



# What's all this sit about?

Why do we sit? Is it harmful? What are the alternatives?

by David Durance

**A**re you sitting down? I'm about to give you some bad news – and news is that sitting itself is the bad news. Study after study has shown it's unhealthy. You've probably already heard that. Or experienced it. But if it's so bad, why do we do it? Isn't sitting necessary? Especially when we work?

## THE CULTURE OF THE CHAIR

Chairs and seats are all around us. We use them during work, leisure, relaxation, dining, and commuting. Many, if not most of our daily activities are predicated on sitting on some form of seat. Is this because we have to? Because there's no other option? Because it's practical? Because we've always done it?

In her book, *The Chair*, Galen Cranz analyses the cultural

and historical context of the chair. She observes that, from the earliest records, the chair developed, not as a functional requirement, not because humans need to sit, but to create a symbol of power and rank. The ultimate expression of this symbol was the throne. They were not built for comfort (and still aren't). Thrones were designed to announce the supreme authority of a ruler.

Eventually the symbol filtered down the ranks. At one point men had sitting preference over women – to symbolise their hierarchy in a patriarchal society. Eventually everyone started to get their own little bit of 'power'. Nowadays we just take chairs for granted. Power to the people!

However there are countless examples where sitting and using chairs continue to reference the throne's power play.

Executive chairs are bulkier than ordinary office chairs, and yet are perhaps *less* comfortable and efficient. In the home 'carver' chairs are sometimes still placed at the ends of a dining table, traditionally symbolising the authority of the head of the family or assembled guests. They are called carver chairs because traditionally the occupier of this seat does the carving, a ritual reinforcing their authority. Carver chairs are differentiated by having arms, not to make them more functional – arms can get in the way when eating – but arms make the chair appear more formal and throne-like.

Indeed even the word 'chair' is used to denote the idea of power and authority. We have chairs – the heads – of committees and boards, and university professors hold 'chairs'. The word cathedral comes from the Latin *cathedra*, meaning seat: that is, the seat of power of the bishop – who historically had enormous power in early Europe. We see sports stars being 'chaired off' as a mark of honour and respect.

## SITTING DOWN – CULTURAL DIFFERENCES

In the West we are locked into chair culture. We even go to the toilet sitting down, despite the evidence to suggest that squatting is far healthier for our bowels. Funnily enough, Australian vernacular sometimes refers to the toilet as 'the throne' – perhaps never a truer word said in jest!

Other cultures don't have the predominance of chair use. I've been surprised to observe construction workers in Thailand or wood-carvers and stone-masons in Indonesia sitting or squatting on the ground while they work. It's no coincidence that, in these countries, back health is far superior compared with Western countries. Where chairs *are* used, sitting is sometimes seen as an indicator and symbol of Westernisation, and perhaps, sadly, of modernisation and progress.

## THE CHAIR – A HEALTH HAZARD

There are several studies that establish a relationship between sitting and back pain.<sup>1</sup> The experience of stiffness and discomfort after sitting for a long period would be

// JUST AS WE SHAPED THE CHAIR, SO HAS THE CHAIR SHAPED US! [CRANZ] [GALEN CRANZ]//

common for most of us. However even when we feel we are sitting in a comfortable chair it may be in fact harming us physiologically.

One study<sup>2</sup> shows that administrative workers suffered high incidences of musculoskeletal problems and the conclusion is that sitting is as risky as lifting heavy weights.

Other unhealthy consequences associated with sitting:

- Reduction of body movement making muscles more likely to pull, cramp or strain when stretched suddenly.
- Fatigue in the back and neck muscles slows the blood supply and adds tension to the spine, especially in the low back or neck<sup>3</sup>.
- Prolonged loading may result in permanent deformation. Repeated load application may also result in cumulative fatigue, reducing the disks' stress bearing capacity<sup>4</sup>.
- Evidence points to changes in the fat and cholesterol metabolism, and inactivity throughout the day stimulating disease-promoting processes. Exercising, even for an hour a day, isn't sufficient to reverse this effect<sup>5</sup>.
- Sitting also decreases peripheral circulation – the seat pressure increases popliteal (back of the knee) pressure, trapping blood in the lower leg<sup>6</sup>. This is a risk factor for Deep Vein Thrombosis (DVT), a well documented danger known to occur during long-duration air flights.
- Sitting also changes muscle length, particularly shortening the the hip flexors and hamstring muscle

// OUR CHAIR HABIT WAS CREATED, NURTURED, MODIFIED, REFORMED AND DEMOCRATISED IN RESPONSE TO SOCIAL - NOT GENETIC, ANATOMICAL OR EVEN PHYSIOLOGICAL FORCES. [GALEN CRANZ]//

groups. These muscle groups have an important role in stabilising the body. When they are not operating optimally, the back muscles have to do more work – leading to tiredness and strain.

- The constraint of movement can have emotive and cognitive effects as well as physical<sup>7</sup>.

## BACK REST – SUPPORT OR HINDRANCE?

The action of a back rest is to minimise slumping, and counteract the tendency of the pelvis to tilt forward and the corresponding increase in disc pressure. It can also decrease pressure overall as more weight is taken by the back rest. However to keep the head balanced the neck must be thrust forward. This increases tension in the neck and shoulders, the bend in the thoracic spine, and compression in the chest and abdomen, leading to a corresponding risk of pain in the neck, thoracic spine

deformity, and decreased blood flow in the abdomen. This reduced circulation creates muscle fatigue, tiredness and reduced function in the internal organs<sup>11</sup>.

## BACK TO WORK

Our culture is so predicated around sitting, and indeed our bodies have become so accustomed, even permanently modified by it, that it's hard to avoid. Sitting in a conventional office chair isn't great, but the situation can be improved with good chair selection and attention to good posture. It should be noted that as tasks vary, so does chair use and posture.

If you're using a laptop, it's important to add an external monitor and keyboard to create a better posture. If you continue to sit in the same position and scrunch yourself up over your laptop for hours, you're going to be asking for trouble!

## How sitting hurts us – the biomechanics

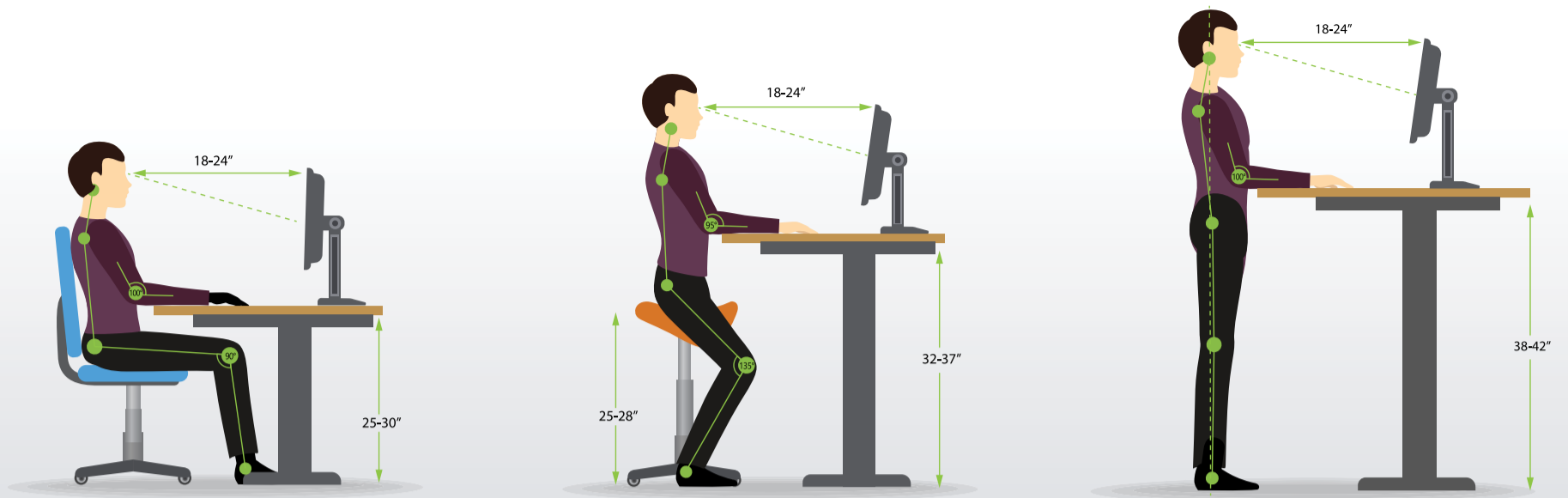
Sitting significantly raises intervertebral disc (IVD) pressures as opposed to standing. This can be explained by the corresponding change in lever arm length between the axis of the spine and the axis of weight bearing. When standing, the weight of the body acts from the floor, through the leg and hip socket, into the pelvis, sacrum and spine. The hip socket is closely aligned to the mean axis of the spine (depending somewhat on posture).

Here, the lever is short and the pressure on the discs is at a minimum. When seated, weight acts on the back of the thighs, buttocks and the sitting bones at the base of the pelvis. This tilts the pelvis posteriorly (the sacrum is tucked forward, and the tip of the pelvic girdle moves backwards) and the hip sockets, and sitting bones are further forward than they are when standing. Weight is transferred to the spine through the sitting bones, and to a lesser extent, through the hip sockets. The line of action of the transferred weight is overall further forward than it is when standing; so the lever is longer, the force from the lever adds to the axial load on the spine and consequently,

IVD pressure increases.

Typically sitting IVD is 50% more<sup>8</sup> than standing. When the back is slumped the pelvis is even further forward, and there is an additional lever created by the weight of the upper body and head shifting forward of the spine. IVD is now double standing IVD<sup>9</sup>. Leaning further forward, for example to pick something up from the floor, creates four times the stress. Definitely something to avoid!

Increased IVD causes increased and cumulative stress on annular fibres surrounding the disc. Raised IVD also has the effect of decreasing disc perfusion. Discs do not have their own blood supply, but rely on delivery of nutrients – perfusion – from the spinal fluid<sup>10</sup>. The decrease of nutrients can lead to degeneration – with consequent serious long-term health problems. Sitting has also been shown to restrict breathing due to constriction of lungs, and increase pressure on internal organs, especially when the upper body is compressed due to slumping. This can lead to tiredness and other significant health issues.



## REDUCE YOUR RISK OF INJURY— SOME TIPS TO IMPROVE HOW YOU SIT:

- For conventional sitting, the seat height should result in your knees being 50mm below your hip sockets.
- Seat should have a firm textured surface, upholstered 12-25mm thick. Avoid seats with a concave left-right contour.
- The more a task takes you forward the more forward the seat should tilt.
- Your monitor should be at eye-level.
- You need 'bottom space' between seat and back-rest.
- Have your mid back supported or better: full back, neck and head support.
- Use armrests if reading, keyboarding or drawing.
- Both feet should be on the ground.
- Keep your legs uncrossed.
- Check that your spine retain its natural curves (lordosis).
- Your chest should be open rather than collapsed.
- Your head should be balanced on top of the spine.
- If your computer is a laptop use a stand to get the screen at the right level. Add an external keyboard and mouse so your arms are in the optimal position.
- Consider upgrading to an ergonomic mouse. Aim to have your mouse settings set to be as sensitive as possible so that large movements of the cursor can be achieved with small movements of the arm and/or wrist. I use a trackball type mouse, and find it great, particularly for mouse-intensive graphics/CAD work. A trackball allows the arm to be completely at rest, as all control is accomplished with the fingers or thumb. It does however take a bit of getting used to, so be prepared to feel awkward for a week or so.
- Your eyes should be able to look at work within a 15 degree cone to the horizontal. The ability to touch type reduces the need to tilt the head forward, reducing thoracic stress. If you can't touch-type try to look down rather than tilt the head. This might not be practical if you wear spectacles, especially multi-focals, because the head has to be tilted to bring the keyboard into line with the bottom part of the lenses. Consider using a specific pair of glasses for computer work. Or learn to touch-type.
- Remember, no chair or sitting position is ideal. Take frequent breaks – get up and move around for 3-5 minutes at least every hour. Set a timer to remind you to do this if you're one of those people that become very task-oriented and too lost in your work to remember to do this.
- Consider avoiding sitting altogether by working in a standing position, or alternate sitting with standing.



## ERGONOMIC CHAIRS

Chairs that are designed to minimise IVD pressure, and encourage a good work position, can be said to be ergonomic, but beware: there are many chairs on the market which profess to be ergonomic, but don't make the grade, in my opinion. And there is a limit with what can be done to make a chair comfortable and healthy to use. In any case, a good ergonomic chair still carries its own risk – postural fixity. The body needs to move to keep it healthy and a chair that is too comfortable might entice the sitter to stay immobile for long periods of time. Advice is generally given to take a break for five minutes every hour. However some recent research indicates that to prevent fatigue the work-to-rest ratio should be more like 50%!<sup>12</sup>

## AUTONOMOUS SITTING

Autonomous sitting, is sitting upright on a chair without a back or with little use of a back rest. The idea is that backrests need to be used because of muscle weakness – and back rests, as discussed earlier, cause a range of problems. Sitting straight – without assistance – is possible, but most people fatigue and eventually slump into a C-curve.

Muscle weakness is caused by use of the back rest in the first place. So the idea behind autonomous sitting is to maintain the position – fighting against fatigue – and strengthening the muscles so eventually the position is stable and less fatiguing. The reality is that this process is not just a simple one of exercising and strengthening, but neuro-muscular reprogramming. This is a process that might take years to achieve – even with expert guidance.

## PERCHING CHAIRS

If, instead of sitting with legs at 90°, the legs are dropped to be at an angle of about 135°, the pelvis tilts anteriorly, and the result is a spine that more closely resembles the spine in someone who is standing. This minimises disc pressure. A number of chairs achieve this either through a tilted seat, or with a saddle which allows the legs to drop away.

The ball chair – or Fit Ball – is one example of a perching chair. Because of its movement and bounce it has the advantage of reducing fixity and increasing circulation. It is low in price and can double as an exercise aid. I've found it doesn't work well for me, perhaps it works better for shorter people, as there is no height adjustment. There aren't many options for where to put your legs. It's hard to get on or off, especially when you're tucked under a desk or in a confined area.

Dr Riter's Ergo Chair is an attempt to address some of these issues. It's higher and more compact. An air pump is used to adjust the height. Similar designs use a round or hemispherical ball housed in a steel frame





on castors. I've had no direct experience of them, but all look likely to have the advantage of maintaining muscle tone through the need of constant balancing when using them in addition to that needed for autonomous sitting.

The Bionomic chair is another example of a tilted seat. Designed by Dr Jeffrey Herbert, an Australian chiropractor, the forward sloping seat maintains lordosis and the backrest provides plenty of lumbar and thoracic support. I have used this chair for nearly 10 years with good results.

## SADDLE CHAIRS

Saddle chairs are another type of perching chair. They provide a great option for professionals, such as dentists, or tattooists, who work in close proximity to clients. Because in this position the legs don't project forward as much, this allows a closer sitting position, less leaning, and consequently less leverage and load on the back. They seem to be popular for health professions that work directly with client's bodies, eg dentists or optometrists. This is because sitting on a saddle chair allows a large degree of upper body movement, while still providing good, restful support. They also work well with different height settings.

Good examples of saddle chairs include the Bambach, designed by Australian Mary Gale, the seats by Salli, and Peter Ospvik's Calypso chair.

Some people report discomfort, or concern about pressure on the perineum when using saddle chairs. There are options that address this – they feature a split seat that reduces perineal pressure and, in some models, adjustability that optimises contact between the seat and the sitting bones.

Like all perching chairs, saddle chairs are mostly meant for autonomous or semi-autonomous use, ie, sitting without a backrest, although some have an optional back for a 'rest' position. It's not meant to be relied on. This means there's going to be a period of adjustment as back muscles have to make up for what might be a lifetime of inactivity. Having a backrest may discourage sitting autonomously, and therefore reduce its associated benefits, however for many people, where the discipline of autonomous sitting is just too big a hurdle, it might be a better option.

I've been experimenting with using a saddle when sitting at my computer - which is a quite often these days. My lower back is happy with it, but it is taking a bit of getting used to. I've noticed a fair bit of pressure on the sitting bones - as there should be - but these pressure points become a little sensitive after a few hours. I'd recommend introducing it to your routine over a period of a few weeks. For best results it needs a higher, stool-like position – so make sure your desk height is correspondingly increased, or use a variable height desk. I've seen optional covers that are designed to minimise pressure points, but I haven't tried these myself.





## KNEELING CHAIRS

The kneeling chair, first designed by Norwegian Hans Mengoel, keeps the pelvis tilted anteriorly, maintaining the natural curve of the back. A revolutionary design, the chairs were designed, and marketed, as task chairs. A number of versions exist, some with a degree of adjustability, some without.

A potential downside is discomfort due to increased pressure on the shins. Some versions tend to be quite low, and therefore don't always optimally address conventional height office tables. They also require an autonomous sitting position, resulting in the previously discussed possible attendant initial fatigue and acclimatisation.

## RECLINERS

Reclining chairs have become quite popular items of leisure-related furniture. They've not been used in office environments, perhaps they are too non-traditional and there's probably a stigma associated with 'lying down on the job'. However there's no reason not to employ a reclining position in a home office. Galen Cranz has her version; Winston Churchill, the political hero of World War II, famously worked while reclining in bed!

In reclining, as in the perching and kneeling positions, the pelvis is anteriorly rotated, maintaining natural curves in the back. When the axial compression of the spine is reduced there is support for the natural anatomical curves of the spine, which allows for efficient transfer of load through the skeleton. Visceral compression is also reduced.

There are issues with addressing a work surface or computer in this position. In particular, the head needs to be well supported; otherwise there is the risk of neck and thoracic stress. And a way needs to be found to support a keyboard or work materials, as well as arms. Some recent innovations have addressed these problems, workstations from Altwork and notable example. There's always going to be a space issue, and they certainly come with a premium price! However for those with acute back pain they could be the best option!

## STANDING

We are seeing a recent revolution in office culture with the wide scale introduction of standing desks, or sit/stand variable height seating. This change has been partly brought about by changing office roles, with people moving around more, prevalent use of computers being the only required work interface – meaning less desk real estate is required – and increased awareness of the risks of sitting.

What I like about this option is that it eliminates or at least substantially reduces the need to sit at all. And, as you may have come to see by now, there





really isn't really such a thing as an ideal seat.

Once again, the transition between having used a seat all ones life, to standing might take some . If you don't stand a lot during the day your muscles aren't going to be up to standing full time. Also, there is a question about how good a standing posture you might have. The answer here is to sit part time and stand part time. Sit/stand desks that provide flexibility to regularly move from sitting to standing – particularly those with the additional ease and speed of an electric mechanism. I think they are best coupled with the type of seating that easily allows this transition, such as a perching type seat/saddle chair. As you're already halfway to a standing position, it's easy to move from sitting to standing and the sit/stand mechanism is solves the potential issue of height, leading to optimal monitor and

keyboard positioning.

Whatever your choice, remember that *no* sitting is optimal, nor standing in the one position. Get up, move and stretch often, and generally keep yourself in shape to counter some of the long-term issues or risks. ●

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# THE WORLD'S LEADING STANDING DESK.

