Applying fNIRS to study the effects of nutrition on cognitive development in infants: A pilot study on working memory in infants in UK and rural Africa

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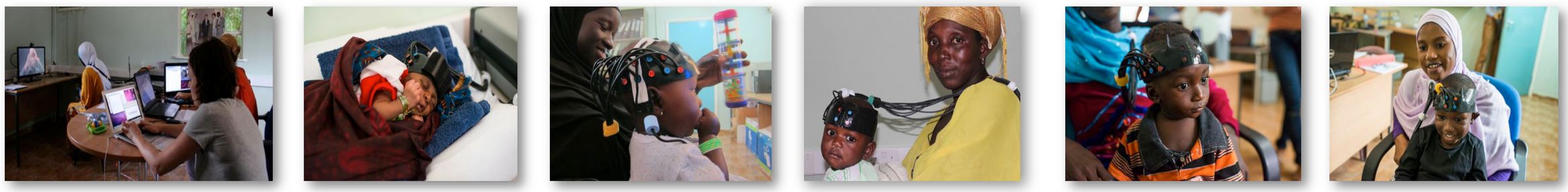
General aims

- Establishing fNIRS for assessing objective markers of neurocognitive function in infants in resource poor settings.
- Providing early biomarkers of cognitive development to inform and evaluate nutritional intervention strategies.

Experimental set-up | 0-2 months | 4-8 months | 9-13 months | 12-16 months | 18-24 months

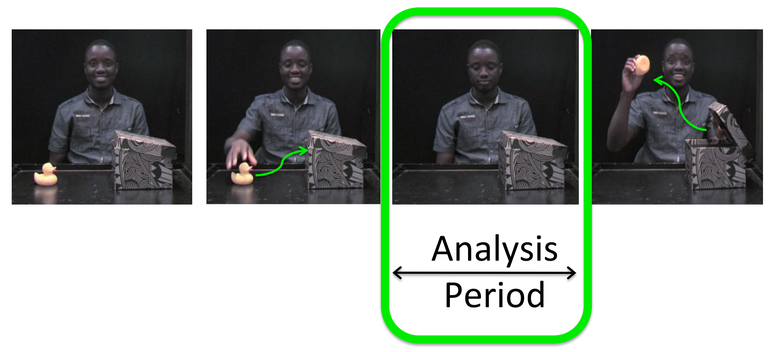


Working memory and nutrition

- Poor nutrition in infancy -> suboptimal hippocampus-based memory functioning,
  -> deficiencies in frontostriatal-mediated executive functions.
- Currently only detected once the affected cognitive functions reach the point of observable **behaviour**, limiting the possibility of **intervention** at an earlier stage.

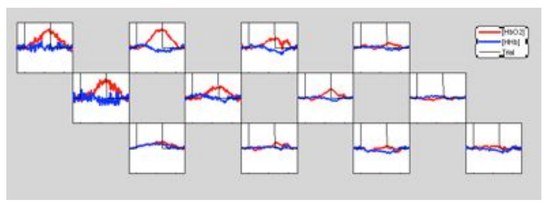
Paradigm – Object permanence

- Hold a mental schema of an object in mind, when it is no longer visible;
- Tapping into both executive functions and working memory.
- By recording the cortical correlates of working memory in infants, could fNIRS provide a tool for earlier detection of potential cognitive deficits due to under nutrition?

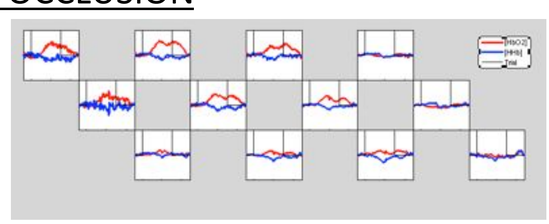


Preliminary results – Pilot Data (Gambia)

3s OCCLUSION



6s OCCLUSION



3s OCCLUSION | 6s OCCLUSION | COMPARISON 6s > 3s

Channels with significant group responses in 12-16-mos for the 3s and 6s occlusion of the object; and channels with significant differences between the two conditions.

Conclusions

- fNIRS can be used to measure neurocognitive function in infants from birth to 24 months of age in a resource poor setting.
- fNIRS may be used to elucidate typical and atypical brain development from birth and hence investigate the effects of nutritional insults and interventions in global health studies.

More Information

www.globalfnirs.org

Brain Imaging for Global Health