EVALUATION OF THE PRESSURE DISTRIBUTION UNDER THREE DIFFERENT TYPES OF HARNESSES FOR GUIDE DOGS

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SUMMARY
The aim of this study was to evaluate the pressure distribution under three different types of harnesses for guide dogs.
All harnesses were made of leather. The measurements were carried out in eight guide dogs.
The dogs led by a trainer had to pass a course, representing the stresses of daily life. All dogs were clinically sound and showed no sign of lameness. The pressure exerted form the harness to the dog was determined by sensor strips and individually adapted to each guide dog and related to the gait with a kinematic measurement system. All harnesses and exercises were compared to each other.
In all harnesses the highest pressures were found in the region "sternum right". The first harness showed the highest load (maximum pressure 2.02±0.6N/cm²). In all other regions, the pressures are in the range of 0-1.32 N/cm².
It is notable that the regions "sternum right" and "sternum left" are almost constantly loaded. Contrary to previous assumptions the back regions are little affected. This investigation shows the big differences between harnesses. A suitable harness will reduce load to the guide dogs.

INTRODUCTION
The aim of study was to evaluate the pressure distribution under three different types of harnesses for guide dogs.

The overload of the harness lead to back problems of the guide dogs [1,2].

METHODS
All harnesses were made of leather. In the first harness the mobility of the frame was restricted by loops. The second harness was padded in the spine-area. The third harness had a rigid connection with the frame.

The measurements were carried out in eight guide dogs, which led a trainer for guide dogs through a course, which should simulate the stresses of daily life. All dogs were clinically sound and showed no sign of lameness (ground reaction forces). The pressure exerted form the harness to the dog was determined by sensor strips (T&T medilogic Medizintechnik GmbH, sample rate 60 Hz, 0.1-4 N/cm²) and individually adapted to each guide dog. The time course of the pressure was cut in motion cycles via a marker on the left forelimb of the guide dog using a kinematic measurement system (Motion Analysis Corp., USA CA Santa Rosa, sample rate 80 Hz).

Each dog had to walk a course including following exercises: straight line, curve left, curve right, upstairs, and downstairs. Straight line was chosen as reference exercise. All harnesses and exercises were compared to each other.

At the guide dog ten regions were determined: "chest strap front right", "chest strap shoulder right", "chest strap front left", "chest strap shoulder left", "sternum right", "sternum left", "chest right side", "chest left side", "back right" and "back left".

RESULTS AND DISCUSSION
In all harnesses the highest forces and pressures were found on "sternum right". In the reference exercise the first harness showed pressure values (2.02 ± 0.6 N/cm²) comparable to those of horse saddles with "serious deficiencies".

In all other regions, the pressures are in the range of horse saddles with "excellent to good fit" (0-1.32 N/cm²).

CONCLUSIONS
It is noteworthy that the regions "sternum right" and "sternum left" are almost constantly loaded.

Contrary to previous assumptions the back regions are little affected, because of the lifting of the frame. This investigation shows the big differences between the harnesses (See table 1) and makes clear that a suitable harness will reduce load to the guide dogs.

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REFERENCES

1. Daniel, R.K., Priest, D.L., Wheatley, D.C.: Etiologic Factors in Pressure, *Arch Phys Med Rehabil* **62:** 492–498, 1981.
2. Helmink, S.K., Shanks, R.D., Leighton, E.A.: Investigation of breeding strategies to increase the probability that German shepherd dog and Labrador retriever dog guides would attain optimum size. *J. Anim. Sci.*, **81**:2950-2958, 2003.

Table 1: Maximum values und SD of the region sternum right. Comparison of different exercises and harnesses.

Exercise	**Straight**	**Left curve**	**Right curve**	**Stairs up**	**Stairs down**
H1					
Force [N]	30.3 ± 9.2	28.8 ± 9.0	27.6 ± 7.5	28.4 ± 6.5	27.3 ± 7.4
Pressure [N/cm²]	2.02 ± 0.61	1.92 ± 0.60	1.84 ± 0.50	1.89 ± 0.43	1.82 ± 0.49
H3					
Force [N]	27.4 ± 5.0	26.2 ± 3.1	26.9 ± 3.2	26.0 ± 4.1	25.6 ± 4.5
Pressure [N/cm²]	1.83 ± 0.33	1.74 ± 0.21	1.80 ± 0.21	1.73 ± 0.27	1.70 ± 0.30
H3					
Force [N]	17.1 ± 7.3	16.6 ± 7.5	16.9 ± 6.9	17.9 ± 7.2	20.3 ± 6.8
Pressure [N/cm²]	1.14 ± 0.49	1.11 ± 0.50	1.13 ± 0.46	1.19 ± 0.48	1.35 ± 0.45

H1…Harness 1, H2…Harness2, H3…Harness3