

**i** Assisted by gravity and diaphragmatic movement

## Digestion

Gravity aids digestive function throughout the whole digestive system, however, the digestive system, cannot work effectively if the individual has a collapsed posture (posteriorly tilted pelvic and kyphotic spinal curvature):

- Affects the ability of food to pass along the digestive track
- Affects bowel function which can lead to constipation
- Can cause aspiration with swallowing
- Can set off primitive reflexes such as the gag reflex or tongue thrust

Tilting the individual will extend their trunk, which in turn will allow easy passage of food from the mouth to the oesophagus and improve their head and neck position, which are directly related to the position of the trunk.



## Vision

Tilt extends the trunk as already mentioned, which in turn, impacts the position of the head and neck. Individuals who, when seated, exhibit a collapsed posture with a flexed head and neck can be assisted via tilt to extend their head and neck, helping expand their visual field.

**i** Expands visual field

## What are the contraindications for the prescription of tilt?

- Individuals with indwelling catheters may experience backflow of urine, if, and when, in tilt
- Functional reach may be impacted
- Sensory processing issues - especially for those with vestibular or tactile problems
- Elevating the front of the wheelchair can affect access under tables etc.
- Greater tilt angles may cause a possible threat for physically limited users
- Using a tray - items may slip or fall off

## Anterior tilt – considerations for use

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- Management of tone and abnormal reflexes
- Access under tables and surfaces
- Improved functional reach

Anterior tilt, a forward tilt angle as opposed to backwards, can have exceptional benefits for a wheelchair user both functionally and physiologically.

Stavness's paper entitled 'The effect of positioning for children with cerebral palsy on upper extremity function: a review of the evidence', found the majority of published studies support the positive effects of a neutral to slightly anterior orientation. The range of anterior slope may range from 0 – 15 degrees and is best utilised with a pelvic positioning belt.

Anterior tilt can provide exceptional benefits to wheelchair users, both functionally and physiologically. For some individuals just a small change in the angle of orientation anteriorly can effectively manage tone and abnormal reflexes, which can often interfere with function. In addition, small amounts of anterior tilt lowers front seat-to-floor height and can be the difference between getting under a table/desk or being limited by the lower extremities. Many power wheelchair users would be able to use anterior tilt to assist with functional reach, making the user independent when performing mobility-related tasks such as self-care, hygiene, cooking, cleaning, laundry and much more!



## Setting the tilt on the TDX SP2:

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The Ultra Low Maxx seating system on the TDX SP2 can be set to a predefined anterior or posterior tilt:

- 5° anterior tilt - reduces the maximum possible tilt by 5°
- 10° anterior tilt - reduces the maximum possible tilt by 10°
- 5° posterior tilt - increases the maximum possible tilt by 5°

For more controls information in relation to powerchairs, take a look at our, 'Clinical Guide to Powerchair Provision' document available at [clubtherapy.com](http://clubtherapy.com).

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# The Clinical Benefits of Powered Tilt

## What is tilt?

“Tilt systems change seat angle orientation in relation to the ground, while maintaining the seat-to-back and seat-to-legrest angle” (RESNA 2015).



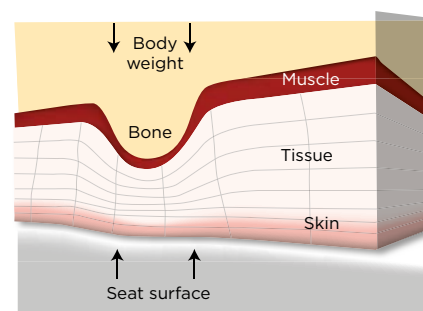
## What is tilt most commonly prescribed for?

- Enables weight shifting by redistributing pressure away from the buttocks, especially the Ischial Tuberosities (IT's), to the back
- Provides a change in posture for users who cannot independently shift their bodyweight
- Helps promote good seating alignment and decreases the potential for postural deviations

However, changes in body position are also necessary to address issues related to function, physiology, transfers and biomechanical issues, contracture or orthopaedic deformities, oedema, spasticity, comfort and dynamic movement.

## Does existing research identify at what point pressure becomes harmful to the human body?

To date, research has not identified a specific threshold at which loads can be deemed harmful across people or sites on the body. However, it does show that the damaging effects of pressure are related to both its magnitude and duration. Pressure magnitude is managed by the support surface and postural controls as well as body posture, while duration is addressed via turning and weight shifting frequency to actively redistribute pressure.



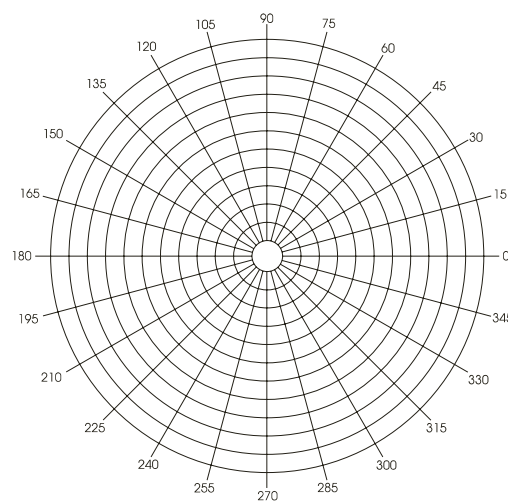
# The Clinical Benefits of Powered Tilt

## What does research say about tilt in relation to pressure relief?

At present, there is no defined angle for optimal pressure relief, but at clinic level, it is suggested tilting anywhere from 30°- 65° or “as far back as the system will go” to relieve pressure.

Studies looking into the effects of tilt report the following:

- A minimum of 30° tilt is required to:
  1. Initiate unloading of the sacrum
  2. Achieve a clinically significant reduction in pressure at the Ischial Tuberosities (IT's) (Giesbrecht et al, 2011)
- Tilting to 20° resulted in an 11% reduction in interface pressure and eliminated shear forces. (Hobson et al, 1992)
- 45° tilt resulted in a 45% reduction of interface pressure over the IT's. (Burns et al 1999)
- 25° tilt resulted in a 22% reduction of interface pressure. (Vaisbuch et al, 2000)



An interesting new finding sheds light on dosage of tilt. Performing tilt of 35° with recline of 120° for a duration of three minutes is more effective than a duration of one minute in enhancing skin perfusion (Yih-Kuen Jan et al, 2012). RESNA 2015

Considering the existing research on tilt alone, it must be greater than 25° to achieve pressure relief and/or tissue perfusion at the ischial tuberosities (IT's).



## Invacare TDX SP2 with Ultra Low Maxx

At Invacare, our TDX SP2 with Ultra Low Maxx powerchair offers a maximum tilt of 50°. Not only does this ensure effective redistribution of pressure for ischial relief and tissue reperfusion, it also warrants sufficient tilt for effective positioning of the individual. Not forgetting the importance of comfort, the ability to tilt to 50° offers the user the ability to find a position of comfort optimal for them.

It should be noted, however, in order to provide the most effective pressure relief, the literature recommends the use of tilt in combination with recline. The TDX SP2 with Ultra Low Maxx powerchair, therefore, offers 50° tilt with 170° back rest recline for optimal performance. With its centre of gravity adjustment, the compact wheelbase remains stable during both the tilt and recline cycles.

**i** When we sit, the force of gravity pushes down on our body

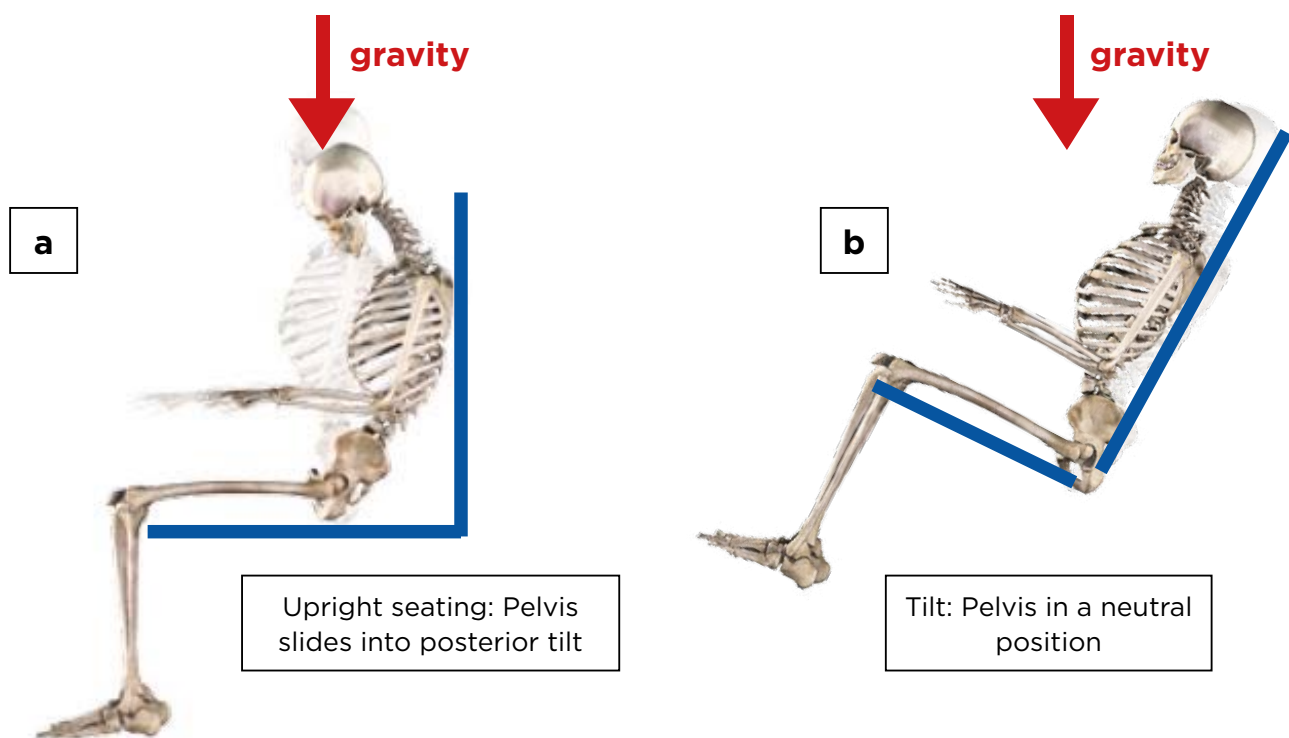
## Benefits of tilt explained

### Postural alignment - Gravity assisted positioning

For individuals with compromised muscle strength, gravitational forces impacting on the body cause the user to become slouched in their wheelchair and exhibit a posteriorly rotated pelvis and kyphotic (C-shaped) spine. This may happen due to fatigue caused by sitting in the wheelchair too long or reduced sitting ability, in which the user's muscles are not strong enough to fight against the force of gravity, preventing them from being able to maintain an upright posture.

A slumped or kyphotic posture increases the risk of secondary complications, such as tissue adaptation and contractures; respiratory and breathing problems, digestive issues, bowel and bladder problems or complications with vision and communication. It can also compromise the cardiac system, affecting blood flow around the body, increasing the likelihood of pressure injuries occurring as oxygen and nutrients transported in the blood are unable to reach muscles and tissue.

Tilt reduces the effects of gravity as illustrated in images (a) and (b) below. Tilting the wheelchair helps control pelvic movement and prevent sliding, creates trunk extension, as well as assisting with trunk, head and neck positioning.



## Respiration and breathing

When an individual cannot maintain an upright seated posture, such as in image (a) above, respiratory function becomes compromised as the diaphragm is unable to function optimally.

The diaphragm is a large dome shaped muscle which separates the thoracic and abdominal cavities. As we breathe in (inhale), the diaphragm contracts downwards, this elongates the lungs filling them with air which pushes the abdomen forward, a process referred to as abdominal breathing. Next, the intercostals muscles draw the lower ribs upward, expanding the chest from side to side. Finally, towards the end of inspiration, the upper ribs are drawn forward and up.

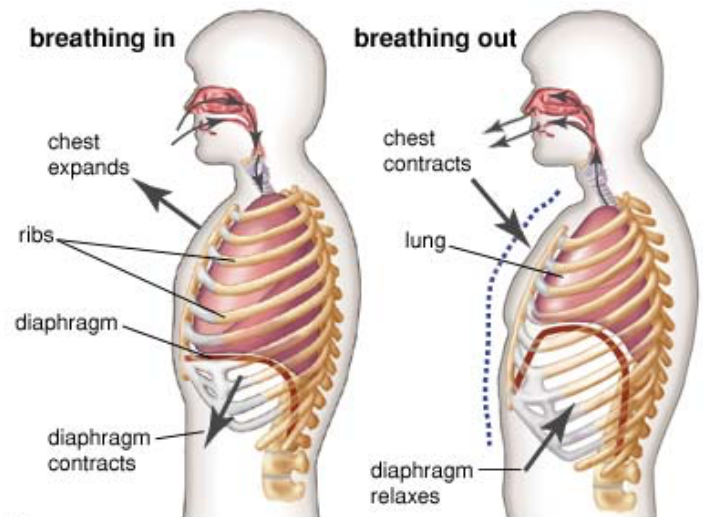
In image (A), the individual's lungs are not able to fully expand, which can result in shallower and faster breathing, difficulties taking a deep breath or even the lower part of the lungs collapsing.

Neuromuscular disease and skeletal abnormalities can both contribute to a compromised respiratory system. In neuromuscular disease, including cervical spinal injury, the diaphragm may be weakened, placing a greater burden on the intercostals and accessory muscles. Skeletal abnormalities can also alter the shape of the diaphragm, affecting its overall function. Indications that respiration is being compromised include shortness of breath or a shallower, faster breathing rate.

## Spasticity

Individuals who suffer from spasticity can find that movement of a joint triggers spasticity in their body, making it difficult for them to maintain an optimal sitting position. Tilt systems maintain static joint angles, meaning they do not change.

**i** Postural stability supports the diaphragm



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## Tilt helps to:

- Create thoracic or trunk extension allowing the diaphragm to contract and relax optimally, permitting lung expansion and movement of the chest wall and abdomen.
- Posterior stability of the spine provides the anterior stability for the rib cage to expand.
- Helps alleviate back and neck pain which may be associated with respiratory dysfunction as the muscles work to achieve postural control.

**i** Joint angles remain static - stops spasticity being triggered