The In-cage automation of a test for dexterity after stroke.

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Introduction:
Rats are often used to assess therapies that might improve reaching and dexterity using Ian Whishaw's Single Pellet Reaching Task. Typically daily, a researcher takes the rat from its cage to the apparatus and trains it to retrieve sugar pellets from one of two pedestals. After neurological injury, rats may be assessed weekly for one or two months. The researcher may be occupied with training, rehabilitations and testing for several months. Over the last six years we and others have been developing methods for automating this task (Fenrich et al., 2014, 2015; Wong et al 2015). This poster presents the device we have developed to execute the single pellet reaching task in-cage and unattended.

Device Development:
Prototypes were designed using computer aided design software, manufactured using 3D printing technologies and controlled using miniature computing hardware, custom designed electronics and an array of sensors.

Device Control:
A custom experiment management application and device firmware was developed to manage devices and experimental data workflows. This facilitated 24/7 timed operation of devices in parallel whilst housing multiple rats per cage.

Device Capability:
Each rat is implanted with a wireless microchip to enable them to be housed in groups, yet trained and assessed independently. Each Ratbot dispenses a sugar pellet such that the rat must reach through a slit to retrieve it from a pedestal at a programmable position. This allows for automated acclimation, training and execution of the task. Reaching data is automatically captured and persisted to a database for easy reporting and analysis.

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CONCLUSIONS

- RatBots allow, for the first time, 24/7 in-cage training and assessment of dexterity in rats.
- Rats may be housed in groups because implanted microchips allow for easy identification.
- More data is captured per rat. (reach distance, success rate, reach attempts)
- RatBots can detect disability after stroke in middle-aged, and young adult rats.
- With automation, more studies are possible, accelerating discovery of new therapies.
- Rats enjoy the task and do not need to be food restricted.

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12 minutes per day to maintain 8 cages

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