

What do we want out of our ideal behavioural method?

- **Automated**
 - High-throughput – many animals tested simultaneously; minimises experimenter contact with animal during testing; labour-saving; many behavioural measures possible; consistency and accuracy of task parameters and measures; data saved automatically; standardisation.
- **Non-aversive, low-stress**
- **Multi-dimensional**
 - All tasks carried out in the same apparatus, using the same stimuli, with the same rewards, and requiring the same responses. Battery. Establish a cognitive profile
- **Translational**
 - Make tasks as similar as possible to those used to test human populations

Human Cognitive Testing



All in the mind of a mouse

Could mice with faulty genes help us to understand the biology of psychiatric disease?

Carina Dennis investigates.

First, there is the cowering in the darkness. Then the furtive scurrying and crouching against the wall. But what really grabs the attention of the former CIA agent is the nervous scratching. An expert in video surveillance, he is programming a computer to monitor these movements. But, unlike in his previous work, he is not tracking

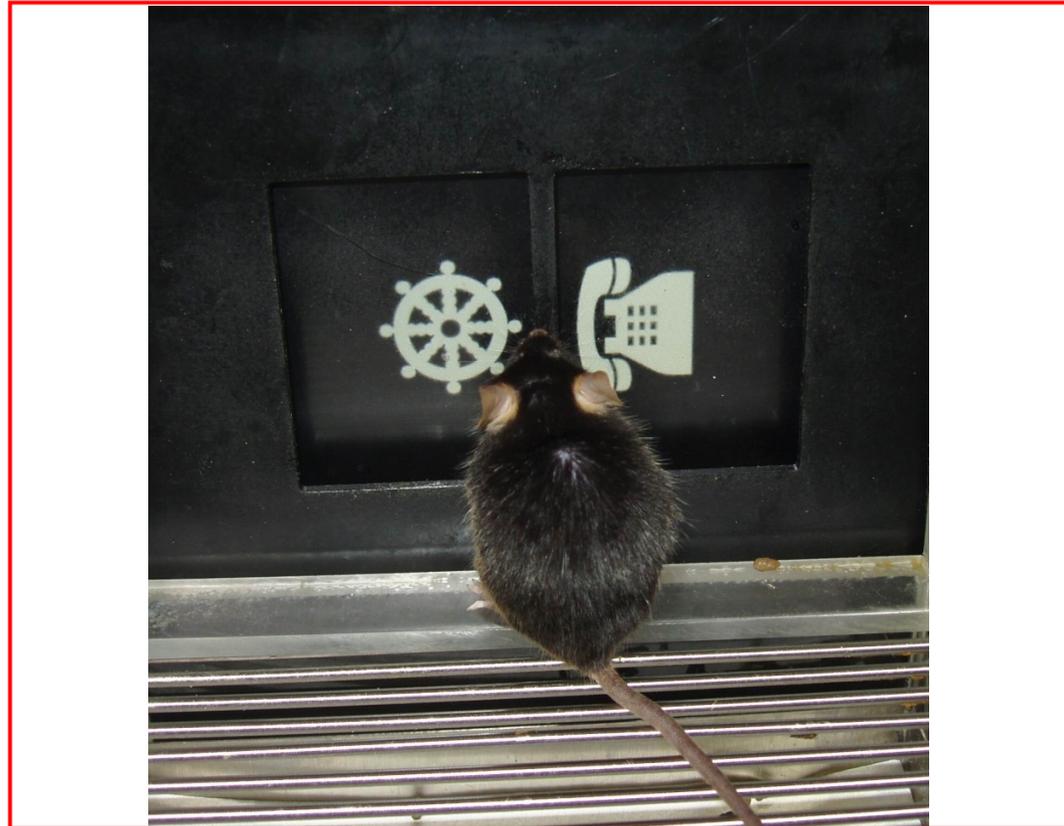
psychiatrist at the National Institute of Mental Health (NIMH) in Bethesda, Maryland, who is using mice to test different forms of a human gene implicated in schizophrenia.

Timid tendencies

The great advantage of mice is that, unlike rats, they can readily be genetically engineered —

it's often easier." Now, new screening technology and more sophisticated behavioural tests are giving the field a boost.

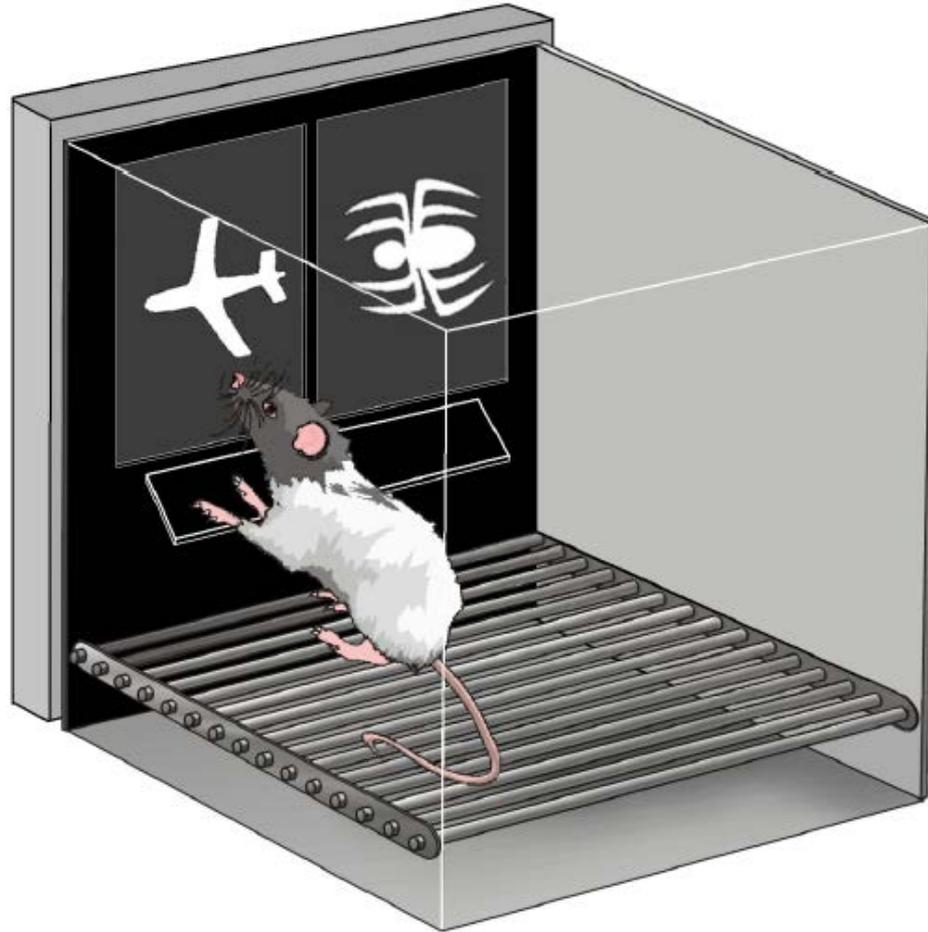
Researchers are using a range of approaches to study how genes influence specific behaviours observed in psychiatric conditions. Some are targeting known genes, whereas others are randomly disrupting genes in the mouse



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Visual discrimination learning



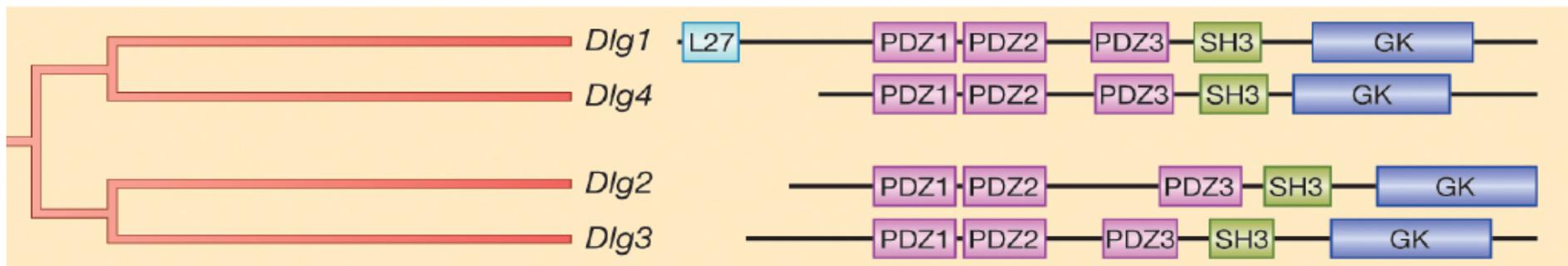
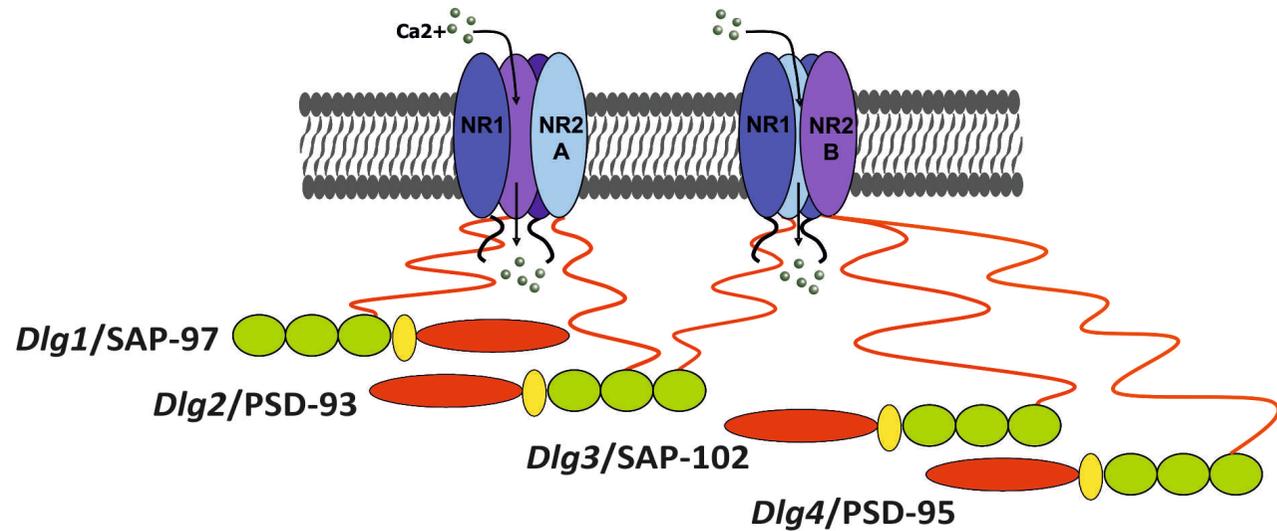
Dlg family of synaptic scaffold proteins

Membrane Associated Guanylate Kinase (MAGUK)

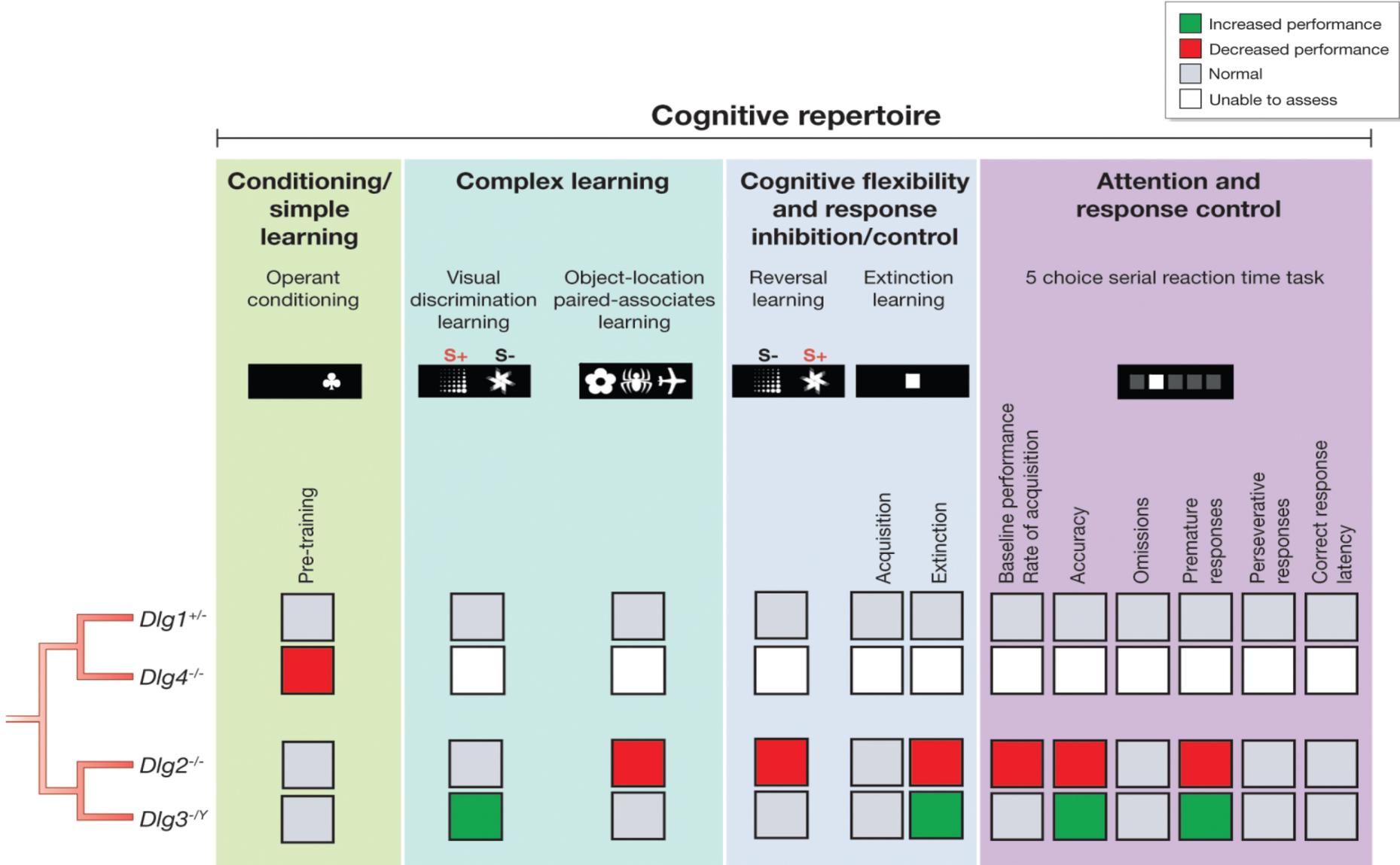
Intracellular scaffolds that are key for assembling neurotransmitter receptors and enzymes into signalling complexes

Dlg:

- *Dlg1/SAP-97*
- *Dlg2/PSD-93*
- *Dlg3/SAP102*
- *Dlg4/PSD-95*



Dlg genes play distinct roles in different aspects of cognition



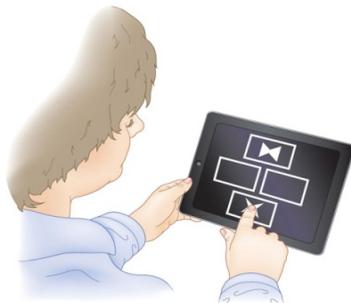
Cognitive testing in humans and mice

Humans carrying copy number variations (CNVs) in *Dlg2* have been reported
 (Walsh et al., 2008; International Schizophrenia Consortium, 2008; Kirov et al., 2011)

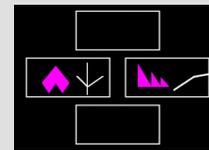
1) Visual discrimination & cognitive flexibility

2) Visuo-spatial associative learning

3) Sustained Attention

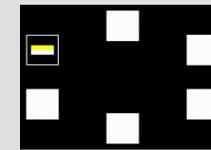


**Cambridge
Neuropsychological
Test
Automated
Battery
(CANTAB)**

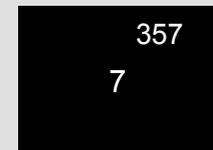


**Intra/Extra Dimensional
Set Shift**

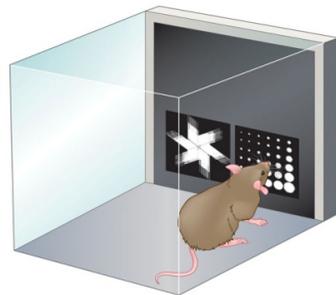
Discrimination Reversal



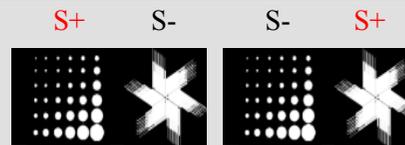
**Paired
Associates
Learning**



**Rapid Visual
Information
Processing**



**Rodent Touchscreen
Cognitive Test
Battery**



**Visual
Discrimination
Learning**



**Reversal
Learning**



**Object-location
Paired-Associates
Learning**



**5-Choice
Serial Reaction
Time Task**

Conservation of *Dlg2* cognitive functions

