

fNIR Measurement in 8-11 Month Old Infants' Prefrontal Lobes During Locomotion and Executive Function Task

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Researchers have suggested that the relative amount of oxygenated haemoglobin (oxy-Hb) and deoxygenated haemoglobin (deoxy-Hb) indicates the level of activity occurring in adult and infant brains. Functioning near infra-red (fNIR) technology uses LED light and optical sensors to measure the volume of oxy-Hb and deoxy-Hb in the capillaries of the prefrontal cortex in real time. The prefrontal cortex is an area firmly linked to executive functioning — neurocognitive and regulatory processes associated with inhibitory control, cognitive flexibility, and the planning, initiation, and evaluation of voluntary actions (Diamond, 2013). Some researchers (e.g., Koziol, Budding, & Chidekel, 2011) have suggested that self-guided locomotion contributes to the development of executive function.

There are two goals of the current study: 1) analyze changes in oxygenation in the prefrontal lobe during passive versus active movement through an environment; 2) examine the differences in oxygenation between two video tasks designed to measure attention regulation. The study's two parts use a within-subjects counterbalanced design to investigate these objectives in 8-11-month-old typically developing crawling infants. In part one, the infants wear the fNIR while they are pushed toward their parents in a stroller and while they crawl toward their parents. In part two, the infants wear the fNIR while watching a cat puppet task and a switch task on a plasma screen. The switch task involves attentional control and switching away from an established response — hallmarks of executive function, while the cat puppet task requires only simple looking.

We predict that there will be a greater increase in oxy-Hb when the infant actively moves by crawling versus passively moving in a stroller. In addition, we predict that there will be a greater increase in oxy-Hb during the switch task as compared with the cat puppet task. Five infants have completed the study and their preliminary data will be presented.