TEST YOUR CRANIAL NERVES

INTRODUCTION

The cranial nerves are 12 pairs of nerves that can be seen on the ventral surface of the brain. Some of these are sensory nerves bringing information from the sense organs; other cranial nerves are motor nerves controlling muscles and glands; while some cranial nerves contain both motor and sensory pathways. The picture below shows the name and location of each pair of cranial nerves. The table below identifies the type of and function of each cranial nerve.

![Cranial Nerves Diagram]

<table>
<thead>
<tr>
<th>NAME</th>
<th>TYPE</th>
<th>FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>I – Olfactory</td>
<td>sensory</td>
<td>smell</td>
</tr>
<tr>
<td>II – Optic</td>
<td>sensory</td>
<td>vision</td>
</tr>
<tr>
<td>III – Oculomotor</td>
<td>motor</td>
<td>eyeball movement (up, down &amp; medial), pupil constriction, lid elevation</td>
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<tr>
<td>IV – Trochlear</td>
<td>motor</td>
<td>turns eye downward and medially</td>
</tr>
<tr>
<td>V – Trigeminal</td>
<td>both</td>
<td>receive sensations of touch &amp; pain from face &amp; mouth chewing</td>
</tr>
<tr>
<td>VI – Abducens</td>
<td>motor</td>
<td>turns eye laterally</td>
</tr>
<tr>
<td>VII – Facial</td>
<td>both</td>
<td>taste (anterior 2/3 of tongue) secretion of tears &amp; saliva</td>
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<tr>
<td></td>
<td></td>
<td>controls most facial expressions</td>
</tr>
<tr>
<td>VIII – Auditory</td>
<td>both</td>
<td>hearing, balance</td>
</tr>
<tr>
<td>(vestibulocochlear)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IX – Glossopharyngeal</td>
<td>both</td>
<td>taste (posterior 1/3 of tongue) controls some muscle used in swallowing</td>
</tr>
<tr>
<td>X – Vagus</td>
<td>both</td>
<td>taste (posterior 2/3 of tongue) senses blood pressure and heart rate</td>
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<tr>
<td></td>
<td></td>
<td>stimulates digestive organs</td>
</tr>
<tr>
<td>XI – Spinal Accessory</td>
<td>motor</td>
<td>controls trapezius &amp; sternocleidomastoid muscles controls swallowing movements</td>
</tr>
<tr>
<td></td>
<td></td>
<td>controls muscles used in head movement &amp; in shoulder elevation</td>
</tr>
<tr>
<td>XII – Hypoglossal</td>
<td>motor</td>
<td>controls tongue movements</td>
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</table>
PURPOSE
Knowing the names and functions of the cranial nerves, allows you the opportunity to test their functions. These tests will help you understand how the cranial nerves work. These tests are not meant to be a “clinical examination” of the cranial nerves. You will need a partner to help – both of you can serve as the tester (experimenter) and the subject. Record your observations of what your partner does and says.

SAFETY:
Follow all normal safety rules.
All cotton swabs and cotton balls must be discarded after usage.

MATERIALS:
6-8 containers of common substances that produce an odor (cloves, peppermint, orange oil, etc.)
Cotton balls
Cotton swabs
Snellen chart or something to read to check for visual acuity
2 flashlights
2 pencils
clipboard or similar size cardboard
Feather (or any other harmless object for touching the side of the face)
Paper clip
Dull straight pin or ink pen
Solutions – sweet water, salty water, sour water
Tuning fork and rubber mallet
Tongue depressor
4 Trash containers

PROCEDURE: Follow the directions for testing each nerve or groups of nerves.
CRANIAL NERVE I – OLFACTORY

Test:

a. The eyes of the subject should be closed and one nostril should be occluded with a cotton ball.

b. The tester should select two containers for the subject to identify. Using the wafting motion, the subject should identify the common substance.

c. Occlude the other nostril and repeat step B using the same two containers.

d. Swap positions and repeat experiment for the other person.

Results

<table>
<thead>
<tr>
<th>Container #</th>
<th>Identity of odor</th>
<th>RIGHT NOSTRIL</th>
<th>LEFT NOSTRIL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Sample A</td>
<td>Sample B</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sample A</td>
<td>Sample B</td>
</tr>
</tbody>
</table>

CRANIAL NERVE II – OPTIC

Test:

a. Use a Snellen chart to determine the visual acuity of the subject. Subject should stand 14 inches from the chart. Close one eye while reading the chart. Repeat with other eye.

b. Visual field checks – Subject and tester should sit directly in front of each other. The tester should hold a pencil in the center of the forehead of the subject. Slowly lower the pencil and note when each can see the pencil. (Both partners should see it at the same level).

c. Place cardboard or clipboard against the right side of the subject’s nose. Shine a light directly onto right eye. Note what happens to both pupils. Move the board to the other side of the nose and repeat with other eye. This needs to be done in a dark place.

d. The subject should follow the light as the tester moves the light up and down and side-to-side. Note if eyes move in coordinated fashion or if they jump.

Results:

a. Right eye - ___________________ Left eye ___________________

b. Did both of you see the pencil at the same time? ___________________

c. Right eye with light: Did both pupils do the same thing? __________ What happened? ______________________

Left eye with light: Did both pupils to the same thing? __________ What happened? ______________________

d. Describe the movement of the eyes as they follow the light. ________________________________

CRANIAL NERVE III - OCULOMOTOR

Test:

a. Have subject follow your finger while you move it in a large circle, a figure “H” or a figure like an asterix (*).

b. Check subject’s response to light by shining a flashlight directly into subject’s eyes.

c. Accommodation and convergence - Have the subject to look at the tip of a pencil about 18 inches from their nose. Watch their eyes as you bring the pencil toward the bridge of the nose.

d. Cover/uncover test – With one eye covered, have the subject look at an object across the room. Watch eyes for movement as the tester removes the cover. Repeat with other eye.

Results:

a. Did the eyes move symmetrically? ________________________________

b. What was the pupil’s response to the light? ________________________________

c. Describe the movement of the pupils and the eyes as the pencil is brought closer to the nose.

d. Describe any difference in the movement of the eyes.
CRANIAL NERVE IV—TROCHLEAR

Equipment: cotton swab, trash container

Test:
- Observe the extraocular eye movements by moving a pencil in 6 directions (up, down, side to side, diagonally). Subject’s eyes should move together.
- Have subject close both eyes. Using a cotton swab, gently touch the subject’s eyelashes.
- Have subject look to the far right and left while holding his/her head still.

Results:
- Did eyes move together as they looked in all 6 directions? _______________________________
  Note direction of movement if eyes did not move together in same way. _______________________
- What was the result of touching the eyelashes with the swab? _________________________________
- Describe the appearance of both eyes as they look in each direction.

CRANIAL NERVE V—TRIGEMINAL

Equipment: dull straight pin, feather, paper clip, cotton ball, makeup brush

Test:
- Compare masseter muscle size and strength with subject’s jaw clenched. (Subject’s jaws must be closed as if biting down on a piece of gum).
  1. Feel the masseter muscle size
  2. Gently pull down on lower jaw to test strength.
- Have subject close both eyes. Touch different parts of his/her face with 2 different objects and have subject identify the objects and the location of each touching. Repeat on opposite side of face. Be careful not to touch the eyes of the subject.

Results:
- Describe the strength of the masseter muscle. Was the person able to resist the downward movement?

  b. Right side of face:
     Identify 1st object touching face- __________________________ Identify location __________________
     Identify 2nd object touching face- __________________________ Identify location __________________
  
  Left side of face:
     Identify 1st object touching face- __________________________ Identify location __________________
     Identify 2nd object touching face- __________________________ Identify location __________________

CRANIAL NERVE VII—FACIAL

Equipment: 3 taste solutions—sweet, salty, sour, cotton swab, trash container

Test:
- Observe subject while:
  1. Smiling
  2. Frowning
  3. Puckering lips
  4. Eyebrow elevation
  5. Tight closing of the eyes
  Subject’s face should be symmetrical with all movements.
- Instruct subject to puff out cheeks and resist your efforts to collapse them.
- Subject should identify the following tastes with eyes closed: sweet, sour, salty
  Use a clean cotton swab to apply each substance, one at a time, to the center of the tongue.
  (Each cotton swab should be discarded after usage).

Results:
- Was the subject’s face symmetrical with all 3 movements? ________________________________
- Was subject able to resist effort to collapse his/her cheeks? _______________________________
- Container # - _________ Taste - __________________
  Container # - _________ Taste - __________________
  Container # - _________ Taste - __________________
**CRANIAL NERVE VIII – ACOUSTIC**

**Equipment:** tuning forks
rubber mallet for striking the fork
ticking clock

**Test:**

a. With both eyes closed, have the subject determine the distance at which they can hear the ticking of a clock.
b. Weber Test – Tester should place the stem of a vibrating tuning fork in the center of the forehead of the subject. Subject should describe any discrepancies of the sound in each ear.
c. Rinne Test – Subject should close their eyes. Place the stem of a vibrating tuning fork firmly on the mastoid process. [Lightly touch the mastoid process with the base of the tuning fork.] Then without striking the fork again, hold it beside the external ear canal and have the subject tell you when they no longer hear the vibration (time and record).
d. Romberg Test – Subject should stand with arms dangling by his/her sides and feet touching side by side. Subject should then close both eyes and remain in this position for 20-30 seconds. (Tester must remain nearby in case subject begins to fall)

**Results:**

a. Record the distance subject could no longer hear the sound.

b. Is the sound heard equally well in both ears?

c. Vibration time on the mastoid process time -

Vibration time by the ear canal time -

d. Did subject show any evidence of increased sway or balance loss?

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**CRANIAL NERVE XII – HYPOGLOSSAL**

**Equipment:** Card with typed sentence

**Test:**

a. Observe tongue at rest with mouth open – Note movement, if any.
b. Subject sticks out tongue and then moves it from side to side quickly. Note the location and movement of the tongue, which should be fast and smooth.
c. Subject presses tongue on inside of their cheek, while tester applies slight pressure on their cheek. The cheek should be firm & resist slight pressure.
d. Have subject open mouth. Note location of the uvula.
e. Test speech by having subject repeat sentence – “Round the rugged rock the ragged rascal ran”.

**Results:**

a. Describe the movement or stillness of the tongue.

b. Was tongue centered or pulled to one side?

Did the tongue move fast & smooth?

c. Was the tongue able to resist pressure?

d. Was the uvula centered in the mouth?

e. Was subject able to say the sentence?

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**CRANIAL NERVE XI – SPINAL ACCESSORY**

**Equipment:** none

**Test:**

a. Trapezius test - Tester should press down on the subject’s shoulders. The subject should lift his/her shoulders against the tester’s hands. The movement should be equal and strong.
b. Sternocleidomastoid test – Subject starts with head turned to the side. Tester should place both hands on the cheeks. Subject should push his/her face against tester’s hands.

**Results:**

a. Did both shoulders feel the same?

Was the subject able to lift their shoulders while their partner pushed downward on their shoulders?

b. Was the subject able to turn their head or exhibit any movement?
CRANIAL NERVE IX – GLOSSOPHARYNGEAL
X – VAGUS

Equipment: Tongue depressors
Trash container

Test:
   a. With mouth open, subject should say “ah”.
   b. Subject should speak or cough – should be clear and strong.
   c. With a tongue depressor push down on the tongue, the subject should elicit the gag reflex. Do not place tongue depressor more than half way back on the tongue. Moving depressor closer to the back of mouth might make gag reflex work really well. (You will be sorry that this happens.) Discard tongue depressor after usage.

Result:
   a. Describe location & movement of uvula and soft palate. __________________________________________
   b. Was cough or words clear & strong? __________________________________________________________
   c. Was gag reflex noticed? ________________________________

ANALYSIS

1. Which cranial nerve is the largest?

2. How many cranial nerves are responsible for eye movements?

3. What does “abducens” refer to?

4. Which cranial nerves carry gustatory (taste) information?

5. Which cranial nerve is the longest?

6. Which cranial nerve is responsible for pupillary constriction?