

**Integrating psychological and neuroscientific
constraints in models of Stroop processing
and action selection**

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Tom Stafford

Department of Psychology,
University of Sheffield

DEDICATION

For my grandfather

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*"Here's to the few that forgive what you do,
and the fewer that don't even care"*

- Leonard Cohen

ABSTRACT

This thesis concerns the investigation of the principles of action selection when applied to a cognitive task. Action selection is the task of mediating between competing potential behaviours. A connectionist model of the Stroop task (Cohen, Dunbar, & McClelland, 1990) is improved by combination with a biologically plausible model of action selection which is based on the functional anatomy of the basal ganglia (Gurney, Prescott, & Redgrave, 2001a). A schematic model of word-reading (Ellis & Young, 1988) is also incorporate into the combined model. These models show that the basal ganglia model provides an improvement upon response mechanisms based on choice models of reaction time, as well as allowing a wider range of data to be accounted for. The combined model allows the prediction of the pattern of results when using non-standard stimulus-response mappings in the Stroop task. The predicted result is experimentally verified. These models and findings support a decomposition of the concept of automaticity within a connectionist framework. Action selection is an important component of cognition and it is essential to consider the properties of response mechanisms when constructing psychological models. Proposals concerning the use of connectionist models in psychology are made.

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