How humans struggle to differentiate imagination from reality

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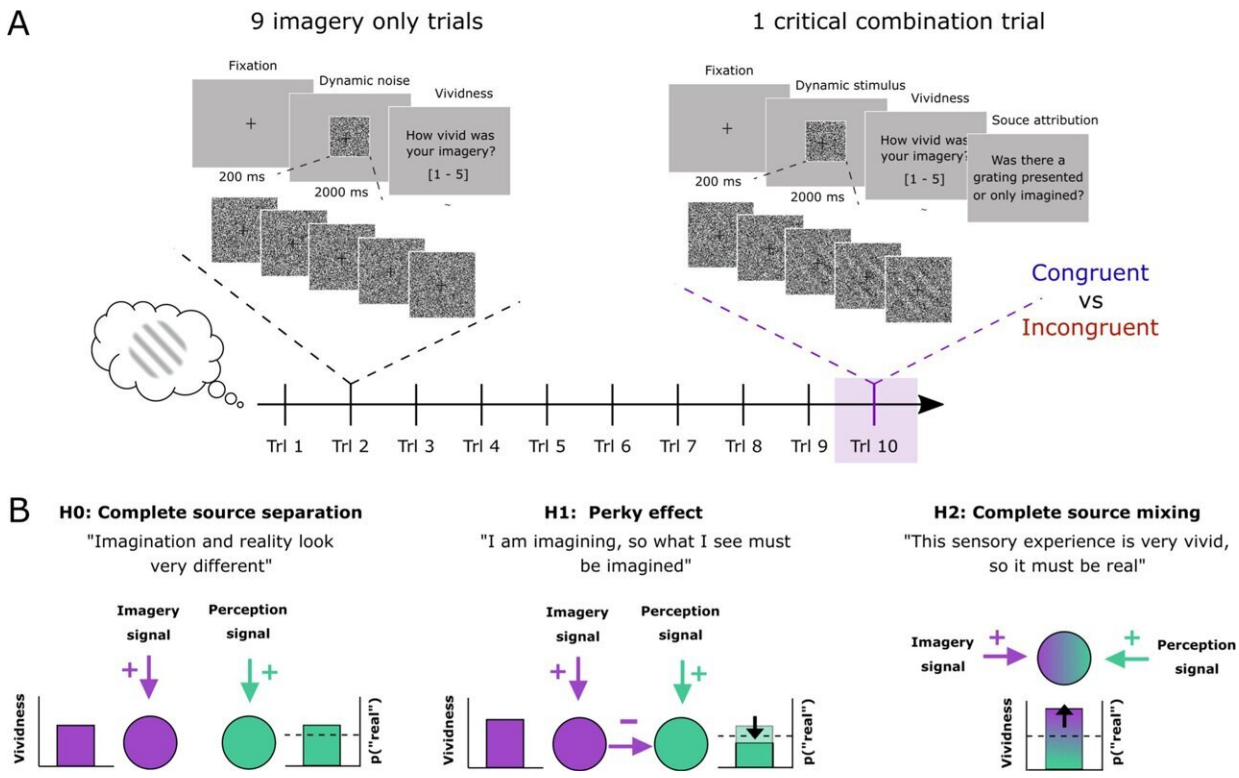

Experimental design and theoretical accounts of reality monitoring. A We employed online psychophysics to test reality monitoring in a statistically robust manner. Participants were instructed to imagine oriented gratings while looking at dynamic noise. On the final, critical trial, a grating with either the same (congruent) or perpendicular (incongruent) orientation to the imagined stimulus gradually became more visible until it was around detection threshold. Participants were then asked whether they thought a stimulus was presented on the last trial or if what they saw was imagined. Importantly, each participant only performed one critical, reality monitoring trial ensuring they remained naïve

about the potential presence of external stimuli. B We compared three theoretical accounts of perceptual reality monitoring: H0 source separation, H1 Perky effect and H2 complete source mixing. Credit: *Nature Communications* (2023). DOI: 10.1038/s41467-023-37322-1

The more vividly a person imagines something, the more likely it is that they believe it's real, finds a new study by University College London researchers.

The research, published in *Nature Communications*, involved more than 600 participants who took part in an online experiment, where they were asked to imagine images of alternating black and white lines while looking at a computer screen.

After they imagined a stimulus, participants then had to report how vividly they were able to visualize it.

Then, without the participant's knowledge, at the very end of the experiment, an actual stimulus with the same features as those the participant was imagining was gradually faded in to view on the computer screen. Participants then had to rate how vividly they imagined the stimulus and described whether what they saw was real or imagined.

The results showed that the imagined and perceived stimuli became intermixed in the participants' minds. For example, when a real stimulus was faded in, participants believed that their imagination had simply become more vivid.

Meanwhile, when imagining more vividly, the participants were more likely to believe that they had seen a real stimulus—even when nothing had been presented to them.

Lead author, Dr. Nadine Dijkstra (Wellcome Center for Human Neuroimaging at UCL) said, "In daily life, we often imagine things that are not there. For example, if we are asked whether a cat's ears are round or pointy, we might inspect a mental image in our mind's eye to answer the question.

"Neuroscience has discovered that imagination and perception rely on overlapping brain circuits. We were interested in whether this overlap leads to confusion between the two: given that the same circuits are involved—how can we be sure what is real and what is not?"

The researchers used a computer model to establish whether the pattern of results was consistent with the theory that people judge whether something is real or imagined, based on how vividly they experience it.

The team validated this model using neuroimaging, showing that the brain encodes the strength or vividness of real and imagined stimuli in a similar manner—confusing reality and imagination.

Dr. Dijkstra, said, "Our results suggest that, counterintuitively, there is no categorical difference between imagination and reality; instead, it is a difference in degree, not in kind."

Senior author, Professor Stephen Fleming (UCL Psychology & Language Sciences, Wellcome Center for Human Neuroimaging at UCL, and Max Planck UCL Center for Computational Psychiatry & Aging Research) added, "Normally imagination is relatively weak, and so we don't confuse it with reality. But if imagination becomes strong or vivid enough, it may get treated as real.

"In near-future scenarios, in which brain stimulation or virtual reality technology become novel sources of strong sensory signals, our findings imply it may be more difficult than we think to tell apart reality and

unreality."

More information: Nadine Dijkstra et al, Subjective signal strength distinguishes reality from imagination, *Nature Communications* (2023). DOI: 10.1038/s41467-023-37322-1