

# Appendix

## The description of the clinical tests

The participants are either in a sitting or supine position during the examination.

**The sitting position:** The participant is sitting comfortably upright, with a horizontal gaze, on a height-adjusted bench with the feet resting on the floor. The hips have an open angle and the hands are resting on the thighs.

**The supine position:** The participant is lying supine with the forehead and the chin in the same level.

### *Joint sound*



Figure 1. The joint sound test.

**Purpose:** To reveal if there are sounds like a “click” or “crepitus” when the participant moves the jaw. Normally the movements should be silent.

**Performance of the test:** The participant is in the supine position. The examiner tests each joint separately both with a stethoscope and by palpation, while the participant performs the different active movements of the jaw (mouth-opening, closing, protrusive, retrusive and lateral movements). Each of the movements are repeated three times to clarify if the sound disappears or remains the same. Prior to the movements the participant must close the jaw and bring the posterior teeth in full contact; maximal intercuspal position.

**Interpretation of the test:** Any “click” or “crepitus” sound is registered. A “click” sound is a distinct noise, of brief and very limited duration, with a clear beginning and end. A “crepitus” sound is a noise that is more continuous than the “click” sound.

**Note:** It is important to distinguish if the sound comes from the actual joint and not from the opposite one by listening both with and without the stethoscope and by palpation.

### ***Functional tests***

#### **Range of motion, figure 2.1 – 2.3**



Figure 2.1 Mouth-opening.

**Purpose:** To measure the participant’s ability to open the mouth; the range of motion is measured in mm.

**Performance of the test:** The participant is in the supine position. A caliper or a ruler is placed between the incisors as close to the midline of the central incisor as possible. The 2.1 (the left maxillary central incisor) and 3.1 (the left mandibular central incisor) are selected as the maxillary and the mandibular reference tooth respectively. The width of the jaw opening is measured.

**Interpretation of the test:** Normal opening is 40-60 mm.



Figure 2.2 Protrusion.

**Purpose:** To measure the participant's ability to move the mandible anteriorly.

**Performance of the test:** The participant is in the supine position. A reference tooth is selected by the examiner. The participant is asked to move the mandible in the maximum unassisted protruded position. The left and the right sides are measured separately with a caliper or a ruler.

**Interpretation of the test:** A limited protrusion on either side is defined as  $\leq 7$  mm.



Figure 2.3 Laterotrusion.

**Purpose:** To measure the participant's ability to move the mandible laterally.

**Performance of the test:** The participant is in the supine position. From the midline between

the participant's central maxilla incisors (2.1 and 1.1), the examiner draws a vertical line with a marker on a reference tooth (selected by the examiner) in the participant's mandible. On right lateral excursion the patient is asked to move the mandible to the right and on left lateral excursion the patient is asked to move the mandible to the left. The left lateral and the right lateral excursions are measured with a caliper or a ruler.

**Interpretation of the test:** A limited laterotrusion to either side is defined as  $\leq 9$  mm.

### Movement quality

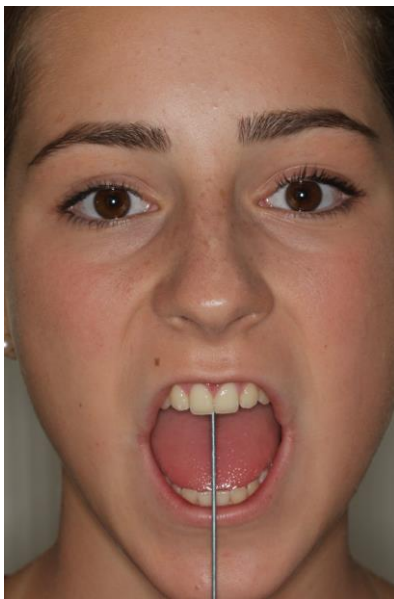


Figure 3a. Opening straight.



Figure 3b. Deviation without correction.

**Purpose:** To examine how the jaw moves during mouth-opening.

**Performance of the test:** The participant is in the sitting position, and is asked to open the mouth. By using a thin metal stick as reference (see Figure 3), the examiner observes if the participant's jaw opens straight (negative test; Figure 3a) or deviates to one side and then moves back to the midline position on maximum opening. This is called a deviation with correction or a C-curve (positive test for deviation with correction). If the jaw deviates to one side without a movement back to the midline position on maximum opening, there is a deviation without correction (positive test for deviation without correction; Figure 3b). If the

jaw deviates to one side and correct beyond the midline before correcting back to the midline position, an S-curve might be observed.

**Interpretation of the test:** Normally the jaw moves straight during mouth-opening. If the jaw deviates to one side and returns to the midline position, this might be due to a disc displacement with reduction in the ipsilateral joint. If the jaw deviates to one side without correction, there might be a restriction in the ipsilateral TMJ due to intra articular structures or tight muscles or capsule, a hypermobility in the contralateral TMJ or a combination of these conditions. If the jaw moves like an S-curve it might be due to both a joint disorder and a muscular dysfunction. If the jaw moves straight and jaw opening is limited, there might be a restriction in both TMJs due to either intra- or extra articular structures or a combination of these.

## Joint-mobility



Figure 4. The joint-mobility test.

**Purpose:** To test the mobility of both capii mandibulae.

**Performance of the test:** The test is performed with the participant in both the sitting and the supine position, because the mandible tends to retrude in supine position compared with the sitting position. The examiner palpates the caput mandibulae in the participant's preauricular area, while the participant performs the different active movements of the jaw (opening,

closing, protrusive, retrusive and lateral movements). The examiner registers the condylar movement in each joint separately.

**Interpretation of the test:** By comparing the condylar movement of both capii mandibulae, we can assess if one side has less mobility than the other. Reduced condylar movement, especially in the anterior direction, is interpreted as a reduced joint mobility in the joint being tested and increased condylar movement is interpreted as a hypermobility in the joint.

### **Anterior glide (end-feel)**



Figure 5. Anterior glide (end-feel).

**Purpose:** To evaluate the type of end-feel.

**Performance of the test:** The participant is in the supine position. With the thumb intraoral on the participant's mandibular molars (causing a light traction) and the other fingers around the outer mandible, the examiner performs an anterior glide in the joint. The left and the right sides are tested separately. The quality or the nature of the end-feel is registered.

**Interpretation of the test:** A hard end-feel can be due to bone-to-bone contact if the disc is dislocated and the caput of the mandible touches the eminence of the temporal bone. A firm or springy end-feel might be due to stretch of the soft tissues or muscle spasm. A soft end-feel might be due to soft tissue compression, which is unlikely for the TMJ. An empty end-feel

might occur when the patient stops further movement before the examiner senses any organic resistance to the movement. One reason could be pain triggered before the end of the motion.

### ***The pain provocation tests***

Pain is reported and registered as a familiar (concordant) pain or an unfamiliar (discordant) pain, and pain intensity is graded on an 11- points numeric pain rating scale (NPRS).

### **The dental stick test**



Figure 6. The dental stick test.

**Purpose:** Pain provocation; to reproduce pain from the intra- or the extra articular structures.

**Performance of the test:** The participant is in the sitting position and instructed to bite on a dental stick. The left and the right sides are tested separately. The participant points out pain location with a fingertip. Pain location and intensity are registered.

**Interpretation of the test:** Pain located over the ipsi- or contralateral joint is considered as a positive test for the intra-articular structures of the joint. No pain or pain evoked in the surrounding areas is considered as a negative test for the intraarticular structures. Pain pointed out in the surrounding areas of the joint can be consider as a positive test for the extraarticular structures such as the masticatory muscles.

## Isometric test



Figure 7. The isometric test.

**Purpose:** To test if pain is provoked from the intra- or the extra articular structures.

**Performance of the test:** The participant is in the supine position. The examiner gives an isometric resistance on opening, protrusion and left and right laterotrusion when the mouth is halfway opened (mid position). The participant is instructed to keep the position of the mandible while the examiner gives increased resistance without movement in the joint.

**Interpretation of the test:** Pain pointed out by the participant (using one fingertip) on the ipsi- or the contralateral joint is considered as a positive test for the intraarticular structures, while no pain or pain evoked in the surrounding areas is considered as a negative test for the intra-articular structures. Pain pointed out by the participant in the surrounding areas of the joints can be consider as a positive test for the extraarticular structures such as the masticatory muscles.

## Joint provocation test



Figure 8. The joint provocation test.

**Purpose:** To test if pain is provoked from the joint and the retrodiscal structures.

**Performance of the test:** The participant is in the supine position. With the little finger in the participant's external ear canal, the examiner gives a pressure of maximum 2 kilos for 1-2 seconds to provoke pain from the retrodiscal structures. Calibration of palpation pressure was performed by using a digital scale.

**Interpretation of the test:** If pain is provoked, an intra-articular structure may be the cause.

## Distraction test



Figure 9. The distraction test.

**Purpose:** To evaluate if distraction of the joint surfaces reduces or provokes pain.

**Performance of the test:** The participant is in the supine position. With the thumb intraoral on the participant's mandibular molars and the fingers around the outer mandible, the examiner performs a caudally separation Grade II (Kaltenborn 2011) of the caput from the mandibular fossa [28]. The left and the right sides are tested separately.

**Interpretation of the test:** If the distraction causes pain relief it might be due to released intra articular pressure or reduced compression of the retrodiscal tissue. Pain provocation might be due to stress applied to both intra- and extra articular structures.

### **Anterior glide (pain)**



Figure 10. Pain-provocation during anterior glide.

**Purpose:** To test for pain on anterior glide.

**Performance of the test:** The participant is in the supine position. With the thumb intraoral on the participant's mandibular molars and the fingers around the outer mandible, the examiner performs an anterior glide in the joint. The left and the right sides are tested separately.

**Interpretation of the test:** Pain provocation might be due to stress applied on intraarticular structures.

## Movement - pain



Figure 11.1

Movement-pain; mouth-opening.

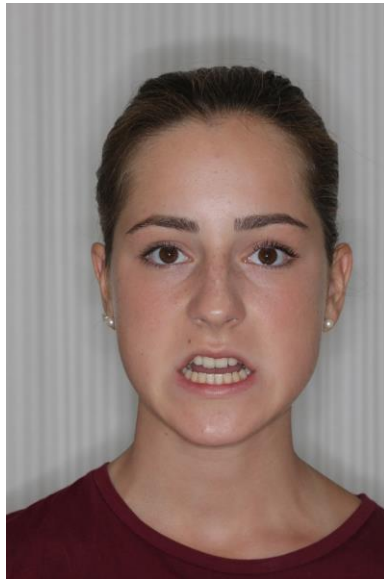


Figure 11.2

Movement-pain; protrusion.



Figure 11.3

Movement-pain; laterotrusion.

**Purpose:** To test for pain on mouth-opening, protrusion and bilateral laterotrusion.

**Performance of the test:** The participant is in the sitting position. The participant opens and closes the mouth (Figure 11.1), moves the jaw anteriorly and back in neutral position (Figure 11.2) and then moves the jaw to the right and to the left (Figure 11.3).

**Interpretation of the test:** Pain provocation might be due to both intra- and extra articular structures.

**(Source: Author)**