Task Chair Ergonomics

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CHAIR MECHANICS

Chair Tilts - Passive vs. Active

Chair tilts enable a task chair seat and back to move. Tilts are also called controls or mechanisms.

Tilts can be divided into two categories –
passive
active

A "passive" tilt means two things.

- The seat and back move automatically in response to your movements.
- The seat and back are connected, which means they move in a predetermined pattern or angle.

An "active" tilt also means two things.

- You determine the angle of the seat and/or back by raising a lever that "loosens" the seat and/or back, thus allowing you to change their position, and then "locking" them in place by releasing the lever.
- The seat and back are independent of each other, allowing you to set the seat and back at any angle that works for you.

"Active" tilts are also call "asynchronous" tilts because the seat and back are independent … not synchronized.

Engage

Impress

A passive tilt is found on Engage and Impress.

Kismet

An active tilt is found on Kismet.

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Which tilt is "better"? The majority of ergonomists (though not all) would say a passive tilt is preferrable since it encourages periodic changes in position thus enhancing blood flow and "unloading" specific muscle groups.

Types of Passive Tilts
There are several types of passive tilts.

One of the most common is the synchrotilt. The action of the seat and back are "synchronized" such that for every two degrees the back relines, the rear of the seat "drops" one degree.

The synchrotilt is popular because the tilt action opens-up the torso angle, which is a comfortable position for most people.

A knee-tilt maintains the same seat to back angle and pivots from a position under the knee. Why? This keeps the user's feet flat on the floor.

A center-tilt also maintains the same seat to back angle but pivots from a position near the center of the chair. This usually results in the user's feet coming off the floor, which is a undesirable.

The majority of KI's task chairs are synchrotilts, such as Engage, and Impress.

KI has two knee-tilt chairs – Allude and Heroic.


Allude


Heroic

KI does not have any center-tilt chairs.

Counterbalance Tilts
Synchrotilts have been the most popular tilt in recent years. However, a new type of passive tilt is gaining in popularity.

This new tilt came about due to three factors:
- People generally do not adjust back tension on synchrotilts.
- Synchrotilts are heavy and reduce the mobility of chairs.
- Synchrotilts are expensive.

This new tilt is a counterbalance mechanism, which uses the person's body weight to control back articulation. Back tension is thus automatically "set" by the user's weight. Counterbalance mechanisms are less bulky than synchrotilts (weigh less) and are less costly to manufacture.

The counterbalance principal was first used in a stack chair designed by Giancarlo Piretti, the Piretti Stack Chair. Since then, it has been used in task seating such as Allsteel's #19, Knoll's Life, etc.

Counterbalance mechanisms achieve the same benefit of a synchrotilt – opening of the torso angle – without the above three negative factors.

Seat Depth Mechanism

Most seat depth mechanisms allow the depth of the seat to vary via a ratchet-type control: a handle is pulled up, freeing the ratchet – the seat is then moved to the desired position – the handle is dropped, falling into one of the ratchet "teeth" to secure the seat position.

Why have seat depth adjustment? Simply because individuals – who may be the same height – have different leg lengths.

Seat depth adjustment eliminates two undesirable situations:

- a person with long legs lacking adequate thigh support due to a short seat, and
- a person with short legs having to sit forward in the chair to avoid having the front edge of the chair "cut" into the back of their knees; in this position, they lose the support of the back.

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Back Height or Lumbar Adjustment

Just as no two individuals have the same fingerprints, no two individuals have the same back curvature.

The natural, stress-free inward curvature of the lower back or lumbar is called lordosis. This curvature is similar in appearance to the letter "S". Lordosis results in even distribution of body weight over the discs of the vertebrae.

An unhealthy curvature of the spine is called kyphosis. This results from slouching or bending forward and leads to a flattening of the natural lumbar curve. If chronic or done over long periods of time the result may be back problems due to pressure on the spinal discs plus strain on the ligaments and muscles.

To promote healthy curvature of the spine (lordosis), most chairs have a built-in lumbar curve in the chair back. However, since no two individuals have the same back curvature, it is necessary that the position of the lumbar curve can be adjusted.

Adjusting back height has two advantages:

- Correct positioning of the chair's lumbar support in relation to the user's spine, and
- Correct position of the chair's upper back to support the user's upper back.

CHAIR SIZES

In the 1990's, some manufacturers offered a given chair model in three sizes, to fit different body types. The most notable example is Aeron from Herman Miller, available in A, B, or C sizes.

This trend is no longer common due in large part to the inventory / facility management issues of having a single chair model in more than one size. Instead, manufacturers have attempted to extend the adjustment range of a given chair size such that the chair can "fit" the majority of people in a facility.

We are seeing extended ranges to "fit" more people in the following adjustments:

- seat height
- seat depth
- back height
- arm height and width

CHAIR DESIGN

There are two competing trends in chair design, driven in part by advancements in chair comfort and ergonomics.

The most noticeable and prevalent trend among higher priced task seating is an expressly technical design – showcasing the structure or mechanics of the chair. One of the first examples of this was Miller's Aeron, followed by Miller's Mira, Steelcase's Think, Haworth's Zody, and now Miller's Embody.

A second trend is toward more tailored, "quiet" chair design such as Steelcase's Amia.

From an ergonomic standpoint, neither design has an advantage. It is simply a question of consumer preference.

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ADJUSTING YOUR TASK CHAIR

BIFMA has published a guide to task chair adjustment, which is reproduced below.

THE ULTIMATE TEST FOR FIT
The Work Chair

Seat Height
Users should be able to sit with their feet comfortably on the floor or footrest without undue pressure on the underside of the thighs. The thigh-to-torso angle should not be less than 90°.

Seat Depth
Users should be able to sit in the chair without undue pressure against the back of the knees, with their back properly supported by the backrest and with adequate buttock and thigh support.

Seat Width
The seat should be wider than the hip breadth of the user to allow space for movement and clothing. The seat width should not limit the ability to comfortably use the armrests (see Inside Distance Between Armrests).

Seat Pan Angle
The angle of the seat pan should allow the user to support their feet on the floor or footrest. Seat pan angles should not cause the user's torso-to-thigh angle to be less than 90□. Forward seat pan angles should not cause users to shift excessive weight to their feet or experience the sensation of sliding out of the chair.

Back Support

Seat Backrest Height
The ultimate test for fit is highly posture dependent. All backrests should provide adequate lumbar support and buttocks clearance. For tasks requiring upper body mobility, the backrest should provide adequate back support, but not interfere with the user's movement (typically these backs should not be higher than the bottom of the user's shoulder blades). For users who prefer reclining postures, or more upper back support, the back height should provide support for the shoulder blades.

Backrest Width
The width of the backrest should provide adequate support for the curvature of the user's back without causing localized pressure points.

ADJUSTING YOUR EQUIPMENT TO FIT YOU

Adjust the height
Your feet should rest comfortably on the floor or, if necessary, should be supported by a footrest. For most people the knees should be at a level equal to or slightly lower than the hips. Adjust the chair height to attain a natural inward curve of the spine and optimize the comfort of your lower back. If the chair is too low, your lower back will flatten or round out. If the chair is too high, your feet, and therefore your back, are unsupported. Circulation to the lower leg can also be compromised if the chair is too high.

Check the length of the seat pan
There should be 2-3 inches between the back of your leg and the seat of the chair. This will allow for a natural bend in your knees. If the seat pan is too short, it can create pressure points and discomfort in the back of the thigh. If the seat pan is too long, you will not be able to sit back in the chair. Some chairs have adjustments that shorten or lengthen the seat pan if necessary. Lumbar pillows can also be used as a method to improve the fit of a seat pan that is too long.

Adjust the seat pan and backrest angles
If your chair has seat pan and backrest angle adjustment, adjust the angle of each to support your work activities. The chair should support an upright position for keyboard activities. If your chair rocks or reclines, consider adjusting the tension to support upright postures for computer and desktop activities.

Adjust the lumbar support
The curve of the backrest should support the natural curve of your back. You should not feel too arched, nor should you feel unsupported. If your chair does not provide sufficient lumbar support, you might be able to use a lumbar pillow or towel roll to improve the fit.

Adjust the armrests
Armrests should adjust to match your elbow height when your elbows are relaxed at your sides. If your armrests are too long or too high, they will interfere with proper keyboarding position. Your armrests should allow you to keep your elbows relaxed at your sides and should not interfere with access to the work surface If your armrests do notadjust for proper fit, consider removing them.

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