

Climbing Test

Measures Vertical Activity in Rodents



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Climbing Test

A novel method to measure vertical movement in rodent

Climbing behavior can be of interest for the most diverse applications.

The Ugo Basile automated system replicates its first manual application in the Pain field, for measuring Pain-Depressed behavior. It showed that, while mild analgesics block pain-depressed climbing, strong analgesics fail to alleviate depression of climbing (Santos et al. 2023, "Climbing behavior by mice as an endpoint for preclinical assessment of drug effects in the absence and presence of pain", *Frontiers*).

Background

The device, developed in collaboration with the laboratory of **Prof. Sidney Neegus from Virginia Commonwealth University**, provides a measurement of the vertical movement of rodents, a parameter which has not been widely investigated so far, in spite of the fact that **rodents are animals that live in a 3D space** and hence the analysis of XY position only is a limitation in many current studies.

However, climbing behavior and vertical movements have been previously studied in non-automated experiments to investigate many fields, from muscle strength (Ueno et al. 2022), to antidepressants (Perona et al. 2008), stroke (Jin et al., 2017), Parkinson's

(Sundstrom et al., 1990), sex-differences (Borbelyova et al., 2019), locomotor activity and kinematics (Green et al., 2012), neuroleptics and dopamine agonists (Costall et al., 1982; Pinsky et al., 1988; Medvedev et al., 2013), XYZ activity (Wexler et al. 2018), opioid receptors (Michael-Titus et al., 1989), neuropathic and cancer pain (Falk et al., 2017).

The Ugo Basile Climbing System aims to provide a simple and automated tool to measure vertical climbing movements within a grid cylinder to inform all the scientists that are interested in this crucial parameter for their research.

Product Description



A **load cell** underneath the **aluminum base** (diameter 10,5 cm) provides the **automated start** of the test once the animal leaves the base and starts climbing over the grid cylinder (height 28 cm) and its ceiling, thanks to the 5x5mm internal grid.

The system is composed of a **electronic unit** onto which the climbing cylinder is positioned. The output parameters, stored in the electronic unit and exportable in Excel, include:

- Time spent climbing (in the cylinder walls or the ceiling over the total time)
- Activity amount
- Number of climbing episodes
- Latency to first climbing episodes



Aluminium circular base close up



Example of the "Start Experiment" screenshot

Application

Certain diseases and conditions affect rodents' climbing abilities. For example, neurodegenerative disorders can impair their motor skills and climbing behavior. Researchers use these changes in climbing behavior to study and test potential treatments for such diseases.

In summary, climbing behavior in rats and mice is not just a simple activity but a multifaceted aspect of their biology with implications for their well-being, natural behavior, and various fields of research.

It provides valuable insights into their physiology, behavior, and responses to environmental and genetic factors, making it an essential component of biological and biomedical studies involving these rodents.

- **Ethological Perspective:** climbing is a natural behavior in rats and mice in the wild. They use climbing to access food, escape from predators, explore their environment, and find shelter. Studying climbing behavior allows researchers to gain insights into their natural habitat and evolutionary adaptations.
- **Behavior and Physiology:** climbing behavior reflects the rodents' muscular and

skeletal capabilities. It involves coordination, strength, and agility. Understanding their climbing abilities can provide insights into their neuromuscular systems, balance, and sensory perception.

- **Environmental Enrichment:** in laboratory settings, providing opportunities for climbing is an important aspect of environmental enrichment. Rats and mice kept in captivity benefit from a stimulating environment that mimics their natural habitat. Climbing structures in cages promote physical and mental exercise, reducing stress and improving overall well-being.
- **Research Models:** rats and mice are commonly used as model organisms in biomedical research. Their climbing behavior can be relevant to various research areas, including neuroscience (study of motor skills and balance), behavior (exploring effects of drugs or genetic modifications), and psychology (studying spatial cognition and learning).
- **Disease Models:** from stroke to depression, anxiety, skeletomuscular performance, Parkinson's, pain, neuropathic pain and cancer pain.

Features

Conductive sensors to track Z movements

Load cell floor

Electronic unit

USB and LAN data saving

Benefits

Automated measurement of time climbing, distance travelled, time on ceiling, climbing episodes

Automated start of the test

Controlled by touch screen and with internal memory

Easy export into excel and data security

References

- Edna J. Santos et. al., 2023, "[Climbing behavior by mice as an endpoint for preclinical assessment of drug effects in the absence and presence of pain](#)", Journal of Ethnopharmacology
- Shinichiro Takada et. al., 2019, "[Attenuation of Post-Traumatic Osteoarthritis After Anterior Cruciate Ligament Injury Via Inhibition of Hedgehog Signaling](#)", Journal of Orthopaedic Research
- Simona Cabib et. al., 1984, "[Chronic stress enhances apomorphine-induced stereotyped behavior in mice: involvement of endogenous opioids](#)", Brain Research
- Walter Krause Neto t. al., 2016, "[Vertical Climbing for Rodent Resistance Training: a Discussion about Training Parameters](#)", International Journal of Sports Science

Specifications - Operation

Start/Stop	By Start/Stop button on the climbing cage
Tare	By Tare button on the climbing cage
Experiment duration	Max 3600 seconds
Height sensors	7 rings + 1 on the roof (capacitive sensors)
Data Portability	By USB flash drive (included) or LAN connection
Data Output	Results table in .csv

Specifications - General

Commands	4,3 inches touch-screen (Resistive)
Read-out	4,3 inches touch-screen (Resistive), PC
Power Requirement	Universal input 100-240 VAC, 50-60Hz, 200W MAX
Sound Level	Negligible
Operating Temperature	18°C to 25°C
Endpoints and statistics	Max height, Average height, Average distance covered, Total climbing time, Total time on roof, Latency on the single climbing event

Physical

Sensing cylinder diameter	External diameter 12 cm. Internal Diameter 11,5 cm
Grid cylinder diameter	11 cm
Sensing cylinder height	29 cm
Grid cylinder height	28 cm
Shipping Dimensions	36x55x45cm
Gross Weight:	8Kg
Net Weight:	5Kg

Ordering informations

36103	Mouse climbing test system for vertical movement assessment, electronic unit with USB for data export in Excel (36103-001), climbing cylinder and ceiling (diameter 12cm, height 29 cm)
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Extra warranty (Standard 12 months + 12 months with product registration)

Related Products



Tail Flick Unit
Thermal stimulation,
D'Amour & Smith method
Product Code: 37560



**Thermal Place Preference
for Mice and Rats**
Product code: 35350/35360



Hot/Cold Plate
Screening of Thermal
Hyperalgesia/Allodynia
Product code: 35300



**Plantar Test for Thermal
Stimulation**
Hargreaves Apparatus
Product code: 37570

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