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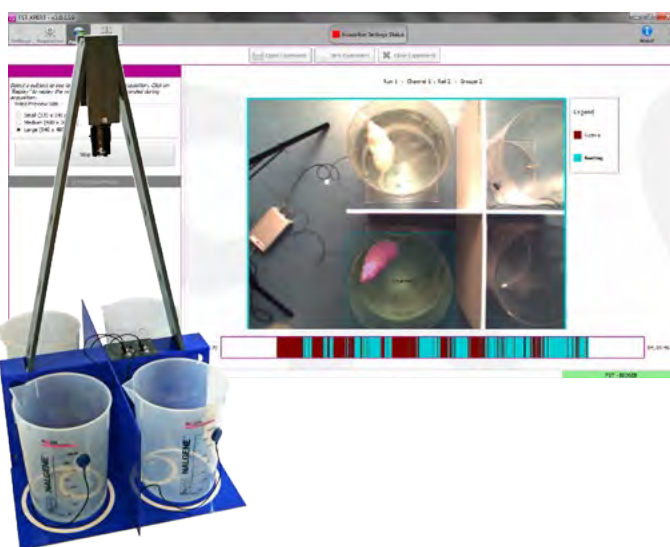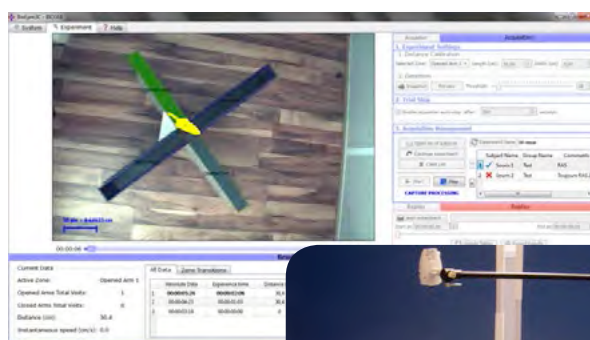
MEETING YOUR NEEDS BY DESIGNING INNOVATIVE AND HIGH-QUALITY SOLUTIONS FOR YOUR RESEARCH

STUDIES ON ANXIETY & DEPRESSION

MAIN INSTRUMENTS

- Tail Suspension Test
- Automated Forced Swimming Test
- Elevated Plus Maze

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THE ONLY FULLY AUTOMATIC SOLUTION IN THE WORLD FOR RUNNING A SIMPLE AND OBJECTIVE DESPAIR TEST ON MICE

BIO-TST5 : Wireless Tail Suspension Test

INSTRUMENT OVERVIEW

The Tail Suspension Test (TST) was developed as an alternative to the Porsolt Forced Swimming test. Mice, suspended by the tail using tape (a painless method), innately attempt to escape from this adversive situation. However, following failed attempts, they experience a kind of despair and become immobile. The magnitude of immobility is considered to be correlated with the depressive-like state of the subjects and is significantly decreased by antidepressants. The TST was described in the 80's by Steru & al. and allows fast evaluation of drugs' (anti-depressants, sedatives) psychotropic effects: a classic and painless research test for anxiety & depression.

Our TST is **the only fully automatic system in the world!** Based on the "ITEMATIC-TST" (Steru, 1987), it uses both strain gauges and video recording. No pain is induced: the mouse's tail is simply stuck to the sensor using tape. The original design has been modified, adapted and improved for Porsolt & Partners Pharmacology Co in 2000. It can hold 3 mice in 3 separate compartments and features adjustable floor height and anti-climbing plates for C57 strain mice.

Bioseb's TST provides animals' randomization, measurement of up to 6 animals in one run, direct computation of "Immobility", "Energy" & "Power in Motion". Definitions can be adjusted to your protocol. The energy is a unique way to differentiate between passive swinging and active struggling. The power in motion is an additional discriminating calculation giving an indication of the strength of the mice.
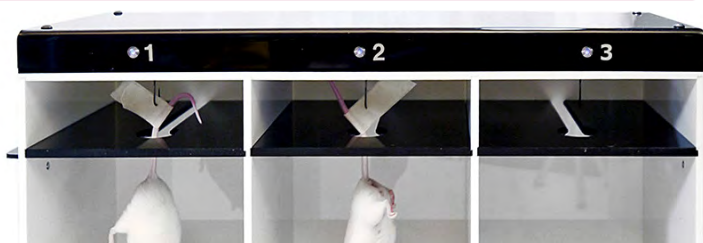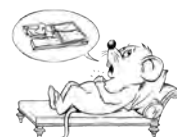
HOW DOES IT WORK?

The TST is based on **strain gauges measuring the quantity of movement generated by a mouse trying to escape** from its suspension. During the test, the movements are analyzed in terms of activity (active/non-active), energy & power developed over time. As human observation is time consuming and tedious, our TST automates the entire experiment.

The operator prepares the home cages and pieces of tape. Once the experiment has been setup in the software, the operator suspends each single mouse according to the **randomization shown on screen**. Each channel is started individually by pressing a specific key on the computer so that each mouse is suspended the same amount of time (something impossible with a system based solely on video).

After the run, mice are removed and the operator is prompted to suspend the next batch. Post-experiment, the data can be analyzed: statistics on averages, minimums, maximums & standard deviations are computed in seconds and can be presented for both groups & individual animals. Furthermore, **if using the video option, it is possible to replay the experiment with different treshold parameters.**

KEY FEATURES

- Simple, yes fully automatic and operator-independent
- Includes 4 randomization types the animal list
- Measurement of up to 6 animals in the same run
- Full control of the calibration
- High predictability for antidepressant effects in humans
- Based on innate behaviours and despair models
- Widely used and validated in literature
- Replay possible with other parameters
- Short-lasting experiment (usually 6 minutes)
- Optional video recording to adjust the activity threshold
- Now wireless with Bluetooth connectivity

Painless & wireless

# BIO-TST5: Tail Suspension Test - Wireless - Automatic

DEDICATED SOFTWARE

The brand new software for Bioseb's Tail Suspension test is based on direct acquisition from the strain sensors, as well as video monitoring. It is **powerful, yet flexible and user-friendly**.

• Just **one screen** is needed to set up all parameters: number of animals, thresholds, starting/ending times of the measuring period.
• The animal list can be edited, exported, or imported from Excel or CSV format directly.
• The «Randomization» module defines the order of the different «dosed» animals with their groups.
• During the test, a bargraph displays energy and the **real-time computation of results**.
• The results for immobility time, energy value and power during the mobility period are displayed via graphs and numerical tables.
• Data files are saved and protected in a GLP-compatible format.
• **Replay of past experiments is always possible**, allowing testing of different parameters.
• Possibility to discard the result of a particular animal (for example if the subject falls down during the test), in order to secure traceability.
• A manual scoring module used together with a camera can be used to determine the type of threshold the operator should set in the system.
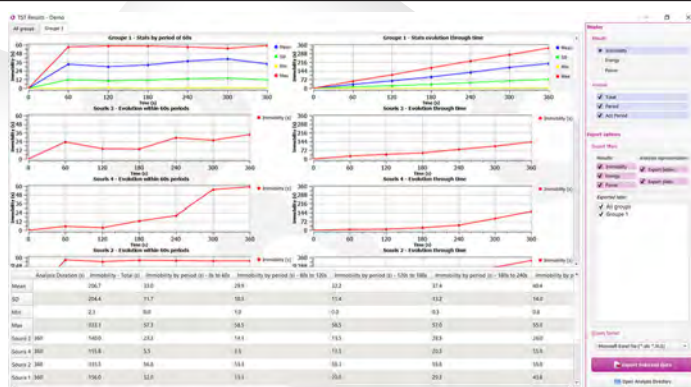
PAINLESS TAPE METHOD, SOFTWARE SCREENSHOT

DOMAINS OF APPLICATION
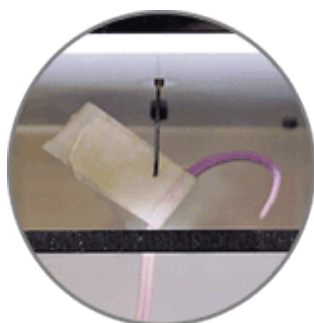
• Depression & anxiety
• Drug screening
• Basal depressive-like state phenotyping
• Studies on behavioral abnormalities
• Behavioral effects of pharmacological compounds
• Antidepressant efficacy on chronic stress models
• Sleep and mood disorders
• Studies on serotonin aspects
• Acupuncture and dopamine
• Behavioral effects of genetic manipulations

HIGHLIGHTHED BIBLIOGRAPHY Exhaustive list on our website

Synthesis and Evaluation of New 1,5-Diaryl-3-[4-(methyl-sulfonyl)phenyl]-4,5-dihydro-1H-pyrazole Derivatives as Potential Antidepressant Agents, Molecules (2015), Özdemir A..et al., DOI: 10.3390/molecules20022668

Antinociceptive and antidepressant-like action of endomorphin-2 analogs with proline surrogates in position 2, Bioorg Med Chem. (2014), Perlikowska R. et al., DOI: 10.1016/j.bmc.2014.06.056

Altered skeletal muscle mitochondrial biogenesis but improved endurance capacity in trained OPA1-deficient mice, Journal of Physiology (2013), Caffin F. et al., DOI: 10.1113/jphysiol.2013.263079

Early postnatal motor experience shapes the motor properties of C57BL/6J adult mice, European Journal of Neuroscience (2013), Serradj N. et al., DOI: 10.1111/ejn.12311

TECHNICAL SPECIFICATIONS

Number of animals	1-3 mice if one set of cages is used, 1-6 mice if 2 sets of cages are used
Hardware	Stainless steel, Black and white PVC
Power	110-230 Volts- 9 volts DC
Dimensions	50 x 15 x 30 cm for a set of three cages
Acquisition sampling rate	200 Hz for the sensors, 15 images/second for the camera

ORDERING INFORMATION

Reference	Description
BIO-**TST5**	For mice
BIO-**TST-VID**	Video option: threshold adjustments on replay

SUPPLIED WITH

• 1 or 2 sets of 3 cages
• Power supplies and USB cables
• 1 software license (USB dongle with product ID tag)
• Optional HD USB camera with tripod and USB cable

FOR MORE INFORMATION, VISIT OUR WEBSITE: WWW.BIOSEB.COM/TST

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A VERY INNOVATIVE AND EASY TO USE INSTRUMENT FOR BOTH MICE OR RATS - COMPLETELY OPERATOR-INDEPENDENT

Rat version

Mouse version

BIO-FST: Dual-Sensor Forced Swimming Test

INSTRUMENT OVERVIEW

The Forced Swimming Test (FST), also known as Porsolt Test or "behavioral despair test", is a common behavioral test for the development & screening of antidepressant and anxiolytic drugs to identify new treatments and understand the biological mechanisms of current treatments.

Bioseb's Dual Sensor FST has been designed for rats and mice thanks to the work of Dr. Denis DAVID (described in NEURON, 2009, "Neurogenesis Dependent and Independent Effects of Fluoxetine in an Animal Model of Anxiety/Depression").

Bioseb offers **a powerful dual approach based on vibrations detection and video-based motor activity analysis for automating the test** for 4 animals simultaneously. Using state-of-the-art video tracking algorithms combined with beakers' vibration, the software allows the researcher to analyse and separate behaviours via a calibration process «taught» by an expert in the lab.

You will be able to record video of the trials, calculate the immobility, swimming and struggling time for each animal and in batches of four. Acquisition can be replayed and re-analyzed later with different settings: a calibration made by an expert from another lab could be used as well. Results can be exported to any software of choice for further analysis.

Experiment management is facilitated via a list of animals that can be entered into the software or imported from Excel. Several randomization modes are offered, and the randomized list can be exported, imported, and printed.

HOW DOES IT WORK?

What is the **TYC (Teach-Your-Computer)** algorithm?
• Gives total control when evaluating protocols.
• The researcher is the expert!
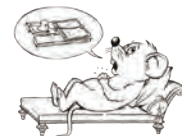• The TYC is taught how to detect the 3 states: Resting/Floating, Swimming, and Climbing/Struggling

Scoring can be learned, then consistently applied with no variability and drift over time! The TYC algorithm is an optimization tool: with a single run evaluated manually, one will train the software to use scored parameters. TYC will **adjust scoring algorithms to follow the researcher's evaluation rules**.

The system allows easy comparison of several approaches, useful in training students, and provides consistency across multiple studies.

Two types of behavior can be observed:
1. Non-depressed rodents (rats or mice), even when unable to escape from the water-filled cylinders, will try to swim and struggle to escape the containers.
2. Depressed rodents will stop trying sooner and start to float in the cylinders, showing behavioural despair.

The floating or immobility time during the forced swimming test is **an accurate indication of the effects of anti-depressants and anxiolitics**.

KEY FEATURES

• Results completely operator-independent
• Dual approach: combining input from vibrations and video
• 3 states: Resting/Floating, Swimming, Climbing/Struggling
• Calculate immobility, swimming, struggling time, swim
• Results for each animal tested and in batches of four
• Animal lists entered into the software or imported from Excel
• Several possibilities for randomization
• Up to 4 animals (mouse/rat) can be tested simultaneously

BIO-FST: Dual-Sensor Forced Swimming Test
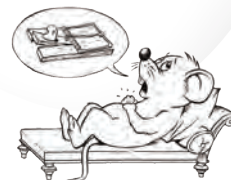
DEDICATED SOFTWARE

Bioseb's Forced Swimming Test FST DUAL SENSOR solution allows **automatic computing** of several parameters or states for rats and mice:

- Swimming
- Non-active (immobility, passive floating)
- Climbing/struggling
- Dipping (rat only: can be easily set manually when analysing the files)

Results are organized by groups or individual animal, and can be displayed for every minute of the test. or by time period.

Acquisition can be replayed and re-analyzed with different settings: a calibration made by an expert from another lab can also be used. The scoring tool is useful for calibration, training and comparison with expert.

Results can be exported for further analysis, for instance to MS Excel.
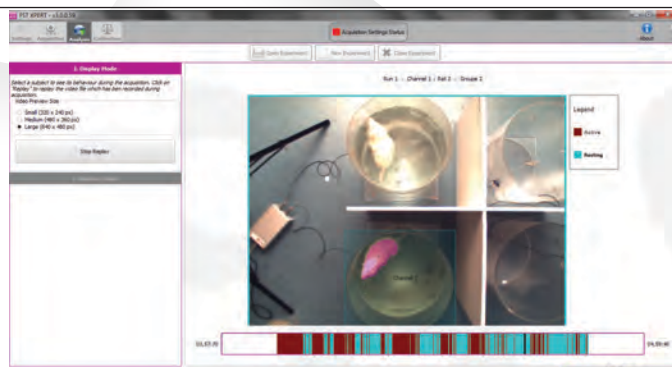
Screenshot of the video acquisition/replay mode

DOMAINS OF APPLICATION

- Review of antidepressant activity
- Primary screening test for antidepressants
- Evaluation of psycho-stimulants
- Evaluation of anxiety treatments
- Examples of Agents used are Imiprimine, Fluoxetine, Desipramine, and Venlafaxine.
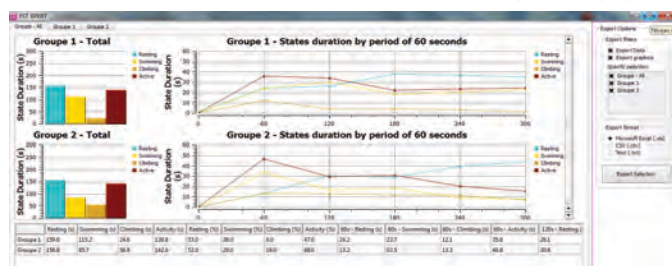
Screenshot of results window with different states

HIGHLIGHTHED BIBLIOGRAPHY Exhaustive list on our website

Antinociceptive and antidepressant-like action of endomorphin-2 analogs with proline surrogates in position 2, Bioorg Med Chem. (2014), Perlikowska R. et al., DOI: 10.1016/j.bmc.2014.06.056

Antidepressant and anxiolytic potential of the multimodal antidepressant vortioxetine (Lu AA21004) assessed by behavioural and neurogenesis outcomes in mice, Neuropharmacology Volume 73 (2013) Jean-Philippe Guillouxa et al., DOI: 10.1016/j.neuropharm.2013.05.014

Huntingtin Acts Non Cell-Autonomously on Hippocampal Neurogenesis and Controls Anxiety-Related Behaviors in Adult Mouse, PLoS One (2013), P.Pla et al., DOI: 10.1371/journal.pone.0073902.

TECHNICAL SPECIFICATIONS

Technology	Learning machine TYC algorithm, combines video tracking and vibrations
Dimensions (Lx W x H cm)	80 x 80 x 180 for the Rat version, 60 x 60 x 120 for the Mouse version
Weight kg	24 kg for the Rat version / 12 kg for the Mouse version
Power supply	PC USB port
Graduated Beakers (x 4)	Transparent ACRYLIC type (Rats: 30 cm D. x 50 cm H. / Mice: 17 cm D. x 20 cm H.)
Sensor calibration / repeatability	After one-time initial calibration (6 min) : 4% variability
Wearable Part	Instrumented beakers
Sampling Rate	300Hz, encrypted (glp) averaged and recorded synchronously with video images.

ORDERING INFORMATION

| Reference	Description
BIO-**FST-DSM**	For mice
BIO-**FST-DSD**	For rats
BIO-**FST-BKR**	Additional beaker for mice
BIO-**FST-BKR**	Additional beaker for rats

SUPPLIED WITH

- A customized support frame that separates the four beakers, houses the interface and supports the HD camera
- 4 graduated beakers for rats or mice (extras available upon request)
- An FST DUAL SENSOR software product with license
- User's manual
- *Options:* extra beakers
- *PC not included*

FOR MORE INFORMATION, VISIT OUR WEBSITE: WWW.BIOSEB.COM/FST

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A COMPLETE, DEDICATED & AUTOMATED SOLUTION FOR THE ELEVATED-PLUS OR ZERO MAZE TEST
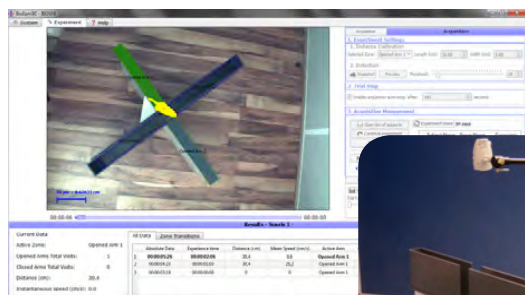
BIO-EPM3C
Elevated-Plus-Maze

INSTRUMENT OVERVIEW

The Elevated-Plus-Maze is a common test to assess anxiety-like behavior in laboratory animals. Based on the natural fear of rodents for height and open spaces, it is a general research tool in neurobiological anxiety field, usually used to screen the efficacy of drugs.

The Elevated-Plus-Maze is one of the first tests used by neuroscientists to evaluate anxiety-like behavior in rodents and the most widely used after the Open Field to evaluate anxiolitic/anxiogenic effects. The EPM could also be considered for the screening of mice strains. The EPM can also be used to assess side effects of psychiatric disorders treatments.

Bioseb proposes an all-inclusive solution for the Elevated-Plus-Maze test with hardware and software components.

Video tracking is a very good way to automate the Elevated-Plus-Maze test, which is why we designed the EPM-3C, a dedicated software, to run any EPM protocol (compatible with Bioseb hardware or other brands), based on a **powerful video tracking system**. Zone transition is matched perfectly with manual scoring by using specific morphologic detection. The tracking zones (open/closed arms, center) are easy to define, and the software is optimized to be **set up easily and starts with just three clicks**, in order to assist, speed up and simplify your experiments.

Regarding the hardware, we designed its EPM maze for mice and rats according to the standard dimensions widely used in the field. The corridors of our Elevated-Plus-Maze are made in high quality perpex, so that the material will not retain odors. Their light grey, non-reflective color makes them ideal to combine with video-tracking. Finally, the assembly of the equipment has been made really easy.

Tripod and industrial quality camera are also provided so **you can start your experiments rapidly**.

HOW DOES IT WORK?

The new EPM-3C solution from BIOSEB features **unprecedented simplicity to run ELEVATED + MAZE protocols**.

The test setting consists of a plus-shaped apparatus with two open and two enclosed arms, each with an open roof and elevated from the floor. The aversion of the rodents to open spaces leads into a restriction of movement to the enclosed arms.

Anxiety of rodents is directly linked to the proportion of time spent in closed arms versus the time spent in open arms. The more anxious the animals, the more time they spend in the closed arms.

To start the test, the animal is usually placed in the center zone of the maze and the duration of the experiment is generally about 5 minutes. The **time spent in the various arms** is the main data recorded during this test. The Bioseb software also gives the total number of entries in the various arms (open, closed and center), the global activity of the animal (calculated with the total distance of the animal during the test) and the latency of the first entrance to the open arm.

Your results can then be exported into Excel tables for further analysis.

KEY FEATURES

- Easy to set up
- Designed for Rats or Mice
- Hundreds of publication & validation for the EPM test
- The first choice for anxiety
- Modular structure allows storage in minimum space
- Short-lasting experiment (no more than 5-10 min)
- Exploration-based conflict task
- Based on innate behavioral tendencies (ethological test)

# BIO-EPM3C: Elevated-Plus-Maze System: 3 clicks only!

DEDICATED SOFTWARE

The **Bioseb EPM-3C Software** gives all the information you need from your EPM experiment and most of the **parameters are computed in real-time.**

The data is available for each arm individually, but also for grouped arms. The results **can be exported to windows Excel** - the software runs under Windows Seven and Eight.

Following table introduces the results available with the Bioseb software and the scientific meaning of each data.

Bioseb's EPM-3C software: Screenshot
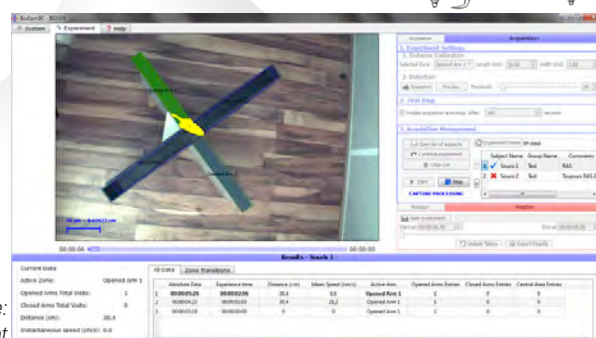
Parameters measured	Scientific significance
Total time per zones (s and %)	Main indicator to assess anxiety
Latency to first entry per zone	Latency to first entry in open arms is another indicator to assess the anxiety of the animal
Visit (and % per zones)	Number of visits (or entries) in open arms is an indicator to assess the anxiety of the animal
Distance (cm and % per zones)	Distance covered by the animal is a good indicator of the animal activity during the test
Mean time per visits (s)	Mean time per visits in open arms can also be used as an indicator for anxiety
Mean speed (cm/s)	Speed of the animal is another indicator to assess the locomotor activity of the animal

DOMAINS OF APPLICATION

- Prescreening of newly developed pharmacological agents for treatment of anxiety-related disorders
- Anxiolytic and anxiogenic effects of pharmacological agents, drugs of abuse and hormones
- Study of the effects of reproductive senescence/aging and/or pre-, peri- or postnatal exposure to various stressors
- Model to detect anxiolytic effects of benzodiazepine-related compounds
- Behavioral assay to study the brain sites (e.g., limbic regions, hippocampus, amygdala, dorsal raphe nucleus, etc.) and mechanisms (e.g., GABA, glutamate, serotonin, hypothalamic–pituitary–adrenal axis neuromodulators, etc.) underlying anxiety behavior

and much more...

HIGHLIGHTHED BIBLIOGRAPHY Exhaustive list on our website

S 47445 Produces Antidepressant- and Anxiolytic Like Effects through Neurogenesis Dependent and Independent Mechanisms, Front Pharmacol. (2017), Mendez-David et al, DOI: 0.3389/fphar.2017.00462

Positive effects of the traditional Chinese medicine MLC901 in cognitive tasks, J Neurosci Res. (2015), Lorivel T et al, DOI: 10.1002/jnr.23591

Dissociable Roles for the Basolateral Amygdala and Orbitofrontal Cortex in Decision-Making under Risk of Punishment, The Journal of Neuroscience (2013), Caitlin A. Orsini et al, DOI: 10.1523/JNEUROSCI.3586-14.2015

5-HT4 Receptor Subtype, ?-Arrestin Level, and Rapid-Onset Effects of Antidepressant Drugs, Neuromethods Volume 95 (2014), Indira Mendez-David et al, DOI: 10.1007/978-1-4939-2187-4_6

The Roles of Inflammation, Oxidative Stress, and Neurotransmitters in an Animal Model of Post-Traumatic Stress Disorder, Louisiana State Universty (2014), et al

TECHNICAL SPECIFICATIONS

Technology	Color tracking
Analysis	Real-time from camera flow or video file
Camera (included)	HD USB based / Resolution : 744x480 pixel / Sampling rate : 76 fps
Dimensions (in cm)	For mice: Central zone 5x5 / Arms 75x5 ; For rats : Central zone 10x10 / Arms 110x10
Weight	For mice : 7.5 kg / For rats : 26.5 kg
Material	High-quality perpex in non-reflective grey, suitable for video-tracking

ORDERING INFORMATIONS

Reference	Description
BIO-**EPM3C**	Software, camera & tripod

Reference	Description
BIO-**EPM-R**	Elevated-Plus-Maze for Rats
BIO-**EPM-M**	Elevated-Plus-Maze for Mice

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