

Adaptation of tape removal test for sensation measurement in perineal area of rat

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Introduction

Regeneration after spinal cord injury is a goal of many studies. Although the most obvious target is to recover motor function, restoration of sensation can also improve the quality of life after spinal cord injury. For many patients, recovery of sensation in the perineal and genital area is a high priority. Currently there is no experimental test in rodents for measuring changes in sensation in the perineal and genital area after spinal cord injury.

The aim of our study was to develop a behavioural test for measuring the sensitivity of perineal and genital area in rats. We have decided to modify the tape removal test.

Materials and methods

Tape removal test

A small piece of tape (approximately 1 cm²) was attached to the perineal area of rat (Figure 1). Time to first touch the tape was measured (Figure 2). Maximum time allowed to remove the stimulus was 5 min. Each rat was trained in 5 consecutive days (D1-5) and then tested weekly (W1-7).



Figure 2 Rat removing the tape

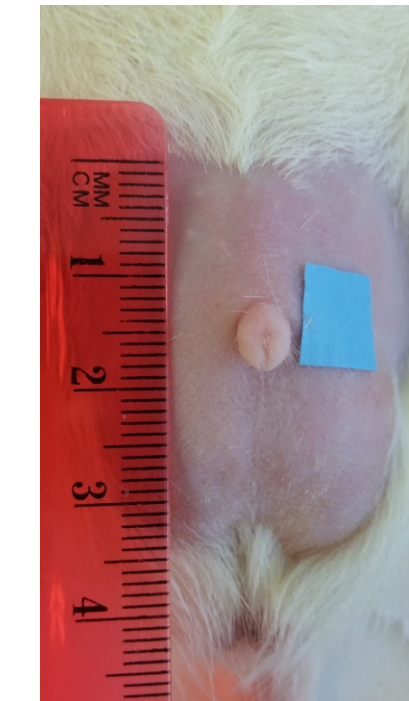


Figure 1 Placement and size of the tape

We compared different rat strains, both genders, shaving and non-shaving, shaving with razor blade or using depilatory cream and different types of tape.

Spinal cord injury

AT10 dorsal column lesion as a model of spinal cord injury was performed.

Lesions were reconstructed from the histological sections

(Figure 4) from all rats and lesion size was quantified using

ImageJ. The percentage of preserved area was then correlated with behavioural deficit measured by additional sensory and motor tests (BBB, von Frey, ladder, horizontal ladder) before and after the surgery.

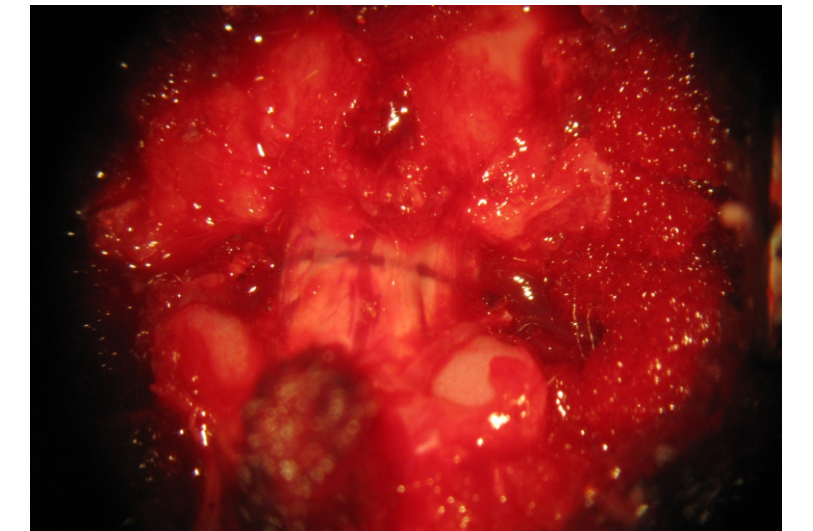


Figure 3 Spinal cord after cut with forceps

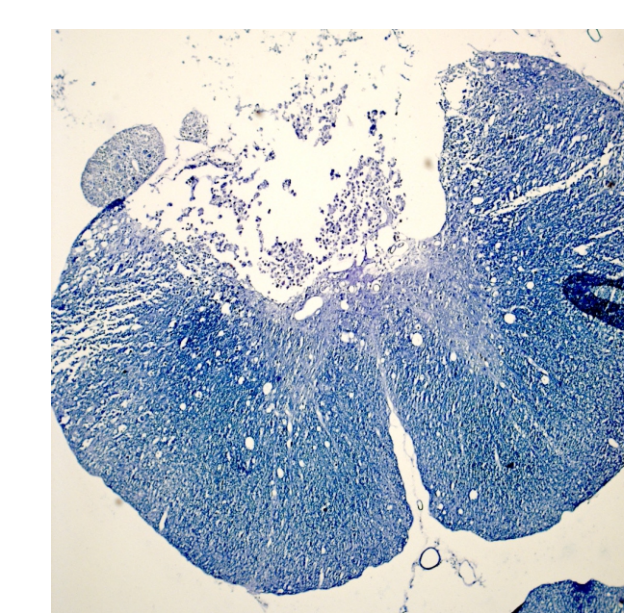
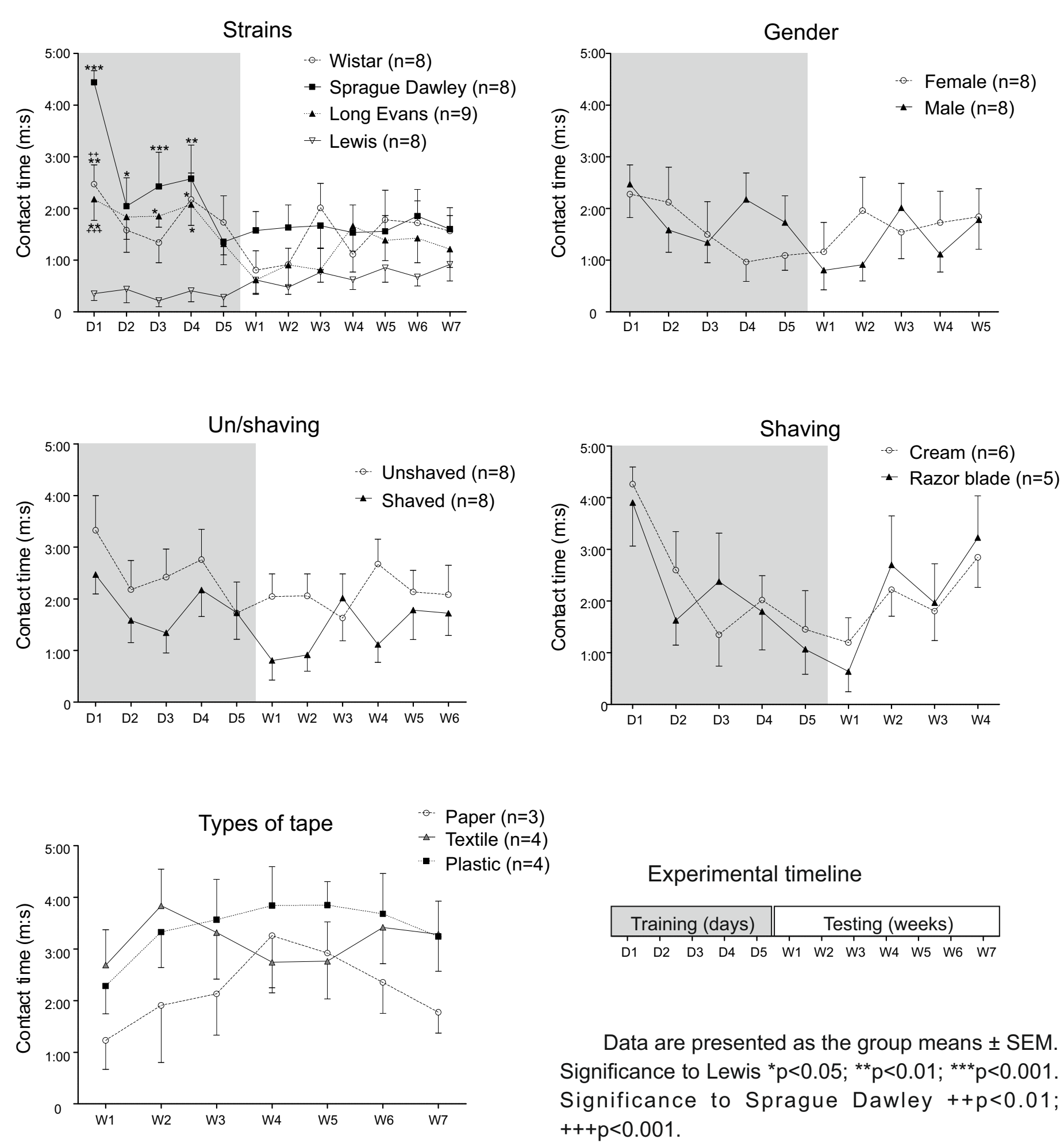


Figure 4 Transverse section of dorsal column lesion

Results

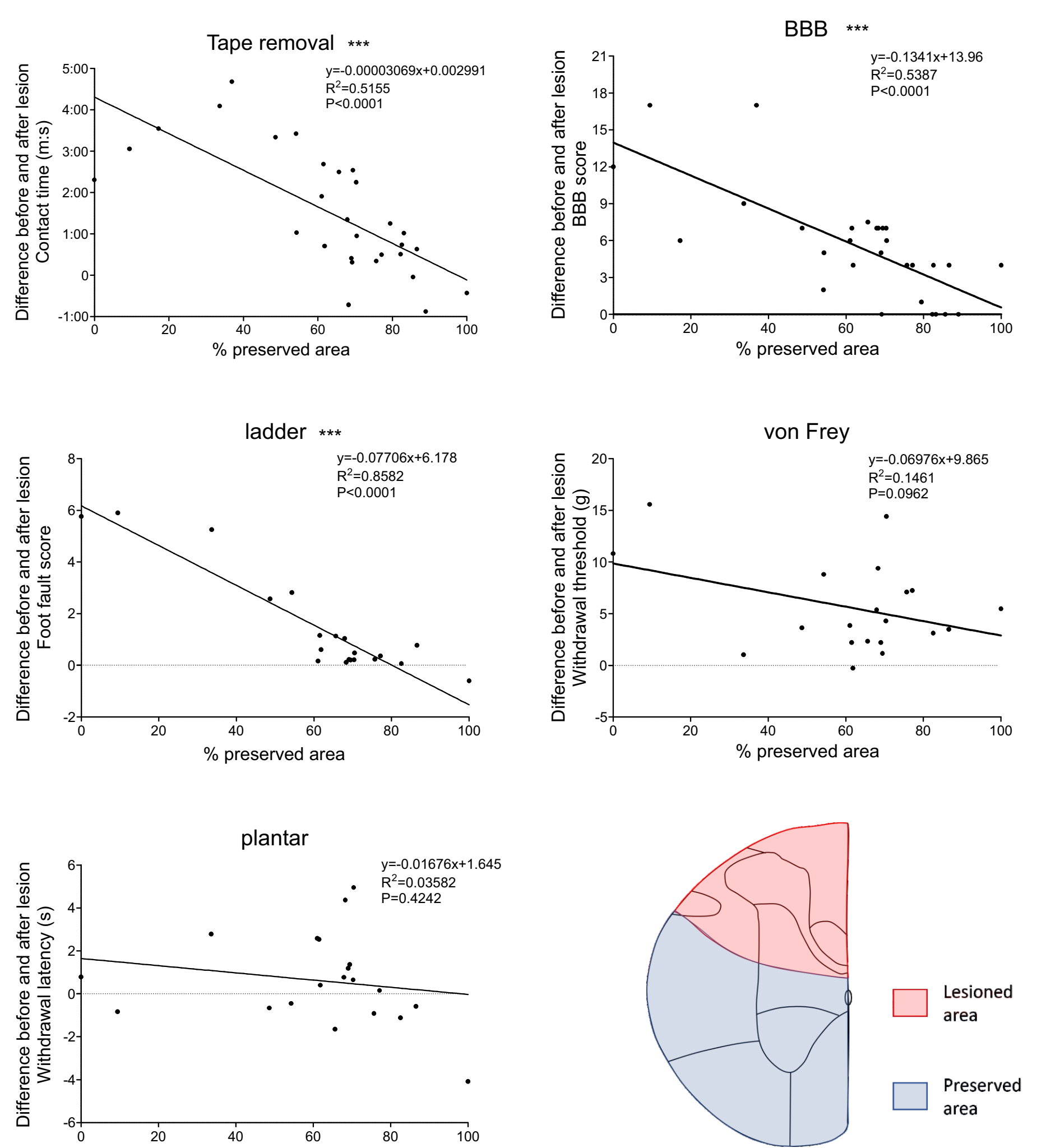
Tape removal test - different settings



Four rat strains were compared - Wistar, Sprague-Dawley, Long-Evans and Lewis. The best of them was Lewis, however, this difference was significant only first few days during learning the task.

There were no significant differences between gender and different types of tape or shaving.

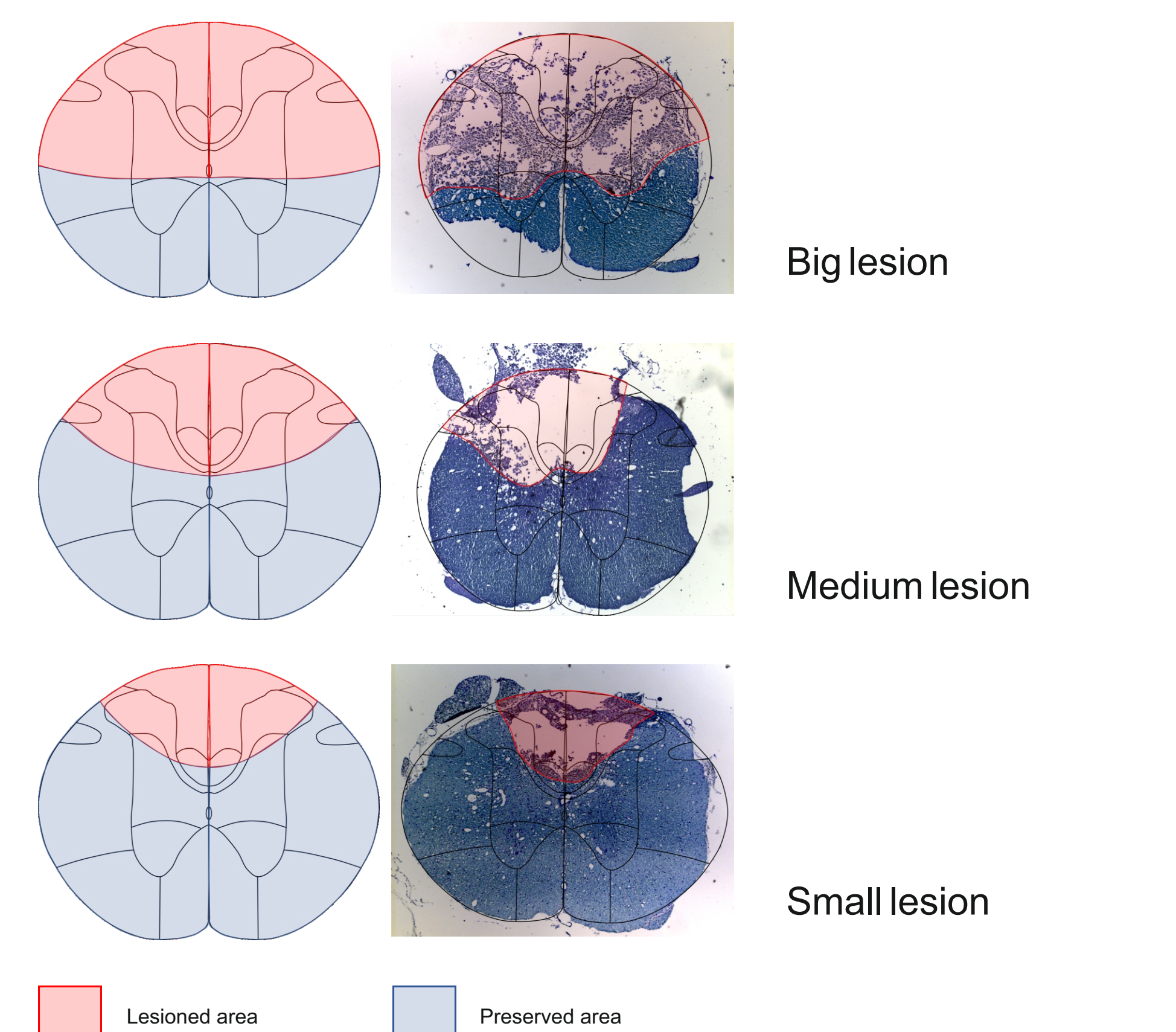
Functional outcome after dorsal column lesion



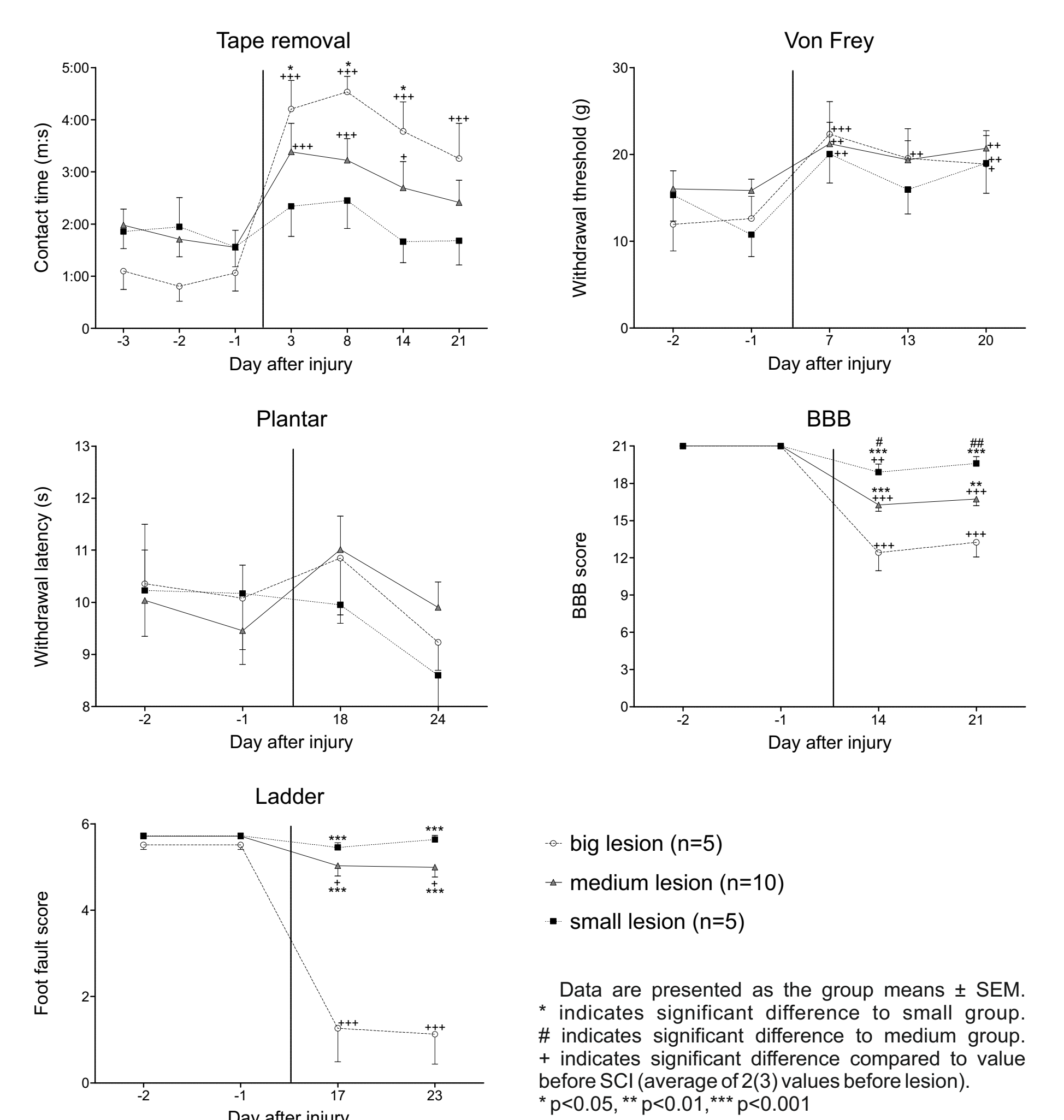
There was a strong relationship between lesion size and tape detection time.

Other standard behavioural tests (BBB, von Frey, ladder and Plantar test) were performed in the same animals. There was a correlation between lesion size and deficit for the ladder and BBB tests, but not for the von Frey and Plantar tests.

Functional outcome after dorsal column lesion



Because the size of the lesions varied between animals, we divided them into three groups, big, medium, small.



In the tape removal test the time rats took to first contact the tape increased after SCI depending on the size of the lesion. The similar effect was seen in the BBB, ladder and von Frey test, however, in the last one results are not so distinct. In plantar test no changes were detected, most likely due to ventral position of the nociceptive and thermal pathway.

Conclusions

- Tape removal test is suitable for testing perineal and genital sensitivity in rats and can be used in different strains.
- There is no difference between gender, shaving of perineal area or type of tape.
- Deficits in the perineal sensation after T10 dorsal column lesions can be detected for at least 3 weeks after lesioning and correlate with the size of the lesion.
- The test is therefore suitable for testing treatments for sensory restoration in the genital region in dorsal spinal cord injuries of sufficient size.

Acknowledgments

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