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# The Role of Attention in Multi Attribute Decision Making

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## Résumé

Real-life decisions typically involve multiple options, each with multiple attributes affecting value. In such complex cases, sequential shifts of attention to specific attributes of options are thought to guide the decision process. We designed a task that allowed us to monitor attention in monkeys engaged in such multi-attribute decisions. Options were presented visually with two attributes: reward amount and probability. Initially, these attributes were masked behind colored circles that indicated the attribute type, but not its magnitude. When these circles were fixated, they were instantaneously (at frame rate) removed to reveal a symbolic indicator of the attribute magnitude. By fixating different masks, the monkeys could freely collect information one option at a time. After this information gathering stage, the final decision was indicated with an arm movement in the direction of the chosen option. We recorded the activity of pre-supplementary motor area neurons encoding action value signals reflecting the decision process. Neuronal activity was aligned to both the information gathering and option selection stages and analyzed using generalized linear models and de-mixed principal components analysis. We found that attention guides the decision process through two mechanisms. First, attention enhances the activity of neurons representing the currently fixated option, independent of the attended option value. Second, attention up-regulates the gain of information contributing to the evolving value estimate of the attended option. In contrast, we found no evidence for a third suggested mechanism, in which only the currently attended option is represented. Instead, attention influences the ongoing information accumulation and competition between the options by modulating the strength of the value information that drives this circuit.

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