Information Supporting Chair Options

Microscope Workstations

“Experts in this field, such as Stephen Pheasant, E. Grandjean, G. Soderberg, Dennis Zacharkow, Robin McKenzie and others, identify the benefits of sitting down to work as:

- To relieve the joints of the lower limbs of load bearing;
- To avoid working in unnatural positions;
- To reduce energy consumption making less demands on the respiratory and vascular system;
- To provide greater stability for fine work

These same researchers agree that there are also disadvantages to sitting, the most serious of these being the poor position of the spine, especially in the lumbar region. They also identify that sitting in a conventional seat compresses the chest and abdomen, which are thereby restricted in their function. While the abdominal muscles are deactivated, the back muscles must work hard to prevent falling forward so that when the back muscles eventually tire and the person ‘slumps’, the spine is then supported by the ligaments alone.” (8)

“Where microscopes are installed, consider cut-out work tables which provide an area for supporting the forearms while using adjustment knobs. The microscope should be elevated and angled appropriately to enable the user to look directly into the eyepiece whilst maintaining an optimal posture

Microscope workstations should be designed and installed at an appropriate height so that the user can adopt optimal work postures during task performance. There should be no fixed panels or cupboards underneath preventing the user getting close to workstations or their legs under the workstation when sitting at the microscope.” (2)

“Workstation adjustability is a key factor in our ability to adapt work areas to the constantly changing people, task, and equipment in the lab environment. Musculoskeletal Problems Reported By Microscope (3)”

Musculoskeletal Problems Reported by Microscope Users

<table>
<thead>
<tr>
<th>Anatomical Location</th>
<th>Employee Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neck</td>
<td>50-60</td>
</tr>
<tr>
<td>Shoulders</td>
<td>65-70</td>
</tr>
<tr>
<td>Back (Total)</td>
<td>70-80</td>
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<tr>
<td>Lower Back</td>
<td>65-70</td>
</tr>
<tr>
<td>Lower Arms</td>
<td>65-70</td>
</tr>
<tr>
<td>Wrists</td>
<td>40-60</td>
</tr>
<tr>
<td>Hands and Fingers</td>
<td>40-50</td>
</tr>
<tr>
<td>Legs and Feet</td>
<td>20-35</td>
</tr>
</tbody>
</table>

“The current workstations, have storage under the work surface which prevents the workers from raising the chair high enough to work in a neutral posture. A worker having to sit sideways because there is no leg room at his workstation. Working in an awkward posture can restrict blood flow and cause the employee to exert more effort to perform a task than working in a neutral position. The neutral posture is the optimal position of the body to exert the greatest force, promote blood flow and nerve conduction and reduce the risk of ergonomics related injury. Workers can spend 6 to 8
hours a day at the bench. Duration is an ergonomics risk factors which magnifies other risk factors such as awkward posture." (7)

**Precision work** Precision work demands focus and requires constant efforts and stability.

“(A) The natural ‘S” shape of the lumbar region of the human spine when standing (B) The spine is distorted into a kyphotic ‘C’ shape when sitting on a conventional seat. (C) Leaning forward on a conventional seat not only deforms the spine further increasing intradiscal pressure but also produces compression of the thorax and abdomen, which restricts the function of lungs and abdominal organs.

When a person sits in conventional seating, the posture becomes “collapsed” even if the person assumes an upright position at first. It deteriorates when in order to perform any task, the person seated in conventional seating leans forward to see their work. While conventional chairs may be adequate for passive sitting (and there is room for argument even about this) they are simply not suitable for seated work as discussed. They result in the pelvis rolling back so that the natural “S” spinal curves are lost and a slumped “C” curve is seen with the neck extended, the head forward with the chin protruding.” (8)

“Workers on precision work which requires a great deal of concentration tend to lean forward and adopt a tense posture. Chairs with a forward tilting seat and backrest, and/or a work surface which slopes towards the worker help to avoid this problem and are recommended for this type of work.” (1)

“Where elbow support is needed to reduce neck and shoulder muscle strain (e.g. small component assembly, plating cultures, and preparing samples): Approximately 50mm above elbow height. These heights are intended to accommodate most users in a standing posture however an adjustable height stool (and high footrest) or a sit/stand stool option should be provided to enable a seated option. Many laboratory tasks involve fine manipulative, small movements or precise work with the hands where the upper limbs must be stable therefore standing is not desirable” (2)

“Due to a lack of legroom and limited reaching abilities, a feasible chair may be difficult to find. If possible, seating options should be obtained for trial evaluation while gathering employee feedback. An optimal solution would allow employees to alternate between standing and sitting while blasting. One seating option is a Sit/stand stools which keep the operator at a similar height as standing but allow resting of the back and legs by leaning against the stool.” (4)

**Sit-stand stools fall into 6 classifications:**

1. Leaning seat or Standing assist: Leaning seats and standing stools position the body almost as high as standing. These devices are ideal for spectator sports and for standing work to relieve fatigue. Leaning seats work well for fixed activities, but are not suitable for work tasks that require navigation around the work area or extreme forward reach. recommended for areas where there is restricted legroom
2. Saddle stool: Saddle seats (a.k.a. saddle stools, saddle chairs) are ideal for 2-handed forward-reaching work. Once you get used to them are are quite comfortable, even for those long work days. However, for some people it takes awhile to get used to the wide stance and saddle pressures.

3. Bicycle seat: Bicycles seats are a smaller and usually lower-cost version of a saddle seat, and can be used in the same way. However the smaller seat size make them less comfortable for long periods of sitting.

4. Perch: Perches are generally lower cost and rugged, but they can become uncomfortable when used for prolonged periods. The biggest drawback is that you cannot perch as high as you can on a saddle seat or bicycle seat stool, because there is a tendency to slip forward off the flat seat pan.

5. Tractor and Waterfall seat: Tractor and waterfall seats are quite comfortable, but forward reach range not as great as with the other sit-stand seat types. The user’s feet cannot be ideally positioned under the body’s center-of-mass during the reaching activity because of the greater depth of the seat.” (5)

“Lean-on or sit-stand: These seats are suitable only when it is impracticable to use conventional seating, and when machinery and the workstation does not allow for knee space. Such seats should still be adjustable in height and arranged to take part of the body’s weight. Particular attention should be paid to ensuring such seats are stable and comfortable under the conditions of use” (1)

“Benefits of a Saddle Stool

1. Better posture as the vertebrae discs align naturally, resulting in immediate improved posture with less spinal muscle degeneration.
2. Tension relief in the shoulder and neck area due to the improved positioning of the thoracic and cervical spine.
3. Deeper breathing occurs due to the stretching of the torso allowing for better circulation, resulting in less fatigue.
4. Improved mobility and reach is easily achieved as the legs are free to “scoot” around the operatory, while remaining seated.” (6)

“Shaped like a saddle to enable the body to maintain ideal posture when sitting. It is purpose-designed to position the pelvis in its upright, neutral position and keep it there. In this position the person now bends forward from the hip joints rather than the “waist” (or spine). In the Bambach position, the hips are abducted in external rotation and at between 45° and 60° of flexion. This is the position in which the head of the femur is in its ideal close-packed contact with the acetabulum which means the joint is stable and at ease in the “rest” position. This also means that the thoracic and cervical spinal curves are in natural, neutral alignment. This being the case, the shoulders, neck and head are positioned for maximum ease, accuracy and powerful function because they also are in their neutral positions The legs are able to move freely, the feet are in full plantar contact with the floor, able to take more or less weight as required. The person can move the seat freely around the workplace or the room with ease and safety. The arms, hand, head and neck are positioned for least stress, resulting in a natural increase in range and strength of reach and ease of functional activity

Perhaps Dr. Mandal said it all: Without doubt the best sitting posture is obtained on horseback. The hip joints are in the resting position with a bend of 45°. The hip joints and lumbar spine are not loaded in an extreme position. The lumbar curve is maintained and a perfect balanced position is obtained in which the body adjusts its centre of gravity.” (8)
Solution for Elbow Support

1. **The Free Motion Elbow Supports**
   “The Free Motion Elbow Supports are designed to follow the natural body movement in order to prevent and reduce back, shoulders and neck muscular tension while doing precision work in restrained area. They allow operator to change position without restricting movements and to favor blood flow. Clinical studies have demonstrated that the use of the mobile elbow supports significantly helps reduce the intensity of muscular contraction to the arms and shoulders while favoring a good posture.

“The Free Motion Elbow Supports provide adequate support to the arms while providing full range horizontal motion. Since the shape of the elbow is moulded by the soft cushion, the support system easily follows the user’s movements.”

- Adjustable seat and back heights.
- Adjustable back angle provides lumbar support.
- The seat angle adjustment eliminates pressure on the legs
- Mechanism allows a wide range of movements.
- Tension adjustment to naturally mimic the natural movement of the arms, it remains in a fixed position when not in use (Free flow motion)
- Adapter lets you add 1 or 2 Posiflex free motion elbow supports to most chair

**Examples of use**

“Dental work requires precise and controlled movements, often causing the body to adopt static and awkward positions which can strain the neck, back and shoulder muscles. Over a certain period of time, an inadequate posture can cause discomfort, pain and many illnesses (tendinitis, bursitis, etc.). By helping dental hygienists realize they were always working with their arms in the air, the use of gel padded mobile elbow supports also helped them adopt a more comfortable and secure work posture.”

“Studies on posture have shown that Posiflex not only supports the arms, but also promotes the adoption of safer and healthier work positions. For example, by using the support for the left trapezius, muscle stress is reduced by approximately 50%.”

The average motor unit potential (MUP) of the upper trapezius muscles with and without Free Motion Elbow Supports. The safe limit MUP limit is 5%; the elbow rests make it possible to achieve, or come very close to this limit.

**Posiflex Design**

**Scientific Articles supporting elbow supports**
Solution for Seating Position

********** Most Prices are Unknown. The Few Given are Not Exact **********

1. **Ergo Sure™ Dental Stool**
   Position yourself properly for any procedure while minimizing stresses and strains with operator and assistant stools from DentalEZ
   
   - Tilt seat, adjustable lumbar support and height adjustment
   - The backrest features an adjustable lumbar support and can be adjusted up or down while seated, using one hand
   - Tilt seat from 0–15 degrees allows for better blood flow
   - Broad caster base and five casters to improve stability during position changes
   - Complete mobility to allow movement around the patient’s head, minimizing stressful positions
   - “Integral non-slip skin-foam technology” that is easy to disinfect and fluid-proof
   - The DentalEZ system approach can eliminate Class IV and V movements for optimum ergonomic benefit
   - Ergonomic adjustments with tilt seat and back-in and out adjustment (Assistant’s only)

2. **Midmark Dentist’s Stool** Cost: $ 841.40

   The Midmark Operator Stools are not only engineered to deliver premium styling and exceptional comfort, they are also ergonomically refined to address musculoskeletal pain common in dentistry.
   
   - Seating system offers a contoured seat with raised front to improve weight distribution and overall comfort, promoting a more balanced posture
   - Comfort is also enhanced with waterfall front edges that reduce pressure on the back of the thighs
   - Multiple seat sizes and seat heights, paired with unsurpassed adjustability, allow you to better personalize your seating solution
   - Tilting the seat forward allows you to open the hip angle over 90 degrees, which helps to maintain the natural lower back curve and reduce disc pressure
   - Contoured backrest comfortably supports the lower back, while the adjustable armrests help to support the elbows all in an effort to reduce fatigue in the lower back, neck and shoulders
   - Arm pad adjustments include height, swivel and slide, optimizing positioning of the armrests to

3. **HAG Capisco Chair** Cost: $ 841.40

   Can adjust a HAG Capisco chair from a low-seated position to a half-standing position. The chair encourages creative, healthy sitting positions: forwards, backwards or sideways.
   
   - 165 different fabric options available, with 35 quick-ship options ready to ship out within two business days. Click here to view all upholsteries, and scroll down to see what we have ready for immediate shipping.
   - Non-traditional saddle seat design
   - Naturally follows you as you move to the next sitting position
Adjustments: seat depth, seat height, back height, tilt tension backward, and three-position tilt lock
10 year warranty on pneumatic lift
Solid, recycled aluminum base with curved/arched footplates
Black, silver or polished aluminum frame (a black lift is standard with a polished base)
Shipping dimensions: 28" x 28" x 13" 35lbs (add 10lbs for headrest)
Made of recycled and recyclable materials
Interchangeable components extend product life
http://www.ergodepot.com/HAG_Capisco_p/8106.htm

4. **Salli Surgeon** Cost: $
For demanding precision work, in e.g. operating rooms or dental surgeries.
- MultiAdjuster seat with or without inclination adjustment
- Foot controlled height adjustment with gas spring as standard
- Surgeon has back rest and elbow supports (from the back of the chair)
- A1 or A2 quality leather. Also available in artificial leather and ESD fabric.
- Warranty for the chair 10 years, for the accessories 2 years

5. **Sway** Cost: $ 775
The swing mechanism enables the seat to be tilted into every direction without a separate adjustment lever. This enables the user to exercise while sitting, which adds to the mobility and metabolism of the lower back and activates the whole body. Recommended to all with low back pains or desire to have the healthiest possible seat for their lower back metabolism.
- Hand controlled height adjustment with gas spring
- Weight of the chair 11.5 kg
- Upholstery black leather or artificial leather, see colour chart
- Warranty 5 years for chair upholstery and frame, including the seat, castors, mechanism, gas spring, and base
http://www.salli.com/en/Salli_Sway_2

6. **Salli Stainless** Cost: $
All metal parts made of stainless steel. Perfect for environments where furniture needs to be hygienic and easy to clean. Examples of use: production lines in food industry, bakeries, laboratories, catering establishments.
- Twin seat with inclination adjustment
- Available in artificial leather, see colour chart, or with polyurethane covers
- Height adjustment with gas spring, only medium gas spring
- Industrial base Ø 540 mm
- Ø 80 mm industrial castors
- Weight of the chair 11.7 kg
- Warranty 10 years
7. **Brewer 135DSS Split-Seat Dynamic Saddle Stool** Cost: $698.60
   - Circular movement and tilt:
     - Unique 360° tilt makes movement easier and more natural.
     - Allows core muscles to become active in supporting the spine.
     - Strengthens spine stability muscles, pelvic and leg muscles.
     - Less pressure on the edges of the upper legs when moving side to side.
   - Split Seat design:
     - Improves circulation as there is no edge to press against your upper legs. The veins and arteries that carry blood to and from legs are in the most open position for improved circulation.
     - Offers superior cooling comfort, resulting in improved genital health in both men and women.
     - Balances the pelvis in an upright position placing the weight over the “sit bones” and not the soft tissues.
     - Better hip abduction brings improved posture over narrower saddle seats.

8. **RGP 400D** Cost: $
   Unique to the 400-D is its hydraulic mechanism which allows the stool’s back and seat to ‘float’, following ones’ movement. This “Active Seating” is further enhanced by the adjustable heights of both the backrest and the stool itself. Shoulder support systems are available to relieve the neck, arms and back while allowing full range of motion. Postural changes as a result of use of the 400-D have proven effective in promoting work productivity and increased health and well-being.
   - Hydraulically Controlled Mechanism
   - Single Level Control
   - Patented Split Back
   - Available Ergonomic Shoulder Supports
   - Black Oxide Metal Components
   - Limited Lifetime Warranty

9. **RGP 400D Hybrid Stool** Cost: $
   A new ergonomic stool by RGP that facilitates the same desirable leg position as a saddle stool, but without the groin compression and also offers a backrest. It was found that medium-to-tall dentists and hygienists best fit this stool. It was rated 'excellent' on comfort and support by all evaluators over 5' 5". This is one of my 'go to' stools for medium & tall dentists for in-office consultations.

10. **BQ Ergonomics Back-Up Stool** Cost: $
    Designed by a physical therapist, the Back-Up Stool features a unique adjustable 'oblique' section on the front of the stool to allow closer positioning to the patient and also accommodate various user heights. The 'sit' bones rest on the horizontal part of the seat, while the thighs rest on the oblique section and slope downward. Most evaluators rated the stool 'excellent' in all areas, with the backrest receiving the most accolades. This is my other 'go to' stool for medium & tall dentists for my in-office consultations.
    - The hydraulic system allows the user to determine the amount of leg support desired without cutting off circulation to the back of the legs.
● The lumbar support allows for maximum freedom of movement.
● It fits snuggly into the lumbar curvature where support is most needed to maintain natural upright posture in working positions.
● The waterfall shaped seat provides an anatomical platform for the pelvis, supporting a natural and relaxed curvature of the spine and reducing fatigue with prolonged seating.

http://www.bqe-usa.com/Products/BackUp%C2%AE/

11. Global Microsurgeon Chair Cost: $ Designed to be used in conjunction with the Global microscope. Under the microscope the smallest of movements can have a large effect. This chair, which was specifically designed for use with microscopes, represents a real boon for the dentist that can noticeably relieve the shoulder, back and neck areas. Has tilting seat pan & backrest. Armrests adjust up, down, in and out and in front of operator (when positioned in front of the operator, armrests encourage slouched posture with rounded shoulders). Evaluators rated the ease of adjustment and lumbar support as excellent. Comfort was rated fair/good, due to a firm seat that is not highly padded.

● The seat can follow your seating posture and rotates with it automatically.
● Armrest swing forward to provide steady support for your arms during precision work.
● Armrest can be easily adjusted up and down, in and out, meeting your unique needs.
● Arms fold back for easy access and compact storage.
● Back adjustment provides firm support in all positions, including lumbar support, locked into place or adjusted downwards.
● Entire chair tilts forward for perfect positioning.

http://www.globalsurgical.com/stools-chairs.html

12. Crown Seating Vail C30H Chair Cost: $436 An innovative hybrid between a traditional stool and saddle stool. Triangle-shaped seat allows operators to sit at an ergonomically correct angle with thighs angled downward-without the expense of a tilting seat pan. Evaluators rated the small backrest excellent in terms of ease of adjustment and comfort. Access and adjustability were also rated excellent. This stool is especially well-designed for shorter operators (ask for a short cylinder) and hygienists. The price is right!

● "Posture Perfect" Hybrid saddle seat creates unparalleled comfort.
● Full tilt adjustment allows user to sit comfortably while working.
● Extra thick backrest provides superior lumbar support.
● Unique hybrid saddle allows better circulation in the lower leg.
● Short seat pan depth eliminates "perching" on the front of the seat.
● Five-leg plastic base provides improved stability.
● Choice of different height list mechanisms provides a wide range of adjustment."

*Galaxy offers cheaper model $321-$302

https://www.crownseating.com/vail-c30hs.html
13. **Virtù® C120 Mesh Operator Stool** Cost: $815.00 - $589

The unique flexing properties of the high-strength fiber-reinforced frame, combined with the precise variable tensioning of the mesh support system, allows weight and its corresponding pressure points to be optimally dispersed regardless of the position of the body.

- The patented ZenWave™ motion technology allows you to float forward and backward without harmful pressure.
- The Active Tilt™ seat plate pivots smoothly forward and backward to promote proper body alignment.
- The "Free-Float" backrest stays with you as you lean forward, giving you continuous support.
- Customize your seat and backrest position simply with three lever adjustments.
- The convex shape of the "Free-Float" backrest massages and improves blood flow to your lower back.

https://www.crownseating.com/virt---c120dm.html

14. **DenverC130D Operator stool** Cost: $815.00 - $589

- Distinct anatomically designed seat conforms to the natural shape of the body.
- Technologically advanced injection molded foam provides excellent support and comfort.
- Seat Groove prevents undue pressure on the tailbone.
- Multi-angle pelvic positioning helps reduce lower back strain.
- Improved balance point allows you to bend forward and reach further with less strain.
- Small seat size allows the closest positioning to the patient.
- Five-leg powder coated aluminum base provides improved stability.
- Choice of different height lift mechanisms provides a wide range of adjustment.

https://www.crownseating.com/denver-c130db.html

15. **Sterling C85SD Operator stool** Cost: $824 - $536

- Seat and backrest are mounted on heavy duty mechanism, with individual gas-spring cylinders for independent control of seat and backrest.
- The deeply contoured seat forces you to sit all the way back in the seat, ensuring that the sculptured backrest in firm contact with the lumbar region of your back.
- The unique design of the mechanism, seat, and backrest, allows a range of movement with the backrest at all times maintaining contact and support of your back.
- The control lever in the "Free-Float" position, the seat and the backrest will follow you as you lean forward and back in the stool.
- Waterfall front allows better circulation in the lower leg.

https://www.crownseating.com/sterling-c85sd-1.html

16. **Steamboat C60D Operator Stool** Cost: $1031 - $759

- Revolutionary seat pan mechanism allows the backrest to massage user's lower back.
- Multiple layers of foam facilitate better upper body weight support and alleviates pressure under the legs.
- Triple lever adjustment allows user to operate in comfort through maximum adjustability.
17. **ErgoSolex Next Generation of Saddle Stools**  
Cost: $

The saddle shaped seat allows for almost full leg extension. The small lumbar support allows for optimal freedom of movement, while activating stretching of the spine. With our patented design the ErgoSolex feels more like a traditional stool but with the ergonomic benefits of a saddle stool. A good ergonomic stool needs to have a lumbar support to prevent slouching. It is proven that we loose at least 30% of the curvature of the spine after 5-10 minutes of sitting. Without a support more pressure will occur within the discs increasing the chance of spinal injury and (lower) back problems. The triangular shaped seat provides an anatomical platform for the pelvis, supporting a natural and relaxed curvature of the spine and reducing fatigue while prolonged seating.

http://www.bqe-usa.com/Products/ErgoSolex%C2%AE/

18. **Bodybilt seat**

Bodybilt’s line of mid-back stool seating was designed specifically for labs, medical and manufacturing job performers. In addition to Bodybilt’s pressure-reducing seat contours, each model features ten ergonomic adjustments that allow the user to control Bodybilt’s mid-back task chair, with a tall cylinder, adjustable arms, moderately contoured seat pan, center pivot mechanism, and a chrome, height adjustable footing level of comfort.

http://www.ergogenesis.com/

19. **The BamBach Saddle Seat**  
Cost: $699

The BamBach Saddle Seat has improved posture, eliminated shoulder and neck pain, improved precision, and reduced fatigue time and time again. BamBach’s not just a seat it’s a scientific solution. If you work in a hospital or medical environment, the BamBach Saddle Seat is undoubtedly the best seating solution for you because:

- It has a true ergonomic structure, ensuring the pelvis is in an upright position whilst maintaining the spine’s natural ‘S’ shape rather than the crunched ‘C’ shape
- Sitting on a BamBach ensures you work with precision; the wide foot stance keeps you balanced as you move around a room or your patient
- The BamBach Saddle Seat is used in over 500 hospitals in more than 20 different departments.
- Eliminate back, neck and shoulder pain
- Maintain the natural curvature of the spine
- Prevent problems associated with poor posture ranging from mild discomfort to debilitating pain

Cheaper/Other solutions

http://www.independentdental.com/doctor/
https://henryscheinequipmentcatalog.com/treatment-room/stools.html
http://www.beyondtheofficedoor.com/medical-stool.php?gclid=CK69o9WehskCFYQWHwodxg4Cng
http://www.dentalcompare.com/Restorative-Dentistry/4518-Dentist-Chair-Dental-Stools/

3. “Biosafety cabinets and laboratory workbenches Biosafety cabinets and laboratory workbenches ...present ergonomic hazards which are mostly due to lack of adjustability & leg room.” CDC, Laboratory Ergonomics website, 9-24-07 <http://www.cdc.gov/od/ohs/Ergonomics/labergo.htm>