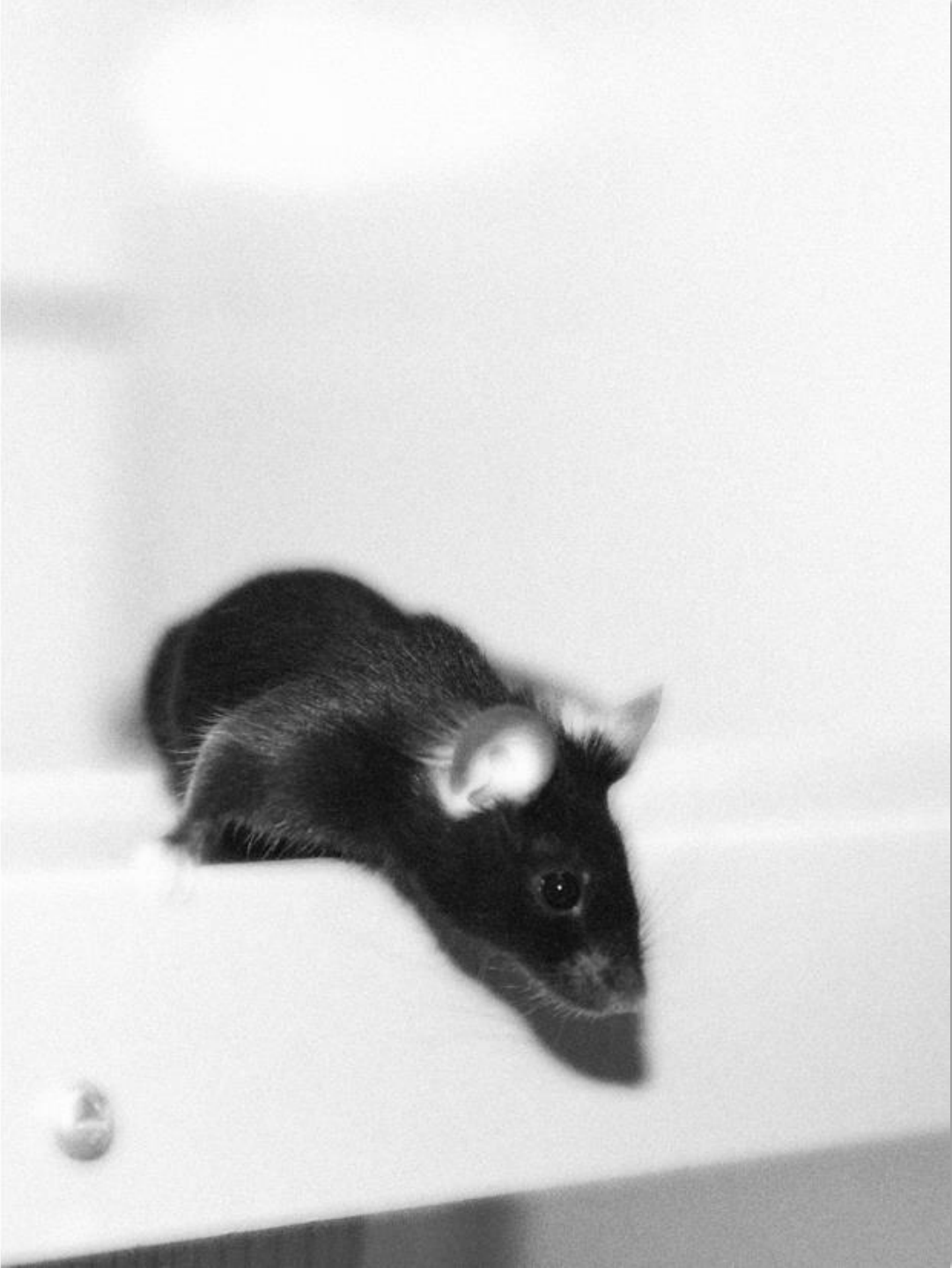


WESTFÄLISCHE
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MÜNSTER

Animal welfare I

How to measure it?



Department of
Behavioural Biology
University of Muenster

Norbert Sachser

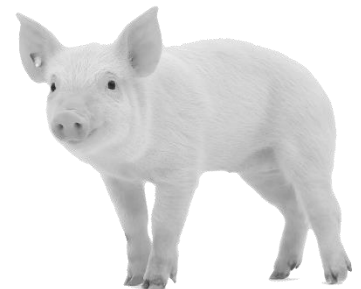
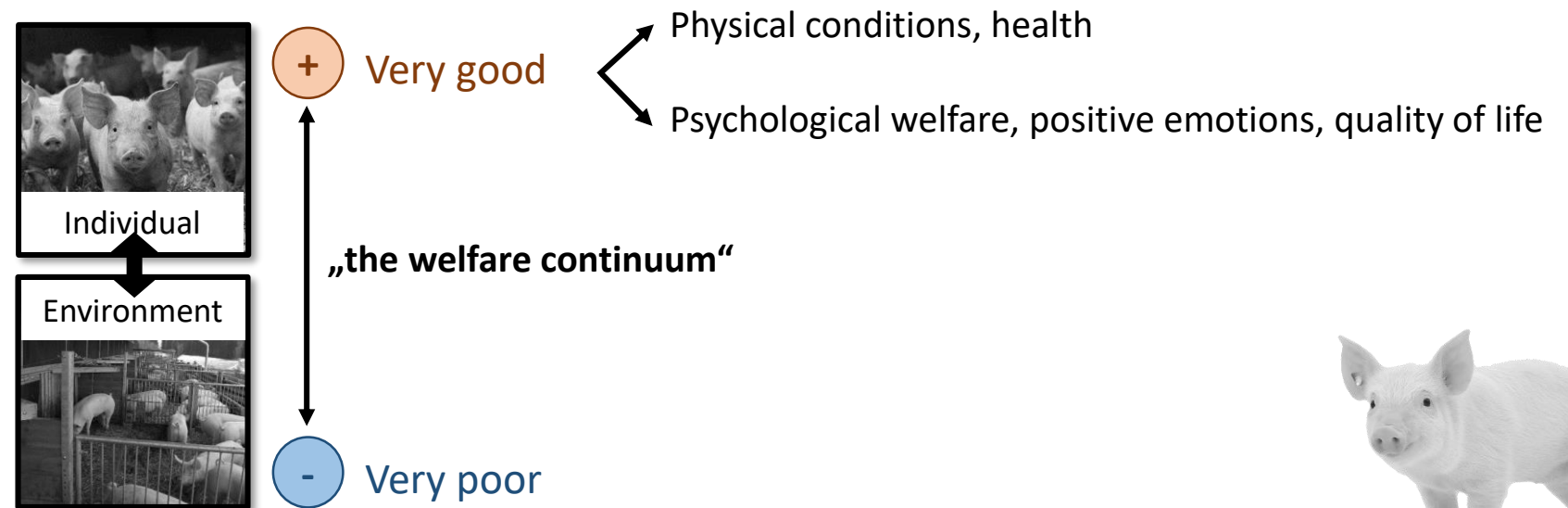
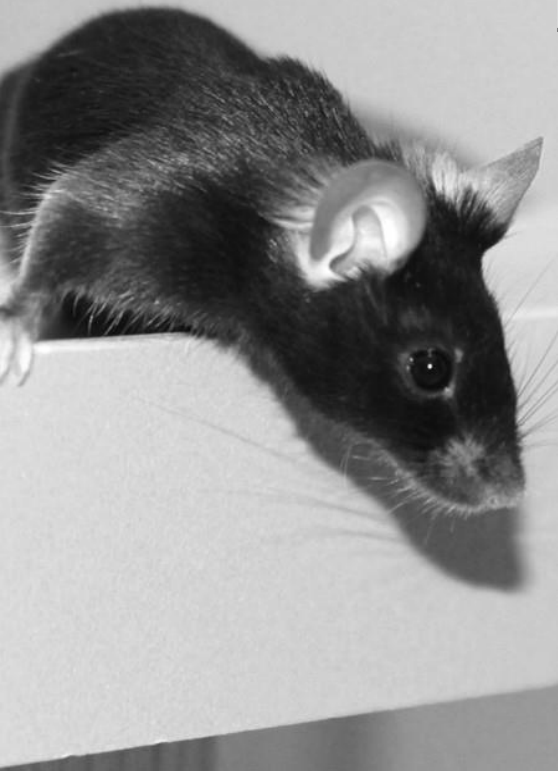
Abteilung für Verhaltensbiologie
Institut für Neuro- und Verhaltensbiologie
Westfälische Wilhelms-Universität Münster
Badestraße 13, D-48149 Münster
richterh@uni-muenster.de



Animal welfare

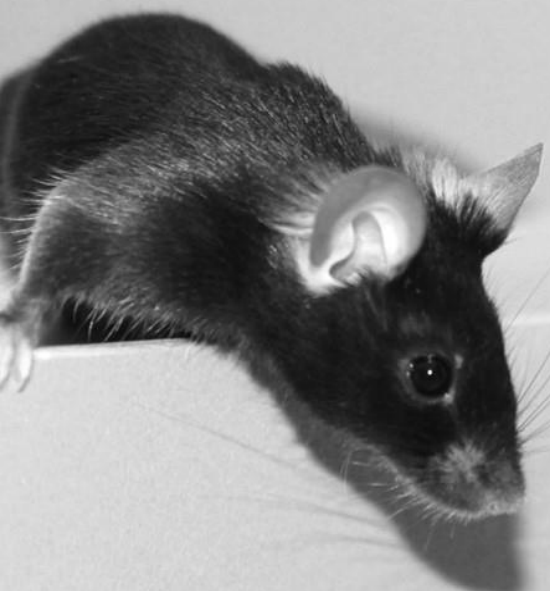
What do we mean when talking about “animal welfare”?

The welfare of an individual is its state as regards its attempts to cope with its environment. It varies on a continuum from very good to very poor.



Animal welfare

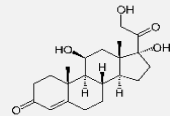
Physiological & behavioural indicators of welfare



Physiology

Activation of the two stress systems

e.g. stress hormones

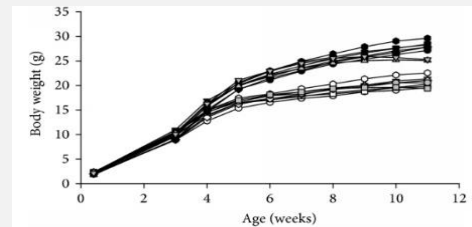


e.g. heart rate variability



Immune markers

Bodyweight



Behaviour

Spontaneous behaviour

Apathy

Vocalisations



Play

Grimace scales



Stereotypies

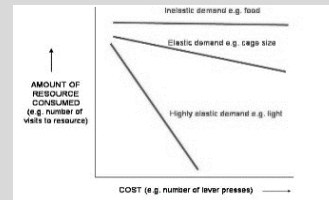


Behavioural tests

Preference tests



Consumer-demand curves

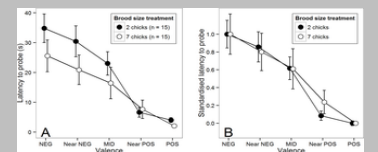


Tests for anxiety-like behaviour



Cognition

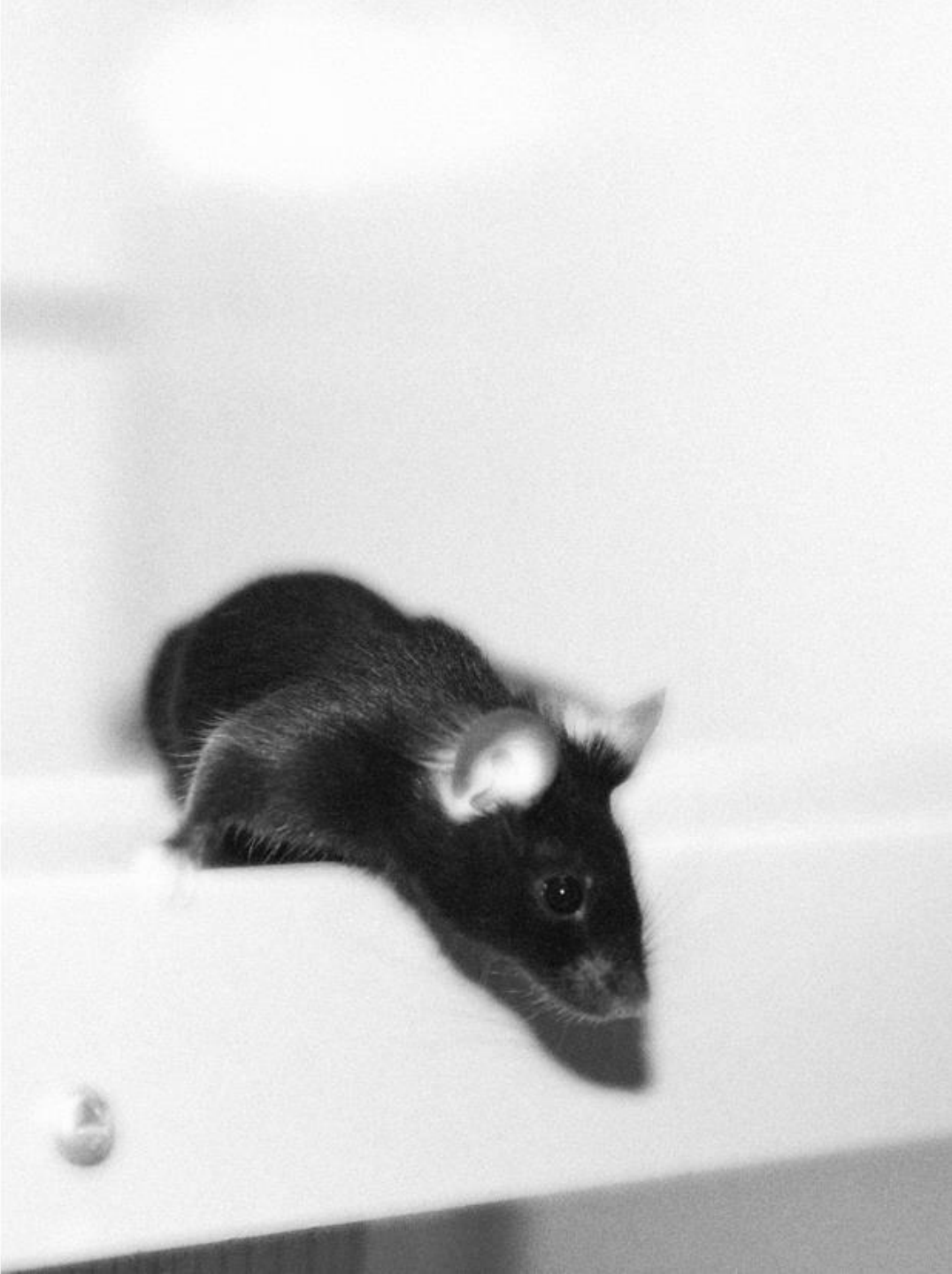
Cognitive bias



Emotions?
Affective states

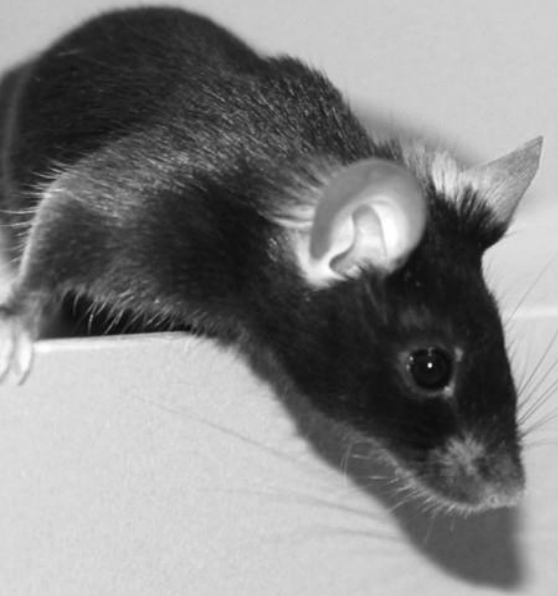
Animal welfare II

Cognitive bias as a tool to quantify emotions in non-human animals



Animal welfare

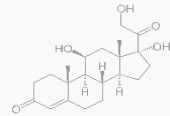
Cognitive indicators of welfare



Physiology

Activation of the two stress systems

e.g. stress hormones

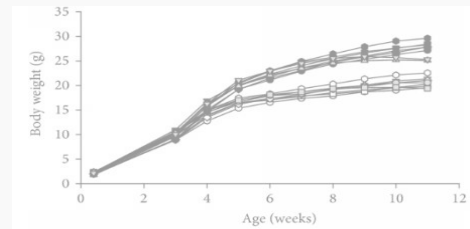


e.g. heart rate variability



Immune markers

Bodyweight



Behaviour

Spontaneous behaviour

Apathy

Vocalisations



Play

Grimace scales

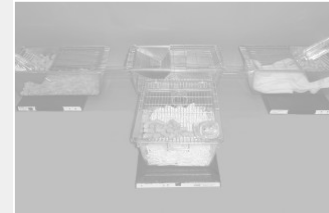


Stereotypies

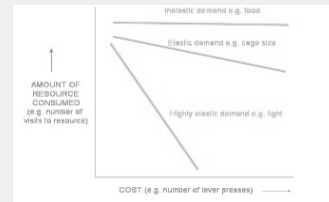


Behavioural tests

Preference tests



Consumer-demand curves

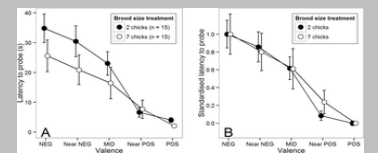


Tests for anxiety-like behaviour



Cognition

Cognitive bias

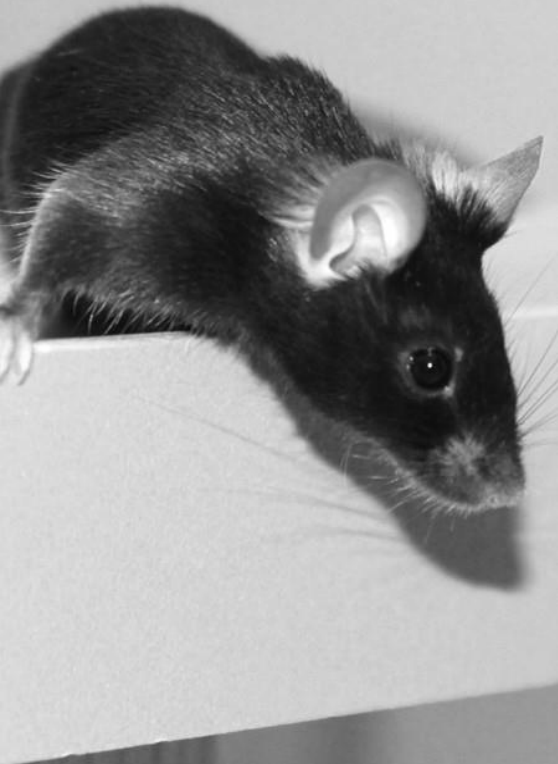


Emotions?
Affective states



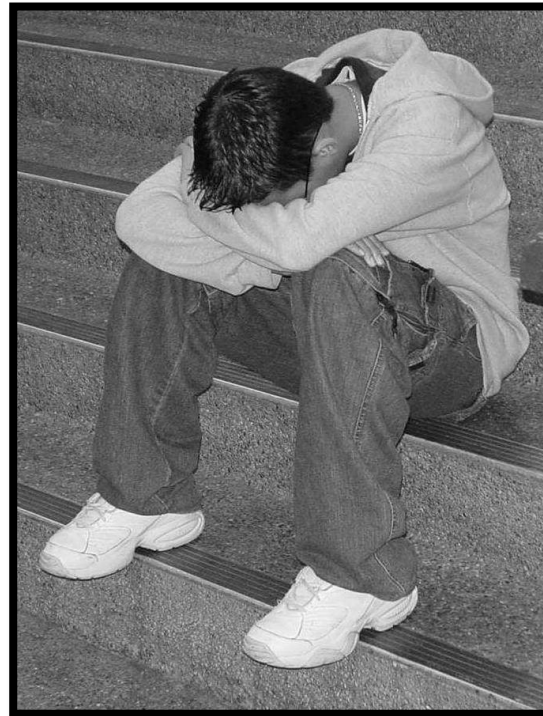
How to assess emotions in non-human animals?

Cognition & emotion



Cognitive bias

Emotional states influence cognitive functioning.



Cognitive outputs of emotion are the numerous information processing changes or biases that are observed amongst humans in whom particular emotions or moods have been induced or reported.

- Attention bias
- Memory bias
- Judgement bias



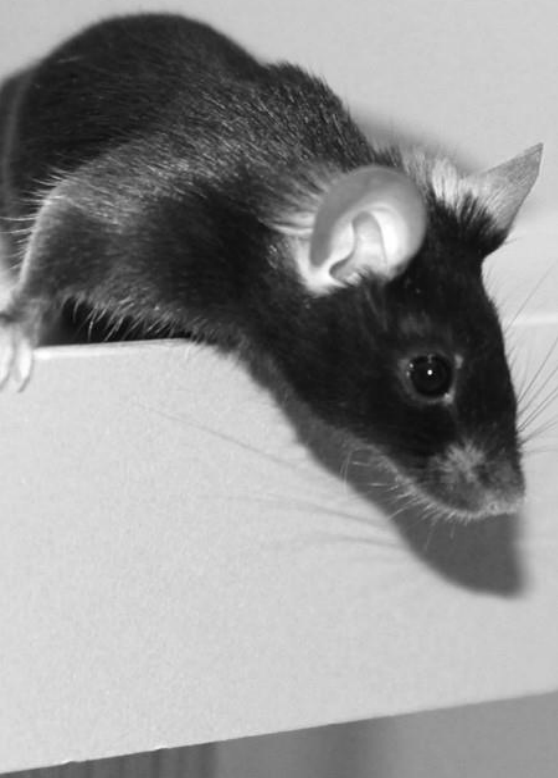
How to assess emotions in non-human animals?

Cognition & emotion



Attention bias

Anxiety is often associated with shifts in attention towards threat.



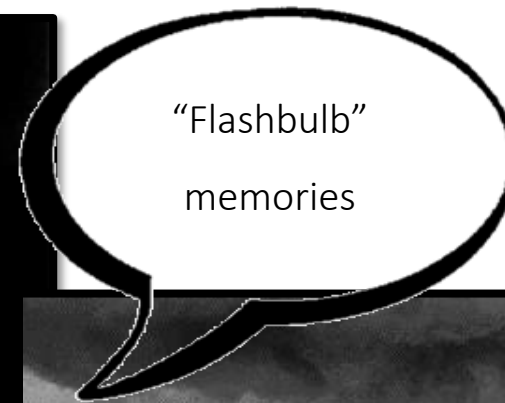
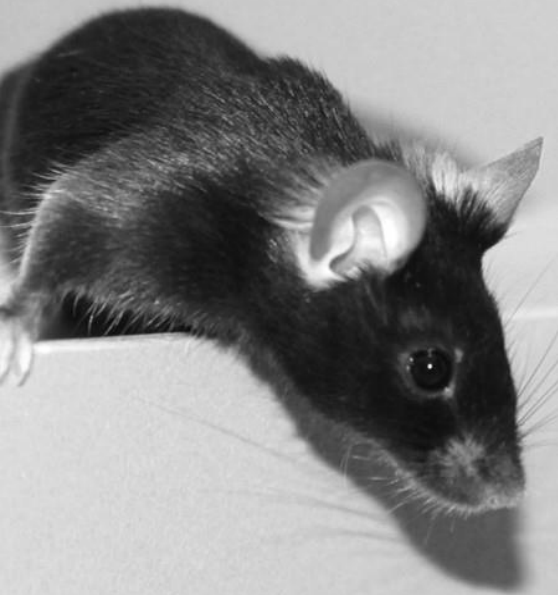


How to assess emotions in non-human animals?

Cognition & emotion

Memory bias

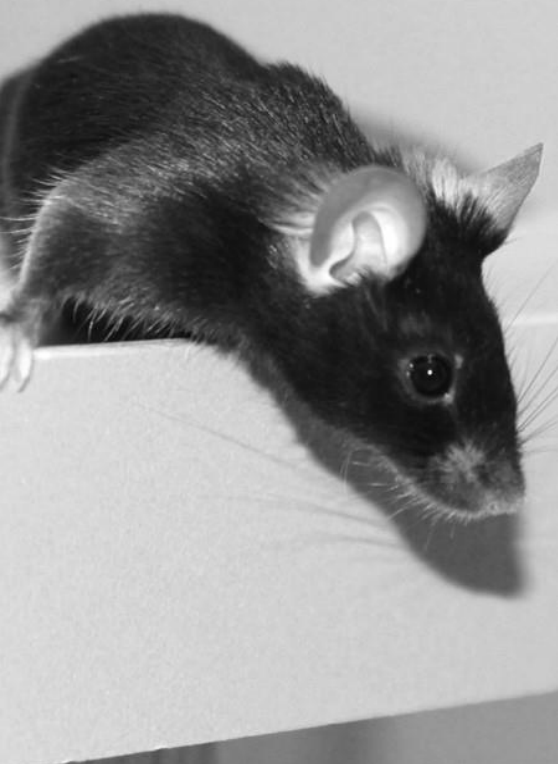
There are strong links between emotions and the storage, consolidation & retrieval of memories.





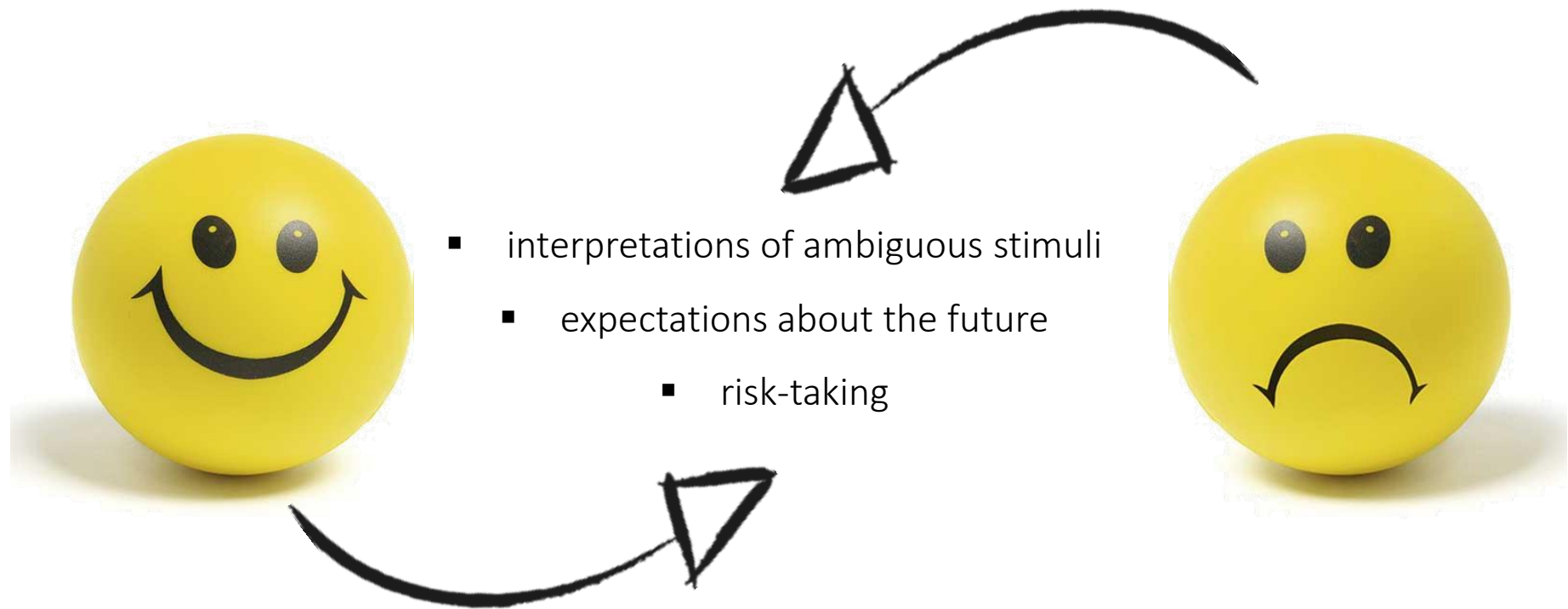
How to assess emotions in non-human animals?

Cognition & emotion



Judgement bias

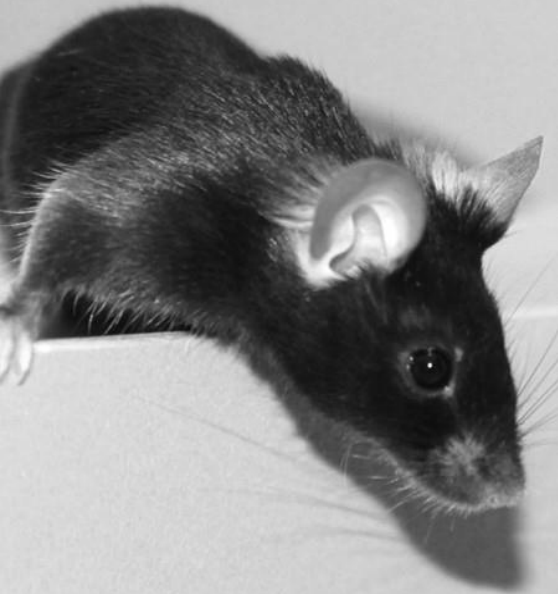
Anxiety is often associated with a bias in the interpretation of ambiguous stimuli.





Cognition & emotion

Judgement bias



Animal behaviour

Cognitive bias and affective state

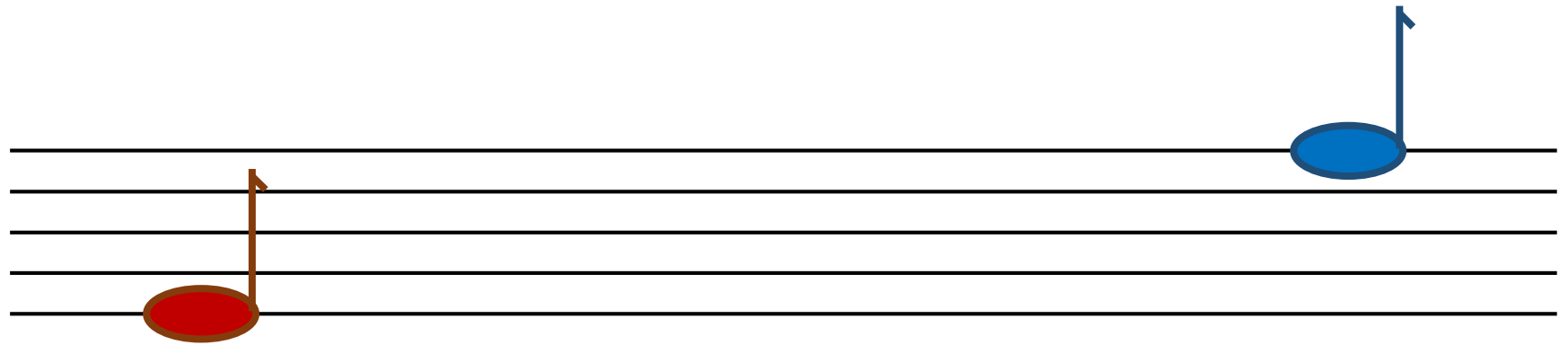
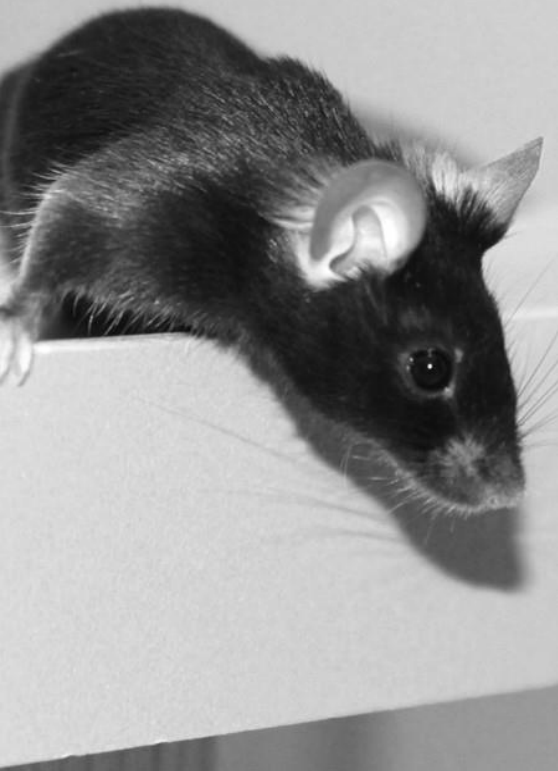
Information processing by humans can be biased by their emotions — for example, anxious and depressed people tend to make negative judgements about events and to interpret ambiguous stimuli unfavourably¹⁻⁴. Here we show that such a 'pessimistic' response bias can also be measured in rats that are housed in unpredictable conditions^{5,6}. Our findings indicate that cognitive bias can be used as an indicator of affective state in animals, which should facilitate progress in animal-welfare studies.

We trained rats to respond by pressing a lever when they heard a tone associated with a positive event (delivery of a 45-mg food pellet) and to refrain from pressing the lever as a way to avoid a negative event (30 s of 70 dB white noise) when they heard another tone. Once the animals were able to score a correct response to each tone more than 50% of the time (binomial testing for three consecutive daily 30-min sessions), they were allocated to either 'unpredictable' housing, which induces symptoms of a mild depression-like^{5,6}, or to 'predictable' housing.



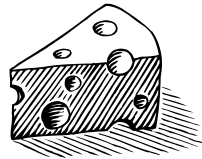
Cognition & emotion

Judgement bias paradigms



Press lever „left“

to get:



food reward

Press lever „right“

to avoid:



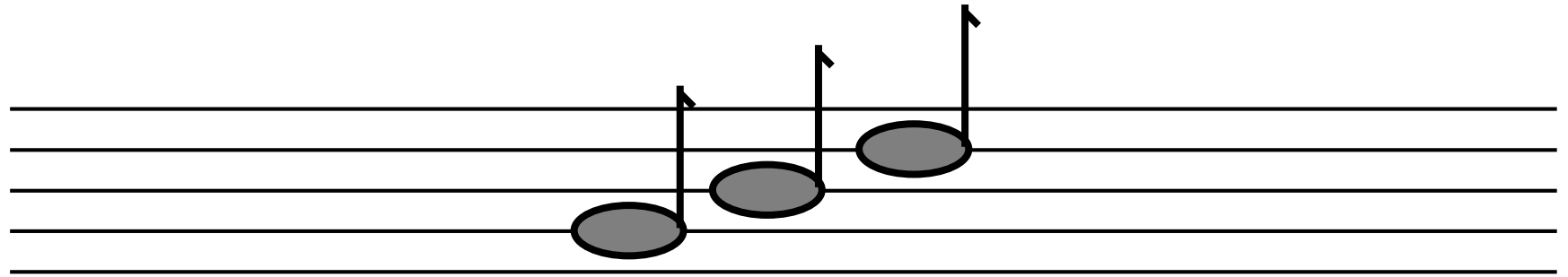
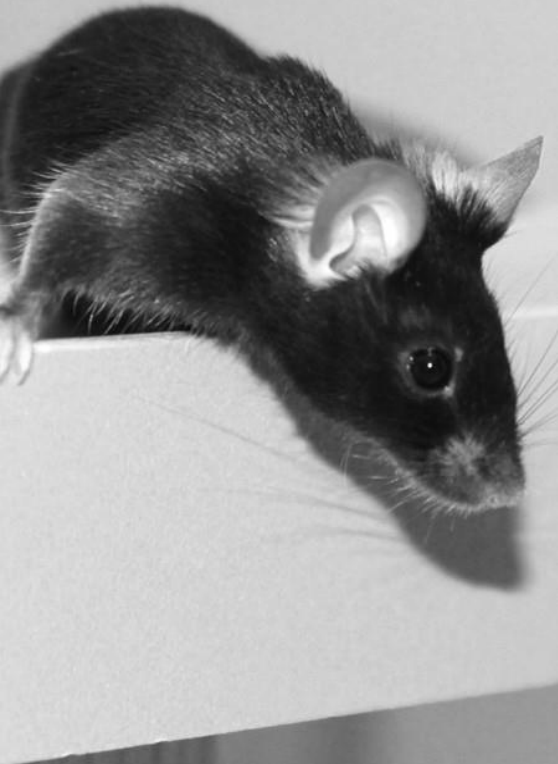
mild punishment





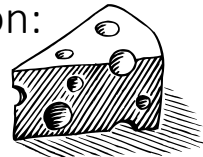
Cognition & emotion

Judgement bias paradigms

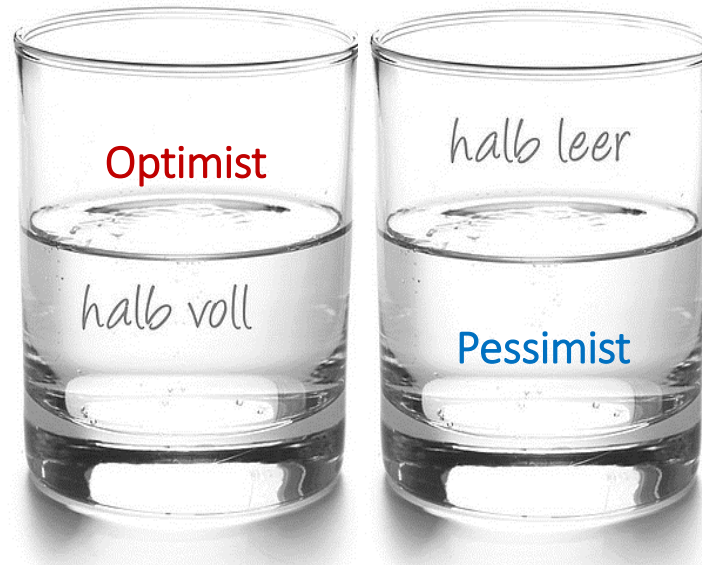


Response „left“

Expectation:

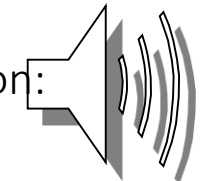


food reward



Response „right“

Expectation:

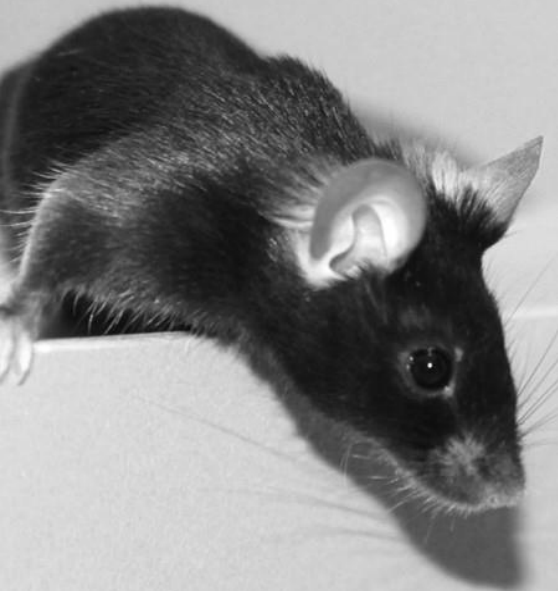


mild punishment

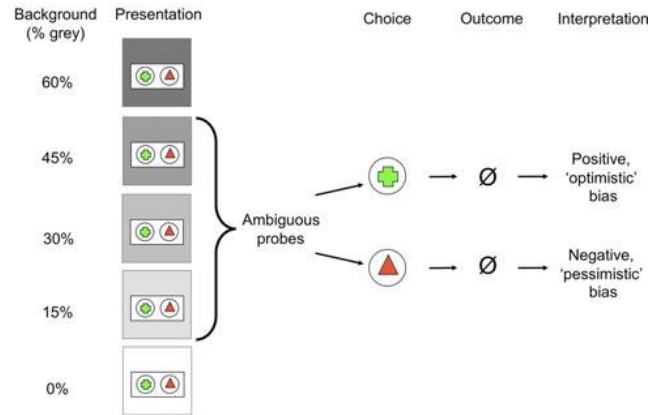


Cognition & emotion

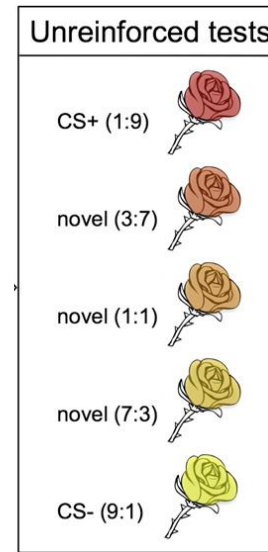
Judgement bias paradigms



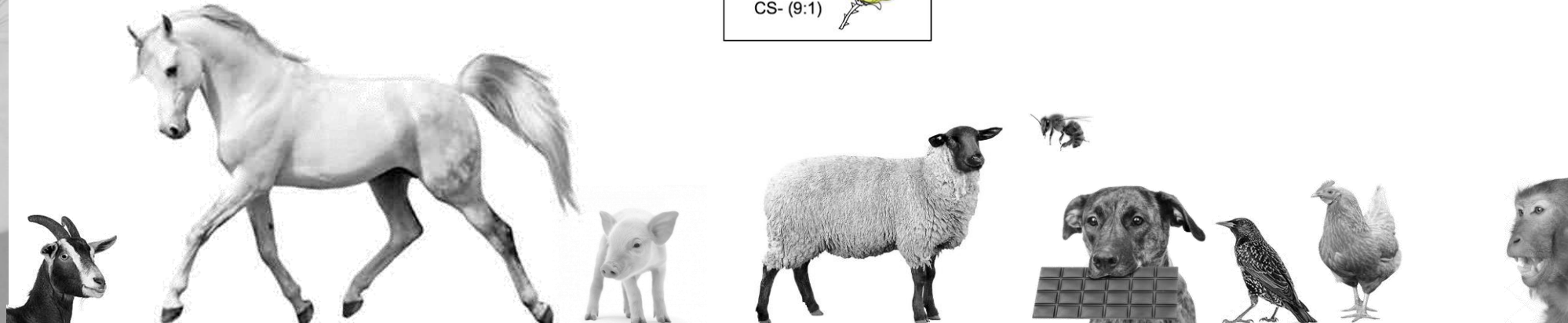
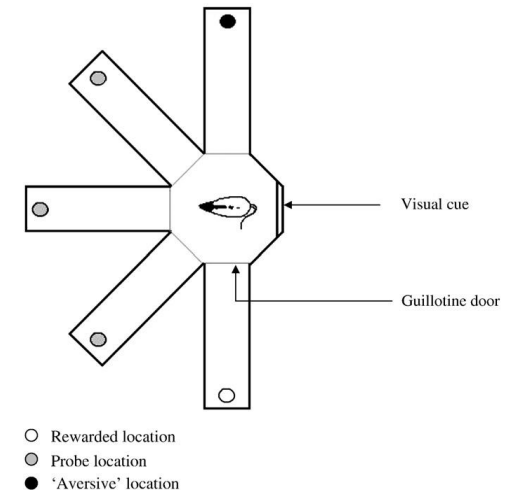
visual cues



odour cues

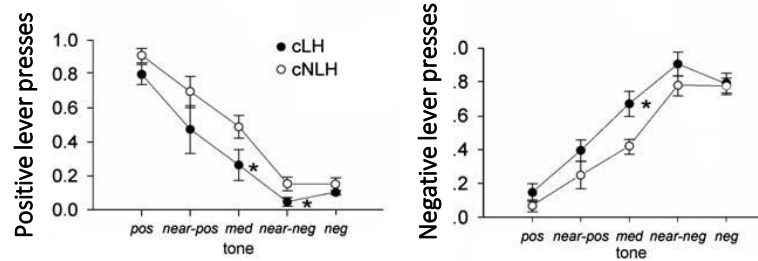


spatial cues

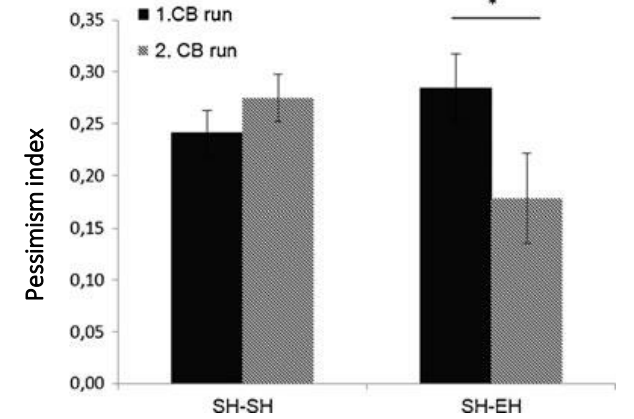


Cognition & emotion

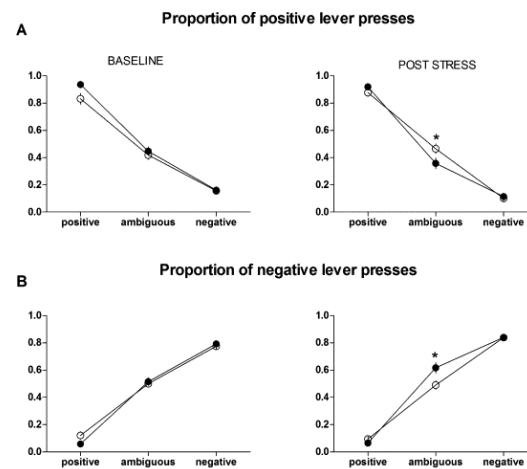
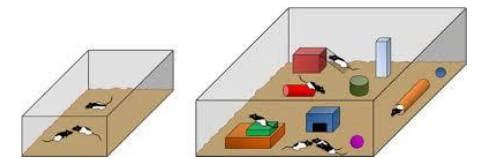
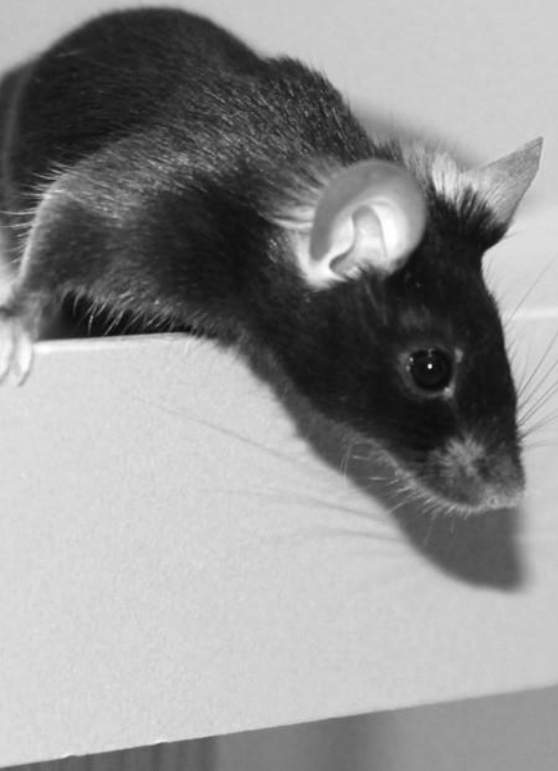
Inducing optimistic- and pessimistic-like states



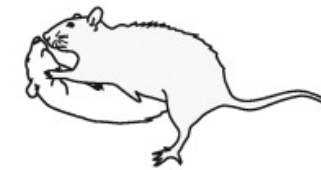
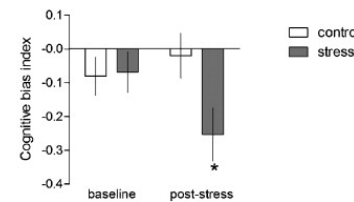
Enkel et al., Neuropsychopharmacol, 1-8, 2009.



Richter et al., CABN, 12: 527-542, 2012.



Chronic psychosocial stress makes rats 'pessimistic'



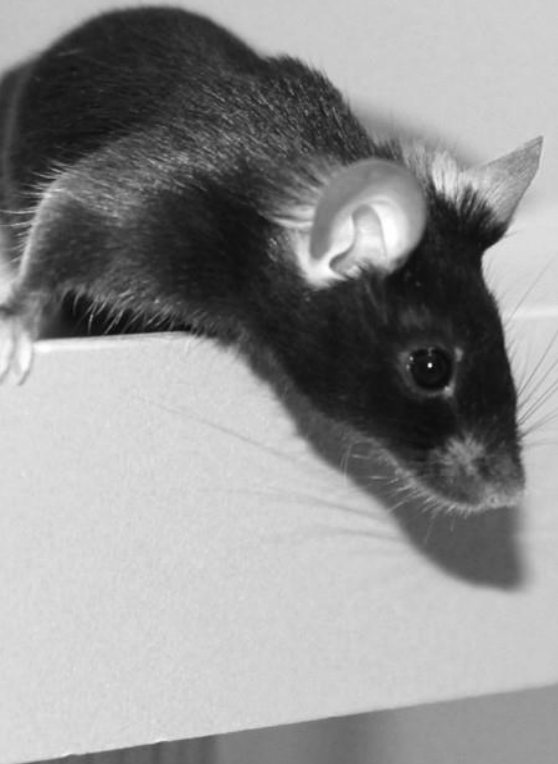
social defeat

Papciak et al., Behav Brain Res, 256: 305-310, 2013.



Cognition & emotion

Validation of a judgement bias paradigm for mice



Touchscreen system



Procedure

		Left Touch	Right Touch
Discrimination Training	Positive Condition		
	Negative Condition		
Test	Ambiguous Conditions		
		Pessimist	Optimist



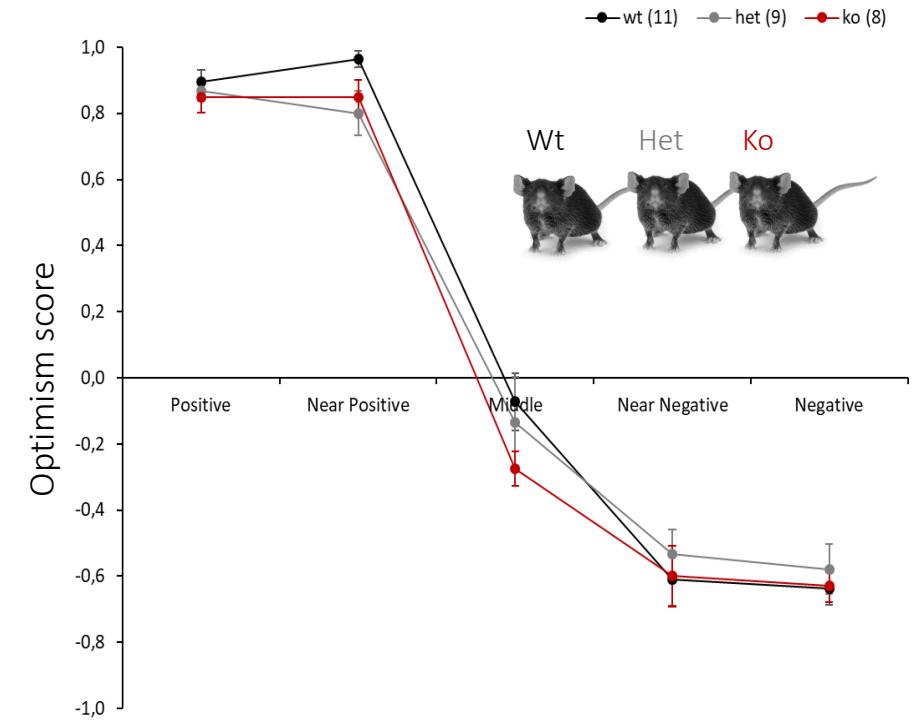
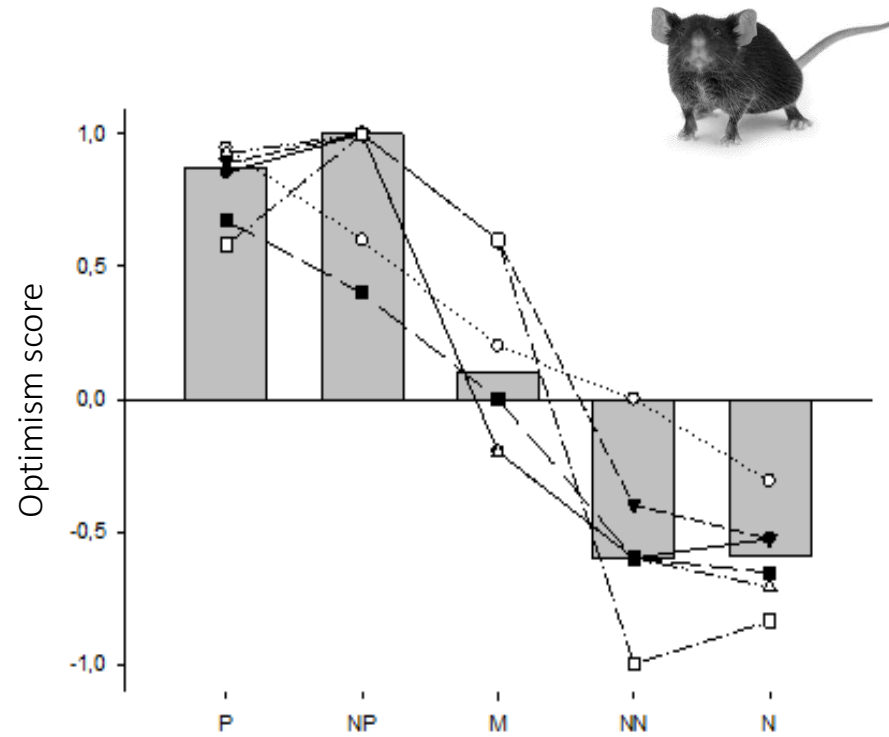
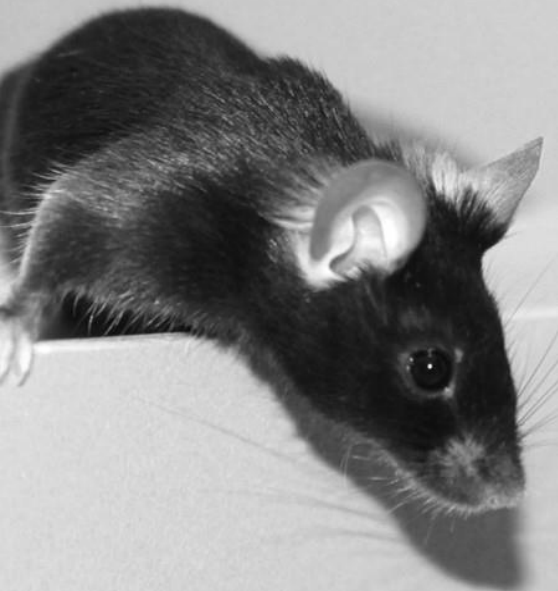
Cognition & emotion

Validation of a judgement bias paradigm for mice

Fear, Anxiety, Anxiety Disorders
Furcht, Angst, Angsterkrankungen



SFB / TRR 58





Cognition & emotion

Validation of a judgement bias paradigm for mice

Fear, Anxiety, Anxiety Disorders
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SFB / TRR 58

