

Preference uncertainty in the human brain

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It has been known for decades that preference-based choices often vary strongly from trial to trial, thus violating axioms of transitivity. However, the biological sources that lead to such variability have remained elusive. In this talk, I will first show that patterns of neural activity in the vmPFC encode probability distributions over stimulus values and that the brain uses this probabilistic information in its computations to derive preferences. In a second study, we propose a biologically grounded model of preference-based decisions that allows organisms to access and exploit the uncertainty associated with their preferences in order to optimally guide preference-based choices. We validate this model based on realistic preference-based choice data in humans. Interestingly, we show that framing effects naturally emerge from this model. Together, the results of these studies support the idea that subjective preferences are not merely encoded as noisy point estimates (as usually assumed in standard choice models and diffusion models) but as probability distributions over preference values that are encoded by the activity of neural populations. Finally, access to the preference reliability encoded in neural populations (as formally proposed here) would make it possible for humans to optimally combine multiple sources of information for decisions. Our model of how this information is encoded may therefore pave the way for mechanistic explanations of more complex types of choices (such as multi-alternative and multi-attribute choice situations) and other puzzling distortions often observed in economic decisions.