

## Standing until you drop?

When work  
keeps you on your toes ...



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# Standing until you drop?

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keeps you on your toes ...

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Initiativkreis Neue Qualität der Büroarbeit

**baua:**  
Bundesanstalt für Arbeitsschutz  
und Arbeitsmedizin

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# Introduction

A hundred years ago, tram drivers still had to perform their work standing up – it was believed that a seated driver could fall asleep and cause an accident. Drivers can now sit (giving rise to new problems), but several hundred thousand workers still have to stand all the way through their working day. It definitely isn't healthy, which is impressively underscored by the fact that standing occupations account for a disproportionate number of cases of work incapacity. Studies have shown that continuous standing causes an unbalanced load on the human organism and is responsible for numerous disorders of the cardiovascular system and the musculoskeletal apparatus. The consequences of continuous standing are similar to those of continuous sitting. This partly also answers the question concerning possible solutions for standing occupations: Surely it is no solution to turn continuous standers into continuous sitters – after all, it would only replace one evil with another. Rather what we are looking for are approaches which make work more mobile and hence free workers from constrained postures – whether continuously standing or continuously sitting.

This brochure shows why standing is so bad for people and why it isn't possible to get used to it – in this case practice does not make perfect, only sick! Furthermore, it presents possibilities for relieving the burden on workers in standing occupations and for generally designing work so that it is

healthier, more humane and more productive. At the same time, the brochure's intention is not only to encourage companies to give some thought to those of their employees who have to stand continuously, but also to speak to workers. Under the heading of 'Individual Prevention' an indication is given of what every individual can do at least to alleviate the adverse consequences of continuous standing over long periods. Nevertheless, it should be stressed at this point that individual prevention is the second-best solution since it can only relieve the symptoms. The prime consideration must therefore be to reduce the proportion of working time spent standing. This is the only way to improve the quality of work and to enhance well-being and health at work – both important prerequisites for the competitiveness and sustainability of every individual company because economically healthy enterprises are not possible without healthy workers.

STANDING UNTIL YOU DROP?



# Upstanding qualities called for!

## Working in the vertical

### Always on your feet

17 million people in Germany take their seat day after day in an office, a further two to three million occupy a sitting position in industrial production shops. And every day 2.5 million people sit up front in trucks, buses and trains. That means in all about 22.5 million workers who spend most of their working day seated at an angle of 90 degrees. And what about the rest? After all, there are about 39 million working people in Germany! Well, we encounter a whole load of them literally on their feet every day – in stores, filling stations, butchers' shops, bakeries or at weekly markets. They stand their ground selling every day from early to late, often until they're fit to drop. But it's not only here that upstanding qualities are called for; the same applies to hairdressers and other craft occupations, workers in the nursing and care professions, kitchen personnel in canteens, catering kitchens and restaurants, and numerous occupations in the production domain – here the individuals concerned often spend 70% and more of their working day standing. All this standing is not actually very good – on the contrary. Alongside the discomfort, it places an excessive burden on the muscles, joints, ligaments and sinews, and not least the veins. The consequences are back pains, circulatory disorders and varicose veins.

### Standing upright – not actually a problem!

If standing is so bad for humans, why did they start to walk upright around 5 million years ago in the first place? Quite simply because the benefits of an upright posture clearly outweigh the drawbacks. If they hadn't gone upright, humans would only have represented a brief episode in the earth's history in view of the larger, faster and, above all, very hungry creatures who were their companions. Only the free use of hands and the possibility this gave rise to of 'grasping' things and turning them into tools (and weapons) gave man the crucial evolutionary advantage in the struggle for survival. And someone who can stand upright on the steppes can also see further and make out potential enemies earlier. The standing posture is therefore in itself a good thing, especially as it can hardly be assumed that our prehistoric ancestors would have had to struggle with circulation problems or varicose veins as a result of standing. After all, there is no real reason to simply stand around for eight hours or longer – if you don't have any shop counters, cocktail parties, workbenches and hairdressing salons ...

So neither walking upright nor standing as such is a problem for man. He is, after all, certainly capable of walking for hours on end or doing long-

distance runs. He can also spur 'his' team on for 90 minutes from the terraces without have to fear the development of health problems – at least not any arising from standing ...

An upright posture only becomes a problem if it is maintained continuously for a long period and then becomes a constrained posture. Evolution designed the human organism for motion, alternating between sitting, standing, lying, running and all the postures in between. Anyone who sits, lies or stands, imposes a one-sided and literally unnatural strain on his body. Since in our modern society we have largely abandoned the natural, motion-intensive lifestyle and now spend our days 'free of alternating load' either mainly seated or mainly standing, so-called diseases of civilisation are widespread in the industrialised countries. In Germany, for example, disorders of the musculoskeletal and cardiovascular systems are top of the list of the most frequent health disorders in the population as a whole. 80% of the population is occasionally tormented by backache, and this is also the most frequent reason for a visit to the doctor. Those concerned often get shown the 'yellow card': 25% of all sick notes are issued for disorders of the posture and motion apparatus, 14% of the cases of work incapacity are due to back complaints.

### Work in motion

The problem of lack of movement at work is quite a recent phenomenon. There have always been occupations where stationary work in constrained postures was repeatedly required, e.g. academics and a number of craft occupations. But right into the 19<sup>th</sup> century the majority of workers worked in

situations where they certainly couldn't complain about lack of movement: in agriculture. Around 1800 more than 80% of the population still earned their daily bread by the sweat of the brow; in any case there was adequate opportunity to alternate between sitting, standing and walking. Even if we go further back, we will hardly find workplaces which would have demanded continuous sitting or constant standing. Even the philosophers in ancient Greece preferred walking around to standing or sitting as they thought. Testimony to this are the vast foyers for this purpose, which still exist. And although the monks of the Middle Ages often had to stand in their retreats and during masses, meditation took place as they were strolling around in the cloisters. And in craft workshops and factories in the pre-industrial age, technology and work organisation were by no means developed to the point where 'superfluous' motion had already been rationalised away. This was the 'achievement' of industrialisation. With a high degree of division of labour and extensive mechanisation, work was not only rendered considerably more productive, but also largely lacking in motion. For the first time factory work imposed the complete synchronisation of human labour with the machine, and ever since the rhythm of the machine has determined the rhythm of work. And since machines are stationary devices, man has also become stationary ...

The fact that such work performed in constrained postures, be it standing or sitting, is ruinous of health in the long run is not a modern insight, but one which is frequently ignored even today. As early as 1833 the Tübingen Professor J.H.M. Poppe, in his treatise "The art of securing the life and health of

craftsmen, artists, factory workers and other manual labourers as far as possible against the hazards of their life”, formulated the sentences which still retain their validity: “The constrained position of the body is for several craftsmen a cause of illness or sickening and of a shortening of life. Some craftsmen must sit all day, others must stand all day; others in turn (and these are more fortunate than the other two kinds) can sometimes sit, sometimes stand, and indeed sit more than stand, or stand more than sit. Even sitting itself, if it persists for a long time, is deleterious to health; it is even more deleterious when a constant forward movement, or even a constrained bodily posture, is also involved. (...) The workers who stand continuously during their work include in particular book printers (typesetters and print workers). The typesetters are worse off than the printers, who perform a physically more strenuous work, but can, at the same time, move. Continuous standing causes weakness due to the never-ending muscular effort, the workers’ feet swell; they get ulcers, disorders of the kidney etc.”

### Always there for you

Someone who is standing can exert more force on a workpiece or tool. Standing was therefore the usual working posture in many 19<sup>th</sup> century factories. Today, in the electronic and digital age, major physical forces have become superfluous in most factories. Machines can often be controlled, programmed and monitored from a sitting position or while alternating between sitting and standing – although this hasn’t got round to everybody yet. In the classic standing occupations in the trade domain, on the

### Turned into a pillar of salt ...

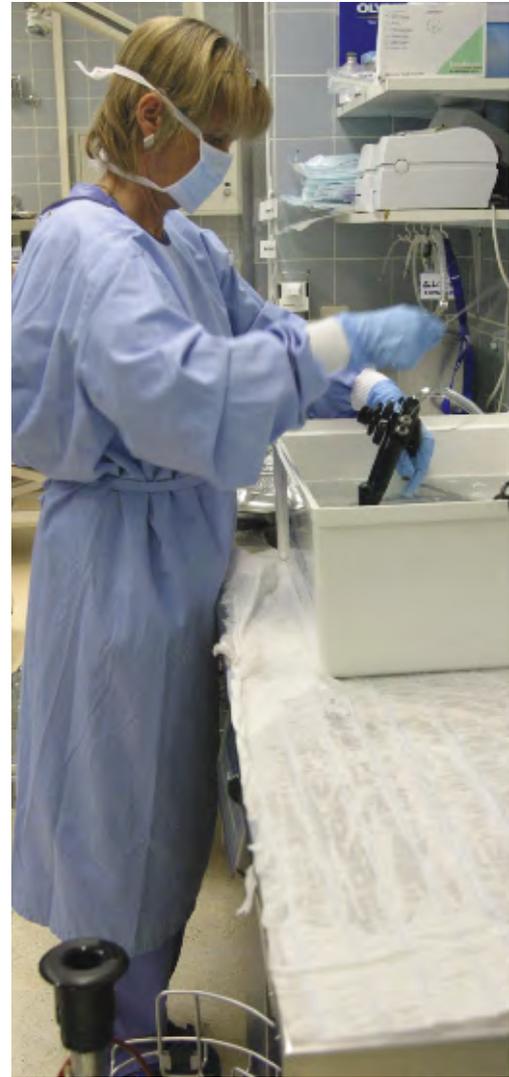
The world record for standing without moving is held by the Indian Om Prakash Singh from Allahabad. He remained absolutely motionless – apart from involuntary blinking – for twenty hours, ten minutes and six seconds. This record, imitation of which cannot be recommended unreservedly, was set up on 13/14 August 1997, the day of Indian Independence; in his own words, Prakash dedicated it to the ‘unknown martyrs’ – although he didn’t make clear whether he meant the heroes of the struggle for independence or the many people who have to stay standing throughout the world ...

other hand, little has changed – just like 100 years ago sales personnel spend nearly the whole day on their feet. The reasons for this are partly practical ones – after all, they have to approach customers, which is hardly possible from sitting – on the other hand, psychological considerations also play a part. Someone who is standing is seen as busy, active, dynamic and, in particular, approachable – not totally unimportant in sales! Furthermore, it is impolite to sit while the other person is standing. Sales personnel will therefore have to remain upright in future. The paradox is that even when customers are off looking for the next bargain, the sales personnel stay standing, waiting for the next ones. What is the point of this behaviour? If we look back, we can learn something. As early as 1890, the associations and unions of sales personnel complained repeatedly about the strain due to standing for excessive periods of time. The unwritten law was that shop workers were not allowed to sit even when there were no customers to serve. The ordi-

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Many people in 'standing occupations' complain of health disorders and frequently take medication to counter pain and circulation problems.



**Continued from p. 7**

nance of the Bundesrat (Federal Council) of November 1900 changed little in this respect, laying down as it did the provision of seating possibilities for sales personnel. Some employers did comply with these regulations and provided seating facilities in the shop areas, but it was absolutely forbidden to use them! Anyone who did, did so for only a short time and found themselves no longer standing behind the counter but on the street...

And today most bosses prefer to see 'their' sales personnel on their feet and not sitting down. There are occasionally so-called comfort seats in the salesrooms, but they are still often for display purposes rather than seriously meant for use. There is still the widespread view that personnel must stand, and not sit, ready to serve. This contempt for man's physiological needs is not without consequence: More than half of the sales staff complain of health disorders, and one in every two frequently takes medication to counter pain and circulation problems. Anyone who takes a closer look at the physiology of standing will see immediately that these disorders arise from the constant standing at work.

STANDING UNTIL YOU DROP?



# Are you standing comfortably?

## Medical and biomechanical aspects of standing

### Programmed to move!

Ever since man first stood upright, he has had to fight against falling over. This balancing act, which is essential for sitting, standing and walking, is rendered possible by the perfect interplay of skeleton, joints, sinews, ligaments and muscles. Until this co-ordination works satisfactorily, the new-born human needs about 18 months. To ensure it works well for a whole lifetime, man needs mainly one thing: movement!

Standing over long periods is undoubtedly the exact opposite of movement and overstrains our posture and motion apparatus. Anyone who's had to stand through a stand-up party, a rock concert or reception will have experienced this for themselves. After only a short time we shift from one leg to the other, we fidget, our back starts to hurt – we feel really uncomfortable. Occasional 'standing sessions' are cancelled out relatively quickly by the tried and tested 'recipe' of taking your shoes off, moving onto the couch and putting your feet up. The consequences of continuous standing are not so easy to deal with.

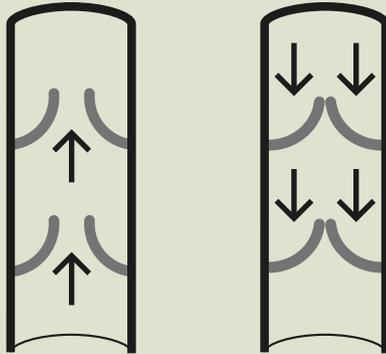
### Standing work

Standing still is hard work for the body, even though there are no actual 'external' signs of this. Evidence

of how strenuous remaining vertical for extended periods is provided by the not too infrequent cases of London guardsmen falling over when they have to 'withstand' four hours until the next changing of the guard. And there have been many members of a guard of honour who have waited for a foreign state visitor for hours to end up only getting a glance of his shoes...

These incidents are understandable if one considers the physiology of standing in greater detail. During standing the skeleton and joints carry the load – they bear the whole weight of the body. But this alone does not mean one can maintain posture; after all, we have joints which make the skeleton mobile, but also unstable. If you want to stand, you have to stiffen your joints. This job is performed by large groups of muscles, which use sinews and ligaments to prevent collapse. After such stiffening it is possible to stand quite securely, although the upright body has to be constantly balanced so that it remains in a state of equilibrium with the force of gravity. This happens just as unconsciously as the stiffening and it also demands the constant tensioning of large groups of muscles. So much motionlessness provides a firm standpoint, but also gives rise to numerous problems...

## Panta rei – everything flows ...



Vein valves are open for pressure from below (left) and close when the blood flows back (right). However, dilated veins and varicose veins may cause this mechanism to fail – the valves can no longer close properly, blood falls back into the legs and this causes painful congestion.

Venous valves open to pressure from below (left) and close when blood flows back (right). Dilated and varicose veins may cause this mechanism to fail, however – the valves can no longer close properly, blood falls back into the legs and causes a painful build-up.

Man lives from motion. And that is meant literally. Motion is the motor of the cardio-vascular system, which transports oxygen with the blood through the arteries to every cell of the body. When it arrives there, the oxygen and nutrients are exchanged for carbon dioxide and waste products from the tissue cells, these are carried away as venous blood and are discharged via the excretory organs. A perfect system which demands high standards of performance, especially in two-legged creatures. Differently from four-legged animals, the circulation of humans, who walk upright, has to overcome the force of gravity to ensure that the blood supply to the vertically 'stacked' organs is adequate. Especially because the biggest 'energy guzzler' is the one right on top – the brain.

Four natural mechanisms ensure that the precious fluid doesn't simply drop into the legs under normal conditions. First there is the **muscle pump**, which always works when we move. Then our muscles contract, and then expand again. This rhythm acts like a pumping massage on the neighbouring veins, which presses the venous blood upwards in the direction of the heart. The calf and abdominal muscles contribute a major portion of

the pump action. But when the individual is standing, this mechanism fails almost completely. And without the muscle pump, the blood pressure in the feet and calves reaches double the level of that during walking.

If there is no pressure from the muscle pump, the **vessels' independent activity** is urgently needed. The arteries and veins, in other words the vessels, serve not only to ensure a passive flow, but rather they can also intervene actively (within limits!). Thanks to small muscles present in their walls, they are able to become constricted, which prevents the blood from dropping down into the lower half and the brain from being inadequately supplied. They do this totally automatically without our noticing it. This automatic reaction can have disastrous consequences, however: during standing in particular, in other words without the support of the muscle pump, they do everything they can to counter the elevated blood pressure. This works well for a while – but only for a while. In the long run the veins in particular are overloaded, the muscle fibres in the interior walls go limp and overstretched, then they disappear – they are replaced by connective tissue. The irreparable consequence is dilatation of the vein – a varicose vein forms.

Dilated and varicose veins are, unfortunately, not merely a cosmetic problem; they also prevent the so-called venous valves from doing a good job. **Venous valves** ensure that the venous blood cannot flow back on its way to the heart. This is because there are small, sail-like protuberances on the inner walls of the veins which act like non-return valves: they open to pressure from below and close up tight when blood flows back. But if the cross-section of the vein has been enlarged, the valves can no longer seal properly – blood drops back into the legs and painful build-ups arise.

Without a muscle pump, healthy vessels and well-functioning venous valves, the main player in the circulatory system, the **heart**, is soon overtaxed. As a team worker, it relies on the co-operation of its support elements. If this does not materialise, too little venous blood flows back to the heart, which reacts with a faster pulse and pumps more vigorously. If the vessels are damaged, this impressive lone action is no longer sufficient, however, to reinvigorate the circulation and keep it that way. Vessel damage is therefore a real problem for the whole body. The consequences range from heavy legs, burning feet, cramps, inflammation and an elevated risk of thrombosis. Too much venous blood in the legs not only damages the limbs affected, however, but also leads to oxygen deficiency in the central system. And the brain reacts to malnourishment with a general decline in performance, which affects many bodily functions. The results are:

- fatigue, loss of motivation
- disturbed perception, pain in the eyes
- slower reactions
- disturbances in the fine motor skills
- impaired concentration
- headache, fainting

The consequences of standing are therefore not 'only' a problem for those directly affected, who have to pay for all the standing around with a loss of well-being, quality of life and health. Workers 'impaired' in this way are less motivated, less efficient and less willing to work, and finally also less productive. And that can't be in a company's interest. So what can we do to counter continuous standing?

### Trouble standing? – Try walking!

Muscles, joints, intervertebral discs, sinews and ligaments must always be supplied with nutrients if they are to remain fit, healthy and efficient. For example, the muscles can only perform their job if they are well supplied with blood. An absolute precondition for this is that they are regularly tensioned and relaxed. Only in this way will the circulation be stimulated and the blood supply to the muscles sufficient. If, on the other hand, a person stands still for an extended period, the muscles have to perform static muscular work with little nutrition because as the muscle runs out of blood, it also runs out of oxygen. Furthermore, the removal of waste products from the tissue cells also stagnates. The consequences of both are unpleasant and painful: cramps, tension, hardening and not least aching muscles.

Muscles are thus only suitable to a limited extent for static holding work. We notice this very quickly if we stretch our arms out sideways and try to hold them at an angle of 90 degrees for a certain time – after only a short time they will fall to our side again. Something similar happens to the back muscles when we are standing. They become fatigued, are increasingly incapable of holding out against the force of gravity and lose their spine-supporting capacity – the person concerned slumps down and the spine's natural curvature is increased. A spine that gets out of kilter in this way will experience problems in the long run – painful incorrect postures are inevitable.

The 38 joints on which the body's weight is placed during standing also have their supply problems. They are subject to considerable pressure, which

doesn't do them any good in the long term. The interior of the joint capsule is not supplied with blood directly, in fact the articular cartilage is nourished by the joint fluid. For this to work, however, the joint has to be moved – only then will a pump action arise which will ensure metabolism between the interior of the joint capsule and the area around the joint, which is well supplied with blood. If this movement is lacking during standing, the articular cartilage will be undernourished, and will become brittle and susceptible to wear.

The intervertebral discs also suffer from standing. As is known, they are located between the vertebrae, they are firmly connected with the vertebral bodies and have two functions. On the one hand, they provide the mobility of the spine, and, on the other, they act as shock absorbers with respect to vibrations. They can only do these two jobs if they are always well nourished. Because they do not have a blood supply of their own, they draw their nutrients – oxygen and glucose – by means of diffusion from the surrounding tissue. The precondition for this is the regular placement and relief of loads on the intervertebral discs; only then can they absorb fluid like a sponge until full and discharge it again when they relax. If our intervertebral discs are not to starve, we should therefore move, i.e. we should change our posture from sitting to standing to walking and to lying as often as possible. If, on the other hand, we remain standing upright continuously, the intervertebral discs will be permanently under such pressure that even a small snack now and again will be a problem – after all, you can't pump up a limp rubber ball if someone's sitting on it. If they are allowed to dry out in this way, the discs will lose

there elasticity in the long run – they will become brittle and crack. It's no wonder that, under such conditions, the spine's natural springiness will decline, and that the result will be chronic changes to the discs and vertebral bodies. The end of the story will then often be painful, with disturbed functioning of the nerves, lumbago or a slipped disc.

### On feet of clay

We should in fact devote most attention to our feet; after all, their health is a major prerequisite both in terms of our stability and our mobility. Statistics testify to the fact that we don't do this enough: only about 15% of adults in the western industrialised nations have anatomically healthy feet – even though nearly all humans are born with healthy feet! The reasons for this are, alongside inappropriate footwear, mainly standing for long periods. It is even possible to get flat feet from this ...

Our foot is a filigree structure made up of 28 bones, connected by sinews, ligaments and muscles in such a way that they enable the body to stand and move upright. Seen from the side, the healthy foot forms a sprung curve which elastically absorbs our weight as we walk. Even when we're standing still, we don't normally do this on the whole foot, but only on the end points of the curve, 60% on the rear end and 40% on the front end. The 'arch' in between is formed on the underside of the foot by means of muscles, sinews and ligaments. If we look at the foot from above, we can see that it opens out like a fan from the heel. This fan also curves slightly upwards at the front. The longitudinal and transverse arches serve as shock absorbers when walking.

To preserve the foot's well thought out 'sprung architecture', it primarily needs to be in motion. If this is not the case – such as during static and continuous standing – the muscles, sinews and ligaments suffer in the same way as those of the spine: the muscles go limp, the tendons and the ligaments wear out, the arch of the foot falls and the joints are overstrained. That puts us on a totally different footing – a flatfoot two centimetres longer – and it hurts: every step and all standing becomes a torment; knee, hip and spine are all affected by the loss of spring in the feet.

STANDING UNTIL YOU DROP?



# Life has its ups and downs!

## Variety and ergonomics at the workplace

Actually it goes without saying. Even so many employers find it difficult to live up to, be it out of ignorance or lack of interest. But many workers also simply stay permanently on their feet without protest. Yet movement is just as important for humans as eating, drinking and sleeping. And it's by no means impossible to inject more movement into the daily routine, thus at least alleviating the stiffness due to constrained postures – seated or standing. The rule is: the sooner a programme of movement is introduced at the workplace the better. After all, many forms of health impairment resulting from continuous standing and sitting are irreparable, cost those affected their health and quality of life and cost the company and society a lot of euros.

So where do we begin? The best place to start is in your head! Many people aren't even aware that there is a problem of lack of movement at the workplace. One possibility here is for the works council to take the initiative and to talk about the subject in discussions, round tables and informative sessions. After such a sensitisation process, it will then be possible to conduct a risk assessment and survey the individual workplaces to establish where there is excessive strain due to continuous standing. For those workplaces where the users have to stand for a lot, individual improvements should be drawn up

and implemented. There are many possibilities for providing relief, and they go in two main directions:

- A complete restructuring of the workplace in the direction of mixed work, where the new arrangement of jobs should provide for standing, sitting and walking.
- An improvement in the workplace situation through the provision of suitable standing aids, seating facilities etc.

From an ergonomic point of view, mixed work is definitely the first of these two options because it can offer both physical and mental variety, which accommodates the needs of the working individual. But when the boss claims 'mixing impossible', the only option is at least to ease the standing for the person concerned ...

It should be stressed again at this point that with all the changes the aspect of motion should be the focus of all endeavours. It's not a matter of making the standing person a seated person or vice versa. Rather the idea is to find solutions which make work mobile!

### Mixing is the thing

If you want to reduce a permanent lack of movement and constrained postures at the workplace,

you can hardly ignore the matter of mixed work. The degree of mixed work that can be achieved will depend both on the imagination of those involved and on the individual work situation and job in hand. The choice is between the following variants:

**Job rotation:** Several workers rotate at several workplaces with different tasks which are comparable in terms of the qualifications required. To ensure that the whole thing helps promote movement and/or variation of posture, it should of course involve a change between standing and sitting workplaces. For example, there can be no major objection to training workers in industry for two different jobs, of which one requires a sitting posture and the other a standing one. Why should a worker in the car industry, for instance, not assemble axles, drive shafts or wheels for two hours while standing or walking, and then switch with colleagues for the next two hours to sit while he fits doors with the corresponding speakers, electric window lifts and interior cladding? Of course, this can also work in the service sector. A saleswoman who spends all her time standing behind the counter certainly does not have it easy, and she would surely be pleased to regularly switch places with her colleague sitting at the check-out. Lots of things are possible, and even more conceivable...

**Job enrichment:** This mixed work variant goes one step further and brings together jobs with differing qualitative requirements to form a new job profile, including planning, control and inspection tasks. The aim is to mix working conditions and work content and thus make the work more varied. In view of the load from constrained postures the rule once again is: change of activity is change of posture

and hence change of load. It is therefore definitely possible – given appropriate qualifications – for the sales personnel of a department store to rotate between check-out, selling and advisory activities, goods inspection and purchase, and price marking, and in this way to stay in motion. Studies have shown that such a work organisation can lead to greater work satisfaction, well-being and better health.

**Group work:** This is undoubtedly the most demanding form of mixed work. A number of workers form a group which is assigned a certain task. Performance, assignment of tasks, time schedule etc. are the responsibility of the group within a certain framework. The possibilities for mental and physical movement are greatest here, but their introduction places the greatest demands both in terms of the 'organisation development' department and of the qualification of workers.

The important thing with this form of mixed work is adherence to the principle of rotation within the group. The aim is then not for experts to develop who always does the same thing because that's what they do best. Each one should rather be able to do everything – and also actually do it! Let us take the example of a large-scale catering kitchen. Normally there is a high degree of division of labour here and hence also a one-sided workload. Some stand at the dish-washing machine all day long, while others spend the shift standing at the hot-plates, another group is occupied exclusively with preparatory jobs and cleaning. Goods purchasing and inspection, the drawing-up of the weekly menu and other organisational jobs are often dealt with by the management in the office.

Once again one could imagine a different organi-

sation of work which is more appropriate to the diverse inclinations of man and which develops his skills, knowledge and personality – in brief: which motivates him more, moves him more, demands more from him and advances him! And this is how it could look: At the beginning of the week the menu is drawn up in collaboration with the management. Once the ‘main dishes 1 and 2 and the vegetarian alternative’ have been fixed for the week, the tasks arising are discussed in the group and assigned among them. It is important both in terms of a feeling of justice and health care that activities involving a particularly burdensome load are distributed evenly over all shoulders and/or feet. Purchasing, ordering and goods inspection are also the responsibility of the group and are, of course, dealt with sitting down; there are also seated workplaces available for food preparation. At the hotplates standing is still necessary, but this is reduced to a tolerable level by the stipulation of rotation. All in all, there is thus a sufficient variation for all members of the team between standing, sitting and walking, and in addition the work becomes more holistic, varied, personality-promoting and productive.

### Putting your feet up

Mixed working where a change of activity also involves a change of posture is not always possible. What should invariably be possible, however, is the opportunity to rest one’s feet, legs and back a little by occasionally sitting down. In department stores this only requires the provision of seating which can be used by the standing personnel in times between customer contacts to enable them to catch their breath. Such ‘emergency chairs’ close to certain

### Concerning risk assessment

Under the ‘Act concerning the implementation of occupational safety and health measures to improve safety and health protection of workers at work’ (Occupational Safety and Health Act), every employer is obliged to specify requisite measures to assure and improve the safety and health of workers at work. He can only do this, of course, if he is aware of the safety weak spots. A major prerequisite for this is the risk assessment, which basically breaks down into the following four parts:

- **Detection of risks.** During an inspection tour everything in the plant which could affect the workers’ safety and health is checked.
- **Assessment of risks.** Then comes the assessment. Are the measures taken adequate? What do the rules and regulations etc. say?
- **Elimination of risks.** Note must be taken here of the priority rating of the occupational safety and health measures, i.e. ‘safe technology’ before ‘safety devices’ before ‘organisational measures’ before ‘individual protective measures’!
- **Check of efficacy.** Who likes to spend money on things that don’t do any good? So the measures taken should be checked and adapted at regular intervals.

Assistance in drawing up a risk assessment can be obtained from various online guides on the Internet as well as from the Federal Institute for Occupational Safety and Health, the Berufsgenossenschaften (institutions for statutory accident insurance und prevention) and the State Offices for Occupational Safety and Health.

# Change of activity is change of posture and hence change of load and therefore good.

standing workplaces were even specified in the workplaces ordinance, but in the more recent version the legislators have dispensed with this. Probably they hope that such a thing can now be taken for granted and does not need to be explicitly mentioned. As far as the hardware, namely the seating is concerned, this assumption may be justified. But with regard to the software, namely human thinking, there is reason to harbour doubt as to whether occasional sitting for all involved can be taken as a matter of course. And hence the following call at this point:

- As a superior, you should encourage your personnel to use breaks, waiting times and quiet times to take a seat. Standing has in itself no monetary value – only if someone sits down every now and again will he or she remain efficient, healthy, motivated and also be able to stand their ground should the need arise!
- As a worker, you should lose all your inhibitions regarding occasional sitting. There is no good reason to stay on your feet for longer than the job

in hand demands. Use short breaks and waiting times to sit down. This will benefit your health and in the final analysis also the company. And if your boss makes you stand to attention during your short sitting breaks, perhaps you should show him this brochure. He will (hopefully) then realise that your sitting breaks are also a gain for him!

The conversion of a standing workplace to one at which you can either stand or sit is undoubtedly a more elegant solution than simply making chairs available for occasional use. This can often be achieved at little expense and effort and also accommodates the needs of customers in the service sector. After all, every superior must realise that, if the sales personnel are standing, customers have to as well. This is certainly no problem in the case of small purchases, but who wants to choose the design of a new built-in kitchen while on one's feet? And buying a car can also be a time-consuming business where there are thirty fitting variants and

## More movement with Fit-Karten©



Many people have got out of the habit of moving. The consequences of this deficiency are well known: overweight, cardiovascular disorders, problems with the musculoskeletal system. This is where a new workplace health promotion approach comes in, one funded

by the Federal Institute for Occupational Safety and Health and prepared by the Institute for Sport and Didactics of the

University of Dortmund. Other co-operation partners

were the Berufsgenossenschaft and the IKK West-

falen health insurer. The aim of this approach

is to modify the awareness and hence also

the behaviour of workers. This means

targeted sporting activation to compen-

sate for the loads experienced in standing

occupations.

The heart of the programme comprises Fit-Karten©

(fit cards), which make specific sequences of movements

evident to amateur athletes. Workers can be guided by these

cards to carry out a health-promoting training programme at the workplace or at

home. On the front of the cards there are exercise instructions illustrated by pictures,

while on the reverse there are more detailed explanatory remarks, such as the aim of the exercise or the number of times the exercise should be repeated.

The special feature of the Fit-Karten approach is that it concerns exercises which target and counter the loads experienced at quite specific workplaces. To develop these, motion analyses were first carried out in the initial run-up on saleswomen in the bakery trade and surveys were conducted. On the basis of this data, brief training units were developed and implemented in a movement programme. These movement programmes can be adjusted to the individual in accordance with the pattern of health disorders. The Fit-Karten approach is now also available in a form suitable for the hairdressing trade and other standing occupations are to follow. The Fit-Karten can be obtained from IKK Westfalen. Contact: [mechthild.evers@ikk-wl.de](mailto:mechthild.evers@ikk-wl.de) or +49(0)251 28536901.

twelve different engines to choose from. That is why, for example, information counters and small groups of seats are commonly available in furniture stores and car showrooms. The consultation can be dealt with in the sitting position and the subsequent service and viewing can take place while standing. Something similar could also be considered when it comes to presenting a customer with curtain fabrics or china services from sample books and producers' catalogues.

The idea of alternating standing and sitting at work is also applied today in occupations which only a short time ago were seen as purely standing occupations. Many hairdressers stay on their feet when washing their clients' hair and then pull up a mobile, height-adjustable and revolving stool to actually cut the hair afterwards. The same is true of dentists, who normally use the drill while seated and can thus relax while they get on other people's nerves...



### What must be noted with standing aids



To ensure you don't get off on the wrong foot when you buy a standing aid, here are the most important things to consider when choosing a standing aid and deciding where to use it:

- Before you look for a standing aid, take a good look at the intended place of use: Is there enough space for feet, legs and the standing aid? It is advisable to have foot room of at least 45 cm and knee room of at least 25 cm!
- Swinging standing aids get things moving, but they do not offer any real advantages with regard to the reaching range for the arms. If you use one, you should not overdo the swinging, however – it is not beyond the bounds of possibility that the aid will tip over or slip!
- The support surface should, of course, be height-adjustable to ensure the feet can reach the ground – between 65 and 80 cm is normally sufficient. The rule of thumb for individual height adjustment is that the height of the seating surface should be around 45% of the body height.
- The depth of the support surface should not be less than 15 cm and should be inclined towards you – a precondition here is an angle of incline of between 15 and 30 degrees! Make sure that the support surface passes over into the front edge with a roundness of approx. 60 mm, otherwise there will possibly be pressure points!
- To enable you to occupy a confident standpoint, the standing aid should have a back support or seat support!
- And what applies to office chairs is also mandatory here: All adjusting controls should be easy to locate, easy to understand and easy to move.
- A small tip: Don't simply buy from a catalogue! Stability, comfort and ergonomic design can only be assessed in a practical test!
- And another thing: Normally the standing aid will stand at a table, workbench or something similar. To make sure that the standing aid and table go together well ergonomically, the table should be height-adjustable so that the working height (= table height + height of the product, machine etc.) can be adapted to the body height. Depending on the activity, adjustment possibilities of 68 to 118 cm are essential for the table because tables, like all work equipment, should not be built for a man/woman, large/small, but for as many as possible.

### When is a chair not a chair?

Although workplace design involving seating groups or standing/sitting combinations is already making inroads – they still exist, pure standing workplaces where the workers have to stand constantly. To ensure that such working conditions can be withstood over long periods without any damage to health, so-called standing aids are absolutely indispensable. The products available are many and varied, but what they all have in common is the fact that they facilitate a posture somewhere between sitting and standing. Anyone who believes this is neither one thing nor the other is mistaken. The effect of this hybrid furniture is quite impressive: For users of standing aids as much as 60% of the body's weight is no longer carried by the legs and feet, but rests on the standing aid. This takes the load off the circulation, joints, ligaments and sinews and also keeps the spine in better shape – it moves into the physiologically favourable middle position provided the seat is given appropriate support.

Standing aids, of course, require a certain leg room. If the space is too restricted, so is the possibility for using standing aids. But apart from

this limitation, standing aids can be used anywhere and fully live up to their name – they really do help to stand! Their uses are varied, and the following list is definitely not exhaustive:

- medical practices
- turning, milling and punching work
- conveyor belt work
- hairdressing salons
- the home
- assembly work
- laboratories
- ship navigation
- sales
- drawing work
- control stands
- means of transport

### Variety is the spice of life ...

Standing seats, standing work seats, work seats, seating aids, supported seats, tall stools, swinging seats, swinging standing seats, seat swings, suspended seats, leg rest – the names of the different standing aids are as varied as their versions, designs, forms, colours and possible uses. Basically, stand-

The same rule applies to standing aids:  
The proof of the pudding is in the eating.

ing aids can initially be classified into two sub-types:

- Rigid standing aids which stand on the floor or are even bolted to the floor.
- Swinging standing aids which are either designed to swing freely or are mounted on a base which stands on the floor.

Recommendations cannot be given at this point nor will they be, since it always depends on the area of use and personal preference of the user. Trying out is more important than theoretical considerations – and every responsible employer should let his workers do this! The same applies with regard to the form of rest or support area; here the range goes from surface-type support, which is equivalent to a normal seat, centred support with anatomically shaped seating areas in saddle form for example, to simple leaning, where the form of the standing aid only provides for a point-type support – which is often sufficient to give load relief!

### **Grounded!**

If you stand, you get tired. But if you don't pay attention to what you're standing on, you'll get tired even sooner! At any rate, that's the result of a study by the Federal Institute for Occupational Safety and Health concerning the influence of elastic floor coverings on standing quality (see annex). According to this, elastic floor coverings reduce fatigue at standing workplaces, they conserve joints and the spine – and they are good against cold feet! A realisation which is not really surprising, but whose implementation in practice is in no way standard everywhere. Everyone knows that standing on concrete is not good for you – the covering is hard, smooth and cold. It's better to have non-slip coverings with decent heat insulation, ones which are slightly sprung and are yielding. If such coverings have not been considered in the planning of a workplace, elastic workplace mats can subsequently help by providing greater comfort and springiness.



# Stand your ground!

## Individual prevention for long-standing sufferers

### Good standing is an art

Someone who has to spend all day at work on their feet, should at least stand correctly! This is by no means as self-evident as it sounds. You don't believe it? Just stand in front of the mirror. If you see drooping shoulders, a curved back, a sunken chest or a pot belly, then you're not standing correctly. And this places an even greater load on the body than standing itself does. That's why you should as far as possible avoid allowing your body to slouch – in other words don't place your weight on your heels, don't push your pelvis and your head forward, and don't let your shoulders droop! It's not only that this looks bad, but instead of placing the load on the muscles, it places it exclusively on the sinews and ligaments, causing them to wear out.

The same effects can be observed for a posture which women tend to adopt: the weight is shifted to the front, the knees are rigid, the seat projects backwards and the upper torso leans forward. This incorrect posture is encouraged by shoes with (excessively) high heels – more about this later. This posture also makes the orthopaedic specialist tear his hair out. In contrast, good marks for posture can be obtained if you take the following to heart:

- Stand upright, but don't tense up: stay relaxed!

- Place your feet at shoulder width with the toes pointing slightly outward. (Note for male readers: it's your shoulders that are meant here, not Schwarzenegger's!)
- The knees should be comfortably under tension and not to the limit.
- Pull your behind in and lift your chest!
- Now look ahead of you, letting your shoulders and arms hang loosely – and that's it!

This is, of course, only the basic posture, and it can only be held for a limited time. The basic principle is that standing is not a static matter! You should therefore move as much as possible while standing, in other words change your position, mark time, walk up and down a bit, lift your arms, occasionally tension your back and abdominal muscles briefly. What is to be heartily recommended is also the 'bar position', with each foot raised alternately. To do this, you don't have to visit the next pub; a foot-stool will do just as well!

### Show us your shoes ...

Nobody would go hiking through the mountains in flip-flops. And you rarely see joggers in rubber boots. And, of course, when you're playing handball, football, basketball and golf, the right footwear



is essential. Only in the discipline of ‘continuous standing’ are practical and appropriate shoes often dispensed with. Instead ladies in particular follow the dictates of fashion, which often sends a shiver down the orthopaedic specialist’s spine. If you frequently have to stand, you should therefore not only consider how you look, but also the health of your feet. After all, in the course of our life we have to cover a distance on our feet equivalent to four times round the globe! This can only work if our feet are healthy and we don’t subject them to every silly fashion trend.

Pointed and slender shoes make your feet look slim, but they also make them unhealthy: the forefoot is scrunched up in the front so much that the bones of the midfoot are forced to the side and splay. A foot that splay in this way loses its elas-

ticity and with this its function as a shock absorber. Someone with feet damaged like this who then has to work standing up for long periods will definitely also have problems with their knee joints, hips and spine. The upright body posture needs a healthy base – healthy feet!

Even worse than simply standing in footwear like this is walking. If the shoe is too narrow, the big toe will bend to the middle of the foot. For a short time this will work more or less, but is by no means ideal – and then it won’t work at all: the big toe will bend permanently to the middle of the foot and a large, painful prominence will form around the basic joint. The whole thing is called a bunion (hallux valgus) and is a familiar complaint mainly among older women. To reinforce the ‘deforming’ effect of a narrow, pointed shoe, all that is then needed is a



high heel which will apply additional weight to the forefoot...

### Keeping on the move in your free time

At last the standing ordeal comes to an end and you can leave work! Almost everyone will then go home, kick off their shoes and put their feet up. Nothing wrong with that! Our body knows what's good for it – the raised legs enable the blood to flow back more easily and relieve the load on the veins. In view of this no one needs to have any qualms about relaxing and acting the couch potato after a hard day at work. But if you're still lying there when the late TV news comes to round off the day, you've obviously overdone the relaxation and you will hardly be well prepared for the next standing marathon! People who spend their working day

mainly sitting or standing owe it to their body to move around a lot in their free time. Anything that gets the circulation going and makes the muscles work will do, including swimming, jogging, gymnastics, hiking etc. And when the first exercise – overcoming inner resistance – has been successfully negotiated, the physical training programme will not only further your health and fitness, but it will also be fun. No doubt about that!

If this is not enough for you, why not leave your car at home in the morning and get on your bike? If your workplace is not too far away, you'll probably get there just as quickly by cycling there, you will save money, you will have done something for the environment and also you will have done yourself some good. Even if you go to work by car or bus, you don't have to do without a short morning stroll

### Small checklist for the next shoes you buy

**They fit, are loose and have a gap!** Shoes that suit your feet have to fit. But it's not enough to refer to the last pair you bought to determine your shoe size. The shoe size can change even in adults, for example if you develop flat feet. To make sure the shoes you buy aren't too small, you should try them on in the afternoon or evening – then you will have 'swollen feet' after a strenuous day's work and will get the right size. To make sure, your feet have to be measured time and time again – good shoe shops have the right equipment to do this!

**It's the width that creates comfort!** Often it's only a matter of a few millimetres which make the difference between uncomfortable shoes and comfortable ones. That's why laced shoes or shoes with an adjustable buckle are better than 'slip-ons' which leave little room for manoeuvre. If the width can be adjusted, this will mean that the thickness of the foot can be taken into account as it changes in the course of the day.

**Freedom for your toes!** Toes are not sardines, and shoes are not sardine tins. Shoes should therefore be so wide in the front that the toes have enough room to lie next to one another. Only if this is the case can your feet roll naturally and the big toe will not go crooked!

**Stay supple!** Shoes should support and protect your feet without restricting their freedom of movement. A strong rear cap will give your heel support, supple leather and laces will adjust to the form of the foot with every movement.

**Not too high!** Avoid trendy high heels. Someone who is not willing to dispense with heels altogether can rest comfortably on heels which are between 2 and 4 cm high. Higher heels put the forefoot too much under pressure and will create problems for your whole posture. And a stiletto heel won't help your stability one little bit!

**Soft soles!** To enable your foot to roll properly, the soles must be appropriately flexible. And because life is hard enough, the soles should be correspondingly soft to cushion any shocks **to the feet and joints.**

**The trimmings are important!** The upper should be of leather and technical textiles which can breathe. Only then can you be sure that you won't be stewing in your own juice after only a few hours. But even then you should change your shoes at least once in the course of the day. This will relax your feet and air your shoes a little!

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– just park the car a little way away or get off the bus one stop early!

### Massage is the message

Alongside a lot of movement, active relaxation and well-being are, of course, advisable. If you spend the whole day on your feet, you deserve a treat – especially since this will not only do your mind and soul good, but also your body after the torments of constrained postures. There are a lot of possibilities and you only have to take advantage of them!

- Massages with a brush or massage glove, in the shower or dry, stimulate the blood supply and metabolism just as much as a regular visit to the sauna and daily alternating hot and cold showers. Taken together, all these activate the vessels and tissues.
- If you stand a lot, you should pay greater attention to your legs and feet. What can be warmly recom-

mended are the cold water stimulation therapies of Sebastian Kneipp, in other words knee and calf rinses as well as the traditional water stepping. For this you need to fill a bathtub (or a small plastic tub) with cold water up to about 10 cm below the knee – and now you have a health spring! Step into the tub and tread slowly on the spot. With every step you should raise one leg right out of the water. The whole procedure takes hardly any time, and after only 10 to 30 seconds a slight sensation of pain will set in. Experienced water steppers manage about 30 to 60 seconds. Then the water is brushed off the legs by hand. Foot gymnastics or walking will then give rise, after stepping, to a pleasant warm sensation. Kneipp therapy causes swelling to recede and relieves pain and it can be employed both for the sick and (as a precaution) for healthy individuals. By stimulating the activity of the muscles, it counters varicose veins and oedemas.

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# Movement and relaxation: It's the mixture that counts.

## The benefits of standing

Readers who work in the classic standing occupations can skip this chapter – it has nothing to do with the world they occupy. The aim here is, namely, to say something in support of standing. Standing is in itself neither something negative nor damaging to health initially – on the contrary, for those who have to sit a lot it can be a real boon and source of relaxation. And that's why for all the negative aspects of standing as described in this brochure, no-one wants to stop you standing occasionally – especially if you are forced to sit a lot in your job and elsewhere. This brochure is intended to counter **continuous** standing over long periods, in other words working in constrained postures. It wishes to support the cause of more movement at the workplace and is complementary to the brochure, also appearing at the BAuA and published jointly with the INQA Office, entitled 'The Ups and Downs of Sitting – Sitting at Work and Elsewhere'. This describes the hazards of continuous sitting over long periods, to which the majority of workers are subject today. And here standing is part of the solution – at least in the sense of intermittent standing. Basically, it is concerned with more movement at the workplace and hence greater health, higher motivation and efficiency, and less illness and absenteeism. Work organisation geared more to movement demands, of course, a workplace design which facilitates a variation of postures during work. This brochure explains how this can function at standing workplaces. You can read how this functions with sitting workplaces in the brochure 'The Ups and Downs of Sitting'. But enough said at this point: Anyone who wants to release workers from constrained postures at the workplace will have to change a number of things, both in terms of the software, or the way people think, and the hardware, or the office furniture. To facilitate movement at work, the office furniture also has to be mobile. This includes ergonomic office chairs as well as variable standing aids and easily (e.g. electrically) height-adjustable desks which will make a temporary standing workplace out of a sitting workplace.







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- Foot baths with the corresponding herbal additives, such as rosemary and thyme, can enhance the effect.
- Run barefoot as often as you can! Make sure you run on the correct ground. Soft bases such as meadows, sand and forest floors are good, whereas hard ones such as concrete and asphalt are poor. Running barefoot strengthens the foot muscles and furthers the blood supply, and so it is the perfect treatment for those who have to stand for long periods. And if you feel a bit silly going barefoot through the local park on a Sunday, why not create a barefoot track in your garden?

### The decisive step forward (?)

In fact, man is not good at standing upright – evolution simply didn't take account of standing

workplaces. And anyone who has to stand on their two legs can see that. Continuous standing makes people just as sick as continuous sitting – the circulation system doesn't work, the muscles go limp and the ligaments and sinews wear out, the spine goes crooked. The only remedy is movement. Unfortunately this aspect is ignored in the design of many workplaces. This omission means that workers lose out with regard to well-being, quality of life and health, and companies have to cover high costs due to absenteeism. All this could be avoidable if work was designed more to meet the needs and natural inclinations of human beings. In this brochure you will have found some approaches, suggestions and ideas for a humane design of work. You should test whether you can apply these at your workplace or in your company. Whatever, it always pays off for all



those involved to reduce standing at the workplace and to enhance well-being. After all, economically healthy companies rely on healthy workers who can meet the day-to-day challenges creatively and with motivation. The prerequisite for this is a work design which facilitates physical and mental movement, which advances and promotes all human potential, and which avoids one-sided loads – in brief: which is as versatile as man!

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The action group 'New Quality of Office Work' (INQA-Büro) was constituted at the ORGATEC 2002 as an independent contribution of the national initiative INQA. The founding partners were the Bundesarbeitsgemeinschaft für Sicherheit und Gesundheit bei der Arbeit (Basi – Federal Association for Occupational Safety and Health) as a combination of the top organisations in occupational safety and health in Germany, the Verband Büro-, Sitz- und Objektmöbel (BSO – Association of Office, Seating and Office Facility Furniture) as a manufacturers' organisation, and the German Trade Union for the Metalworking Industry, IG Metall, as the social partner for the office furniture industry. [www.inqa-buero.de](http://www.inqa-buero.de)



The Federal Institute for Occupational Safety and Health (BAuA) is a central facility of the federal government for research into safety and health at work. The observation and analysis of working conditions in companies and administrations are also part of its remit, as are the development of solutions to problems using safety and ergonomic knowledge and epidemiological and occupational-medical methods. [www.baua.de](http://www.baua.de)



The European Network for Workplace Health Promotion (ENWHP) was founded in 1996, co-ordinated by the Federal Institute for Occupational Safety and Health, with the aim of propagating and implementing the idea of workplace health promotion in Europe. Under the heading 'Healthy Employees in Healthy Organisations' the ENWHP constitutes a forum to support the exchange of information and experience between the various players in Europe. [www.enwhp.org](http://www.enwhp.org)



The registered association Verband Büro-, Sitz- und Objektmöbel e.V. (BSO), Düsseldorf, encompasses more than 70 companies who manufacture office furniture in Germany. It represents the common interests of its member companies. The BSO maintains an Internet site with information on everything to do with the improvement of office work through optimum office and workplace design. A regular electronic information service ('YourOfficeLetter') can also be obtained there free of charge. [www.buero-forum.de](http://www.buero-forum.de)



The Bundesverband Bürowirtschaft (BBW – Federal Association of the Office Industry) is the body which represents the interests of the office supplies trade and service companies from stationery shops to ITC specialists or office equipment. [www.buerowirtschaft.info](http://www.buerowirtschaft.info)

## Imprint

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