# TSE systems

# MotoRater

MotoRater
303030 series  **TSE** systems

ANIMA LAB

# MotoRater

**MotoRater "MotionRater" is an innovative automated tool for standardized quantitative and objective evaluation of fine motor function and kinematic analysis in small laboratory animals.**

Movement analysis is not confined to footprints; it also analyzes kinematic parameters for different motion endpoints. The MotoRater observes the animal from three sides simultaneously and provides explicit readouts for relevant body parts, i.e., limbs, joints, tail, etc. making this a comparative translational apparatus for disease study to humans. The modular setup allows evaluation from all kinematic movements during four-movement modalities (overground locomotion, skilled ladder walking, wading, and swimming) providing a highly differentiated analysis of the animal's motor performance.

The option to test animals in the wading and swimming module provides the unique opportunity to evaluate motion patterns of severely impaired animals, which would not support their body weight on solid ground.

# Benefits

| Automated kinematic movement and gait analysis | A single system tests four different movement modalities | Simultaneous observation and analysis of three animal sides | Virtually unlimited number of parameters | Suitable for many (inclunding severely impaired) animal models |
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## TSE Motion powered by Simi Reality Motion Systems is software for video acquisition and data analysis.

To make it simpler, the NEW MotoRater can be operated directly through one software for video acquisition and data analysis providing video through a stationary high-speed "fish-eye objective" camera and analysis through a marker-based kinematic gait analysis for maximal variability and scientific analysis.

## TSE Motion: Video Acquisition

- The animal is placed into the activity compartment and freely moves through the long activity runway (either dry, on a ladder, or containing water) towards a home cage or goal box (serving as a motivator); the long runway favors natural gait and allows recording of 3-4 gait cycles.

- Video properties can be adjusted, permitting optimal tracking performance for various acquisition conditions and animal color.

## TSE Motion: Data Analysis

TSE Motion Analysis software tracks any type and number of specified body points (automatized tracking) during four different movement modalities:

Walking      Horizontal Ladder      Wading      Swimming
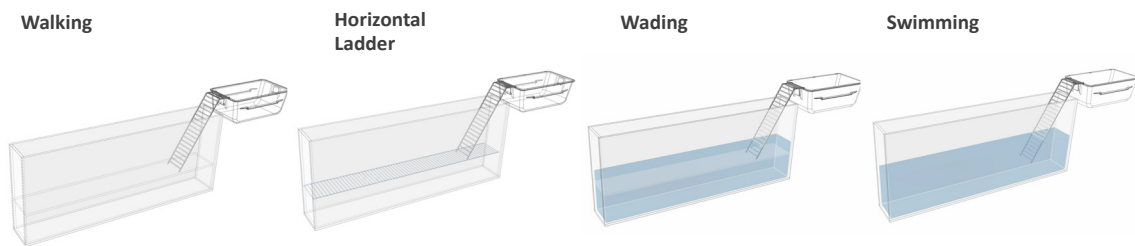
- Kinematically meaningful connections between two or more body points can be defined for calculating joint angles, distances, velocity, and acceleration, etc.
- Body points can be tracked in all frames or only a selection of relevant frames.
- Automated or manual point-and-click tracking is also possible. (relevant if only one or a few selected frames are of interest).

## More than 100 kinematic gait parameters

- Exact & standardized analysis protocols can be created, saved, and applied to tracking data maximizing data reliability across animals and minimizing group size.
- Objective and unbiased analysis.
- Uniquely comprehensive calculation options (including distances, angles, mean, maximum and minimum values, etc.) for:

| | |
|---|---|
| **General spatiotemporal patterns:** | stride distance, duration, speed, stance time, swing time |
| **Inter-limb coordination:** | diagonal cadence, left/right alternation rhythm |
| **Swing phase and paw trajectory:** | swing speed, smoothness, trajectory shape, abnormality |
| **Body posture and joint angles:** | hip height, tail & nose height, limb function |
| **Gait variability, deviations:** | retraction, protraction |

- Data smoothing and filtering options.
- Elaborate options for graphical data representation including stick view figures, phase model diagrams, statistic plots, and more.
- Dynamic video and diagram animation.
- Programming of analysis templates; standard templates (e.g. gait analysis) are available on request.

# Research Applications

**Animals are objectively and reliably screened for deficits in a high-throughput fashion.**

Relevant disease models include:

- Ischemia / Stroke
- Huntington's disease
- Multiple sclerosis
- Amyotrophic lateral sclerosis
- Duchenne muscular dystrophy
- Parkinson's disease
- Batten disease

- Spinal cord injury
- Spasticity / Ataxia
- Pain / Arthritis
- Locomotor recovery / treatment / exercise efficacy
- Aging
- Other neurological and rare diseases

## TSE MotoRater can be integrated with other cutting-edge technologies

As a synchronization hub, the trigger box allows advanced users to integrate external systems into the MotoRater. For example, EMG recordings can be triggered and observed directly in the TSE Motion software. Additionally, the wireless EMG option can be obtained through TSE Stellar Telemetry and wireless optogenetics.
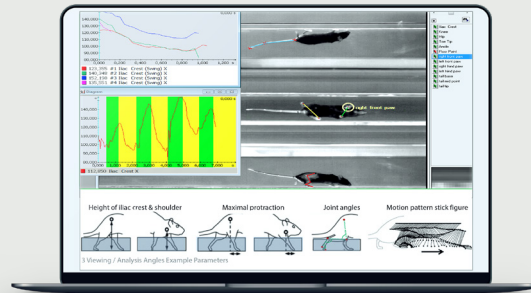


## Selected Publications

• The MotoRater from TSE Systems is world-renowned among leading academic institutes, research centers, contract research organizations, and pharmaceutical companies. Dozens of scientific papers based their research on the MotoRater have been published in peer-reviewed journals like Nature, Cell, and others. You can find below a selection of scientific publications.

• Yoshizaki S, Kijima K, Hara M, Saito T, Tamaru T, Tanaka M, Konno D-J, Nakashima, Okada S. Tranexamic acid reduces heme cytotoxicity via the TLR4/TNF axis and ameliorates functional recovery after spinal cord injury. J Neuroinflammation. 2019; 16: 1–15.

• Krupa P, Svobodova B, Dubisova J, Kubinova S, Jendelova P, Machova Urdzikova L. Nano-formulated curcumin (LipodisqTM) modulates the local inflammatory response, reduces glial scar, and preserves the white matter after spinal cord injury in rats. Neuropharmacology. 2019; 155: 54–64.

• Chen B, Li Y, Yu B, Zhang Z, Brommer B, Williams PR, Liu Y, Hegarty SV, Zhou S, Zhu J, Guo H, Lu Y, Zhang Y, Gu X, He Z. Reactivation of Dormant Relay Pathways in Injured Spinal Cord by KCC2 Manipulations. Cell. 2018; 174: 521-535.

• Preisig DF, Kulic L, Krüger M, Wirth F, McAfoose J, Späni C, Gantenbein P, Derungs R, Nitsch RM, Welt T. High-speed video gait analysis reveals early and characteristic locomotor phenotypes in mouse models of neurodegenerative movement disorders. Behav Brain Res. 2016; 311: 340–353.

• Zörner B, Filli L, Starkey ML, Gonzenbach R, Kasper H, Röthlisberger M, Bolliger M, Schwab ME. Profiling locomotor recovery: Comprehensive quantification of impairments after CNS damage in rodents. Nature Methods. 2010; 7 (9): 701-708.

**Our system comes with all-in-one warranty and
excellent technical support service**

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