

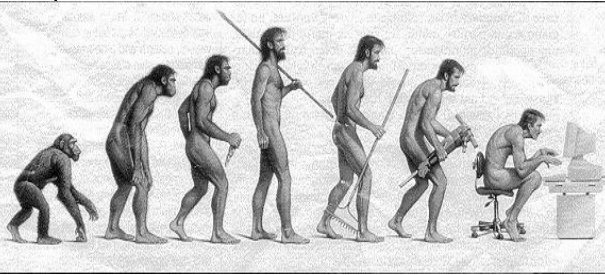


Seated work activities


●●● Ergonomic considerations in seated work



Rani Lueder, CPE
Humanics ErgoSystems, Inc.
www.humanics-es.com

How do we think we sit?
How do we actually sit?
How should we sit?




●●● Bernardino Ramazzini (1777)

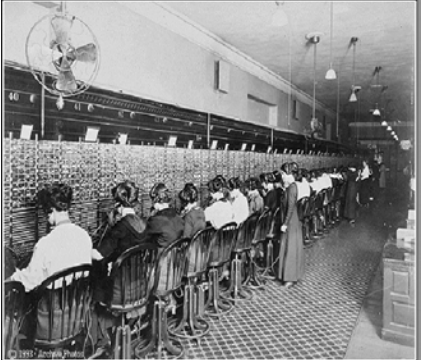

“First, constant sitting, secondly the incessant movement of the hand and always in the same direction...”

“Incessant driving of the pen over paper causes intense fatigue of the hand and the whole arm because of the continuous and almost tonic strain on the muscles and tendons, which in course of of time results in failure of power in the right hand”.


Bernardino Ramazzini on the Diseases of Writers
Ramazzini (1777) from *Essai sur les Maladies de Dissesus*
Original translation from Latin in “De Mortis Artificum” by M. De Foureau




●●● Many of the same risk factors a century ago.

●●● Over 1,000 postures people can sustain




Hewes, G.W. (1957) The anthropology of posture. *Scientific American*. Feb. 123-132.


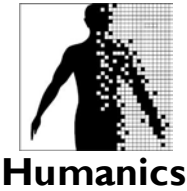


●●●

Often reflect national, cultural and gender differences.



Hewes, G.W. (1957) The anthropology of posture. *Scientific American*. Feb. 123-132.

Seated work activities

●●● If all you have is a hammer, . . . you think everything is a nail.

BY KEITH BENDIS FOR THE WASHINGTON POST

●●● When our posture is not supported, most comfortable ≠ what's best

●●● Comfortable ≠ best postures

← Healthy ligament
Damaged ligament (below)


Provenzano et al (2001) Microstructural morphology in the transition region. *Connective Tissue Research*, 42, 123-133.

●●● Symptoms are complicated and unpredictable

●●● Tunnels

●●● Screw up one thing, screw up everything!

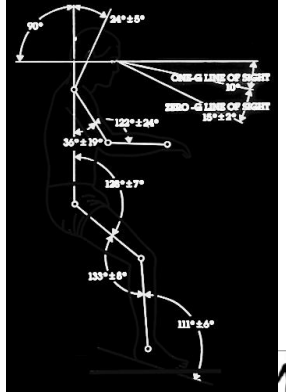
How do we support the back?



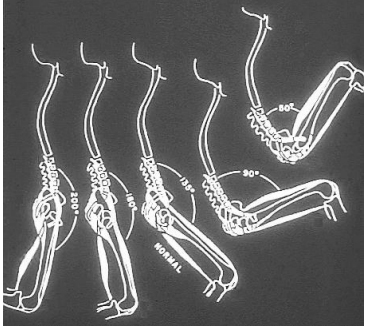
"The case for & against movement for its sake", by Rani Lueder, CPE
www.humanics-es.com/movement-ergonomics.htm

What are good postures?

- Balance muscle loads
- Reduce physical demands
- Relieve physical stress

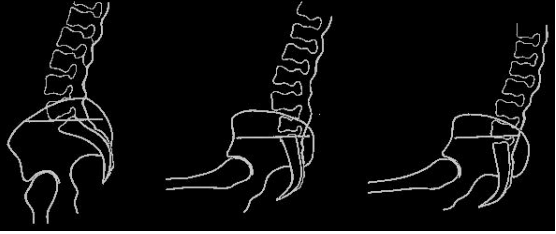


Keegan x-rayed one man 13 times



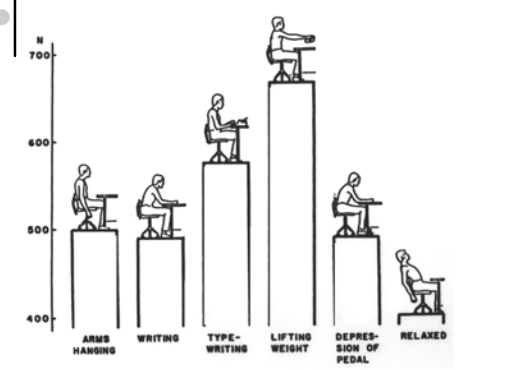
Keegan, J.J. (1953) Alterations of the lumbar curve related to posture and seating. *Journal of Bone and Joint Surgery*. 35A, 3, 589-603.

Pelvic tilt

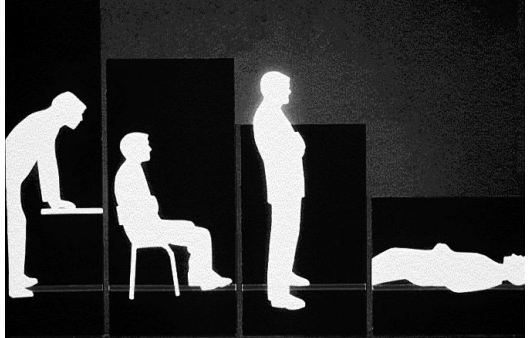


Standing Sitting erect Sitting relaxed

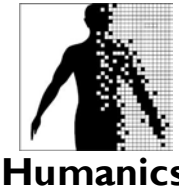
Keegan, J.J. (1953) Alterations of the lumbar curve related to posture and seating. *Journal of Bone and Joint Surgery*. 35A, 3, 589-603.



Andersson, B. J.; Ortengren, R.; Nachemson, A.; Elfstrom, G. (1974) Lumbar disc pressure and myoelectric back muscle activity during sitting. I. Studies on an experimental chair. *Scand J Rehabil Med*, 6(3), 104-114.

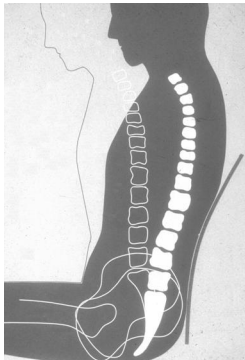



Wilke, H. J.; Neef, P.; Caimi, M.; Hoogland, T.; Claes, L. E. (1999) New in vivo measurements of pressures in the intervertebral disc in daily life. *Spine*, 24(8), 755-762.

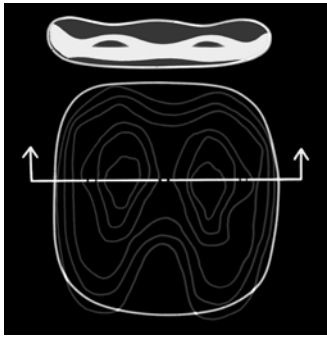



Seated work activities

●●● Lumbar fit

●●● The seat pan

●●● Zazen sitting


Sacral support




www.humanics-es.com/zenseating.htm



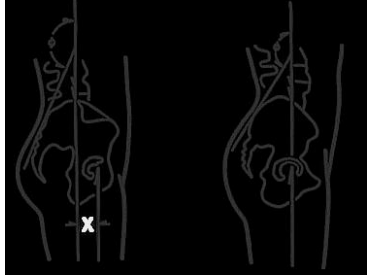
●●● "Rotatory" movements



van Deursen, D. L.; Lengsfeld, M.; Srijders, C. J.; Evers, J. J.; Goossens, R. H. (2000) Mechanical effects of continuous passive motion on the lumbar spine in seating. *J Biomechanics*, 33(6), 695-699.




●●● The "gender gap"

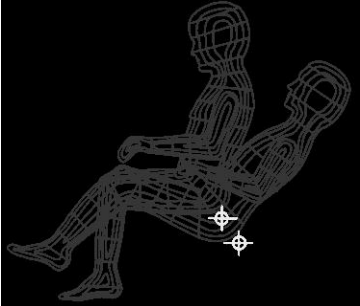


Female Male


Tichauer, E. R. (1978) *Biomechanical basis of ergonomics: Anatomy applied to the design of work situations*. John Wiley & Sons, p. 99.




●●● "Fit": user and seat pivot point




Dunk, N. M.; Callaghan, J. P. (2005) Gender-based differences in postural responses to seated exposures. *Clinical Biomechanics (Bristol)*, 20(10), 1101-1110.



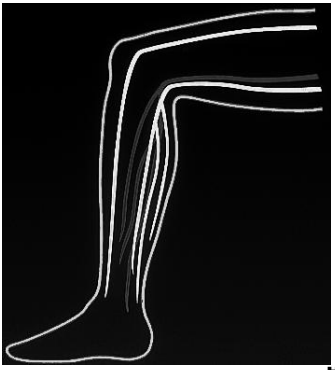

●●● | Seat height and depth





Rani Lueder review at www.humanics-es.com/seatheightrevis.htm



●●● | Seat compression

●●● | Postural constraints

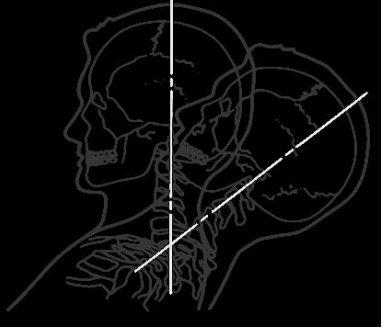

●●● | Fit?



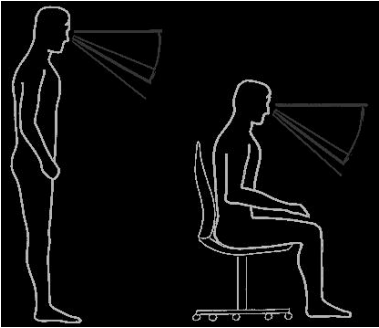

●●● | Fit?




●●● | Lines of sight


● ● ● Standing and sitting viewing angles



Humanics


● ● ● And then, the training

- Critical information is missing
- Content is wrong
- "Blame the victim" (for bad design)




● ● ● Training effects

- Practice effect
- Order effect
- Direction of adjustment effect




● ● ● The practice effect ...

- Practice as a group, using their own chair (stay away from a work surface).
- Demonstrate all chairs they need to adjust.
- Find a way to fully adjust in one minute.



● ● ● The order effect

- Seat height.
- Seat pan depth.
- Backrest height and angle.
- Backrest tension - unlocked.
- Armrest width and height.

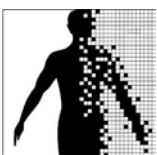



● ● ● Direction of adjustment

Seat height: Down, then up then down


Back height: Down, then up, then down

Seat tension: Low, then high, then down




●●● | Seat adjustments...

- Active vs. passive controls
- Adjustments
 - obvious, easy, intuitive
 - from seated position
- Adjustment controls interact




●●● | More on adjustments...

- Keep adjustment steps consistent
- Can employees with CTDs adjust?
- Left-handed users




●●● | Best time to train...

- ASAP
- When the new furniture arrives
- When moving / starting a job




●●● | Seat design trends

- Dynamic backrests for a dynamic back.
- Rethink forward seats.
- Keep moving!
- Foot support, finger height, line of sight.
- Neck supports.
- One size does not fit all.

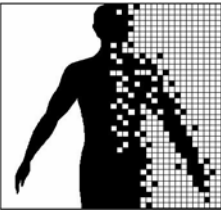


●●● | Download handouts

www.humanics-es.com/seating.htm

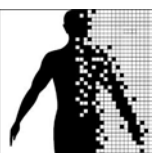



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Thank you!

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About Rani Lueder

Rani Lueder, MSIE, CPE is President of *Humanics ErgoSystems, Inc.* an ergonomics consulting firm in Encino, California that she established in 1982. She has consulted, performed research and served as an expert witness in occupational ergonomics, posture and the design and evaluation of products and places for adults, children and people with disabilities for more than two and a half decades. She has consulted for corporations, governments and universities in seven countries and has provided expert testimony on a range of cases related to product design, occupational health and accommodating people with disabilities.

She has performed large-scale evaluations for organizations and served on retainer for numerous organizations. She continues to serve on retainer to the Japanese Scientific University, the University of Waseda. She also served on retainer for several years with the Japan Institute of Human Posture (Tokyo), The University of Waseda and ErgoSeating in Japan. She was a member of the ANSI committee revising the American National Standard for workstation design.

She teaches human factors and ergonomics in industrial design at the Art Center College of Design in Pasadena on a regular basis. Her service-related activities include participating in various ergonomics standards committees and chairing a Human Factors and Ergonomics Society Task Force on their online human factors and ergonomics content and services.

She edited and co-authored the book "Ergonomics for children: Designing products and places for toddlers to teens (2008; Taylor and Francis, London and New York). Her second edited book, "Hard Facts about Soft Machines: The ergonomics of seated posture" is available in seven countries from Taylor and Francis (1995). Previously, she edited and was a joint author of the book "The Ergonomics Payoff; Designing the electronic office" (HRW). She was United States co-organizer for the "2nd International Conference on Seated Posture", held in 1988 at Waseda University near Tokyo, Japan.

Rani has an MSIE in Ergonomics/Industrial Engineering from Virginia Tech, and is a member of the Human Factors and Ergonomics Society (US). The Board of Certification in Professional Ergonomics certifies her (#258).

Her website at www.humanics-es.com contains extensive content in ergonomics.