What Prototypes Can Teach Us About Unknown Knowledge

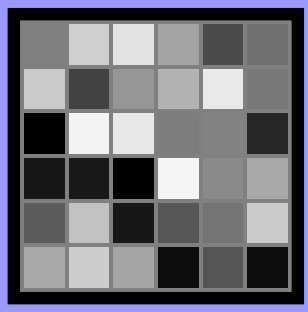
Christoph Witzel & **Denis Cousineau**

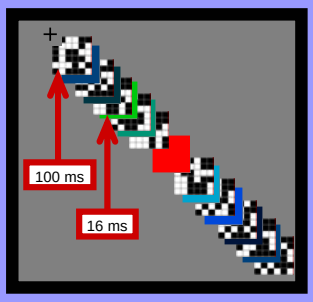
christoph_witzel@gmx.de
Psychologisches Institut
Ruprecht-Karls-Universität Heidelberg
Hauptstraße 47-51, 66117 Heidelberg, Germany

denis.cousineau@umontreal.ca
Département de psychologie
Université de Montréal
C.P. 6128, succursale Centre-ville, Montréal (Québec) H3C 3J7, Canada

INTRODUCTION

The present study explores the perception of **structure in implicit learning**. Its objective is to provide a model of the learned structure that is usable in future research on the relationship between basic abilities to perceive structure and more complex, analytical abilities. We propose a model that describes this structure using the first ***Principal Component***. This model has characteristics that correspond to those of prototypes. Although being concordant with the connectionist line of thought, the proposed model is more illustrative in its simplicity and more interpretable in its results than neural networks.





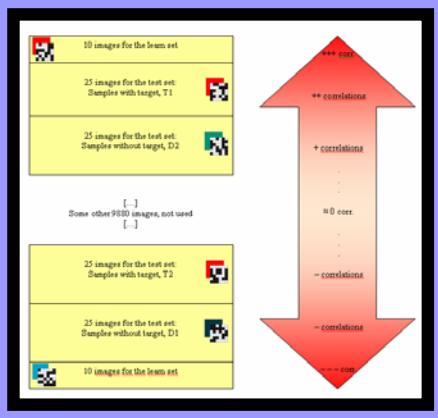
METHOD

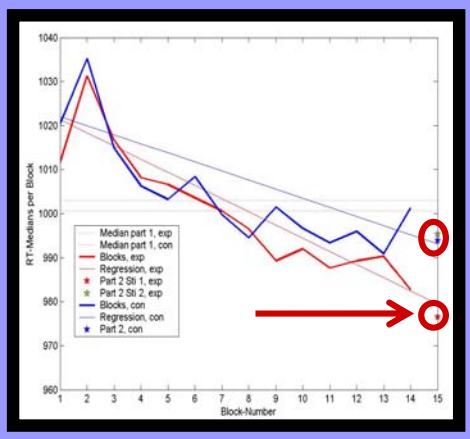
A paradigm, called ***Prototype Priming***, has been developed to test this model. Stylised images composed of 6 x 6 black and white squares, called 'masks', are used. One trial consists of ten successively presented masks (100ms each) with 9 interposed coloured images (16ms each). The cover task given to the participants consists in indicating as fast as possible if the 5th of the coloured images is red, i.e. the 'target'.

In a **learning phase**, 14 blocks of 100 samples are presented. There are two groups of masks, which differ in their similarity to the prototype in terms of positive and negative correlations with the Principal Component. One group of masks is associated with the presence of the target and the other to its absence.

A **test phase** with 100 new stimuli follows in a 15th block that is indistinguishable from the previous ones for the participants. In the test phase, half of the stimuli are analogous to the learning phase (Sti1), the other half inversely (Sti2). Consequently, we have four stimuli groups. Two types of response times are recorded: those for the target with the analogous grouping and those for the target with the inverse grouping.

A **control group** receives samples with ambiguous groupings in the learning phase so that no prototype learning is possible.





RESULTS & DISCUSSION

In the learning phase, participants presumably learn the prototypes; in the test phase the transfer of prototypical knowledge to new stimuli is tested. The control group is used to evaluate the amount of motor learning and habituation to the experimental setting. We **predict** that, in the test phase, the reaction times of the experimental group on trials with stimuli similar to the prototypes (Sti1) are lower than those dissimilar (Sti2), and also lower than those of the control group.

Seven persons participated in the experimental and four in the control group, each of them having a unique set of stimuli. Predicted results are **confirmed** ($p=0.016$ and $p=0.0013$, respectively). A post-experiment interview verified that people had no explicit knowledge about the actual relationships between masks and target.

CONCLUSIONS

We can conclude that the experimental group really learned the prototypical structure. The Prototype Priming paradigm seems to be very fruitful. However, in order to be representative, these results should be replicated with a larger group. Further, two experimental conditions will be added in the future: One to test the memorisation of exemplars; another to examine the impact of explicit instructions.