

 MEMORY

Separating the wheat from the chaff



Our working memory can only contain a few items at a time. Its storage capacity is limited, and some of the space is taken up by irrelevant information. In a new study, McNab and Klingberg show, using functional MRI, that the basal ganglia have an important role in filtering out such irrelevant information to make working memory more efficient.

The authors devised a task in which participants had to remember the position of red and yellow circles on a screen. At the start of each trial, participants saw a cue, lasting 3–5 seconds, that indicated whether they should remember the positions of

both the red and yellow circles (no-distraction trials) or of only the red circles (distraction trials, in which the yellow circles served as irrelevant information). Neural activity during this preparation phase was higher in the middle frontal gyrus and left basal ganglia in distraction trials compared with no-distraction trials, indicating that these areas are involved in the preparation to filter out irrelevant information. The 'preparatory filtering activity' in the prefrontal cortex and basal ganglia (specifically the globus pallidus) correlated positively with the participant's working memory capacity.

The authors then determined whether preparatory filtering activity indeed resulted in fewer distractors being stored. Previous research has shown that storage of information (whether or not it is relevant) is associated with activity in the parietal cortex. McNab and Klingberg found that preparatory filtering activity in the globus pallidus negatively correlated with activity related to irrelevant storage in the parietal cortex. Thus, high preparatory filtering activity in the globus pallidus resulted in fewer distractors being stored and consequently in a better working memory.

These findings indicate a role for the globus pallidus in filtering out information that does not have to be stored in working memory. The prefrontal cortex might contribute to this process by flagging information that is necessary or worth remembering. Variations in activity in these areas and in their connections might explain individual differences in working-memory capacity and might underlie attention-deficit disorders.

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