Positive Biopsychosocial Ecologies Related to Human Neurodevelopment

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Family household-income has been identified as a risk factor for poorer developmental outcomes among children. However, family income is only a distal factor of the more proximal bio-psycho-social factors (e.g., perinatal history, family relationships, school and neighborhood quality) encompassing the lived experiences of children that may more directly influence development. This study examined 22 proximal measures in the economic, psychosocial, physiological, and perinatal ecologies of children, in association with brain structure and cognitive performance.

Methods: We studied a sample of 8,158 9–10-year-old children from the Adolescent Brain Cognitive Development (ABCD) study. An income-to-needs ratio (INR) was calculated based on family income and family size. NIH Toolbox Composite scores were used as our measure of cognitive performance. Brain structure was measured via total cortical surface area. The 22 measures in domains of bio-psycho-social factors were entered into a group factor analysis to identify latent factors describing the lived ecologies of children. Linear mixed-effect models tested associations of the INR and derived ecological latent factors with cognition and brain structure.

Results: Associations between the INR and cognition and total cortical surface area showed the steepest increases in the low socio-economic range (<200% INR), with apparent increases still visible beyond economic disadvantage in the range of 200–400% INR. Notably, we found three latent factors encompassing positive ecologies for children across the areas of economic, psychosocial, physiological, and perinatal well-being in association with better cognitive performance and the higher total cortical surface area beyond the effects of income. Specifically, latent factors encompassing youth perceived social support and perinatal well-being were positive predictors of developmental measures for all children, regardless of income. Further, we found a general latent factor that explained relationships between 20 of the proximal measures and encompassed a joint ecology of higher social and economic resources relative to low adversity across psychosocial, physiological, and perinatal domains. The association between the resource-to-adversity latent factor and cognitive performance was moderated by the INR, such that among children with economic disadvantage, cognitive performance increased only for children with high latent factor scores (i.e., more resources relative to lower adversity).

Discussion: Our findings suggest that both positive ecologies of increased access to resources and lower adversity are mutually critical for promoting better cognitive development in children from low-income households. Our findings inform future studies aiming to examine positive factors that influence healthier development in children.

References: Gonzalez, M. R., Palmer, C. E., Uban, K. A., Jernigan, T. L., Thompson, W. K., & Sowell, E. R. (2020). Positive economic, psychosocial, and physiological ecologies predict brain structure and cognitive performance in 9–10-year-old children. *Frontiers in human neuroscience*, *14*, 578822.