



# What do rats need?

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University of British Columbia



# Standard laboratory housing



climbing structures



height



soil





How often do rats actually burrow,  
climb, and stand upright?



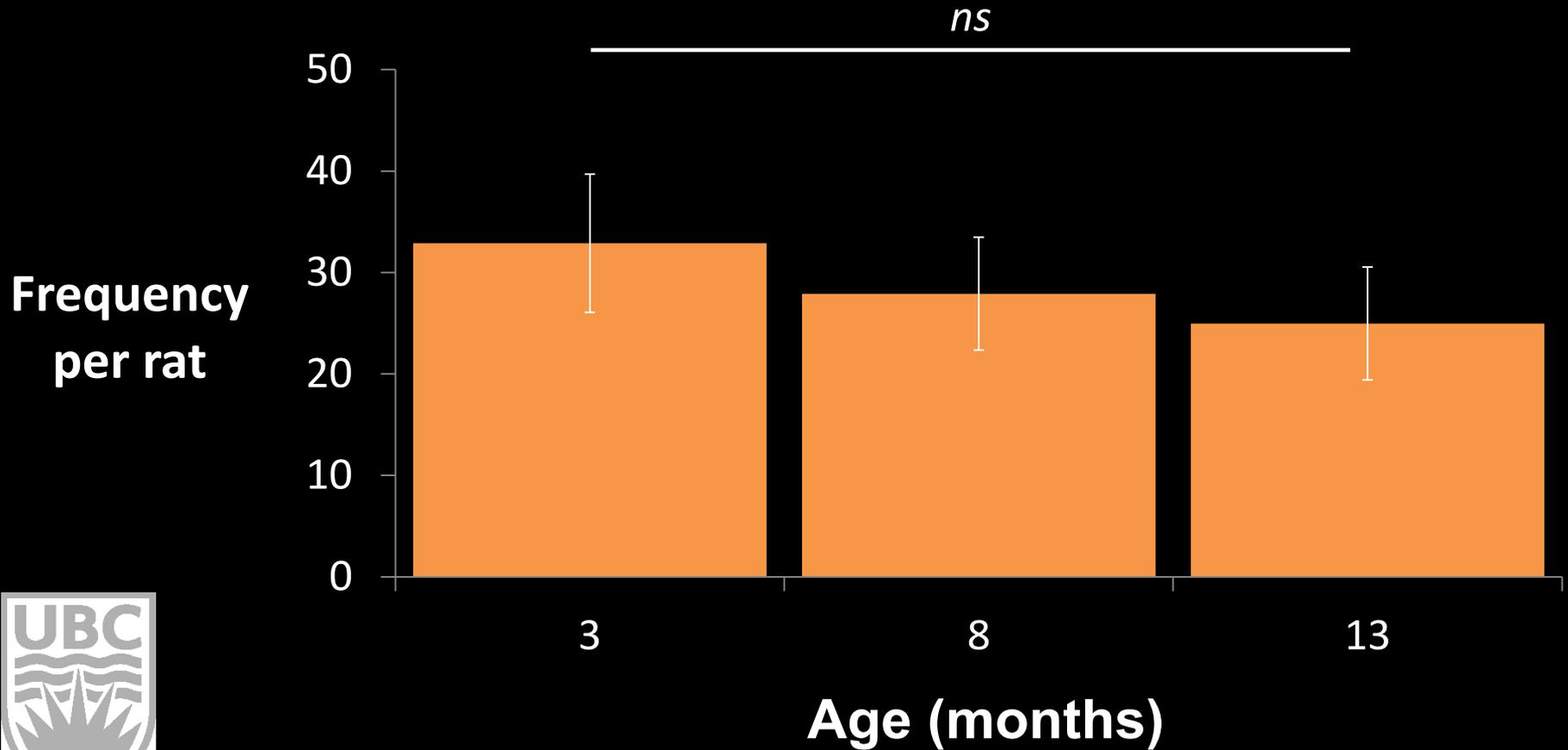
# Methods

- Female Sprague-Dawley rats
  - Purchased from Charles River Canada
  - Filmed 24-h per day with infrared cameras
  - Recorded frequency of behaviours when rats were 3, 8 and 13 months old
- ▶ Activity levels decline with age





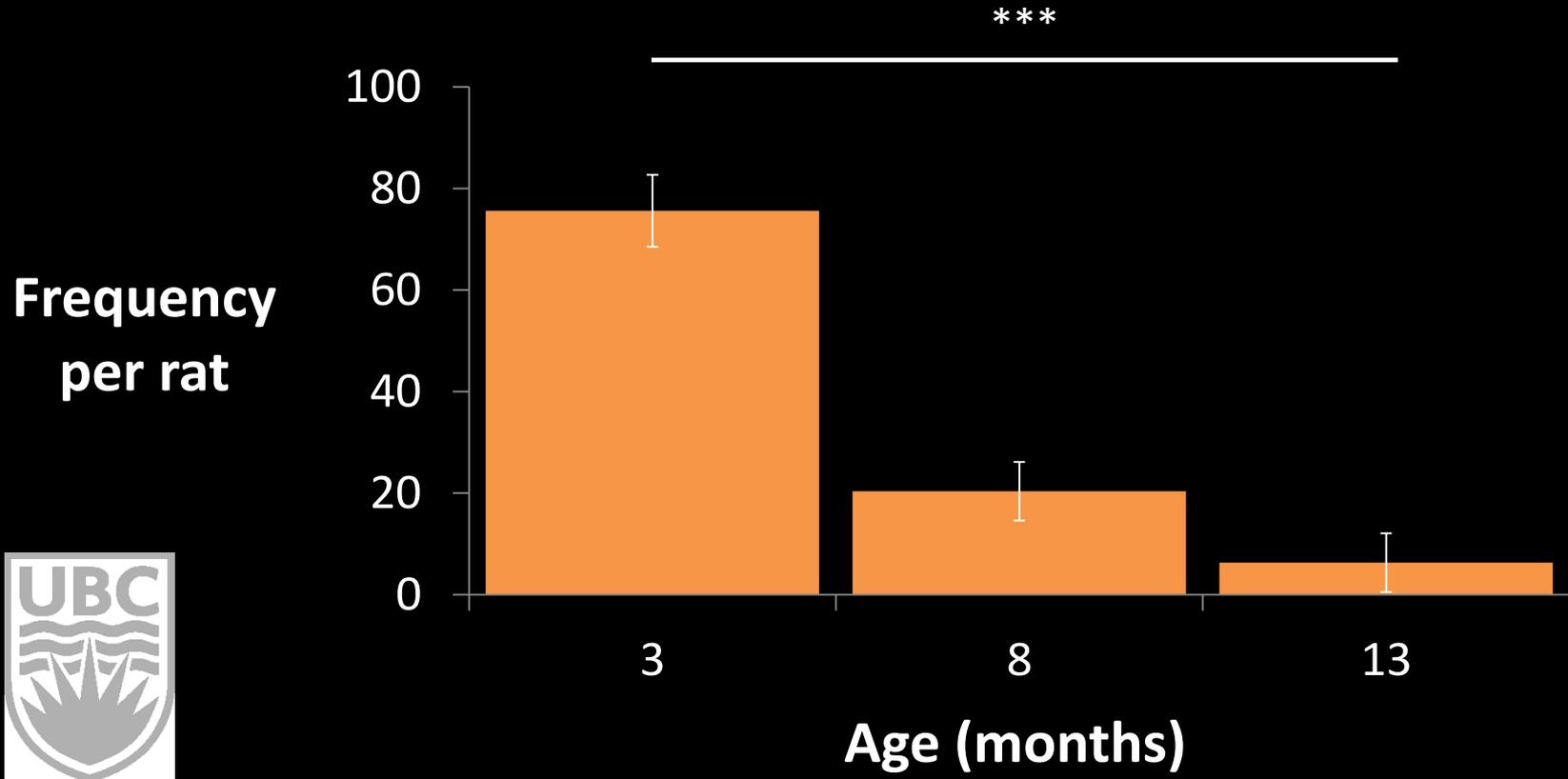
# Daily burrowing frequency





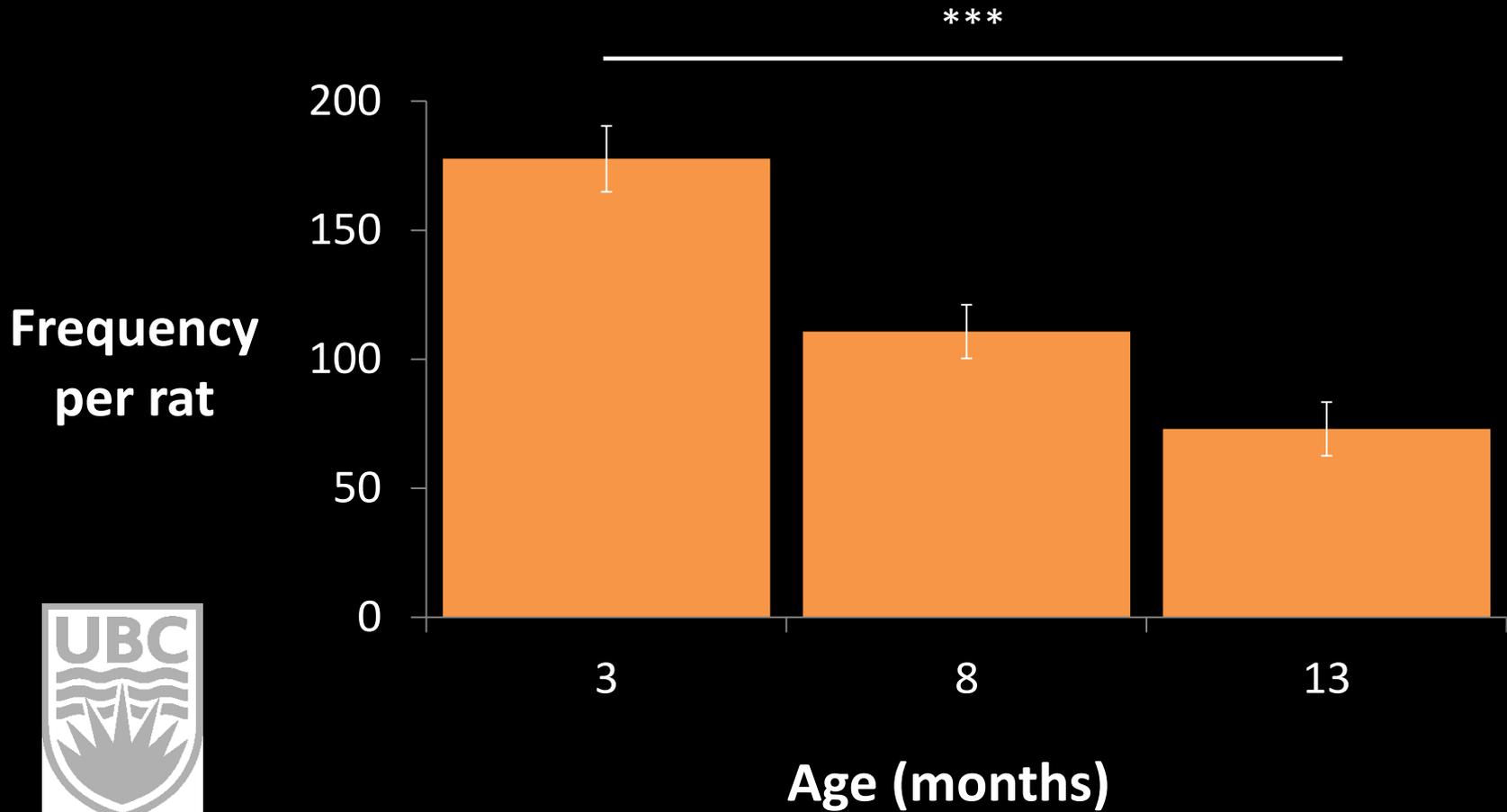


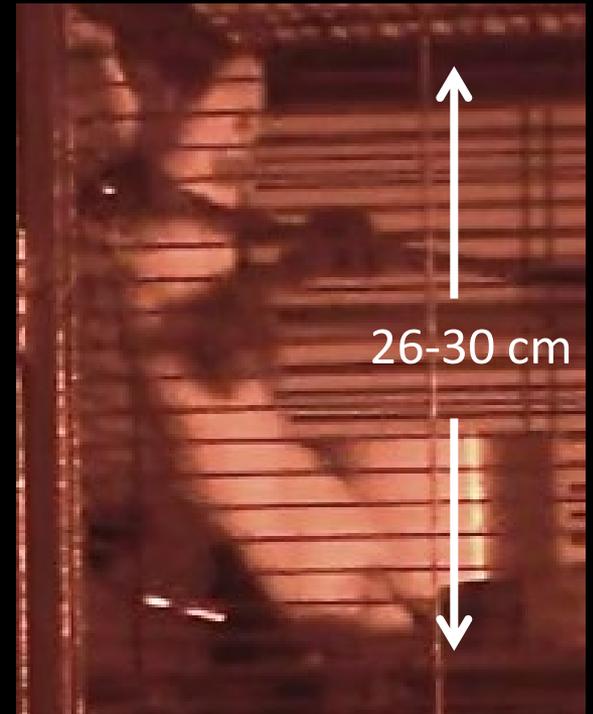
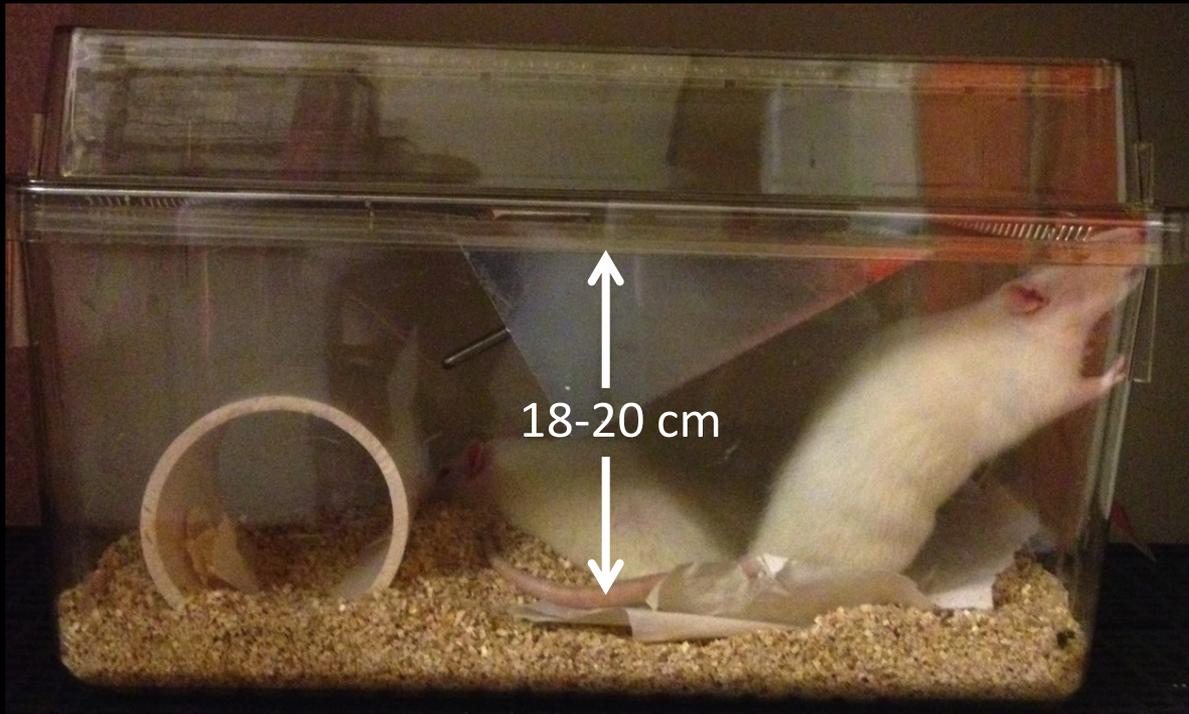
# Daily climbing frequency





# Daily frequency of upright standing

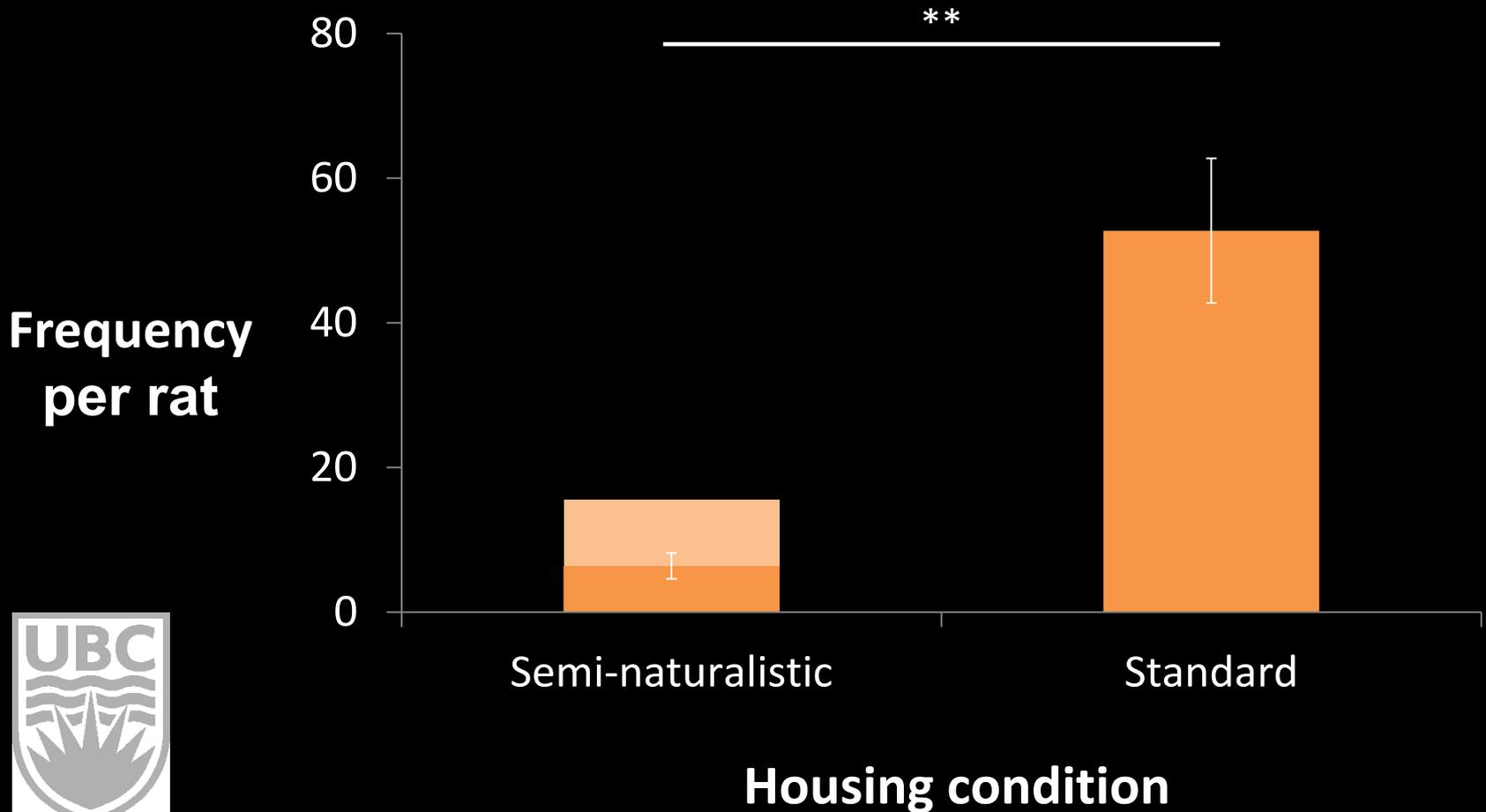




Because standard-housed rats cannot stretch upright, do they compensate by performing more lateral stretches?



# Daily frequency of ~~lateral~~ stretching all



# Stretching

“Corrective response to stiffness caused by positional stress or immobility”

*Bertolucci, 2011*



- These behavioural restrictions likely lead to poor physical and psychological health



- These behavioural restrictions likely lead to poor **physical** and psychological health
- Stiffness alleviated by lots of stretching
- Weight gain



> 130 g heavier



- These behavioural restrictions likely lead to poor **physical** and psychological health

## *Other studies:*

**PNAS** “Control” laboratory rodents are metabolically morbid:  
Why it matters  
Bronwen Martin<sup>a</sup>, Sunggoan Ji<sup>a</sup>, Stuart Maudsley<sup>b</sup>, and Mark P. Mattson<sup>c,1</sup>

“Physiological profiles consistent with increased disease susceptibility”

- Weaker immune systems



- These behavioural restrictions likely lead to poor **physical** and psychological health

### *Other studies:*

- Poorer prognosis in neurodegenerative diseases
  - schizophrenia, Parkinson's, Alzheimer's, Huntington's
- Poorer cancer prognosis
  - Higher tumour burden
  - Tumours more likely to be malignant
  - Remission less frequent



- These behavioural restrictions likely lead to poor physical and psychological health

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RESEARCH ARTICLE

## Differences in Anticipatory Behaviour between Rats (*Rattus norvegicus*) Housed in Standard versus Semi-Naturalistic Laboratory Environments

I. Joanna Makowska , Daniel M. Weary

“Our results [...] suggest that standard-housed rats were experiencing poorer welfare than rats reared in the semi-naturalistic environment”



- These behavioural restrictions likely lead to poor physical and psychological health

### *Other studies:*

- Higher anxiety and depression-like states
  - Open Field, Elevated Plus Maze, Social Interaction, Forced Swim tests
- More abnormal behaviours
  - Stereotypies
  - Barbering



- These behavioural restrictions likely lead to poor physical and psychological health

exploration

curiosity



# Exploration & curiosity

*The American Journal of Psychology*, Vol. 11, No. 1 (Oct., 1899), pp. 80-100

## NOTES ON THE PSYCHIC DEVELOPMENT OF THE YOUNG WHITE RAT.

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By WILLARD S. SMALL, Fellow in Psychology, Clark University.

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# Exploration & curiosity

Desire for new stimuli



# Exploration & curiosity

Desire for new stimuli



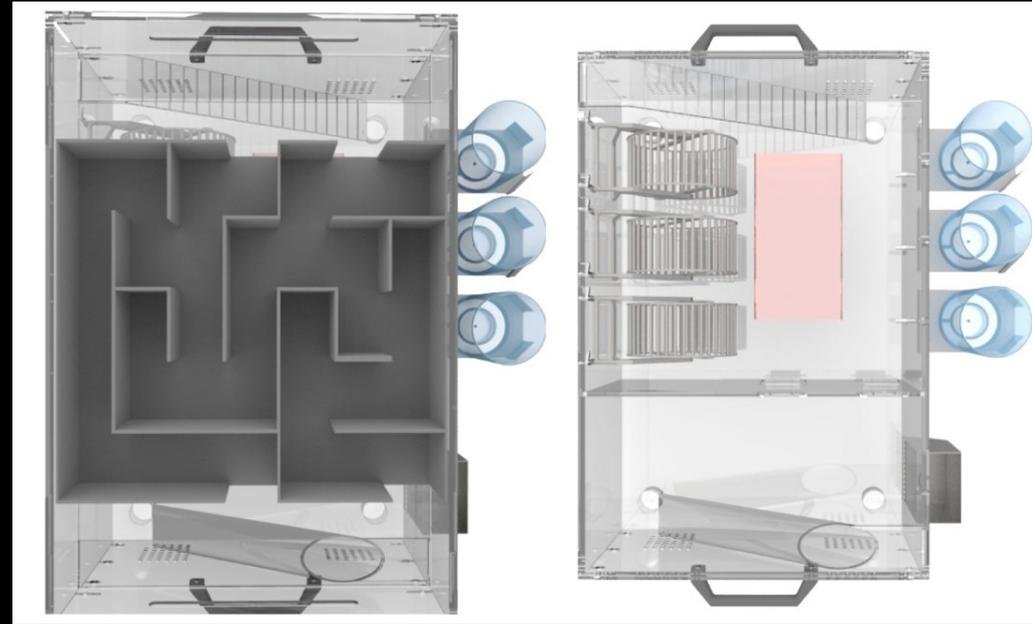
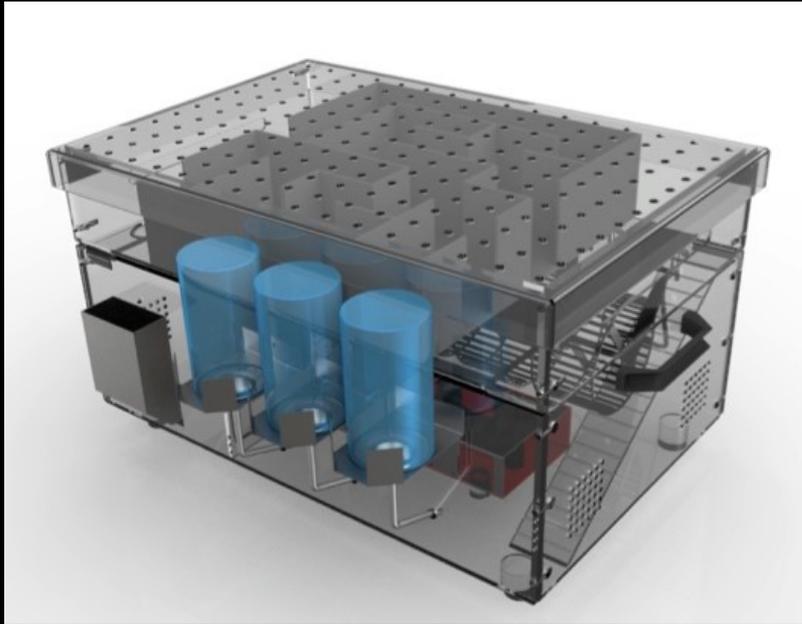
# Hanging-out options



# Sleeping options



# Marlau™ cage



2-level cage with access to food and water separated by a maze

- 12 possible maze configurations
- Running wheels



# Raised wire lid; perch



# Socialization?

**positive human interaction**

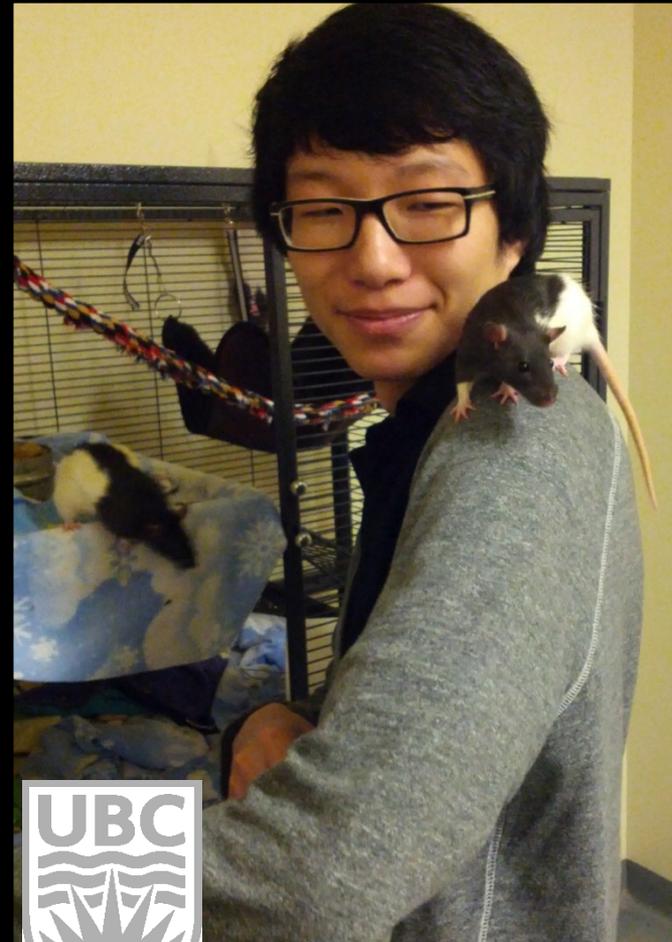


# Socialization?

“Dogs and cats, especially when housed individually or in smaller enclosures, should be allowed to exercise and provided with **positive human interaction**”



# Humans as enrichment: dynamic



# Humans as enrichment: rat tickling



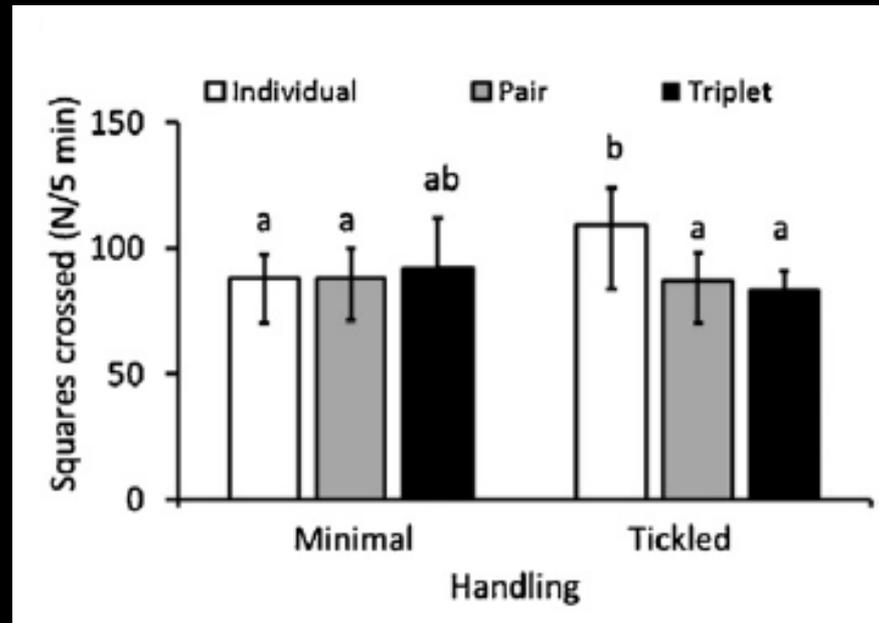
**“They readily approach the hand that does the tickling, and they exhibit lots of squirming during the tickling. Many begin to react to the hand as if it were a play partner, exhibiting playful darts and pouncing interactions which appear to fulfill their biological need to play”**

*Panksepp & Burgdorf, 1999*



# Rat tickling

3 weeks of tickling for 2 minutes a day



Reduced anxiety in the  
open field test for  
individually housed rats



# Historical perspective



# The Wistar Institute of Anatomy and Biology in Philadelphia



Credited for laying down the foundation on which the rat became established as an important laboratory animal



Original building, 1894



Colony building

BREEDING AND CARE  
OF THE  
ALBINO RAT  
FOR  
RESEARCH PURPOSES



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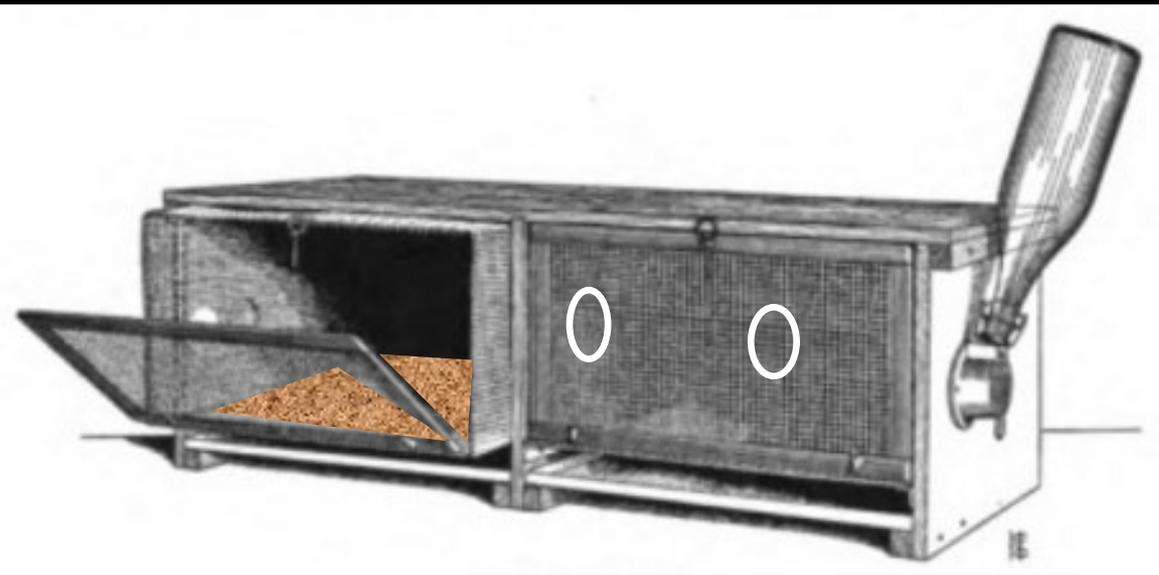
MILTON J. GREENMAN  
AND  
F. LOUISE DUHRING

August, 1923

Strived to uncover “the means of making rats contented and happy” through an “intimate acquaintance with the habits of this little animal”

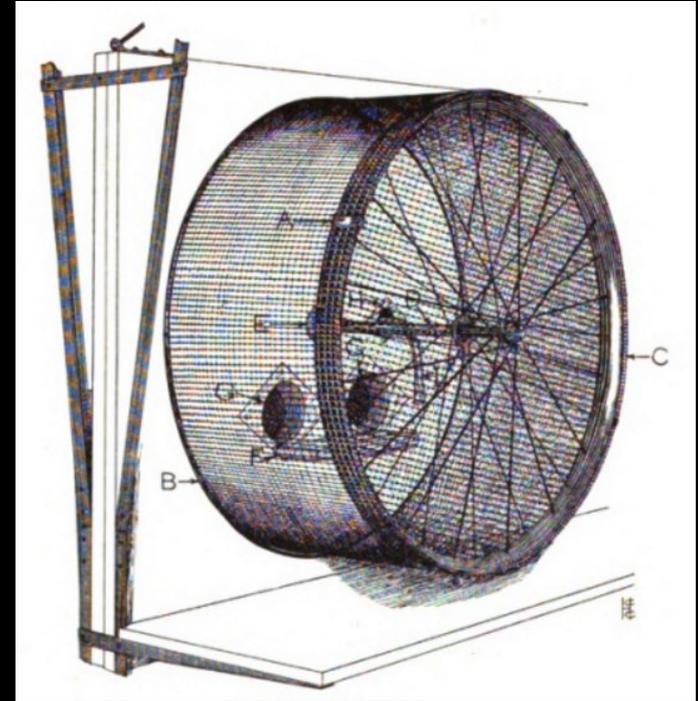
“**Fear and lack of exercise** are factors which react unfavourably upon the growing rat”

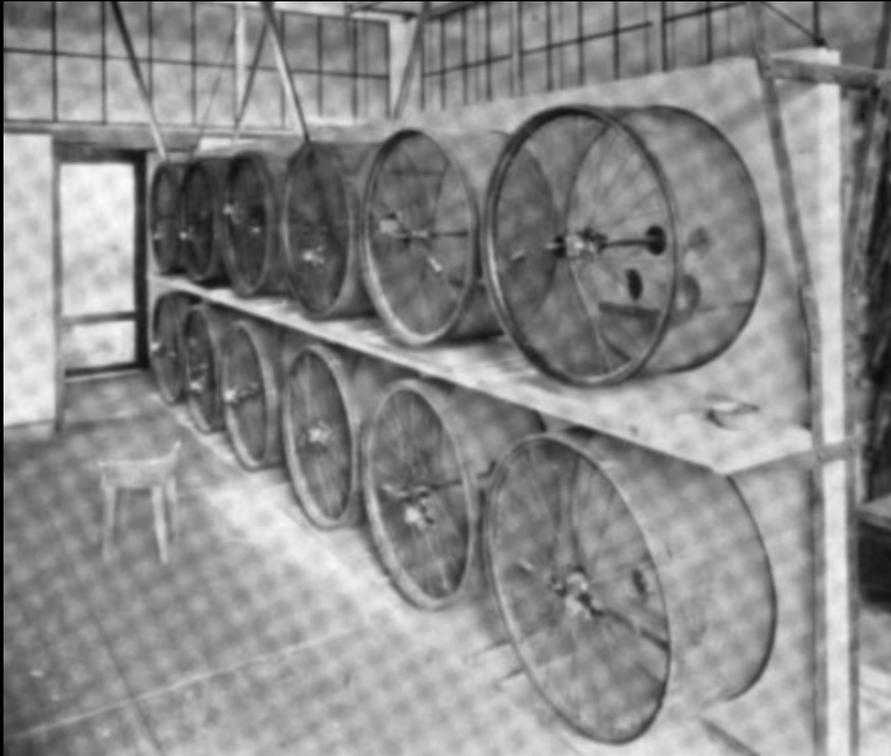




- Segregate space for different activities
  - Cross if became frightened

“this simple shifting of location appears to satisfy the animal that it has protected itself”





Up to 10 rats per unit



# What do rats need?



Engagement with their  
environment



physical & mental  
stimulation

