Purpose: To test for asymmetry of forelimb usage in rats. After injury to the motor system one tends to find that rats use the forelimb contralateral to the lesion less frequently.

Equipment:

- Plexiglass cylinder (20 cm diameter, 45 cm high) with transparent bottom
- Video camera
- Light source

Procedure:

1. Acclimatize rats to testing room for at least 30 minutes prior to sessions.
2. Ensure cylinder is clean.
3. Set up light source below the cylinder. Check to make sure there is no glare on the cylinder from the light.
4. Set up the video camera. Rearing movements may be videotaped from below, or from the side with the use of a mirror. Ensure the entire cylinder is in view before recording.
5. Place the rat in the cylinder and record movements for 5 minutes.
6. Return rat to home cage and clean cylinder before the next rat is tested.

Analysis of wall exploration:

This test was designed by Dr. T. Schallert (e.g., see ref. [1]) and we have used this test in models of cortical and striatal injury (e.g., [2]).

Forelimb movements are analyzed using frame-by-frame analysis ("slow motion") of videos. A "push off" is the independent use of either forelimb or simultaneous use of both when rearing (e.g. pushing off the floor of the cylinder). "Wall exploration" is the initial placement of a forelimb on the wall and contact during subsequent lateral movements. A "landing" is the use of either limb (or both) to land after rearing.

We find analysis of wall exploration most useful. Independent forelimb use is expressed as:

$$\frac{\text{(number of contacts with contralateral forelimb + ½ both)}}{\text{(ipsilateral forelimb use + contralateral forelimb use + both)}} \times 100$$

Rats are excluded if they make fewer than 8 independent touches on the wall as anything less may not give an accurate estimate of limb use asymmetry. If little activity is found, then rats can be videotaped for longer or rearing can be encouraged (e.g., smaller cylinder, rub odor on rim of cylinder). Care must be taken to avoid over use of this test (habituation reduces exploratory behavior) as well as making loud noised during testing (freezing behavior).

References:

1. Schallert T, Fleming SM, Leasure JL, Tillerson JL, Bland ST. Cns plasticity and assessment of forelimb sensorimotor outcome in unilateral rat models of stroke, cortical ablation, parkinsonism and spinal cord injury. *Neuropharmacology*. 2000;39:777-787
2. Maclellan CL, Auriat AM, McGie SC, Yan RH, Huynh HD, De Butte MF, Colbourne F. Gauging recovery after hemorrhagic stroke in rats: Implications for cytoprotection studies. *J Cereb Blood Flow Metab*. 2005