Neurocognitive Consequences of Socioeconomic Disparities: The Intersection of Cognitive Neuroscience and Public Health

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Decades of work in the fields of sociology, education, and public health have demonstrated strong links between socioeconomic status (SES) and important measures of child development, such as IQ, grade retention, and school graduation rates. Such measures tell us in broad strokes that socioeconomic differences in childhood are linked to large differences in cognitive development and academic achievement. However, they tell us little about the underlying neural mechanisms that are at play.

In recent years, research investigating the associations between SES and brain development has begun to flourish. We concur with the editors of *Developmental Science* that the time is ripe to highlight this burgeoning field, which sits at the intersection of neuroscience and public health.

The nascent literature on the cognitive neuroscience of socioeconomic disparities has several gaps that are ready to be addressed. These include questions of neural consequences (*Which brain systems are structurally and functionally implicated?)*; timing (*When can SES disparities in neural and cognitive development first be detected?)*; and mechanisms *(How do different experiences and exposures explain these differences?).*

The work in this special issue addresses each of these questions. In terms of the question of "*which*," Lawson et al show that parental education is significantly associated with cortical thickness in portions of the prefrontal cortex. Noble and colleagues show that educational attainment predicts cognitive control and that this association is accounted for by white matter structure in certain white matter tracts previously linked to cognitive control. Sheridan et al observe links between subjective social status and hippocampal activation in children during a declarative memory task. The question of *"when"* is addressed by Tomalski and colleagues, who found socioeconomic disparities in frontal gamma power in infants as young as 6 months. Finally, the question of *"how"* is tackled by Evans and Fuller-Rowell, who report that self-regulatory capacity moderates the effects of childhood poverty on young adult working memory, as well as by Lipina and colleagues, who show evidence that home literacy activities and computer use mediate the links between SES and certain cognitive outcomes. Certainly, each of these papers raises new questions, and much work remains before we may consider any of these questions fully addressed. It is our hope that this special issue will serve to inspire developmental cognitive neuroscientists in these pursuits.

Perhaps the most important outcome of this burgeoning science will be improved interventions to protect or restore the cognitive capacities of children living in poverty. As Neville and colleagues state in their commentary, "studying SES and the brain provides an opportunity to identify which neural systems are most vulnerable and – more importantly – the mechanisms by which SES can impact brain systems and behavior and also the systems that can be targeted in training programs designed to ameliorate or eliminate those effects." We agree with these authors that it is time to begin developing interventions – to be tested using rigorous cognitive neuroscience methods – to reduce socioeconomic disparities in achievement. The work presented in this special issue lays the groundwork for such interventional measures, by helping to identify which cognitive and neural systems to target, when to implement screening and remediation measures, and how to target particular experiences and exposures that may place a child at risk.

Our emerging understanding of the *which*, *when* and *how* of poverty's effects on brain development can also encourage societal investment in child development by making clear the physical consequences of socioeconomic status on human capital. By placing the problem of child poverty and cognitive development in a biological framework, we highlight the public health aspect of a problem that has heretofore been viewed only in terms of social justice.

The current vital state of SES research in neuroscience is a welcome development, which contrasts sharply with the skeptical, if not hostile, reception such work received less than a decade ago. Back then some neuroscientists argued against bringing the politically charged topic of socioeconomic disparities into brain science. We were warned that a neuroscience of poverty would pathologize poor children, blame the victim, and suggest to the public that socioeconomic differences were innate or immutable. Happily, these dangers have not come to pass. Instead, an ever growing community of neuroscientists and child development experts have joined forces with the goal of understanding how socioeconomic context influences the lives we lead and the people we become through its effects on brain development. With this Special Section of *Developmental Science* we present a sample of research aimed at this goal, and hope to engage other researchers in this important pursuit.

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