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# Cognitive Development under conditions of chronic hypoxia: The Bolivian Children Living at Altitude (BoCLA) Project.

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## Abstract

Millions of people currently live at altitudes in excess of 2500 metres, where oxygen supply is limited, but very little is known about the development of brain and behavioural function under such hypoxic conditions. We describe the physiological (including transcranial doppler, EEG and ERP), cognitive and behavioural profile of a large cohort of infants (6-12 months), children (6-10 years) and adolescents (13-16 years) who were born and are living at four altitude locations in Bolivia (from 500m up to over 4000m). Level of haemoglobin oxygen saturation was significantly lower in all age groups living above 2500 metres, confirming the presence of hypoxia, but without any detectable detriment to health. Only subtle neuropsychological changes were found below 3800m. Importantly, the proportion of European, Native American and African genetic admixture was comparable across altitude groups, suggesting that adaptation to high altitude in these children occurred in response to chronic hypoxic exposure irrespective of ethnic origin. Interestingly, above 4000m there were more changes, suggesting an altitude threshold over which the ability of the developing brain to adapt to hypoxia may be less effective. These BoCLA data have potential implications for public health and for our understanding of neurocognitive outcome in children living at sea-level with pathological forms of mild hypoxia.

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