

User Guidelines for Instrument Operation for Animal Behavior Research

Approved at the Research and Development Meeting in December 23, 2019.

Article 1 These User Guidelines on Animal Behavior Research Instrument Operation Room are stipulated to maximize usefulness. The instruments available in the operation room include the following.

A. Small animal automatic gait analysis system, Viewpoint/GaitLab.

(1) Specifications and instructions:

1. Infrared camera:

(a) The camera can detect behavior in completely dark environments at a resolution $\geq 1032 \times 110$.

(b) Collection frequency: 100 frames/s.

(c) Resolution: 144 pixel/cm².

(d) Temporal resolution: 10 ms.

2. Run way: Lidless design with a length of 125 cm. The material is borosilicate glass. Compatible with rats and mice.

3. Run way lighting source: green LED light (527 nm).

4. A target box is set at the end of the run way.

5. Analysis software:

(a) The software provides automatic recording and analysis, real-time data verification, and cleanness detection.

(b) The software allows for the free setting of detection parameters for different animals, such as speed range, detection sensitivity, and detection range.

(c) The software has automatic footprint analysis. It can automatically analyze the left forelimb, right forelimb, left hind limb, and right hind limb. Footprints are color coded according to their type, with a maximum of four colors. The software detects the body parts and calculate the centroid trajectory of the animal.

(d) The software can compare and analyze 10 or more different pieces of experimental result data.

(e) The software can record data and replay videos of the analysis process.

(f) The software can analyze the following data: hind limbs BOS, fore

lag, hind lag, pair lag, stride length, stride frequency, stance time, swine time, fore limbs BOS, fore gap, hind gap, pair gap, width, length, duty factory, abs hind lag, abs pair lag, abs hind gap, abs pair gap, area, max intensity, intensity sum, mean intensity, and Nb of distinct area.

- (g) The raw data and analyzed data must be able to be exported as any of the Windows-compatible Excel (matlab) formats.

6. Control computer: Dell.

- (a) Processor: Intel Core i5-6400 (2.7 GHz).
- (b) Memory: 8GB DDR4 2133 MHz.
- (c) Hard disk: 1 TB.
- (d) Operating system: Windows 7.
- (e) LCD screen: 24 inches.

B. 24-hour cage monitoring system, ViewPoint.

(1) Specifications and instructions:

1. 24-hour cage monitoring device:

- (a) Dimensions: 50 cm × 55 cm × 25 cm (L × D × H).
- (b) Built-in black and white infrared camera (including a wide-angle lens) and infrared lighting.
- (c) Detectable range: >43 cm × 25 cm.

2. Analysis software:

- (a) The software enables the real-time extraction of digital images and records.
- (b) The software can concurrently support 10 or more 24-hour cage monitoring devices.
- (c) The software can analyze real-time data, including activity data, state duration (freezing, average, and bursting states), state count (freezing, average, and bursting states), activity peak values, rearing count and time of occurrence, as well as animal displacement and movement distance (including location, trajectory, movement distance, movement speed, movement time, percentage of time staying at a given area).
- (d) The software has an option for image dynamic background tracking.
- (e) The software can replay and reanalyze recorded videos.
- (f) With the borosilicate glass that is highly resistant to scratching, the software installed can automatically start or terminate an experiment.
- (g) The raw data and analyzed data can be exported in an Excel format or some other compatible formats.

C. Animal behavior tracking analysis software, Plexon/Cinelyer.

(1) Specifications and instructions:

1. Camera system: Color camera; resolution: 752×480 .
2. Analysis software:
 - (a) The software is able to switch between single-color and multicolor tracking modes.
 - (b) The software can calculate the following parameters: movement speed, movement distance, average movement speed, duration of stay in a given area, counts of entering and exiting a given area, angle detection, head direction (detected automatically), angle of joints, dynamic area, count of approach, and time of approach.
 - (c) The software has an object identification function. It can automatically capture the three points of the animal's head, body, and tail.
 - (d) The software can be applied to the following experiments: water maze, elevated plus maze, radial maze, open field, social behavior, operator behavior, and place preference.
 - (e) The software can automatically analyze the count and time of set events.
 - (f) The software can analyze real-time videos and archived videos.
 - (g) The software has digital input and output functions: six-channel transistor-transistor logic input and output functions are available and can be connected to external electrical stimuli or lighting.
 - (h) The software can automatically analyze, with the same set of analytical parameters, a series of the same experimental videos and trajectories.
 - (i) The software allows for the group analysis data results (e.g., same experiment with different animals) to be obtained, analysis data to be extracted individually, and the data to be output to Excel.
 - (j) The software can graph the results of data analysis.
3. Four standard water mazes: The plastic cloth material can be folded for storage. Two mazes have a 1.5-m diameter (one black and one white), and two mazes have a 1-m diameter (one black and one white).

D. A set of digital rotarods for rats and mice, RR-02/ Orchid.

(1) Specifications and instructions:

1. Rotarod for rats and mice:
 - (a) Five lanes.
 - (b) The run ways can be changed independently with ease.
 - (c) Lane width: 70 mm for rats and 50 mm for mice.

- (d) Drop height: 225 mm for rats and 240 for mice.
 - (e) A force plate drop sensor is included.
 - (f) Each lane has an independent timer (0–999 s) with a resolution of 0.1 s.
 - (g) An electric motor is included (0–80 rpm).
 - (h) It has three modes: standard speed, acceleration mode = 1, and acceleration mode = 2.
 - (i) The panel can be directly used to set the termination time and experiment code.
2. Analysis software:
- (a) The software can extract and record data, including those for drop time and drop speed. Between-group data can also be compared. Data can be directly output to Excel.
 - (b) The software has adjustable report output functions.

The main service targets are researchers of Taipei Medical University (TMU) and its five affiliated hospitals.

Article 2 This instrument is placed in the Laboratory Animal Center (hereinafter “this Center”) on the third floor of the Back Building of the United Medical Building.

Article 3 Procedure for reserving the machine for use:

- A. To acquire the requisite qualifications for using the instrument, the applicant must attend the Behavior Research Instrument Training Course and Behavior Research Instrument Practice courses. To obtain the qualification, after 1–3 practices, the applicant must pass a practical assessment conducted by this Center. The applicant must apply using this Center instrument reservation system to obtain permission to use the instrument.
- B. Please register using the reservation system of the Core Facility Center and this Center 1–10 days prior to the day of reservation.
- C. Instrument availability period:
 - (1) During the semester: Monday to Friday, 8:00 a.m. to 5:00 p.m.
 - (2) Summer and winter vacations: Monday to Friday, 8:30 a.m. to 5 p.m.
 - (3) In principle, reservations are in 1-h increments. The maximum use time is 4–8 hours (depending on the instrument). For extensions to this maximum time, please apply with the management unit for permission.
 - (4) To avoid infection, animals that are not bred in this Center cannot be used in this instrument.

- D. Users must sign in and sign out precisely in accordance with their time of reservation. If the user does not sign in to use the instrument on time without prior cancellation of the reservation, the use will still be charged as per their original time of reservation.

Article 4 Regulations on instrument use are as follows:

- A. Eating, drinking, smoking, and the storage of food are prohibited in the operation room.
- B. Operation of the computer with gloves on is strictly prohibited.
- C. Users should carry their compact disc-recordable (CD-R) discs or hard disk drives to save the data they require.
 - (1) The small animal automatic gait analysis system is compatible with only CD-R discs in accessing the data.
 - (2) The 24-hour cage monitoring system is compatible with only CD-R discs and hard disk drives in accessing the data.
 - (3) The animal behavior tracking analysis software is compatible with only CD-R discs in accessing the data.
 - (4) The digital rotarod for rats and mice is compatible with only CD-R discs in accessing the data.
 - (5) The testing system for active and passive avoidance experiments involving small animals is compatible with only CD-R discs in accessing necessary data.
- D. Please follow the standard operating procedure when turning the instrument on or off. After using the instrument, the user shall maintain the cleanliness of the instrument and the operation table and remove experimental waste. Those violating these regulations will be suspended from using the instrument for a month after this Center confirms the violation.
- E. Because the raw files of the instrument are extremely large, the instrument host and the analysis computer do not save user data. This Center is not liable for any data loss.
- F. When the instrument fails, please inform the technicians as soon as possible. Users must not disassemble the instrument without permission. If the user breaks the instrument because of personal negligence, the user must pay the repair fee.
- G. The pricing scheme of this instrument takes into account the cost of consumptive materials and not instrument purchase and maintenance fees. Please ensure that your sample is prepared to a satisfactory quality. If the experimental result is unsatisfactory because of factors other than instrumental malfunction, the user must still pay according to the pricing

scheme.

- H. If a user violates any of the aforementioned or other relevant regulations, and this Center verifies such deeds to be major violations, this Center will bar the user from using any instrument and from accessing the animal facilities. Users will be notified of the ban, which is effective from the time of notification.

Article 5 The pricing scheme of this instrument are set to ensure optimal service quality and increase effective service life. As resolved at the Research and Development Meeting, individuals or units that use the instrument must share in the fees required for consumptive materials, repair and maintenance, and operator services.

- A. Charge standards:

	Intramural	Extramural
Counting unit	NTD/hour	
Gait analyzer	250	750
Behavior tracking system (water maze)	200	600
Rotarod system	150	450
24-hour behavior observation system	100	300

- B. Payment methods

According to regulations governing the notification of payment for an instrument service use by the Core Facility Center, the user must first receive a notification from management personnel. The user then pays in cash at the Cashier Section of TMU. After payment, the user holding the payment receipt can receive their experimental data. For researchers who intend to write off the payment through research-project or university budgets, they must complete the reimbursement process within 1 month after using the instrument.

Article 6 Points of contact:

Laboratory Animal Center technician: Wu, Wen-Chi. Phone extension: 7256.

Laboratory Animal Center technician: Wang, Chuch-Yi. Phone extension: 7153.

Article 7 These Guidelines and any amendments therein shall be implemented upon the approval of the Meeting of the Research and Development Office.