are contradictory. One theory suggests attention is captured by cues that are good predictors of significant events — to enable animals to work out what cues are relevant to them. The rival theory argues instead that attention is applied where it is most needed — to cues that may or may not be followed by events of significance — that is to say, to cues that possess uncertainty. Both of these theories seem intuitively plausible and have scientific evidence to back them up but they are, unfortunately, contradictory.

“Can the brain really be wired up to attend to the world in two contradictory ways?” asks Dr Haselgrove. “Surely there must be a resolution to this problem.”

Dr Esber said: “The basis for solving the problem is to appreciate that uncertainty can be thought of as another type of predictiveness. For example, the ripples on a lake caused by a fish under its surface may frequently help a hungry heron in his hunt and will be associated with a tasty meal. However, the fish will sometimes be too quick for the heron, or the ripples will be caused by the wind — and the heron will go hungry. Although the ripples can be thought of as an uncertain cue for fish, they are in fact predictive of two things: the satisfaction associated with a tasty meal, and the frustration that accompanies hunger.”

In other words, uncertainty is a situation where a cue is predictive of two opposite events.

From this insight Dr Haselgrove and Dr Esber were able to apply the principles of associative learning that have developed since the time of Pavlov's investigations into conditioned reflexes to devise an entirely new explanation for how learning influences attention in animals and importantly resolve the contradiction between uncertainty and predicitiveness.

Provided by University of Nottingham