VisioTracker
Automated Analysis of Visual Performance in
Fish and Larvae
**VisioTracker: Hardware Features**

TSE VisioTracker is a fully automated high-throughput system for the quantitative analysis of visual oculomotor performance in small adult fish and larvae. Visual system performance is assessed on the basis of the optokinetic response (OKR), which involves reflexive slow stimulus-following eye movements alternated with rapid resetting saccades. The OKR is a highly conserved, easily elicited and robust behavior that is manifested at very early stages, which makes it an ideal model for the investigation of visual system development.

**System Components**
- Immobilization device for small adult fish
- Infrared leds to illuminate subjects from below
- A high quality infrared-sensitive camera equipped with a high-resolution zoom lens to monitor eye movements of fish / larvae
- A circular drum screen surrounding the fish / larva container
- A digital light projector for stimulus presentation
- Control & Stimulation PC
- Control monitor
- VisioTracker software package

**Immobilization & Fixation**
- **Larvae** are immobilized within a Petri dish that contains a freshly made, pre-warmed synthetic gel (e.g. methylcellulose)
- Up to 7 Petri dishes can be placed into the VisioTracker
- One larva is tested at a time
- Preparing and placing several larvae into the setup saves time during experiments
- **Adult fish** are immobilized using the specially designed device
- The fish is bedded in between two moisturized sponges and placed into a glas chamber
- One fish / chamber at a time is placed into the VisioTracker fixed on a support stand
- Two integrated water inlets and one outlet together with a peristaltic pump provide a constant water flow around the animal

Scheme of the setup

Adult fish restrainer
VisioTracker: Software Features

The TSE VisioTracker software was inspired and developed by a team of experienced scientists. It is highly intuitive, quickly learned and easy to use while offering sophisticated technology for the realtime tracking of optokinetic responses (OKR) in small fish and larvae.

Experimental Design

- Design your whole experiment conveniently in one window; use predefined options and drop down menus to define your personalized stimulus settings:
  - Contrast (user-defined soft or sharp boarders)
  - Spatial frequency
  - Angular velocity
  - Stripe color
  - Number of cycles
  - Cycle duration
  - Movement direction of the grating
  - Binocular or monocular (two or one eye) stimulation
  - Field of view (for monocular stimuli only)

- Eye tracking larvae: A separate particle detection image shows how well eyes are recognized; eye detection can be easily adjusted using predefined parameters
- Eye tracking adult fish: tracking of the eye rims is directly displayed on the live image
- Left and right eye velocities are constantly shown in form of a graph with overlaid stimulus velocity
- Angular position of both eyes is also displayed graphically
- A progress bar indicates time elapsed/progress of the experiment
- A video can be recorded of the whole experiment with user-selected frame rate
- The experiment ends after presentation of the last stimulus

Experimental Control

- The experiment starts by single key stroke
- Stimulus gratings are presented fully automatically
- A live image constantly displays the fish’s or larva’s head

Data Analysis

- Saccades can be filtered according to user-defined criteria
- Velocity curves for each eye can be smoothened
- Raw and processed data are stored in separate txt files
- A built in data analyzer plots selected data files and performs statistical group comparisons
- Data can be exported for more sophisticated analyses
Selected Publications

- Huber-Reggi SP et al. (2014) Individual larvae of the zebrafish mutant belladonna display multiple infantile nystagmus-like waveforms that are influenced by viewing conditions. Invest Ophthalmol Vis Sci, 55(6):3971-8


Service & Warranty

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- 24/7 technical hotline
- Remote maintenance and update function
- On-site visits upon necessity
- Free replacement parts during warranty

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