Introduction

About 80% of us will experience back pain at some stage in our lives. A number of work and leisure activities can contribute to back pain, but if you spend long hours driving, you may suffer from prolonged discomfort or pain in your back.

Sitting in the same position for long hours gripping the steering wheel and being exposed to vibration from the road can contribute to the wear and tear on your back, but there are things you can do to reduce your chances of suffering from back pain.

- Vary your work activities as much as possible during the day. Swap between the roles of driver and comms officer so that your posture changes. Try not to keep the same role for more than four hours.
- Take a break from driving every couple of hours.
- Make sure you get out of the vehicle as often as possible, move about and carry out small stretches if you can. Do not carry out any sudden intense physical activity (such as lifting, bending or stretching) without warming up first.
- Make small adjustments to your driving position every couple of hours.
- Follow the posture guide on the following pages to make sure you are sitting correctly.

With thanks to Professor Mark Porter and his Design and Technology team at Loughborough University. Mark has 30 years experience of working in vehicle ergonomics for manufacturers, suppliers, occupational health professionals and drivers.
Driving Posture Guide

Start with the initial set up position, where adjustable:

- Steering wheel fully up and fully forward.
- Seat height at its lowest.
- Cushion tilted so that front edge is in lowest position.
- Back rest approximately 30 degrees reclined from vertical.
- Lumbar adjustment backed off.
- Seat fully rearwards.
1 Raise the seat as high as is comfortable to improve your vision of the road.
   - Check you have adequate clearance from the roof.
   - Ensure you have maximum vision of the road.

2 Move the seat forwards until you can easily fully depress the clutch pedal and the accelerator pedal.
   - Adjust the seat height as necessary to give good pedal control.
3 Adjust cushion tilt angle so that the thighs are supported along the length of the cushion.

- Avoid pressure behind the knee.

4 Adjust the backrest so it provides continuous support along the length of the back and is in contact up to shoulder height.

- Avoid reclining the seat too far as this can cause excessive forwards bending of the head and neck and you may feel your thighs sliding forwards on the cushion.
5 Adjust the lumbar support to give even pressure along the length of the backrest.
- Ensure lumbar support fits your back, is comfortable with no pressure points or gaps.

6 Adjust the steering wheel rearwards and downwards for easy reach.
- Check for clearance with thighs and knees when using pedals.
- Ensure display panel is in full view and not obstructed.
7 Adjust the head restraint to ensure the risk of injury is reduced in the event of a car accident.

8 Adjust the rear view and side mirrors ensuring that they can be used without excessive straining of the neck or upper body.

*Repeat 1-8 and fine tune as necessary*

Be aware that many vehicles will not allow you as much flexibility of driving posture as you may wish. Particular vehicles may cause you to adopt a coping posture. For example, limited headroom forces a reclined posture, making reach to the steering wheel a problem. This leads to excessive forward bending of the head and neck and a slouched posture.

The Highways Agency is investigating the ergonomics of HATO vehicles, but if you find that you experience discomfort when driving please raise the issue with your supervisor or health and safety representative.

*For more information please visit the Driving Ergonomics website: www.drivingergonomics.com*
Driving Ergonomic Resources

Driving Ergonomics
http://www.drivingergonomics.com/

Safety Articles and Tips from Safety Services Company

Ergonomics and Healthy Habits

- By using an ergonomically correct seat and developing good habits while driving, you can combat the stress and unhealthy conditions it may pose.

- Add extra padding over your seat as needed. This way, your seat absorbs much of the vibration from the vehicle.

- Adjust your seat and steering wheel in such a way that you can step on the pedals without having to move your lower back forward off the back of the seat.

- Keep the back of your seat tilted at 110 degrees from your legs to minimize pressure on your spinal disc.

- Support your lower back by placing a pillow or rolled-up towel between it and your seat.

- When going on long trips, tilt your seat a notch or two every 20 minutes. This effectively changes the direction of the vibration on your body.

- Break your driving into sessions by taking at least 5 minutes of break every hour. Take the opportunity to rest and stretch a little during each break.

- Regularly change your seating positions while driving to avoid poor circulation of your blood.

- Never slouch while driving.

- Right after driving, rest for a while before lifting heavy baggage. The same is true if you have to perform strenuous work. Rest for a couple of minutes and do some stretches before carrying out with your task.

Driving and Ergonomics
Source: Canadian Centre for Occupational Safety and Health
http://www.ccohs.ca/oshanswers/ergonomics/driving.html#_1_7

Is sitting in a car seat the same as sitting in a chair?

No, even though you are sitting, they are different activities. When you use the steering wheel, your hands and arms are higher than when you are working at a desk. To operate the brake and accelerator pedals, you have to extend your legs more forward than you would when sitting at a desk. One foot may be flat on the floor and the other at an angle to operate the accelerator and brake pedals. If your vehicle has a standard (manual) transmission, you must use the other foot on the clutch and one arm and hand to operate the gear shift.
In addition, your body experiences up-and-down vibrations from the car travelling on uneven or bumpy road surfaces and the body moves sideways when you turn on corners. Depending on how fast you accelerate or decelerate, you will feel a force on your body.

**Can driving cause discomfort or pain?**

Yes. Discomfort and lower back pain are frequent complaints reported by drivers. In the United Kingdom, the term "repetitive driving injury" (RDI) has been used. These injuries include foot cramps, low back pain, stiff neck, and sore shoulders from poor posture, stress, tension, and staying in one posture or position for a extended period. RDI is a form of a work-related musculoskeletal disorder (WMSD). See the OSH Answers on musculoskeletal disorders for more information.

**What occupations are at risk?**

Any person who spends a lot of time in a vehicle (car, truck, ambulance, etc.) is likely to experience aches and pains. Drivers tend to experience pain more often as it is more difficult to shift body positions while driving. However, passengers can also feel the same effects if they are sitting in a vehicle for prolonged periods without changing position or getting out of the vehicle and stretching or taking a break every hour or two.

**What causes these aches and pains?**

Causes include:

- Poor posture - from personal habit , or from an improperly adjusted or fitted seat
- Low frequency whole-body vibration in moving cars and trucks can contribute to effects on the lower back
- The shape of the vehicle seat itself may put pressure on selected parts of the legs, back and buttocks. This contact can lead to pain or discomfort at pressure points and may affect blood flow to the legs and feet.

**In general what do I need to know to improve driving comfort?**

To be comfortable while driving, look for features such as the interior of the vehicle designed to provide postural and thermal comfort, sufficient "room" or space, acceptable noise levels, and adjustable features that allow the driver to fit the vehicle to their needs.

A vehicle's interior must be adjustable so drivers of different heights and shapes can:

- reach the pedals and controls,
- have sufficient headroom,
- sit high enough to see out the front and side windows and mirrors,
- reach the steering wheel without stretching the arms.

The driver should have sufficient room (25 - 30 cm or 10 -12 in) between the steering wheel and his or her chest (breast bone) in order for the seat belt and air bag to provide the maximum safety protection in case of a crash. The steering wheel column should not interfere with leg movement or bump the knees when getting in and out of the vehicle or while steering and operating the pedals.

**More specifically, what do I look for when selecting a vehicle?**

Consider the following factors:
Does it match requirements for the body size of the driver(s) and any physical limitations the driver(s) may have?

Do the layout and ergonomic features of the vehicle (e.g., steering wheel, seat, pedals and other controls, displays) meet your needs?

How much time per day does the driver use the vehicle and what distance does he or she drive per year?

Does it have features that assist in the kind of work the driver does, e.g., an easy to load trunk for a salesperson who takes samples to clients?

If buying vehicles for a specific group of workers, ensure that they are able to provide input on the selection of vehicles.

Examine various aspects of a vehicle, such as:

**Getting in and out the vehicle**

- Are the door handles easy to grab and operate, including when the driver is wearing gloves?
- Does the open door provide enough space to get in and out easily (without stooping or banging your head on the door frame; and without bumping their knees on the bottom of the dashboard / instrument panel and steering column)?
- If the driver has to climb up and down to enter the vehicle cab, are the steps and handholds (or ladder and grab handles) located appropriately and designed to prevent slipping when if wet or snow-covered. If the step height is high (e.g., SUVs and pick-up trucks), does it have or can you add a running board?

**Sitting in the cab**

- Is it comfortable and sufficiently spacious for the occupant to sit in and maintain a neutral posture (i.e., in a position that places the least strain on the body)?

**Seats**

- Is the seat comfortable (if possible, drive for about an hour)? Is there enough headroom so you do not slouch or bump your head if the car hits ruts or potholes?
- Does the seat support the full length of your thighs and all parts of your back?
- Can you independently adjust the:
  - seat height from the floor,
  - seat cushion angle,
  - seat back angle (tilt), and
  - distance between the seat back and the steering wheel?

When properly adjusted, the driver should be able to reach the pedals, steering wheel and other controls without stretching the legs and arms and should have a good view of the instruments, gauges, and all mirrors, and a good vision through the front and side windows.

- Is the length of the seat pan (seat cushion) adjustable? There should be about 2-3 fingers width in the space between the front of the seat cushion and the back of the driver's knee. If it is too long, it will exert pressure on the back of the knees, be uncomfortable, and may impede proper blood circulation in the legs and feet.
- Is the seat pan (cushion) contoured to better distribute the weight on the seat and prevent or minimize pressure points on the buttocks?
- Is most of the seat upholstered in a breathable material (for thermal comfort)? The edges of the seat pan and back can be finished in plastic or leather to minimize wear and to make it easier to slide in and out of the seat.
- Is the seat pan material ribbed? Horizontal ribbing on the seat cushion helps to prevent slipping forward and vertical ribbing in the back helps to prevent sideways movement.
- Will the seat and seat belt accommodate drivers who are wearing heavy winter coats or protective clothing?
Seat Back Rest and Lumbar Support

- Is the seat back rest high and wide enough to support your shoulders? The back rest should be shoulder-height and not interfere with rear-view vision.
- Does the seat back rest have adjustable lumbar (lower back) support? The back rest should be in contact along the full length of the driver's back. The lumbar adjustments (in and out, up and down) will enable the driver to fit the back rest to his or her back and be more comfortable.

Seat Belt

- Does the vehicle have an adjustable shoulder belt anchorage on the B-pillar (the pillar between the front and back door) that can be moved up or down? This adjustment lets the person position the shoulder belt so that rests on the middle of the collar bone (clavicle) rather than on neck or off the shoulder.
- Does the vehicle have an auditory signal if the seat belt is not buckled?

Head Restraint (Head Rest)

Although commonly called a head rest, it should be called a head restraint as it is designed to restrict head movement when a vehicle is hit from behind. The head restraint offers more protection when it is close to the head as the restraint will come in contact with the head faster and the contact lasts longer during a rear-end collision. A well-designed head restraint will decrease the likelihood of the neck bending backwards and causing whiplash.

- Is the head restraint adjustable for height and for the angle forward and backward?
- Can the head restraint be locked in position? If not, the head restraint may move during a collision and the driver (and passengers) may experience whiplash.
- Is the head restraint in the most effective position?
  - Height - as high as the top of the occupant's head, but it should not be lower than 6 cm (about 2.5 in) from the top of the head (i.e., not lower than the height at the top of the ears)
  - Backset - the distance between the back of the occupant's head and the front of the head restraint - the head should be as close as possible to the head restraint: an acceptable distance is about 7 cm (2.75 in) or less but it should not be greater than 10 cm (about 4 in).

Air Bags

The air bag is an additional occupant restraint device and should never be considered as substitute for a seat belt. A seat belt alone can protect drivers from injury in slow speed collisions, without the air bag deploying. The air bag is designed to deploy in cases of higher speed, frontal impact. If an air bag is deployed while the occupant is not wearing a seat belt, injuries are likely to occur. An air bag alone will not prevent an occupant from being ejected from the vehicle.

- How many air bags are present?
- Does the vehicle have side air bags that can offer protection for the side of the torso in the event of impact from the side?
- Does the vehicle have curtain air bags that can protect the occupants' heads from sideways impact and from broken glass?

Steering Wheel

- Does the vehicle have power steering which requires less effort to use?
- Will the steering wheel adjust up or down, and in or out?
- Does the steering wheel have tilt-away feature to make it easier for the driver to get in or out of the car?
- Can the steering wheel be positioned so it does not obscure the display panel?
- Is the steering wheel column collapsible in case of impact?

Pedals and Gear Shift
• Does the vehicle have fixed or adjustable accelerator, brake and clutch pedals to accommodate leg length?
• Do the adjustable pedals have a retractor safety system that does not allow feet to be caught between the pedals and the floor?
• Are the pedals far apart enough to accommodate drivers with large footwear or winter boots?
• If a manual transmission, is the gear shift in a comfortable position and is it easy to shift in all gears?

**Trunk**

• Does the trunk lid open to give you adequate head space?
• Is the trunk floor a suitable height from the ground to enable the driver to load and unload the trunk without having to stoop or lean into it?
• Does the sill (or lip) of the trunk level with the floor of the truck so that a driver can load the trunk by sliding the item onto the trunk.
• How close to the trunk interior can you get; that is, how "thick" is the sill or bumper? Shorter distances are easier for loading.
• Is there a cargo net, anchor points, straps or other means for securing the load to the floor and prevent material from entering the passenger zone in case of a collision or rollover?
• Is the back seat a folding seat or a split seat (either or both parts of the seat fold forward). Folding seats may be weaker than fixed back seats and may not secure a heavy load in the event of a severe frontal collision. This difference is the reason for needing properly installed anchor points or tie-offs in the trunk floor.

**Car Environment**

• Does the vehicle have adequate temperature and humidity control systems (heating, air conditioning, ventilation, HVAC) to maintain comfortable conditions in both winter and summer seasons, and help maintain good vision by keeping the windows clear of fog or frost?
• Is the vehicle interior sufficiently quiet to enable easy communication with passengers in the front or back seat. Low noise levels also make driving more relaxing and less stressful.

**How do I adjust the driver's seat to fit me?**

Read to vehicle manual and understand all the adjustments that you can do (e.g., seat position, backrest angle, headrest position, steering wheel height and tilt, seat belt, mirrors). Common adjustments include:

1. **Seat height** - raise the seat as high as you can but still be comfortable. This height will optimize your vision through the windows. You should be able to see at least 76 mm (3 in) over the top of the steering wheel. Ensure that you have sufficient room between the roof and the top of your head. Adjust the mirrors after you have finished setting the other features.

2. **Seat cushion length**, if possible - adjust the seat length so that the back of your knees is about 3 - 6 cm (about 1-1/4 to 2-3/8 in) from the front on the seat.

3. **Seat forward/back position** - move the seat forward until you can easily push the pedals through their full range with your whole foot, not just your toes. You may have to readjust the seat height to get better control of the pedals.

4. **Seat cushion angle** - tilt the seat cushion until your thighs are supported along the full length of the cushion without there being pressure at the back of your knees.

5. **Seat back rest** - adjust the back rest until it supports the full length of your back when you are stilling upright. If you are leaning too far back, you may end up bending your head and neck forward, which may cause muscle fatigue, neck or shoulder pain, tingling in the fingers, etc.
6. **Lumbar support** - adjust the lumbar support up-and-down and in-and-out until you feel an even pressure along your back from the hips to shoulder height. As this point, the seat back should feel comfortable and there should be no gaps or pressure points in the back support area.

7. **Steering wheel** - adjust the steering wheel for height or tilt and pull it back for easy reach. The centre of the steering wheel should be about 25 - 30 cm (10 - 12 in) from the driver's breast bone. The closer you are to the air bag, the higher the possibility of injury if the air bag deploys, even if you are wearing a seat belt.

   If your steering wheel can be tilted up-and-down, tilt it so the air bag behind the centre of the steering wheel is pointing to your chest, not your head and neck or your stomach. In addition, your arms should be in a comfortable position (not too high or too low).

8. **Head restraint (head rest)** - while sitting, raise the head restraint until the top of it is level with top of your head. If the head restraint can be tilted, adjust the angle of the head restraint until is practically touching the back of your head when you are in your sitting posture.

9. **Fine tuning** - you may have to go through steps 1 - 8 again if you need to optimize the way that vehicle cab fits you. You should be able to reach and operate all of the controls, pedals, the steering wheel, etc., and have good visibility through the windows and mirrors.
Position your elbows just six inches closer to your side to cut the force in half every time you reach, lift, carry, push or pull.

**Green Zone**

Leverage is better when the load is closer.

As the load gets closer to your body, your leverage increases. This means your muscles do less work when you lift in the green zone. Your muscles must do much more work to lift the same object in your red zone.

**Yellow Zone**

When your elbows move away from your side in any direction, you are working in your yellow zone.

The outer limit of the yellow zone is about six inches out from your side. The force on your shoulder and upper back can more than double when your elbow is in this position.

**Red Zone**

Stop and think: How can I get my elbows just 6 inches closer?

As your elbows move farther out into the red zone, the strain moves to the joints of the low back. Some of these muscles have very poor leverage. In fact, in the far red zone, handling a 10-pound load can result in up to 500-pounds of force on your low back.
WHAT CAN I DO TO PREVENT SLIPS, TRIPS, AND FALLS?

**WORK AREA**
- Wear appropriate slip-resistant shoes.
- Slow down to negotiate turns, corners, obstacles, and areas of limited visibility.
- Keep workspace and walkways clean, clear, and well lit for you and your visitors.

**WET FLOORS**
- Clean up wet areas and spills immediately.
- Make sure signs warn others of the danger of wet surfaces when mopping.
- Use caution in areas where wet floors are likely: entrances, rest rooms, and mopped floors.

**PARKING LOT AND GROUNDS**
- Stay alert for uneven surfaces.
- Watch for curbs and potholes when moving between vehicles.
- Assume there is ice if the temperature is close to freezing; slow down and take short strides.

**STAIRS**
- Take only one step at a time.
- Keep one hand free to grasp the handrail.
- Limit your load and make sure your vision is not obstructed.

**CORDS**
- Do not allow electrical cords or other objects to extend across a walkway.
- Tie up any cords that might pose a trip hazard.
- Tape down or secure cords temporarily located in traffic areas.

**LADDERS**
- Stand on a ladder instead of a chair, table, bucket, or box.
- Use the correct ladder for the job.
- Never step on the top platform of any ladder, including a stepladder.
Is it time to replace your footwear?

Replace your shoes when the worn area of the sole is larger than two pennies.

More reasons to replace footwear:
- Cracks in the sole go all the way through.
- Chunks or pieces of the sole are missing.
- The sole begins to separate from the upper.
- The fabric or leather on the top of the shoe develops holes.

Slips, trips, and falls cause 15% of all accidental deaths, second only to motor vehicles.

Falls and equipment mishaps are the two most common causes of injury for younger workers.

Falls are the leading cause of both fatal and non-fatal injuries for adults ages 65 and older.

In the workplace, slips, trips, and falls cause over 300,000 injuries per year, and average one every two minutes

Occupational Safety and Health Administration and the National Safety Council

For printable posters and brochures visit: www.saif.com > Employer Guide > Safety

PREVENT SLIPS, TRIPS, AND FALLS

IF YOU NOTICE A HAZARD, ACT.
Strengthen and Lengthen

Improve core strength and muscle tone with these active exercises before you work or during breaks. Consider using this time to discuss safety issues, too.

Arm circle while stepping
Warm up your entire body by making large circles with your arms while marching in place.
One minute

Five, side to side
Stand upright with arms relaxed. Take five wide sidesteps to the right and then to the left.
Repeat five times

Deep lunges
Take a large step forward into a deep lunge. Keep torso straight and upright. Feel stretch in thigh and groin. Do not let your forward knee go past your ankle. Hold 12 seconds.
Repeat three times, each side

Chest stretch
Hold bar (or pretend to) behind neck, arms bent at elbows 90 degrees. Gently pull bar backward away from head until you feel a stretch in the front of the shoulders. Hold for 12 seconds, then relax.
Repeat five times

Buttock strengthen
Stand straight, extend one leg backward contracting buttock muscle. Keep trunk upright. Hold 12 seconds.
Repeat three times each side

Standing crunches
Stand straight, tighten stomach muscles by pulling rib cage and pelvis together. Hold 12 seconds.
Repeat five times

Back extension
Place hands on hips. Slowly bend backward, keeping knees straight. Do not extend your head. Hold 12 seconds.
Repeat five times

If you have an existing muscle, joint, or disc injury, or experience pain with exercise, consult your doctor before doing exercises.

Exercise slowly, don’t bounce!

Source: Jennifer Hess, DC, MPH, PhD
University of Oregon
Labor Education and Research Center
A decade of sports medicine research confirms that moderate warm-up exercise benefits both physical performance and injury prevention.

**Warm-ups help prevent strains and sprains**

In the world of peak-performance sports, and in military training, a decade of scientific research has repeatedly demonstrated that athletic performance increases, and soft tissue injuries decrease, when athletes engage in moderate dynamic warm-up exercises shortly before their event.

**How does this research apply to workplace injury prevention?**

Five to ten minutes of moderate warm-up exercise, done before starting work activity, is now considered a safe and effective method for reducing the incidence and severity of soft tissue injuries.

Moderate is a key concept when warming up. A study by the University of Calgary published in May, 2011, suggests that any warm up exercise, when done for too many repetitions or too long a time period, results in muscle fatigue that reduces both the improved performance and injury prevention benefits.

(Continued)
How does this research apply to workplace injury prevention? (continued)

Static stretching is recommended as a valuable part of a well-rounded fitness or rehabilitation program if the following guidelines are followed.

- Warm up before doing any kind of stretching exercises.
- Avoid stretching immediately before weight lifting, sprinting, or other activities (including work activities) that require explosive muscle power.
- Avoid pain. Experts agree that you should gradually improve your range of motion. It is normal and safe to feel tension increasing during a stretching exercise. But if you start to feel pain, back off the tension a bit.
- Use slow steady motions, and well-balanced positions, when stretching. Be aware that fast motions, or unexpected motions caused by loss of balance, can result in strains and sprains.
- Avoid bouncing motions. “Ballistic stretching” may be appropriate if guided by a well-informed trainer or coach. But bouncing while stretching has the potential to create small muscle tears and stiffness.
- Don’t stretch a recently injured muscle unless directed to do so by your doctor or physical therapist.
- Stretching should be part of a fitness program that includes strength training and cardio; a healthy, injury-resistant body requires all three.

Articles that support dynamic warm up as beneficial for performance improvement and injury prevention


