Ergonomics

Do you know your body?
“Let’s get out into the fresh air to regenerate – in this respect we can learn a lot from the smallest members of our society …

In contrast to us adults children treat their back in an exemplary fashion – they don’t work; they’re constantly in motion and sprawl out a lot.

With us adults back pain is the number one disease in the population. In Germany alone several billion Euro are required every year to cover absenteeism and treatments.

Millions of people suffer from damage to the locomotor system. Nearly one third of young adults already have deformed intervertebral disks. It’s no wonder when you consider what we undertake on a daily basis without doing anything for our bodies.

There is so much interesting information that makes work easier and keeps us fit into old age.

You just need to come along with us!”
How it works

Evolution has shaped the human spine in a way that made it possible to walk upright in the first place.

It takes us almost our first complete year of life to learn how to walk freely on two legs. During this time our brain performs extraordinarily, as each movement must be calculated in order to maintain one’s balance.

When walking upright, the stress exerted on the spine is many times higher than in hand-knee position. Some physical exercise is essential in order to strengthen the muscles in the back. Physical inactivity leaves the back just as susceptible to pain as overstressing it.

The Spine

Along with its supporting function the spine, with its pairs of costal bones, provides protection and nutrients to internal organs.

If the functionality of the nerves located between the vertebrae and organs is affected it may have harmful effects on areas of the body which would not normally be associated with spine problems.
Atlas and Axis

The first cervical vertebra, Atlas, joins with Axis, the second cervical vertebra, to form the joint that connects the spine and skull which facilitates nodding and turning movements. Essential nerve cords and the blood supply to the head converge in this area.

Cervical Vertebrae

The following six cervical vertebrae downwards are very mobile. In order to stabilize the body and retain its balance they involve the thoracic vertebrae when turning.

Thoracic Vertebrae

Twelve thoracic vertebrae with one pair of costal bones each form a cage around heart and lungs. The costal bones, connected with the sternum by means of cartilage, follow along with rotations due to their high degree of mobility. Particularly in this area, physical inactivity can lead to stiffening, pain and an impaired respiratory tract.

Lumbar Vertebrae

A large share of the body’s weight rests on the lumbar vertebrae which are built to perform flexion and extension movements. Their limited ability to rotate makes them especially susceptible to sports injuries. Extremely stressful are sports such as skiing, tennis, football among others in which one stops in the middle of rotating movements.
The Intervertebral Disk

The intervertebral disks are located between the vertebrae. Due to their elliptic shape, their outer circle consisting of stronger fibers and their gelatine-like filling they are the ideal buffer between the vertebrae.

During coordinated inclining, flexing and turning movements the intervertebral disks adjust to the various vertebrae positions.

When younger, their filling consists to about 80 % of water. The water content decreases with increasing age. Intervertebral disks are extremely stress-resistant and able to withstand very high pressures; this ability is significantly reduced in old age.

Stress and relief help to supply the intervertebral disks with important nutrients and their elasticity remains intact. Therefore in one’s old age it is particularly important to fend off the breakdown by means of sufficient exercise.

The pressure causes the liquid contents in the core to drop by about 10 % during the day. Over night while lying down the intervertebral disk is regenerated by taking up water and nutrients. Rest periods are therefore especially important in times when there is a lot of stress.

If the intervertebral disk is dislocated a spinal disk herniation may be the result, causing the intervertebral disk to press on the vertebral canal and the spinal cord. As soon as the fiber circle is ruptured and the gelatine core flows into the vertebral canal, it is a classic case of a spinal disk herniation.

The intervertebral disk itself hardly contains any pain-causing nerves but the pressure it applies on the spinal canal or the nerve friction can be very painful, radiate into the arms and legs, and cause a sensation of numbness.
What Impact does the Spine have on other Organs?

The nerves in the spinal column supply the various regions of the body. Injuries, curvatures or arthrosis can result in the organs being supplied insufficiently.

The Brain

The nerve tract in the first vertebra controls the blood supply of the brain. If this area is injured, headache, dizziness and high blood pressure may be the result.

Nose, Eyes, Ears

Disorders of the cervical vertebrae can cause irritations in the nose, eyes, and ears. The latest studies even reveal a relationship between tinnitus and the cervical spine.

The Lungs

Functional disorders of the nerves in the cervical vertebrae can lead to asthma and other diseases of the respiratory tract.

The Heart

Damage of the nerves of the thoracic vertebrae can cause cardiac complaints.

The Stomach

The nerves branching off from the thoracic vertebrae and leading to the stomach can cause stomach disorder and heartburn. Sometimes as little as a manual therapy can improve the situation.

The Digestive System

Nerves in the lumbar area supply the large bowel and the groin. Functional disorders can cause digestive problems and irritations.

The Genital Organs

Blockages in the lumbar vertebrae area can impair the supply of uterus, ovaries, and testicles and lead to menstrual pains or impotence.
Where does the Pain Originate?

With an upright upper body the weight resting on the lower intervertebral disks (lumbar spine) is roughly equal to the weight of the upper body.

Due to the leverage effect, the load increases by a factor of 3 to 5 as soon as the upper body bends forward.

If a 50 kg weight is held in this position, the weight resting on the lower intervertebral disks may be up to 960 kg!

Even in a standing or sitting position the intervertebral disks will be compressed with a weight of 90 - 100 kg. As soon as you bend forward, the pressure increases. Therefore a weight should always be lifted or carried as close to the body as possible.

Prevention

The above shows how important it is to adjust the workplace, office desk, school desk or workbench to the body height.

The proper working height, the interaction of table and chair and variations between sitting and standing positions avoid stress and provide protection from long-term damage.
The Psyche

Back complaints in particular often have psychological causes. Mental problems, unhappiness or angst lead to increased tension in the muscles or to inappropriate stress to individual parts of the body. The phrase “shouldering a burden” does not just come out of the blue. Unwittingly our body adopts a protective posture.

High workloads, excessive television consumption and a lack of exercise often go along with static postures and cause tension.

Cause Unknown?

In many cases there is no obvious cause for pain in the back but they still occur repeatedly.

Possible triggers may be:

- Physical inactivity
- Inappropriate stress
- Sitting or standing over long periods of time
- Working in a bent position
- Weakened muscles
- Lack of leisure activities
- Mental pressure
- Unhappiness
- Conflicts
- Excessive demands
- Angst

Already in the 1970s the pressure inside the intervertebral disk was measured by implanting a sensing probe into it.

As the pressures vary by body height and body weight, all stated values are approximate values only.

The unit of pressure is the ‘bar’. The pressure within a vehicle tire illustrates the amount of the forces at work:

- Tire pressure in passenger cars ca. 2 bar
- Tire pressure in trucks ca. 6 bar
Trouble spot – Office / Assembly Shop

One of the most common sources of danger is working at desks or assembly tables. Long periods of sitting and tension during work are pure poison for muscles and the spine. The monotonous body posture leads to fatigue and loss of concentration.

In the long run, tension may cause intense pain which radiates into other parts of the body. Continuing pain in the head and back, breathing difficulties and many other problems may follow and lead to absenteeism.

Back complaints cost employers and health insurance schemes billions every year.

Meeting at a Stand-up Table

Why not having a stand-up meeting next time in the office? You may even save time and be more efficient.
Mental block?

Then you might as well try and get up. Standing upright improves mental performance and creativity, keeps you awake and makes you fit again.

The change between sitting and standing positions is ideal for our spine and locomotor system.

Concentrated work while sitting and making a phone call while standing up improve concentration and get the circulation going.

However, the standing periods should not be longer than 10-20 min, because otherwise the body might return to adopting an unhealthy posture.

So it is not a tragedy that standing is not necessarily suitable for working in front of a monitor.
Retain your Posture

Typical impairments of posture creep in. For example the swan neck when staring at the screen that can be avoided by the right table height and a deliberate choice of posture. Train your posture, until it becomes your second nature and you don’t have to think about it anymore.

**Sitting correctly**

> Sitting correctly starts with touching your feet down with the legs slightly apart.

> Sit as far back on the seat as possible so that the lumbar vertebrae will be supported by the backrest.

> Lean the upper body against the backrest and keep a distance to the monitor.

> The arms are allowed to rest on the armrest. The forearms should lie on the tabletop at a right angle, if possible.

**Standing correctly**

> Stand upright with the legs slightly apart for a stable stand.

> The gluteus muscles may be regularly tensed to support the back muscles.

> Pay attention to the correct table height at which you should be able to lay the arms on the table at a right angle.

> The laptop is not appropriate for working in front of a monitor permanently. The correct screen height facilitates looking straight at it without having to tilt the head.
The table depth should be at least 800 mm.

For sitting activities the table should be adjustable between 650 mm and 890 mm.

For standing activities the table should reach heights between 950 mm and 1120 mm.

The minimum width should be 1200 mm.
What can I do for my Back?

Keep moving! This is the best way to provide for sufficient blood circulation and oxygen supply to the back and the organs connected with the spine.

And What if it Hurts?

Don’t rest it for more than 1-2 days. Lying for extended periods of time weakens the muscles and decreases the strength of the bones. You will become stiff and immobile. Exercise on the other hand invigorates the joints and strengthens the muscles.

Avoid strenuous activities and undertake short walks, have a swim or go cycling.

There is almost no risk of injuring any part of the body by moving. Should the pain become stronger, please seek professional advice.

Sports Activities

Listen to your body and do not go beyond the limits of your physical resilience. Have fun while doing sports and do not torture yourself.

The more regular you get some exercise the stronger your muscles will be and the easier you will find it to be motivated.
Have a Break ...  
Brief Exercises at the Desk or Assembly Table.

Stand up and stretch the arms over your head, once to the left, once to the right.  
... and bend back carefully as far as you can.
This is great ... Lock backrest, lean your back to it, support head slightly with your arms and bend head backwards over the backrest.

Reach hand over your head ... above your ear and pull your hand to the left, then switch sides to stretch to the right ...

... repeat a number of times in each direction.

However the body also needs some time out ... Just sit back and relax.
Hand in Hand with our Partners

KESSEBÖHMER base systems stand for safety, quality and speed in changing between the positions.

Electric, hydraulic, ratchet and crank — the right adaptation mechanism for any requirements profile. The table height can be adjusted within seconds and even stored in case of the electric module.

By entering a symbiosis with our partners, the manufacturers of high-tech office furniture systems, we are able to deliver stylish pieces for office landscapes and home offices. See the partner directory in the appendix for more information on our range of table systems for your office.

Ergonomics at the Workplace

Most problems with the back are home-made and have been caused by incorrectly equipped workplaces.

Table height, width, and depth, the surface shape and the free space for legs significantly influence the ergonomic design of your workplace.

A healthy workplace is a good investment. This one-time expenditure for height-adjustable office furniture will pay off quickly by having motivated and healthy employees.

Being a supplier for high-quality adjustment systems, the tabletops in the above illustrations serve for demonstration purposes only. Superior table designs with Kesseböhmer adaptation systems are available through the furniture manufacturers shown in the appendix.
Type A - Height-adjustable tables, which allow the height of the table to be adjusted by the users during work.

Seated Workplaces : Minimum adjustment range 650 - 850 mm
Standing Workplaces : Minimum adjustment range 950 - 1250 mm
Seated/Standing Workplaces : Minimum adjustment range 650 - 1250 mm

Type B - Preset height tables, which allow the table height to be preset before work.

Seated Workplaces : Minimum adjustment range 650 - 850 mm, Maximum adjustment interval 20 mm
Standing Workplaces : Minimum adjustment range 950 - 1,250 mm, Maximum adjustment interval 20 mm

Type C - Non-adjustable tables with a fixed column length, which cannot be height-adjusted.

Seated Workplaces : Height 740 + / - 20 mm
Standing Workplaces : Height 1050 + / - 20 mm

Type D - Table height adjustments with limited adjustment or selection options, which can only be adjusted to a very limited extent.

Seated/Standing Workplaces : Adjustment range 680 - 1180 mm
Standing Workplaces : Adjustment range 720 - 1220 mm
Partner Directory:

Germany

O
Anton Schneider GmbH & Co. KG | 71131 Jettingen | www.schneiderkenzingen.de
Brunner GmbH | Stühle Tische | 77866 Rheinau | www.brunner-group.com
BZ Plankenhorn | Ergonomiemöbel GmbH & Co. KG | 78052 VS-Tannheim | www.bz-plankenhorn.de
C+P Möbelsysteme GmbH & CO. KG | 35233 Breidenbach | www.cpmoebel.de
Ceka-Büromöbelwerke | C. Krause & Sohn GmbH & CO. KG | 36304 Alsfeld | www.ceka.de
Febrü Büromöbel | Produktions-und Vertriebs GmbH | 32051 Herford | www.februe.de
Felix Schulte GmbH & Co. KG | Gerätebau | 59581 Warstein | www.planilux.com
FM Büromöbel | 26219 Bösel | www.fm-bueromoebel.de
Franz Giesselmann GmbH & Co. KG | 32547 Bad Oeynhausen | www.giesselmann.de
Gumpo Büromöbel GmbH | 84130 Dingolfing | www.gumpo.de
Haworth GmbH | 31848 Bad Münder | www.haworth.de
Hund Büromöbel GmbH | 77781 Biberach/Baden | www.hund-buero.de
J. Cleve GmbH | 47441 Moers-Hülsdonk | www.jcleve.de
Klain Büromöbel GmbH | 49429 Visbek | www.klain.de
König + Neurath AG | 61184 Karben | www.koenig-neurath.de
Kühnle Büromöbel | 74427 Fichtenberg | www.kuehnle-bueromoebel.de
Lorbeer Büromöbel GmbH | 84301 Eggenfelden | www.lorbeer-gmbh.de
Martin Weigle | Möbelwerkstätte | 73577 Ruppershofen | www.weigle.de
Object Concept | 71364 Winnenden | www.object-concept.de
OFF-Büromöbelwerk GmbH | 97528 Sulzdorf a.d.L. | www.officemaster.de
OKA Büromöbel GmbH & Co. KG | 02727 Neugersdorf | www.oka.de
ophelis Pfalzmöbel GmbH | 76663 Bad Schönborn | www.ophelis-pfalzmoebel.de
Planmöbel Vertriebs GmbH & Co. KG | 32339 Espelkamp | www.planmoebel.de
project Schul- und Objekteinrichtungen GmbH | 06295 Lutherstadt-Eisleben | www.project-online.de
REISS Büromöbel GmbH | 04924 Bad Liebenwerda | www.reiss-bueromoebel.de
Rohde & Grahl Büromöbelwerk GmbH | 31595 Steyerberg | www.rohde-grahl.com
Rösch Office Büromöbelwerk EB GmbH | 04838 Eilenburg | www.roesch-office.de
Vitra GmbH | 79576 Weil am Rhein | www.vitra.com
VS Vereinigte Spezialmöbelfabriken GmbH & Co. | 97941 Tauberbischofsheim | www.vs-moebel.de

R
BTS Business Trading Shops GmbH | 22525 Hamburg | www.monitorhalterung.com
CR GmbH | 53809 Ruppichteroth | www.cr-gmbh.eu
Häfele GmbH & Co. KG | 72192 Nagold | www.haefele.de
Hettich FurnTech GmbH & Co. KG | Division Professional | 32602 Vlotho | www.hettich.com

A
Bosch Rexroth Mechatronics GmbH | 70442 Stuttgart | www.boschrexroth.de

M
Bibliothekseinrichtung Lenk GmbH | 08304 Schönheide | www.bibliolenk.de
Interstuhl GmbH | 72469 Meßstetten-Tieringen | www.interstuhl.de
M. & W. Bacher GmbH | 71272 Renningen | www.die-collection.de
MÖLLERS TRENDBUERO | 33442 Herzebrock | www.moellers-trendbuero.cpm
Norbert Stadler GmbH + Co. KG | 63069 Offenbach | www.norbert-stadler.de
Ronald Schmitt Tische GmbH | 69412 Eberbach | www.ronald-schmitt.de

telerob Gesellschaft für Fernhantierungstechnik mbH | 73760 Ostfildern | www.telerob.de

Austria
- BENE AG | 3340 Waidhofen/Ybbs | www.bene.com
- Franz Blaha Sitz- und Büromöbel Industrie GmbH | 2100 Korneuburg | www.bla.co.at
- Mayr Schulmöbel GmbH | 4644 Schranstein | www.mayr-schulmoebel.at
- Wiesner-Hager Möbel GmbH | 4950 Altheim | www.wiesner-hager.com
- Haselmaier GmbH | Raum-Design | 3283 St. Anton | www.haselmaier.at
- Team 7 | Natürlich Wohnen GmbH | 4910 Ried | www.team7.at
- Umdasch AG | 3300 Amstetten | www.umdasch.com
- Voglauer möbel voller leben Gschwandtn & Zwilling GmbH & Co. KG | 5441 Abtenau/Voglau | www.voglauer.com

Switzerland
- Biella Schweiz AG Büroartikel | 2555 Brügg | biellagroup.com
- Haworth Schweiz AG | 5737 Menziken | www.haworth.com
- Merwag AG | 8498 Giswil | www.merwag.ch
- NOVEX AG | 6281 Hochdorf | www.novex.ch
- USM U. Schärer Söhne AG | Möbelbausysteme | 3110 Münsingen | www.usm.com
- Vitra International AG | 4127 Birsfelden | www.vitra.com
- Peka-Metall A | 6295 Mosen | www.peka-system.ch
- Hilpertshauser AG | 9203 Niederwil | www.hilpertshauser.ch
- De Sede AG | 5313 Klingnau | www.desede.ch

Australia
- Burgtec Australasia PTY LTD | 6021 Balcatta, Western Australia | www.burgtec.com

Belgium
- Van Opstal & CO N.V. | 2630 Aartselaar | www.vanopstal.be
- Wave | 4130 Esneux | www.waveinside.com

Canada
- Nienkämper ICF Group | Ontario, Toronto M1X 1B9 | www.nienkamper.com

Denmark
- Ergomat A/S | 5471 Søndersø | www.ergomat.com
- Four Design A/S | 5854 Gislev | www.fourdesign.dk
- Fumac Production A/S | 7830 Vinderup | www.fumac.dk
- Furnx A/S | 9310 Vodskov | www.furnx.com.au
Finland

Isku Interior Oy | Isku Center | 15101 Lahti | www.isku.com
Hahle Oy | 02780 Espoo | www.hahle.com

Great Britain

PAR Engineering (MK) Ltd. | 23 Orchard House | Castletorpe | www.parengineering.com
Technology Desking Ltd. | Operations Centre, Unit A | West Thurrock | RM19 1NZ | www.technologydesking.com
SBFI Ltd. | The Hop Exchange | London SE1 1TY | www.sbfi.com

France

LMC Toujours une idee d’avance | 59910 Bondues | www.lmc.tm.fr

India

Fraser Techno Circuits Limited | 560048 Bangalore | www.frasertechno.com
Fraser Techno Circuits Limited | 400053 Mumbai | www.frasertechno.com
Kesseböhmer Interior Solutions (India) Pvt. Ltd. | Pune, Natu Baug | www.kesseboehmer.in
Ravish Mehra / Deepka Kalra | 110024 New Delhi | www.vsnl.com

Ireland

Frank Flanagan Fittings Ltd | 32-33 Cherry Orchard | Dublin 10 | www.fff.ie

Israel

Yaad Pirzul (1984) LTD | 66078 Tel-Aviv | www.pirzul.co.il

Italy

Fantoni SPA | 33010 Osoppo | Udine | www.fantoni.it
Haworth S.P.A | 40017 San Giovanni in Persiceto (Bo) | www.haworth-europe.com
Caf Rambaldi s.r.l. | 20034 Giussano (Milano) | www.caframbaldi.it

Netherlands

A&E Trading b.v. | 9351 VJ Leek | www.aetrading.nl
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