So many options: The roles of neural inhibition and abstract representations in selection

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Abstract: How do we select words to express a thought? We investigated the roles of neural inhibition and abstract category representations during simple language-production tasks. First, we simulated a verb-generation task in a neural network model. The model, like people, takes longer to select a verb in response to nouns associated with multiple competing verbs. Neural inhibition (simulated via k-Winners-Take-All inhibition in a prefrontal layer) appears critical for resolving such competition. Consistent with this framework, we found increased selection costs in participants high in trait anxiety (associated with poor GABAergic function) and reduced selection costs in participants administered midazolam (a GABA agonist). Abstract prefrontal representations may also aid selection by providing top-down support that constrains the search space of options. Consistent with this framework, we found children's selection in a verbal fluency task is tied to individual differences in, and experimental manipulation of, abstract representations.