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Modelling eye tracking dynamics with quantum theory

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Abstract

Eye movements during decision making show systematic patterns such as increased fixations to the chosen option (i.e. gaze cascades) and multiple gaze transitions between fixated options. Existing formalisms, such as multivariate decision field theory, only provide limited scope for describing multiple reversals in the attentional focus and it is therefore unclear how they can be applied to the underlying attentional dynamics. Here, we present an open systems dynamical model from quantum theory to describe gaze transitions between choice options and the gaze cascade effect. Our model was tested on a decision task, in which participants repeatedly decided among two complex options (i.e. that lacked easily quantifiable, matched characteristics). The model can describe the gaze patterns on the individual trial level. It reveals structure in the gaze dynamics that is predictive for choice behavior. The explanatory value of this account for studying attentional dynamics during decision making will be discussed.