Grip Strength IMPC_GRS_001

Purpose

The grip strength test is used to measure the neuromuscular function as maximal muscle strength of forelimbs and combined forelimbs and hind limbs. These are assessed by the grasping applied by the mouse on a grid that is connected to a sensor. Three trials are carried out in succession measuring forelimb-strength only, followed by three successive trials measuring the combined forelimb/hindlimb grip strength. All grip strength values obtained are normalized against mouse body weight.

Ontological description: MP:0001515 - abnormal grip strength.

Experimental Design

Minimum number of mutant animals: 7 mice for each sex.

Age of animal: 9 weeks.

Sexual dimorphism: Yes.

Equipment

1. Grip strength meter apparatus
2. Balance

Procedure

1. Set up and use of grip strength meter:

   1. Check the connection of the sensor to the grid is firmly in place to prevent the grid from turning around.
   2. Turn the sensor on and select peak mode, which will enable a measurement of the maximal strength exerted by the mouse – the default unit of force measured is delivered in grams. Do *not* apply loads greater than the nominal capacity of the force sensor at the risk of permanently damaging the strength gauge.
   3. Reset the display sensor to zero.

2. **Grip strength force:**

   1. Remove a mouse from its home cage, gripping the base of the tail between the thumb and the forefinger.
   2. *Forelimb measurement:* Lower the mouse over the grid keeping the torso horizontal and allowing only its forepaws to attach to the grid before any measurements are taken. Gently pull the mouse back by its tail ensuring the mouse grips the top

portion of the grid and the torso remains horizontal and record the maximal grip strength value of the mouse that is displayed on the screen. Repeat this procedure twice more to obtain 3 forelimb grip strength measurements.

3. *Forelimb and hindlimb measurement:* Lower the mouse over the grid keeping the torso parallel with the grid and allow both its forepaws and hind paws to attach to the grid before any measurements are taken. Gently pull the mouse back by its tail ensuring the torso remains parallel with the grid and record the maximal grip strength value of the mouse that is displayed on the screen. Repeat this procedure twice more to obtain 3 forelimb/hindlimb grip strength measurements.

4. Place the mouse on the balance and record the weight of the mouse.

5. Make a note of any further observations found during the test e.g. failure to grip the grid.

6. Place the mouse back in its home cage.

3. Wipe the grid before testing each cage of mice.

Notes

Mice with missing digits (e.g. after toe clipping) should be omitted from this test. Behavioural parameters may be influenced by circadian rhythm therefore testing should be routinely carried out around the same time of day to obtain balanced and valid results. Avoid testing immediately after light-dark transition as behavioural outcome may be affected.

The information about the date of the experiment, that is the date when the measurement is performed, is an important parameter which is to be submitted in the Experiment xml file (dateOfExperiment="2013-02-28").

Data QC

1. Calibrate the grip strength meter in accordance with the equipment guidelines.
2. The force sensor is fragile and should never be overloaded.

Parameters

	Version	Type	Increment	Option	Derived	Unit	Data Type
Forelimb grip strength measurement IMPC_GRS_001_001	1.2	seriesParameter	1 2 3			g	FLOAT
Forelimb and hindlimb grip strength measurement IMPC_GRS_002_001	1.2	seriesParameter	1 2 3			g	FLOAT
Body weight IMPC_GRS_003_001	1.3	simpleParameter				g	FLOAT

	Version	Type	Increment	Option	Derived	Unit	Data Type
General comments about the mouse IMPC_GRS_004_001	1.1	simpleParameter					TEXT
Forelimb grip strength measurement mean IMPC_GRS_008_001	1.2	simpleParameter			IMPC_GRS_001_001 mean_of_increments	g	FLOAT
Forelimb and hindlimb grip strength measurement mean IMPC_GRS_009_001	1.2	simpleParameter			IMPC_GRS_002_001 mean_of_increments	g	FLOAT
Forelimb grip strength measurement max JMC_GRS_001_001	1.0	simpleParameter			IMPC_GRS_001_001 max_of_increments	g	FLOAT
Forelimb and hindlimb grip strength measurement max JMC_GRS_002_001	1.0	simpleParameter			IMPC_GRS_002_001 max_of_increments	g	FLOAT
Forelimb grip strength normalised against body weight IMPC_GRS_010_001	1.2	simpleParameter			IMPC_GRS_008_001 IMPC_GRS_003_001 /		FLOAT
Forelimb and hindlimb grip strength normalised against body weight IMPC_GRS_011_001	1.2	simpleParameter			IMPC_GRS_009_001 IMPC_GRS_003_001 /		FLOAT

Metadata

	Version	Type	Increment	Option	Derived	Unit	Data Type
Equipment ID IMPC_GRS_005_001	1.0	procedureMetadata		GRS-01 GRS-02			TEXT
Equipment manufacturer IMPC_GRS_006_001	1.0	procedureMetadata		Bioseb			TEXT
Grid model IMPC_GRS_007_001	1.0	procedureMetadata		HMGU plate			TEXT
Experimenter ID IMPC_GRS_012_001	1.0	procedureMetadata		JMC005 JMC008 JMC302 JMC303			TEXT

	Version	Type	Increment	Option	Derived	Unit	Data Type
Equipment model IMPC_GRS_013_001	1.0	procedureMetadata		Bio-GS3			TEXT
Date equipment last calibrated IMPC_GRS_014_001	1.2	procedureMetadata					DATE