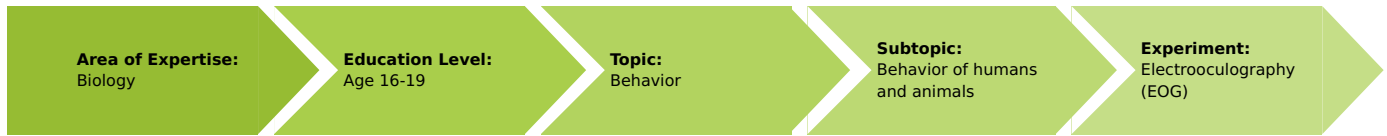


Electrooculography (EOG) (Item No.: P1350460)

Curricular Relevance



Difficulty



Intermediate

Preparation Time



10 Minutes

Execution Time



10 Minutes

Recommended Group Size



2 Students

Additional Requirements:

- iPad or Android tablet

Experiment Variations:

- Alternatively, use a PC with measureLAB (14580-61)

Keywords:

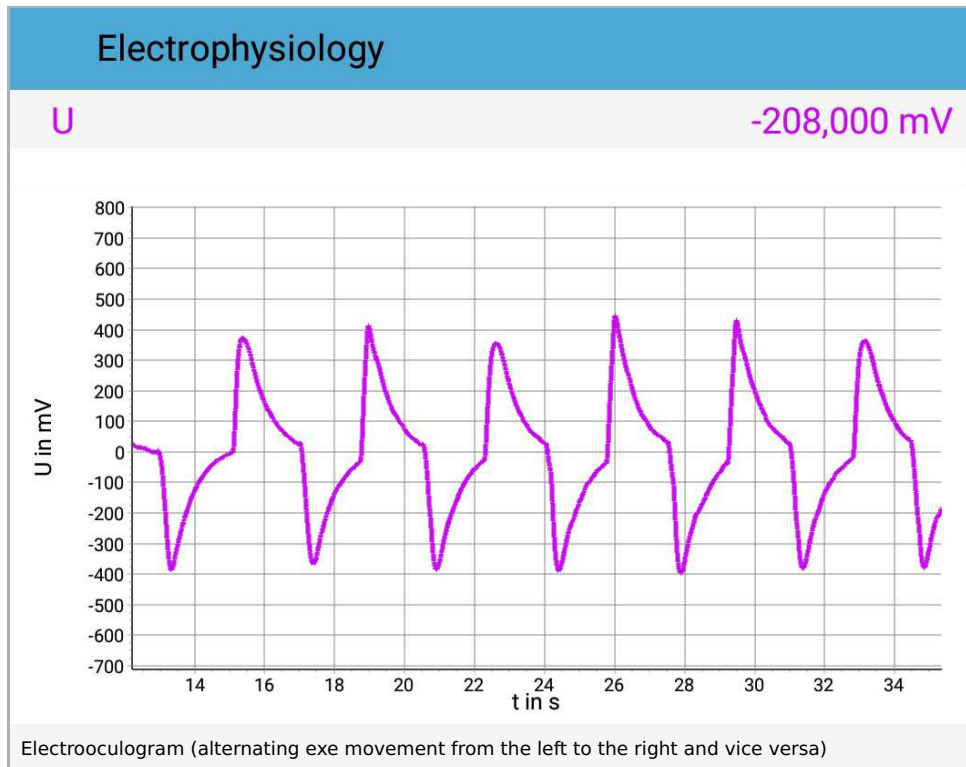
Electrical field measurement, Eye movements, Dipole, Sacchades, Fixation period, Practised reader versus schoolchild, Rapid reading techniques

Overview

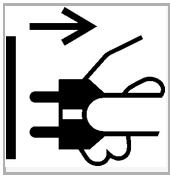
Information for teachers

Additional information

During electrooculography (EOG) the eye movements are measured by recording potential changes on the skin surface. There is a standing potential between the cornea (positive) and the retina (negative), which is called corneo-retinal potential. When the eyes move, the electrical dipole shifts. The resulting changes are measured on the skin surface with the aid of electrodes. In human medicine, electrooculography is used, for example, for detecting disorders of the balance system or eye movement system.



Warning



Unplug when in use!

For safety reasons, the Sensor-Unit Electrophysiology must only be used if the attached Cobra4 measured data recording instrument is not connected to the mains voltage!

The alternating eye movement should not be performed for more than 20 seconds. If the eyes are moved for a longer period, dizziness and nausea may result.

An EOG that is recorded at school should not be overinterpreted in the event of deviations from the example EOG in the illustrations. Disorders that are related to the balance system or eye movement system can only be diagnosed with any degree of certainty by a doctor.

Notes concerning the execution of the experiment

Please ensure that the students take care that the test person does not move during the measurement. Even the slightest movements of the head will cause the electrical activities to be superimposed during the measurement (movement artefacts).

Electrooculography (EOG) (Item No.: P1350460)

Overview

Background

The teaching curricula include numerous topics that deal with the human body. The objective is to teach knowledge of the structure and function of important organ systems, the underlying mechanics of fitness, the function of the cardiovascular system, control of cardiac activity, disorders of the cardiovascular system, preventive measures, experiments concerning the functioning of the eyes and the conduction of stimuli, as well as of one's own body and ways to keep it healthy.

Other topics in this context include the utilisation of medical procedures as well as sports-related topics such as training effects and studies concerning short- and long-term exercises.

Other topics in this context include the utilisation of medical procedures as well as sports-related topics such as training effects and studies concerning short- and long-term exercises.

The Cobra4 Electrophysiology Set is particularly suitable for studying these subject areas through experimenting. Its modern, didactic concept arouses the students' curiosity about experiments and motivates them to follow their own impulses and to explore the boundless experiment options of Cobra4. The measurements are performed with the aid of a computer and by radio transmission so that they can be easily integrated into all kinds of learning situations, from the classroom to the sports field.

The Cobra4 set Electrophysiology enables non-invasive measurements of heart, muscle, and eye activity. This set includes extensive descriptions for student experiments as well as complementary texts for teachers.



The symbol on the front of the Sensor-Unit is the famous drawing by Leonardo da Vinci around the year 1487, which shows the idealised proportions of the human body. The name of the drawing "Vitruvian Man" is derived from Vitruvius who was a contemporary of the Roman Emperor Augustus and author of a treatise on architecture. Vitruvius supported the hypothesis that a man in an upright position fits into the geometrical form of a square as well as into a circle.

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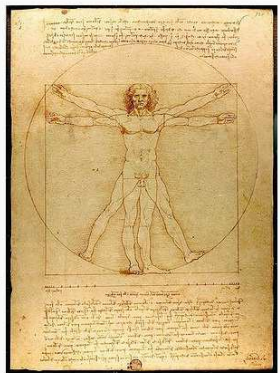
Vitruvian Man

From Wikipedia, the free encyclopedia
(Redirected from Vitruvian man)

The **Vitruvian Man** is a world-renowned drawing created by Leonardo da Vinci around the year 1487^[1] It is accompanied by notes based on the work of Vitruvius. The drawing, which is in pen and ink on paper, depicts a male figure in two superimposed positions with his arms and legs apart and simultaneously inscribed in a circle and square. The drawing and text are sometimes called the **Canon of Proportions** or, less often, **Proportions of Man**. It is stored in the Gallerie dell'Accademia in Venice, Italy, and, like most works on paper, is displayed only occasionally.^[2]

The drawing is based on the correlations of ideal human proportions with geometry described by the ancient Roman architect Vitruvius in Book III of his treatise *De Architectura*. Vitruvius described the human figure as being the principal source of proportion among the Classical orders of architecture. Other artists had attempted to depict the concept, with less success. The drawing is traditionally named in honour of the architect.

Vitruvian Man



Contents [hide]

- History
- Representations in modern times
- See also
- Notes
- External links

History

This image exemplifies the blend of art and science during the Renaissance and provides the perfect example of Leonardo's keen interest in proportion. In addition, this picture represents a cornerstone of Leonardo's attempts to relate man to nature. Encyclopaedia Britannica online states, "Leonardo envisaged the great picture chart of the human body he had produced through his anatomical drawings and Vitruvian Man as a *cosmografia del minor mondo* (cosmography of the microcosm). He believed the workings of the human body to be an analogy for the workings of the universe."

According to Leonardo's notes in the accompanying text, written in mirror writing, it was made as a study of the proportions of the (male) human body as

One comes across da Vinci's motive of the ideal man surprisingly often, among others on the Italian euro coin as a symbol of Italian culture:



It is primarily used, however, in the medical context worldwide, e.g. on medical book covers, or as a logo of health insurance companies.



Short description

We measure our eye movements

With this experiment, you can find evidence of the electrical activity that is generated during the movement of your eyes. Several electrodes attached to the skin of the face measure all the changes of the electrical voltage that are caused by the movement of the eyes. This method is referred to as electrooculography (EOG).



Equipment

Position No.	Material	Order No.	Quantity
1	Cobra4 Wireless/USB-Link	12601-10	1
2	Cobra4 Sensor-Unit Electrophysiology: ECG, EMG, EOG	12673-00	1
3	Shielded leads for electrophysiology, color-coded, 3/pkg	12673-01	1
4	Electrodes for ECG Sensor, 100 pcs.	12559-01	1
5	Crocodile clips for disposable electrodes, 3/pkg	12673-02	1
With disposable electrodes:			
6	Electrodes for ECG-Sensor	12559-01	1
7	Crocodile clips f. disposable electrodes, 3 pieces	12673-02	1
Or with permanent electrodes:			
8	EMG electrodes, 3 pieces	65981-02	1
9	Electrode Gel, tube	65981-06	1
Additional material:			
	Android tablet or iPad		1
	PHYWE measure App		

Android

iPad



Tasks

Record an electrooculogram of the movement of your eyes. For this purpose, move your eyes repeatedly from the left to the right, and vice versa.

Set-up and procedure

Set-up

Preparatory tasks

Preparation and application of disposable electrodes

The heart, muscle, and eye activities are measured on the skin surface. You have to measure at different points depending on the organ in question.

For **getting started**, **disposable electrodes** are the most suitable, since you can simply stick them to the skin areas that are designated in the experiment descriptions and they also supply acceptable results. Simply fasten the crocodile clips to the ends of the colour-coded leads and clip them on the tabs of the disposable electrodes:



Fig.2: disposable electrodes

Preparation and application of permanent electrodes

You can use permanent electrodes alternatively as well.

Permanent electrodes are more time-consuming and costly, but have the following advantages apart from lower follow-up costs:

- EMG permanent electrodes: reduced footprint on the skin and, thereby, more precise measurements
- ECG permanent electrodes: increased footprint on the skin and, as a consequence, stronger signals

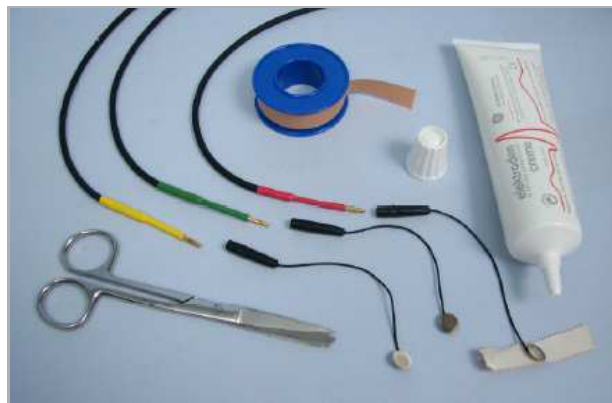


Fig. 3: Permanent electrodes

In order to establish contact, apply some electrode cream onto the surface of the EMG electrode (which is also used for EOG) and fasten the electrode to the desired skin area with the aid of some Leukoplast® adhesive tape. Then, connect the electrode to the end of the corresponding colour-coded lead:

Set-up

- The experiment requires at least two persons wherein one test person is to be connected to the electrodes and another person will operate the Tablet.
- Fasten the three electrodes to the face as shown in Fig. 2.

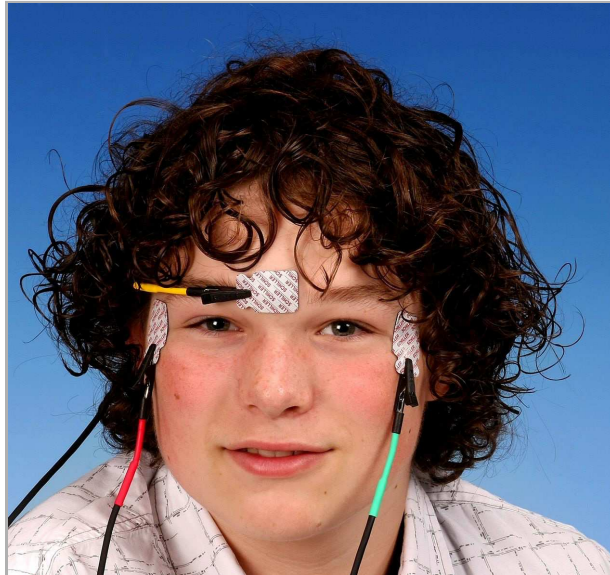
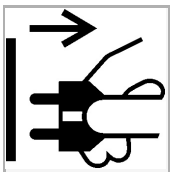


Fig. 4: Fastening of the electrodes around the eyes


- Now, connect the colour-coded leads with the crocodile clips to the electrodes: at first the yellow crocodile clip to the electrode on the forehead above the nose. Please bear in mind that the facial skin tends to be oily, especially on the forehead. In order to ensure that the electrodes adhere well to the skin, you should wash the affected skin areas with soap or at least wipe them with a handkerchief. If the cable impairs the vision of the test person, you can place the cable behind one of the ears. Connect the red crocodile clip to the electrode next to the right eye, and the green clip to the electrode next to the left eye of the test person.
- You can now connect the electrode cables to the Cobra4 Sensor-Unit Electrophysiology. Plug the red plug into the socket that is marked with (+), the yellow plug into the socket that is marked with (-), and the green plug into the socket that is marked with (Ref).

Procedure



Unplug when in use!

For safety reasons, the Sensor-Unit Electrophysiology must only be used if the attached Cobra4 measured data recording instrument is not connected to the mains voltage!

- Connect the sensor-unit Electrophysiology with the Wireless/USB-link and switch it on.
- Connect your tablet via Wi-Fi with the Wireless/USB-link.
- Open the PHYWE measure App  and select the sensor "Electrophysiology". Select the sensor-mode "EOG".
- Select a sampling rate of your choice. The higher your sampling rate the more accurate the measurement will be. In addition to this there is also a possibility to multiply your values by a factor to get an even clearer result.
- Start the measurement data recording process once the voltage has levelled out. The test person should be seated on a chair in a relaxed position. It is very important for the test person to remain absolutely still throughout the measurement, since otherwise the system will also record other electrical activities.
- After just 30 seconds, you will have sufficient data to terminate the measurement. Use the "zoom" tool and "fit in" tool to get a decent plot.

Results and evaluation

After the end of the measurement, select a suitable measurement section with the zoom tool and look at it. You can also use the "survey" function in order to determine the intervals between the regressive movements of the eye.

Go to the report now and answer the questions to your results.

Report: Electrooculography (EOG)

Results - Question 1

Describe and interpret the voltage curve. What happens when the eye moves to the left or right? What happens when you look straight ahead and fix your eyes on an object?

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Results - Question 2

2. Draw the voltage curve of one eye movement from the left to the right and back again.

Results - Question 3

Perform your own experiments with the Cobra4 Sensor-Unit Electrophysiology and measure the eye movement in several different everyday-life situations. Let your exploratory urge run wild! How could the eye movements differ, for instance, when you watch a tennis match in real life or on TV? Describe and interpret your results!

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