

# ERGONOMICS AND POSTURE GUIDELINES FOR ORAL HEALTH PROFESSIONALS



## ERGONOMICS: DEFINITION

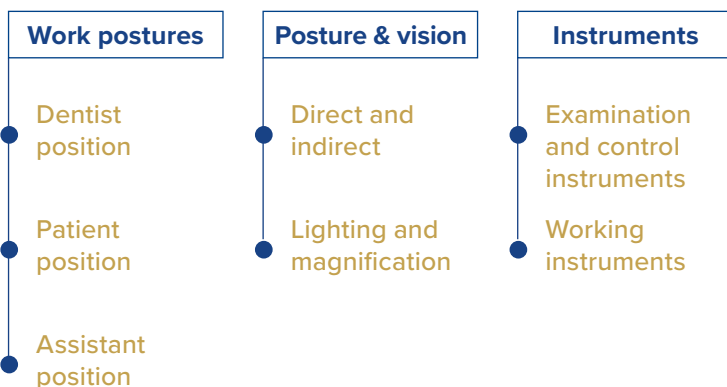
The International Ergonomics Association (IEA) defines ergonomics (or human factors) as “the scientific discipline concerned with the understanding of the interactions among humans and other elements of a system, and the profession that applies theoretical principles, data and methods to design, in order to optimize human well-being and overall system performance.”

During a conventional dental treatment, the dentist often bends over the patient to achieve the most accurate treatment possible. However, bending often leads to an unnatural, harmful posture that negatively impacts the dentist’s health.



Ergonomics in dentistry should strike a balance between keeping the dentist healthy and providing efficient treatment. Ergonomics in dentistry means preventing musculoskeletal problems by enabling the dentist to adopt a more natural and comfortable posture, achieving patient-friendly treatment, improving treatment efficiency, and achieving treatment accuracy.

### Application of ergonomics in dentistry:



## POSTURE OF ORAL HEALTH PROFESSIONALS



### WHAT BAD POSTURE CAN CAUSE

The dark and narrow space in the oral cavity can cause oral health professionals (OHPs) to adopt an unnatural posture during dental treatment, which can lead to serious physical impact and repetitive strain injuries.

The potential to develop musculoskeletal disorders is higher when one disregards good ergonomic principles. In doing so, OHPs are at risk of compromising their technical expertise during procedures. This can lead to a limitation of certain procedures, potential career shortening, and, in the worst case, possible career-ending injuries.

The surveys below show that the main complaints are neck and lower back pain. These issues develop over a number of years and worsen with a heavy workload. It has also been noted that female dentists appear to have a higher incidence of upper body complaints than their male counterparts.

	US Adults in general population <sup>1</sup>	US Dentists <sup>2</sup>
Arthritis	17.7%	15.6%
Neck Pain	13.8%	67%
Lower Back Pain	26.8%	65%

# THE IDEAL POSTURE OF THE ORAL HEALTH PROFESSIONAL



**Movement throughout the day is key:** staying too long in one position can cause fatigue and increase the risk of musculoskeletal problems.

## THE HEAD

To be inclined slightly forward, oriented over the shoulders. The interpupillary line is aligned horizontally not more than 15 to 20 degrees.

## TORSO

The longitudinal axis of the torso is upright. It promotes the natural curves of the spine – cervical lordosis, thoracic kyphosis, lumbar lordosis. If needed, the back rest of the chair can be positioned to provide lumbar support.

## UPPER ARMS, ELBOWS AND SHOULDERS

Arms relaxed at one's side due to the force of gravity. The elbows do not stick out and the forearm is in front of the body. Shoulders are oriented over the hips.

## WRISTS

Should be kept in a neutral position with the wrists straight.

## THE FINGERTIPS

Should be held at the treatment point, at a height that is comfortable and affords a clear view of the procedure being performed.

## SEATED POSTURE

Seating height at knee height; hips slightly higher than the knees; tilt the operator stool slightly downward.

## THE FEET

To be flat on the floor. The lower legs are in a vertical position. Consider comfortable shoes and clothing to ease body movement.

## RHEOSTAT POSITIONING

Place it close to the operator so that the knee is at about a 90 to 100 degree angle. If placed outside this zone, the dentist must shift weight to one side, leading to asymmetrical stresses on the back, hence low back pain. Consider alternating sides.

## POSITION OF THE PATIENT

**A deliberate patient position should be determined according to the dentist's natural posture and his or her reference point, which allows the clinician to achieve optimal performance without any physical burden.**

### Exceptional cases:

Treating patients in an upright position

Occasionally, it may be necessary to treat a patient while in an upright position, for example during certain procedures or when treating elderly patients or those with complex medical histories (hypotension, vertigo). In this case the back rest should be vertical to provide lumbar support to the patient. OHPs may find it more comfortable to stand during these appointments. During pregnancy, a patient may experience postural hypotension, which can lead to fainting. Pregnant patients can be encouraged to lie on their side or be treated in a more upright position.



A slight bend in the knee alleviates pressure on the lumbar spine. Feet can be elevated with a tilt of the chair.

# HARMONIZING POSTURE AND VISION

## MAGNIFICATION BY LOUPES AND MICROSCOPE

- To ensure a more accurate view, loupes or microscopes can also be used.
- While using either loupes or a microscope, keep an optimal distance from the dentist's eyes to the patient's mouth to ensure clear vision, good focus and ideal posture.



Naked eye



With loupe



With microscope

## INSTRUMENTATION

### PREPARATION AND PLACEMENT OF INSTRUMENTS WITHOUT THE FOUR-HANDED SYSTEM

There is a limit to the forearm's natural movement. Preparation and strategic placement of the instruments relieves the clinician's physical burden and improves concentration during treatment. Ideally, dentists should be able to pick up and return basic instruments, e.g., mirror, tweezers, explorer and excavator, without having to look away from the treatment area.

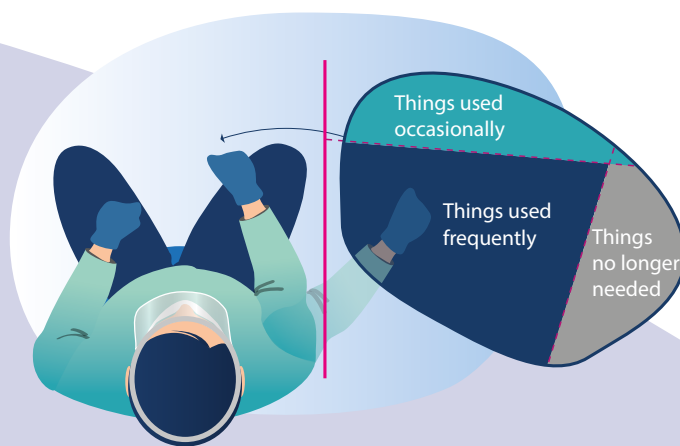
The basic principle is to differentiate foreseeable and unforeseeable tasks during treatment.

- Instruments and materials for which the use or timing is uncertain are prepared on the dentist's side.
- Instruments and materials that the dentist will need are prepared in the order and timing that they will be used on the assistant's side.

### PREPARATION AND PLACEMENT OF INSTRUMENTS WITH THE FOUR-HANDED SYSTEM

#### Recommendation:

Place all of the necessary items for the patient and the procedure within the area of reach before the patient arrives.



## POSITION OF THE DENTAL ASSISTANT

The assistant's role in a four-hand system is very important to achieve a more comfortable, less exhausting, stable, more accurate and more efficient treatment.



### BASIC PRINCIPLES FOR RIGHT-HANDED DENTISTS\*

1. The assistant sits on the left side, facing the dentist.
2. The working area for the assistant at the cabinet or mobile cabinet should be located on the assistant's right side.
3. The dentist uses indirect visualization with a dental mirror to allow the assistant to achieve improved direct visualization to avoid an awkward posture.

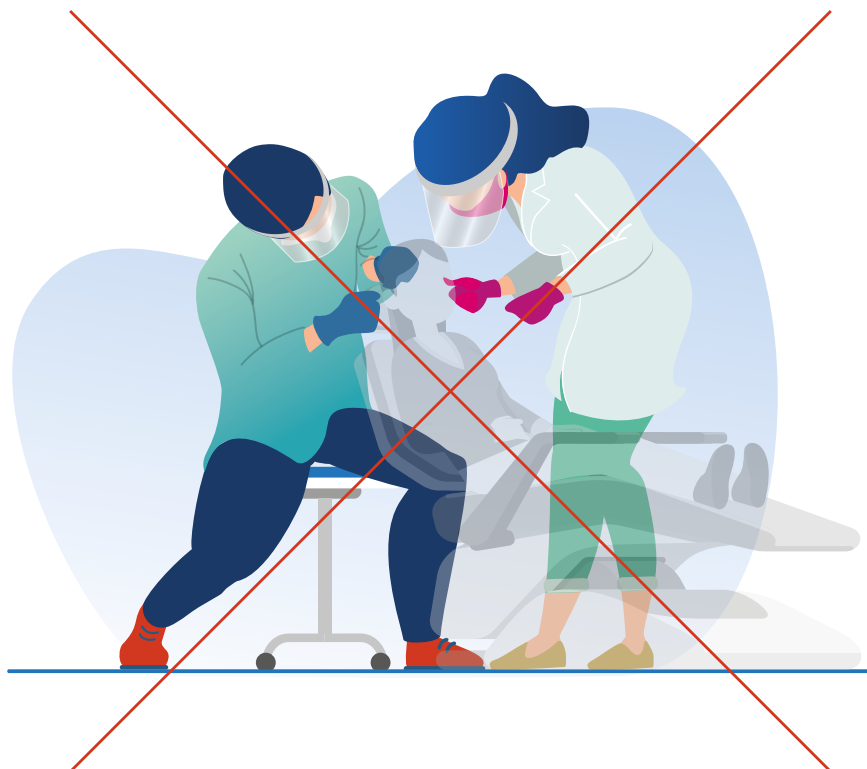
### ADVANTAGES:

1. The assistant does not interfere with the dentist moving between the 10 o'clock and 12 o'clock position.
2. The operating field can be seen clearly.
3. The assistant's hand can easily extend to the oral cavity.
4. Necessary instruments can be easily handed over to the dentist.

Optimal assistant seating allows easier access and proximity to the patient. The assistant should be seated on a stool so that his or her eyes are 15-20 cm higher than the dentist's eyes. The stool should have a foot support to allow the assistant to work both within and out of the oral cavity.

#### This position:

- reduces fatigue and stressful postures;
- stabilizes the suction;
- enables the assistant to properly hand over instruments to dentists;
- exerts the least amount of force on the patient's soft tissue (lips and tongue).



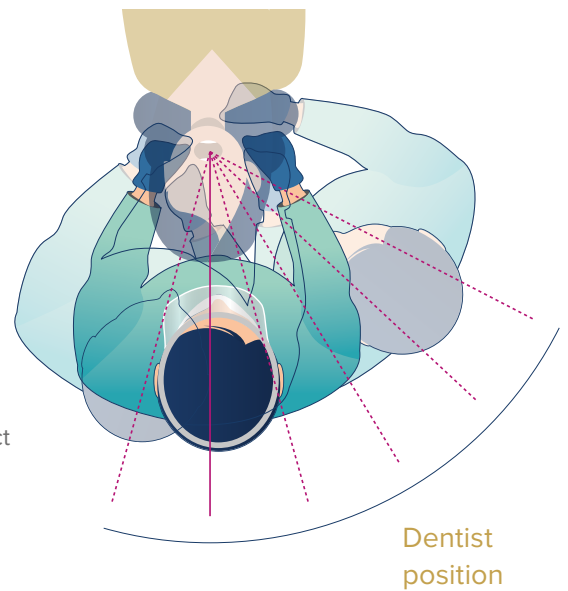
\* Left-handed dentists or dental assistants using right-handed dentist facilities may be at a higher risk of developing musculoskeletal complications. They may want to consider ambidextrous or left-handed dental chair models.

# HARMONIZING POSTURE AND VISION

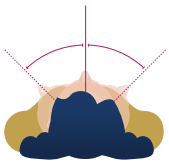
## DIRECT AND INDIRECT VISUALIZATION

In order to maintain a properly balanced, upright posture, it is important to balance direct visualization with indirect visualization using the dental mirror.

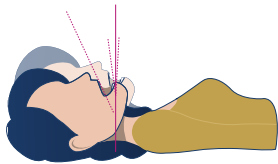
In order to widen the view without compromising good posture, the dentist should ask the patient to place the head on the headrest and adjust it accordingly to allow easier access, depending on which surface they are working. The dentist may ask the patient to open the mouth wider or close it slightly when working buccally.



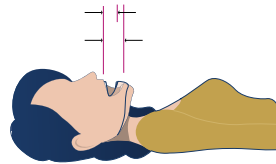
Here are five tips for direct views:



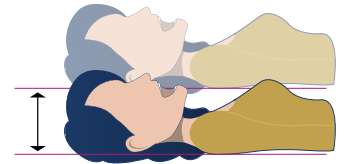
Rotating the patients head left and right



Change the angle of the maxillary occlusal plane



Mouth opening width adjustment



Height adjustment of the oral cavity

## MIRROR

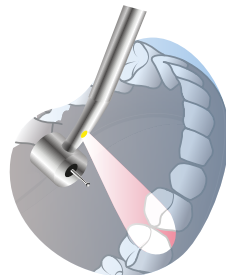
A systematic mirror technique is necessary because practitioners tend to assume unnatural and improper posture when trying to check difficult-to-see and impossible-to-see regions. The mirror technique should also coincide with adequate illumination of the oral cavity.

## LIGHTING

Enough light from the overhead dental light is essential to adequately illuminate the inside of the patient's mouth.

The light beam of the operating light must be perpendicular to the working mandibular plane or to the working maxilla plane to be fully effective.

Dental handpieces with an integrated light source are ideal for illumination.



## CHOICE OF INSTRUMENTS

Sensations and perceptions are different for everyone. These general recommendations can help OHPs find the dental instruments that suit them best.

### EXAMINATION AND CONTROL INSTRUMENTS

The dental mirror and probe are light and thin. Their diameters typically range from 2 to 3 millimeters (mm). They are naturally held between the thumb and the index finger and do not usually lead to any muscle strain.

### WORKING INSTRUMENTS

Instruments with a large diameter (10 mm), textured handle, and a light weight (15 grams) require the least amount of muscle load and pinch force. Diameters larger than 10 mm have no additional benefit; instruments lighter than 15 g may require even less pinch force. Consider alternating tools with different diameter sizes to reduce the duration of prolonged pinch gripping.

Silicone instrument handles are further found to improve hand comfort, reduce hand fatigue, and improve grip and pinch strength.

Instruments should be held in a light, pen-like grip, using a fulcrum (finger rest) either intra-orally or extra-orally. This plays an important role in stabilizing the clinician's hands during treatment, increasing the precise control needed and reducing muscle load and fatigue.



### GLOVES

Favor gloves of proper size and fit and avoid ambidextrous or one-size-fits-all gloves. If they are too large and get wet, ill-fitting gloves require the practitioner to squeeze tighter to maintain the grip on the instrument. If they are too tight, the gloves may constrict the neurovascular structures of the fingers and hand.

### PERSONAL PROTECTIVE EQUIPMENT

Wearing personal protective equipment (PPE) can cause ergonomic problems if not done optimally. This may be particularly true in the time of COVID-19 due to increased PPE requirements. Ergonomic problems related to PPE may include impaired vision, loss of dexterity, increased fatigue and decreased comfort.

Recommendation: Try various PPE types when possible to determine the best comfort and fit. Schedule a 'test' appointment with a colleague to try wearing your PPE in the clinical setting. Consider how the new PPE wearing will affect movement in the operatory and the potential need to move equipment, lighting and seating for improved access during procedures.



[www.fdiworlddental.org/hsdw](http://www.fdiworlddental.org/hsdw)

#### References

1. Blackwell DL, Lucas JW, Clarke TC. Summary health statistics for U.S. adults: National Health Interview Survey, 2012. National Center for Health Statistics. Vital Health Stat 10(260). 2014
2. American Dental Association. 2015 Dentist Well-being and Survey Report. ADA (2017).

#### Recognition

Content developed by Health and Safety Task Team (T. Caruso, D. Ilhan, M. Ishida, J.M. Laffont)

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