

## Mass examination for backbone protection using the twin back of the “Duoback” chair

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The Department of Ergonomics at the University of Hamburg in Germany examined a total of 160 people in a test that measured the spinal load in and around the lumbar vertebra. The test revealed that the spinal load was evidently lessened with application of the new back of the “Duoback” chair to each of the examinees.

### Introduction

Nowadays, many working adults sit in chairs while they work. Most of them, especially those who have worked for a long time while seated, complain about spinal cord problems and related backaches.



[Fig. 1 a & b: The “Duoback” office chair with the height-adjustable arm rest (optional)]



[Fig. 2a & b: The “Duoback” chair equipped with the arm rest. The turning axis located right behind the back of the chair is able to support the upper part of your body when moved to a reclining position.]

A good many technical solutions, including free exercise, are recommended to cope with this backache. Some even recommend working in an upright position. However, all such “solutions” are not without side effects. This is because continuous working in an upright position is likely to cause vascular hyperemia. Also, it may increase

basal metabolism. Basal metabolism is somewhere between 120 and 150 watts when you sit on a chair. However, it may sharply increase to somewhere between 180 and 250 watts when you work in an upright position. You may also focus much better when sitting in a chair. Considering such a positive aspect of sitting, it may be a meaningful effort to research and develop a good chair for our daily work routine.

The recent introduction of the “Duoback” office chair is giving rise to the emergence of a new trend. (See Fig. 1a & 1b)



[Fig. 1a & b: “Duoback” office chair with the height-adjustable arm rest (optional)]

Equipped with the latest ergonomic technology, the “Duoback” chair has turning twin backs that are flexible and movable on X, Y and Z axes. With ergonomic curves in its shape, the twin backs are able to vertically support the upper part of your body when reclining in the chair, thereby eliminating the load of the backbone acting on the lumbar vertebra. You can effectively and “actively” protect your backbone by leaning your back against the twin backs.

(1) (2) (3).

### Principles & Results

The Department of Ergonomics at the University of Hamburg in Germany conducted a mass examination in connection with such backbone protection (3). A governing principle for measurement was to measure elasticity and pressure working on the vertical rod of the test object (chair). (Compare it to Fig 3).



[(Fig. 3: The side of the test object (chair). The pressure gauge is visible in the shelf at the lower part of the vertical rod. This gauge measures vertical force. The cable measuring tension is at the upper part of the vertical rod and also visible. This cable measures the instantaneous elasticity.)



[Fig. 4: Direction of force depending on the angles of inclination]



[Fig. 5: X-rayed image of the person sitting on the "Duoback" chair; picture taken from the rear.]

Natural lordosis is clearly shown. It also shows that the ergonomically designed twin backs allow the spinal column to maintain its natural shape, and that the backbone is free from pressure. The wire providing a cushion to the twin backs depicts the contour of the twin backs.

It was decided that mathematical and technological details would not be concretely mentioned. The technology

assessment department in Hamburg verified the measurement sensor on a kilogram basis. For this reason, the reduced amount of the spinal column load was explained using kilograms.

Test results were illustrated using the dot charts of No. 1, No 2 and No. 3. The 160 people who took part in the test were sitting in the chair (test object) in a way that was pleasing to them. However, those sitting carefully and cautiously were not able to provide accurate data. Despite the varying results, it was possible to come to the following conclusion:

- As shown in Dia 1 and Fig 4, the reduced amount of the spinal column load (except 2 cases) increased in proportion to the pressure.
- The bigger or heavier the physical build (Dia 2) or the weight (Dia 3) was, the higher the reduced amount of the spinal column load was.
- Females were able to get a reduction of 14kg while males were able to get a reduction of up to 20kg.

Most notably, the reduced amount was very high. So far, no similar tests have been conducted, and for this reason no comparable data is available.

A "Passive" reduction value can be assigned to the back of the chair, if such a value is calculated according to the law of inclined surfaces. At an inclination of 10 degrees, the load working on the lumbar vertebra will amount to about 1kg. At an inclination of 20 degrees, the load will rise to about 2kg. Said load will increase twice as much as this due to friction, depending on the clothing worn during the test. Test results showed that Duoback was able to maintain the backbone at an inclination angle of less than 10 degrees, producing better results than conventional chairs.

Duoback users said that they felt comfortable because they felt no pressure working on their backbone. This is not to mention the protection of the spinal column coming from the ergonomically designed twin backs. X-ray images also showed that the ergonomically designed twin backs allow the spinal column to maintain its natural shape and that the backbone is free from any pressure. For this reason, Duoback is often sought out for medical uses, i.e. for treatment of patients. Duoback is actually being sold not only for office use, but also for medical uses as medical equipment.



[Dia 1: Leaning against the twin backs reduces the pressure working on the lumbar vertebra]



[Dia 2: The reduction in pressure working on the lumbar vertebra will differ from one physical build to another.]



[Dia 3: The reduction in pressure working on the lumbar vertebra will differ from one body weight to another.]

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