



# A RELATIVELY NEW METHOD OF NEUROPHYSIOLOGICAL EXPLORATION - FOR THE FIRST TIME IN ROMANIA - NEAR INFRARED FUNCTIONAL SPECTROSCOPY, NIRS / FNIRS - CONCEPTUAL AND PRACTICAL ASPECTS/TECHNICAL DETAILS, REGARDING ITS USE IN PEDIATRIC NEUROREHABILITATION

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## Abstract

**Introduction.** fNIRS is also called - Optical Topography (OT) or simply NIRS. Using - near infrared spectroscopy - brain activity is measured to estimate cortical hemodynamic activity that occurs in response to neuronal activity. Along with EEG, NIRS/fNIRS is one of the newest non-invasive neurophysiological techniques that can be used in portable contexts. The signal is often compared to the BOLD (Blood Oxygenation Level Dependent) signal measured by fMRI and is able to measure changes in both oxyhemoglobin and deoxyhemoglobin concentration.

**Material and Methods.** The device, OxyMon - we have the important opportunity to work with is the first and only one by now, in Romania - uses as technology a continuous wave NIRS/fNIRS system with infrared light emitters that each emits at least two wavelengths (700-900nm). Consequent to consulting a base enough of 20 related articles, the LASER emit light in the near infrared spectrum to measure concentrations of substances that absorb the emitted light. The LASER fire one by one, so that the system can distinguish between infrareds spectrums. This principle is called the time-sequenced principle. The light is transmitted from the LASER through the skin to the receiver by optical fibers containing glass fibers. Specifically a fiber ending connecting to the OxyMon, is called a connector : and a fiber ending on the skin is called an optode (transmitter or receiver). The optodes are fixated in an optode holder. The distance between the optodes is called the source-detector distance or the inter-optode distance. A transmitter and receiver optode together form an optode combination or channel. The NIRS/fNIRS technique is based on the Lambert-Beer law (1851), which describes the relationship between the optical density of the medium, the incident radiation with the transmitted one, the concentration of the medium, the distance between the light input and the light output point and the wavelength used. In the last decade it has been used by anesthetists in pediatric operating rooms allowing continuous monitoring of cerebral perfusion, but is gaining support in other medical specialties.

**Results.** NIRS/fNIRS is a non-invasive brain imaging method, and it is an appropriate technique for detecting brain activity during motor dynamics. Although it provides specific information slower than EEG systems, there are many possibilities for development.

**Conclusions.** The application of NIRS/fNIRS in neuromotor rehabilitation is still new and immature but we can expect many unique and significant discoveries by researching the neuro-myo-arthro-kinetic “apparatus” in relation to cortical hemodynamic activity. It is also noteworthy that these such studies may provide new insights into the potential clinical applications of NIR spectroscopy. This work as the approval of the Ethics Commission of the National Teaching Center for Neuro-psycho-motor-Rehabilitation in Children „Nicolae Robanescu” conform no. 5487/17.06.2021.

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