

# GRAHL

working well

GRAHL  
DUO-BACK®

## DUO-BACK®©

Medical Appraisal of:-  
Duo-Back back rest.  
Ergo-Arm® arm rests.  
6-Star base.

Analysis - Key Points  
Studies - Experiments  
Tests - Appraisals - Advice

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### Key points of interest:

DUO-BACK backrests  
 Elbow supports  
 Dynamic sitting

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## Facts

Health Insurance  
symposium:  
Healthy sitting.

- In a normal business life, a human being spends an average of 80,000 hours sitting.

Fraunhofer - Institute

- 80 % of the population suffers from back pain.

Action Healthy Back

- Back problems are the main reasons for doctor visits.

Globus '91

- Back problems are one of the main reasons for early retirement.

Action Healthy Back

- 1/3 of the population between 35-50 suffers from back pain.

Research of the BKK

- 1/3 of all work absence is caused by muscle and skeletal illness

## Main reasons for back problems

- Office furniture that is not ergonomically formed to fit the human body.

- Too long / improper sitting

- Static sitting

- Reach area ergonomics

## **Solutions**

The use of an optimally adjusted Grahl office chair leads to proper sitting, and reduces the frequency of back pain.

## **Goals:**

- Optimal workstation design
- Promote movement at the workstation. (By alternating tasks.)
- Interruption of static sitting jobs. (Breaks for movement.)
- The use of products that can be adjusted to fit the shape of the human body.
- Learning how to care for the back.

## **Pilot study from the University of Frankfurt: The affects of fatigue on the back musculature**

Sitting upright  
relieves the vertebral  
discs

The longer the upright sitting position can be maintained without fatigue, the less strain is put the vertebral discs.

DUO-BACK is  
essential to sitting  
upright

Grahl DUO-BACK plays an essential roll in promoting an upright sitting position through the adduction of the shoulder blades.

By observing the beginning and end test values we see that the back muscles are more fatigued while sitting in a standard chair than in a DUO BACK.

Changing the load on the vertebral discs often is important to keeping them healthy.

Developed from an  
Orthopedic point of  
view

In a test, the back muscles of both persons tested showed more electrical activity in the back while sitting on a conventional chair than on a Grahl chair, which was developed from an orthopedic point of view.

Next to active breaks for movement, is correct posture while sitting at the work place of the utmost importance for back care. This is greatly affected by the characteristics the chair being used.

While sitting in a  
DUO-BACK the  
muscles are less  
fatigued

How strongly the different office chairs can affect the neck and back muscles is shown in the pilot study. How low the increase in muscle activity was while sitting on a Grahl chair, developed from an orthopedic point of view, is reflected in the low fatigue of the tested muscle groups.

A back friendly  
workplace with  
DUO-BACK

The knowledge gained from these studies teaches us to design our office chairs to promote dynamic sitting. The construction of the GRAHL DUO-BACK offers various possibilities for the development of a back friendly work place.

## Prof. Dipl.-Phys. Mattias Brünig: Proper and relaxed sitting

The GRAHL DUO-BACK makes relaxed but proper sitting posture possible.

The dual backrest is supported in the middle so that when you lean back, the lower portion of the backrest swivels forward. This movement turns the pelvis up.

Rotation of the pelvis  
through the dual backrests

Because the backrest hugs the waist, the thorax is lifted. This can lessen the weight on the lumbar vertebra by up to 20 Kg.

Lessening the load on the  
lumbar vertebra

The backrests also provide good support during movement to the side. This provides many possibilities for the user to move while working.

Supports movement from side  
to side

By the way, the GRAHL DUO-BACK which was originally designed for office work, is also being used in rehabilitation.



## **Toni Hochreutener, kloten (Switzerland)** **The swivel chair with the rucksack affect**

The GRAHL DUO-BACK offers optimal requirements for dynamic sitting.

The lumbar vertebra is relieved to a maximum.

DUO-BACK is a  
work chair

The GRAHL swivel office chair is a work chair. It completely fills the requirements for the activating of support muscles.

This office chair promotes upright sitting and supports the normal organic functions of the body.

The GRAHL DUO-BACK is not a lounge chair. It is a chair that promotes variation between tension and relief in the back muscles.

Sitting on a GRAHL DUO-BACK causes a back muscle pressure-massage-phenomenon to begin. Without weight load of course.

Positive affect  
through the  
variation between  
tension and relief

Whoever changes from forward, to upright, to a leaning back position on this ingenious, good posture promoting office chair, not only prevents fatigue in the posterior, but also in the lateral and anterior muscle groups.

'Rucksack' like  
massage affect

Thanks to the unlimited movement and adaptability of the dual backrests, a rucksack like massaging affect on the entire back musculature, especially in the most burdened lumbar area has been achieved.

The padded elbow rests, which are mounted on the sides of the chair are so cleverly designed so that they can be adjusted to fit any body size. The padded support area makes it possible to sit on this chair and work without putting pressure on the elbows.

Elbow supports are adjustable to any body size

This highly adjustable support is the most ideal aid for the support of the spine that I have found so far.

The upright posture, which this chair demands of the body, requires the exertion of the abdominal muscles. This causes the positive activation of the pelvic muscles. Which in turn pushes the lower torso down. With the activation of the pelvic muscles the GRAHL DUO-BACK is of particular value to women.

The body is moved into an upright position

The parameters of the GRAHL DUO-BACK are so variable that it can be adjusted to fit all body shapes and sizes, and the individual needs of the user through the adjustments of seat height, distance between the dual backrests, backrest height, seat angle, height of the arm rests and adjustable elbow supports. These chairs are also sturdily built, and guaranteed to last.

DUO-BACK with multiple and individual adjustments



Dr. Med Werner Wilhelm:  
An orthopedic appraisal

The backrest is of utmost importance for prolonged sitting

The backrest is of the utmost importance when it comes to endurance and efficiency at a seated work place. It is especially important for the health of the back when we consider the ever-growing number of seated jobs.

DUO-BACK makes dynamic sitting possible

Through the combination of the permanent, forward and backward leaning movement, and the new mobile individual backrests, it is possible to work with the back supported in almost any position. Through this the Grahl swivel chair actually makes dynamic sitting possible. Especially because the individual backrests follow back movement during side to side and back and forth movements.

Dynamic sitting is of extreme importance to good health and work efficiency.

Proper waist support

The GRAHL DUO-BACK optimally fills the requirements for a good backrest, to provide the proper amount of support for the waist and back.

Support when turning side to side and leaning

Supported, seated movements such as side to side movement, leaning back and turning are made possible by the tri-axis movement of the backrests. This also allows for a greater reach area without having to rotate the seat. A greater reach area is especially important for today's computer and industrial work areas.

Swivel office chair - all requirements fulfilled

The requirements set forth by Prof. Schoberth and other scientists for the design of a swiveling office chair are filled in the highest measure by the model designed by Prof. Brünig.

Balanced support provides relief

The GRAHL swivel office chair relieves tension in the back muscles and vertebral discs, and prevents circulation problems in the legs and pelvic area by providing balanced, seated support in every position.

Due to the new backrest construction, the GRAHL swivel office chair offers the possibility of frequent changes in position, with the feeling of good back support in any position. This allows longer, fatigue free sitting.

Allows the possibility of frequent changes

The new backrest also supports the natural back activity. This prevents back fatigue. The new construction helps to prevent back injuries caused by long term sitting.

Prevention of injuries

The GRAHL swivel office chair can have a positive affect on existing back problems. Because of this it can also be recommended for schools, industry and even a modified version for the automobile industry.

For schools and industry



## Professor Dr. med. habil. Theodor Peters: A long term test with the GRAHL Ergomatic DUO-BACK

The tested GRAHL swivel office chair complies fully with all modern industrial medical requirements.

Prevention of pain and nerve damage in the elbows

GRAHL elbow rests have been very positively rated in the areas of industrial medicine and ergonomics. The padded elbow rests prevent pressure pain in the elbows, and possible resulting nerve damage.

Tip-risk and Trip-risk reduced by the 6-star base

By raising the number of the arms on the chair base from 5 to 6, the tip-risk factor has been reduced by more than 7%. Due to the axis of the rollers, the base radius has been reduced from 650mm to 610mm. This greatly reduces the risk of tripping over the cross feet.

Height adjustment, backrest angle and seat tilt

The seats are large and well formed. Seat height can be varied by the use of a large bowed lever. The backrest adjustment provides good back support and minimizes pelvic rotation to the rear. Especially when the seat is tilted slightly forward.

Formed seat front edge makes all the difference

The form of the front edge of the seat prevents pressure points on the thighs and calves. Therefore the circulation is not blocked at any time.

Conform to the shape of the torso

The dual backrests that make the DUO-BACK so unique, conform optimally to the shape of thorax.

They should not put pressure on the torso. For this reason the concavity of the backrest must, as with the tested chair, only extend to a certain point.

The dual backrests not only support in the forward and backward motion (anterior - posterior) but also in the side-to-side movement. Thus relieving the stress on the lumbar vertebra by holding on to the relatively strong thorax. I see this support as the strength of the dual backrests.

Dual backrests support movement in different directions

The dual backrests have sufficient freedom of movement, both vertically and horizontally. This and the adjustability of the backrest height through the large, practically designed hand knobs make it possible to fit individual needs exceptionally well.

The adjustment controls of the DUO-BACK are accessible while seated

It is possible to adjust the height of the DUO-BACK backrests while seated.

Grahl's ERGOMATIC DUO-BACK office chair with elbow rests makes it possible to promote or even to provoke dynamic sitting and work behavior.

DUO-BACK encourages dynamic work behaviour

The Grahl DUO-BACK principle fills the requirements for efficient back support in the forward sitting position (lower support), the middle sitting position (middle support), and rear sitting position (upper support), through the design, construction, and through the individual adjustment possibilities.

Design and build fill all the requirements

## Dr. med. Edgar Berbuer: The DUO-BACK Appraisal

Experiments in the laboratory showed that all of the criteria set forth for an office chair by Schoberth were filled.

DUO-BACK is a significant improvement in comfort

The development of DUO-BACK is a great improvement in the area of dynamic sitting and because of this improves the health and comfort at the work place in an excellent manner.

Supports dynamic sitting

It especially supports dynamic sitting and makes postural changes much easier.

DUO-BACK provides optimal support, even when relaxing

Because of the ideally mounted back rests which follow almost every movement, the back is optimally supported in every position. Even while leaning far back the thorax can be rotated just as well as in the forward position. The back is even optimally supported when leaning back at 45 degrees with one arm hanging at the side. You can actually lounge in the DUO-BACK.

Height adjustable to suit body size

Laboratory tests, and tests done in various work places have shown that the DUO-BACK meets all requirements for an office chair. It promotes dynamic sitting in an excellent way. That means the ability to easily change positions without loss of support. When the height of the back rests is optimally adjusted to size of the body, the DUO-BACK conforms outstandingly to the body in every working position. It fits like a shell around the body and supports it.

Suitable from writing and computer workstations to conference and training rooms

Because of the design of the backrests the DUO-BACK is suitable for any office work place. It is especially suitable for computer work areas, as well as conference and executive workrooms. The DUO-BACK achieves optimum body support in any position without impeding the movement of the extremities.

## Dr.oec.troph. F. Heidinger / Prof. Dr. med. Dr. Ing. W. Diebschlag: Industrial Medical Appraisal

The adjustability of the backrests has been rated very positively. On one side they have a very large height adjustment area, which allows them to be fit to the individual size of the user. On the other side is the brand new width adjustment, which allows the backrest to be fitted to the individuals lateral profile.

The new DUO-BACK  
lateral adjustment

The DUO-BACK, backrest supports the thorax very well, thus relieving the strain on the lumbar vertebra. Furthermore the DUO-BACK, backrest with it's pendular movement, which flexes to meet postural changes,(reaching to the side) provides support for the back in various positions.

Providing good  
support for the  
thorax

The special armrests (elbow supports) were rated very positively and are a recommended asset to any work place where a high level of lower arm and handwork is necessary.

Elbow support armrests  
are ideal for high levels  
of arm movement

The elbow supports present an interesting variation for the relief of strain in the shoulder area in jobs where the lower arms and hands needs to be moved freely. The large adjustment range of the elbow rests, including the height and lateral adjustments has been rated as beneficial.

The elbow rests make it possible to work with the upper arm and lower arm at a physiologically favorable, joint-resting angle of 100°.

Elbow support armrests  
provide a joint-resting angle

Very positively rated was the height adjustment of the armrests on the tested chairs, with an adjustment range of 75mm in the required area.

## Technical University of Dresden: The sitting comfort of a modern ergonomic office chair in comparison

Overall rating good In a test of usefulness in a computer work area, the Grahl office chair was rated good, with a tendency toward very good.

All of the ratings for the design of the Ergonom 67 were at least good.

Form and functionality The expert's positive rating was confirmed by the testing personnel. The form and functionality of the Ergonom 67 was especially highly rated according to the standards of an ergonomic office chair.

Reduction in neck and shoulder problems Problems in the neck and shoulder areas were actually reduced by the use of the adjustable elbow supports.

Test personnel were convinced The Grahl ERGONOM 67 DUO-BACK with dual backrests, and elbow supports were clearly superior to conventional office chairs in the area of seated comfort. In a verbal survey of the tested personnel, the majority preferred the Grahl DUO-BACK over a conventional chair.

Healthy sitting The realization of healthy and active sitting has been fulfilled by the GRAHL ERGONOM 67.

GRAHL recommended for work According to the actual state of knowledge, supported by user questionnaires, it is recommended to use an office chair, such as the GRAHL ERGONOM 67, which supports active, and passive sitting.

The flexibility of the DUO-BACK backrests is achieved by the use of a flexible rubber mount. The dual backrests allow free movement of the spinal column and prevent pressure on the lower spine.

Unique DUO-BACK mountings allow free movement

The height and leaning adjustability of the backrests are stepless. Horizontal adjustment of the individual backrests is possible. The backrest as well as the seat (height and slope adjustable) can be locked in any position.

Back and seat - stepless adjustment

Test results show that the technical construction of the GRAHL ERGONOM 67, as a DUO-BACK model promotes healthy and active sitting.

Successful design and construction



## Physiological connections

Source:  
Prof. Peters  
Dr. Vogel

Vertebral disc pressure in different body positions, as compared to the pressure while sitting in a DUO-BACK, in %:

24%  
Lying down

75%  
Sitting in a  
DUO-BACK

100% Standing

140% in a normal  
sitting position

170% in a static  
sitting position

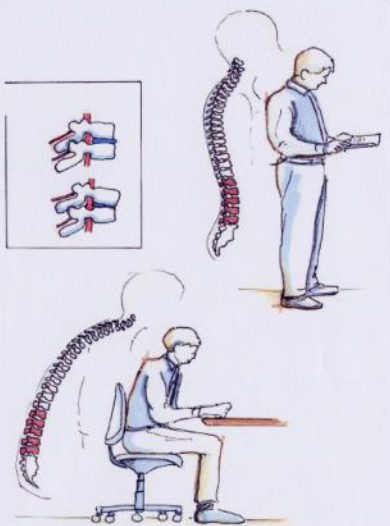
190% with the back  
bend forwards



50% relief  
through the  
DUO-BACK  
Swivel chair

80% is the critical load limit.

Different body positions:



Lordosis:  
Even strain on the  
vertebral discs

S-form:  
The spine's 5  
Lumbar vertebra

Vertebrae with  
healthy stable discs  
and after a slipped disc

Kyphosis:  
Bent spine in an  
incorrect position

## Results

First study: GRAHL DUO-BACK  
Frequency of seated positions with and without backrest

With backrest in contact with  
the back

Reclining back position  
Overall - 18%  
DUO-BACK - 22%  
Other chairs - 2%



Middle - Upright position  
Overall - 38%  
DUO-BACK - 40%  
Other chairs - 31%



Leaning forwards  
Overall - 4%  
DUO-BACK - 4%  
Other chairs - 1%





Without back rest contact

Middle - upright position

Overall - 16%

DUO-BACK - 13%

Other chairs - 23%

Leaning forward

Overall - 25%

DUO-BACK - 20%

Other chairs - 43%

#### Conclusion:

- In conventional chairs, 66% of all persons sitting in the middle and frontal positions, sat without backrest contact.
- The use of the DUO-BACK swivel office chair reduced this percentage by about 50%.

Source:  
Seidel-Fabian 1994  
Test conducted at  
State authorities

## Results

Second study: GRAHL DUO-BACK with Ergo-arm. Relief of problems.

DUO-BACK with  
Elbow support  
armrests

Cervical vertebra 5%

Dorsal vertebra 8%

Lumbar vertebra 3%



Neck 24%

Shoulders 30%

Upper arms 18%

Conventional chair  
with Lumbar support  
and adjustable  
armrests

Cervical vertebra 2%

Dorsal vertebra 9%

Lumbar vertebra 33%



Neck 12%

Shoulders 12%

Upper arms 6%

Cervical vertebra 21%

Upper arms 18%



Neck 21%

Shoulders 30%

Grahl height adjustable  
Elbow support armrests or  
Ergo-Arm armrests

Cervical vertebra 6%

Upper arms 6%



Neck 15%

Shoulders 12%

Regular adjustable armrests

Source:  
Seidel-Fabian 1994