The Effects of Poverty on the Brain

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Many still believe "the poverty problem" is about a lack of money. Unfortunately, it's not that simple. In fact, if that were the only problem, it would be good news, but it's not. Nearly 17% of all children in the United States come from low-income families (U.S. Census Bureau, 2006). Others believe that it's a lack of values such as having a strong work ethic or motivation to succeed; but those theories have been dismissed by research that shows that those are *effects, not causes* of poverty (Sapolsky, 2005). Poverty can also be explored as a product or result of classism, failed social policies, racism, unsafe housing, poor education, inadequate laws or a host of other issues. There is also a wide rage of being poor from absolute poverty (lack of food, housing or shelter), to relative poverty (feeling poor compared to your neighbors), and generational poverty (long-term familial or community based low SES) or situational (temporary economic disaster) poverty though here we'll focus on the long-term.

What is Poverty?

Poverty is a chronic, mind/body condition exacerbated by the negative, synergistic effects of multiple, adverse, economic risk factors. Kids from poverty are different because their brains adapt to suboptimal conditions. But brains can and do change everyday. You can facilitate that change. But for them to change, you must change. Nobody's telling you it's a "piece of cake." But those from poverty can (and do) succeed. It is happening all over the country. The schools that succeed with those from poverty are doing the right things, doing them over time and, as a result, changing young brains for the better. In addition, for your school to succeed with kids from poverty, you'll want to understand how poverty changes the brain and use that knowledge to guide educational practices.

Here we'll explore the effects of poverty on from a neurobiological perspective. The case will be made here that effects on the human brain from chronic exposure to poverty are more than demoralizing. I argue that chronic poverty (versus temporary poverty) changes the brain dramatically. We'll explore 1) that brains from poverty do change in specific and different ways and 2) you can change things for the better—if you know how. The take-home message here is to "Never give up!"

How are Brains of those from Poverty Different?

The effects of poverty on any human being are truly staggering. In short, the kids are different because their brains are different. Our neurons are designed by nature to *reflect their environment*, not to "automatically" *rise above it*. Areas of the brain that are affected by chronic exposure to poverty include those responsible for working memory, impulse regulation, visuospatial, language and cognitive conflict (Noble, et al. 2005). Evidence suggests children of poverty are more likely to have different brains via four primary types of experiences. They are: 1) exposure to toxins, and 2) chronic stress 3) chronic exposure to substandard cognitive skills and 4) impaired emotional-social relationships. While not every single low SES child will experience all of these factors, the majority will. Let's explore each of these.

Exposure to Toxins

Any type of toxin, from a food toxin such as artificial additives, coloring or those with carcinogens, to environmental toxins such as lead, noise or smog will impose stressors on the body and brain. These stressors consume resources and ultimately, a price is paid. When compared to their middle- or upper-income classmates, more children from lower SES are likely to:

- Live on or near toxic waste sites (Brody et al., 1993).
- Live in areas that did not meet one or more of the Air Quality Standards (EPA 2000).
- Have had more exposure to pesticides (Moses et al., 1993)
- Have greater exposure to lead (Brody et al., 1993).
- Have more exposure to cigarette smoke. (Childstats, 1999).

These are relevant because, for example, high levels of lead are dangerous to children because they can cause neurological and developmental impairment. The behaviors we see in the classroom may be a result of years of toxic buildup. The aggregate of exposure to multiple toxins creates damage to the brain, which manifests in behavioral, cognitive, emotional and social ways. It is the aggregate of factors that ultimately prove challenging to overcome, not any single one.

Chronic Stress

Chronic stress creates an adjustment in the body's "stress point" in the same way that we can create a different "set point" for eating and hunger signals. An example of an altered set point is PTSD or depression. This altered set point is known as allostatic loads, from the Greek word "allostasis" meaning "adjusted stability." This devastating change is actually long-term, carry-over stress that continues day after day. Those living in poverty experience a chronic stress overload greater than in their higher socioeconomic class (SES) counterparts. (Almeida, et al. 2005). How, specifically, are kids from lower SES affected by stress as compared to those of middle or upper income?

- Poor families move twice as often, get evicted five times as much (Federman et al., 1996).
- Children of poverty face 50 percent more street crossings with a six times greater risk in pedestrian accidents (McPherson et al., 1998).
- Poor children have more contact with aggressive peers (Sinclair et al., 1994).
- They experience more community violence; from an unsafe home neighborhood or a dangerous path to school which can hurt academic performance (Schwartz & Gorman, 2003).
- Greater safety concerns, leading to academic underperformance (Pratt et al., 1997).

• significantly more daily stresses--up to 35 percent more daily hassles and the toll on the body adds up (Attar et al., 1994)

• worse food choices because appetite and eating habits becomes altered by chronically higher levels of cortisol. (Cartwright, et al., 2003).

One study actually gave randomized, double blind, placebo-controlled, fixed oral doses of cortisol (a chemical associated with stress) and the placebo (colored water) to subjects. After several days of exposure, the researchers found that the cortisol treatment reversibly decreased specific elements of memory performance in otherwise healthy individuals (Newcomer et al., 1999). Other studies highlight the effects of chronic stress on the schoolage brain. This allostatic load increases the likelihood that kids from poverty will emotional problems (Burgess et al., 1995), lowers IQ and reading scores (Delaney-Black, et al. 2002), and significant memory loss (Lupien, et al. 2001).

Chronic stress is clearly bad and humans respond with adaptive allostatic loads in one of two ways: we become more angry and aggressive or, we become much more passive, even helpless (Johnston-Brooks, et al., 1998). This understanding helps educators realize that the frustrating behaviors they see in the classroom from kids from poverty (aggressiveness or giving up) are not *causing* their problems—they are *the symptoms* of their problems (Sapolsky, 2005). This is fundamental change for many educators--moving away from a blaming mentality and getting to work being an ally for their students.

Cognitive Skill Development

There is considerable evidence that children from poverty are more likely to have impaired exposure to critical enrichment factors resulting in substandard cognitive skills. Here are some differences from those facing those from poverty vs those in middle and upper income homes:

• Parents from poverty use different vocabulary words every day, both fewer and less complex than those heard in families of greater income (Hoff, 2003).

• Poor children are more likely to have parents that are less likely (by a factor of three or four) to initiate conversation just to maintain social contact or build vocabulary (Hart & Risley, 1995).

• Kids from affluent communities children have more books in their homes than low-SES children had in all school sources combined (Korat, & Haglili 2007)

• Low SES parents are only half as likely to read to their kids as compared to high-income children (Coley, 2002).

• Have lower quality of nutritional intake in low-income infants and toddlers which is linked to lower cognition (Frank et al., 1995).

These issues are relevant because, for example, while children from poverty typically have cognitive deficits, they can be improved with specific skill-building programs in reading, writing, math and problem-solving.

Emotional-social Relationships

Right from at birth, the formation of a secure attachment between parent and child creates the baseline strengths and coping skills which will set in motion the quality of future relationships with teachers and peers (Szewczyk-Sokolowsky and Bost, 2005). Unfortunately, children from poverty are far less likely to get the baseline of a solid, strong two-parent family and the resulting parental support. As an example:

• Poor children experienced less parental support and were parented in a less responsive more authoritarian, harsher fashion than their higher income counterparts (Evans, 2004).

• Low SES children felt that their parents were not very interested in their activities and, as a result are less open with their parents about their feelings and (Rosenfeld, Richman and Bowen, 1998).

• They develop fewer social ties and have more chaos, stress, and disruption in their lives (Jensen et al., 1983).

• Kids in these homes also hear less responsive, fewer supportive, and less interactive conversations among others in their homes (Hart & Risley, 1995).

• They are also more likely to spend time in foster care or to have parents who are divorced (Evans, 2004)

• Poor parents are half as likely as professional parents to be able to track down their children playing in the neighborhood (Evans, 2004).

• Among American 13-year-olds, those watching six or more hours of television per day are nearly twice as likely to be living in low income households (Evans, 2004)

• Poor parents are more likely to leave their children home alone for extended periods of time, regulate the amount of television their kids watch (Bradley and Corwyn, 2002).

All of the disconnect in relationships takes its toll. Children from poverty believe themselves to have fewer friends and have lower acceptance among their peers (Rosenfeld, Richman and Bowen, 1998). Unfortunately, children from poverty are much more likely than their counterparts to have impaired relationships. This can affect self-esteem and even influence their everyday choices of those whom they'd like to have as friends. And, once at school, their peers are a greater influence on their lives than their parents (Harris, 1998). But remember that chronic stress is a key factor and it increases likelihood of inappropriate attachments (Schore, A. 2002). This creates vicious cycle where poor kids lack the grounded strong quality home relationships, yet, they are more likely to seek the wrong ones at school. Good relationships lower stress, provide guidance and support.

Can Those From Poverty Succeed?

The neurobiological evidence may sound pretty depressing, but there's hope. First, brains are designed to respond to experiences, both good and bad. This means that while those from poverty may have suboptimal brains, positive experiences can (and do) change their brain. If you're thinking that lower IQ kids cannot catch up, the research says otherwise. As example, researchers found that low SES children (with an mean IQ of 77) *adopted* by high-SES parents averaged IQ gains of 21 points when tested eight years later (Duyme, et al., 1999). Yet a school can also provide the enrichment that a quality home life can provide—if you know what to do and act on it.

Second, long-term studies working with children of poverty for five years, measured multiple outcomes. Craig and Sharon Ramey, at the University of Alabama found (1992) that they could significantly increase achievement of low SES children compared to untreated controls. Divided into two groups (one control group), the children who were exposed to the enriched environment scored significantly higher on every cognitive, emotional and social post-test, even as much as 16 years later (Wasik, et al.1990). The evidence shows brains can change if the environment is enriching.

From Synapses to Schools

Taking neuroscience into the classrooms means we have to understand that brains are influenced by experiences and we can change the experiences. First, the school staff needs collective "will" and collaboration so that everyone is on the same page. Changes have to be targeted based on clear data that will meet standards. Simple, clear short-term action steps must be developed to effect changes with a school-wide rubric to evaluate student progress fairly. But this strategy has to be combined with overall instructional, social and environmental templates for long-term change. Many schools do this routinely with low SES kids. Each of them has a slightly different focus, but all of them use focused skill-building, relationship-building, in a positive, hopeful environment, and they offer any needed accommodations by being a full-service school.

Hope turns out to be one of the critical factors in turning low SES students into high achievers. Why hope? Far from being some esoteric, wistful ideal, hope (and other powerful positive emotions) may trigger change through enhanced metabolic states like physical activity and by influencing gene expression which changes the brain (Jiaxu and Weiyi, 2000). Hopeful kids are more optimistic, they try harder, persist longer and ultimately, get better grades. Yet, how many educators in school of poverty even have hope for their students? How many actually make it a mission to provide, on an on-going basis, powerful, positive, believable messages to their kids? Hopeful messages say, "You will make it. We are on your side. Others have made it before. We will do whatever it takes for you to succeed." Schools can provide hope in many ways including access to the best teachers, top resources, relevant curriculum and quality relationships. If you don't have the background to understand the science behind changing brains for the

better, your staff must have believe in the possibility of change and have hope for every student. Hope drives change.

Schools that Focus on Changing the Brain

As a staff developer, I provide workshops on poverty and how it affects the brain. Educators can see vivid, colorful images of how the brain changes, but they often ask, "Where are the schools that actually do this? Who is succeeding?" Educators need the confidence and hope that it can be done. Fortunately, there are countless schools that do enough of the right things and enough things right to get miracles. Here, just a few schools from each of the grade levels will be highlighted.

Sampit Elementary School in Georgetown, SC. is located in rural South Carolina and has 90% of its students receiving free and/or reduced lunch. 71% of its students are African American, the student turnover is 12% and teacher turnover is 10%, yet it maintains high tests cores. Ira Harbison Elementary in National City, California, a diverse community 12 miles from the U.S.-Mexico border, has shown great increases in student achievement. The school has a population that is 60% Hispanic, 45% English Language Learners (ELL), has 100% of its students eligible for free or reduced lunch, and there is a student mobility rate of 17.3%. In New York, Watson Williams Elementary has a student mobility rate of 22% with 96% of its students eligible for free or reduced lunch. Yet it's a highly desirable school with good test scores. Esparza elementary school in San Antonio has 100% poor and minority students, yet it's in the top 25% in the state.

The Preuss school in California has 760 middle and high school students, with 94% minority, 100% poor students, and yet their graduation rates are through the roof. Amazingly, over 95% of their graduates are accepted to 4-year colleges. Belle Isle Middle School in Oklahoma had 59% of their students eligible for free or reduced lunch and had between 97 and 99% of all students achieving a proficient or above rating on the state. Walsh High School near Denver, has test scores among the best in the state. At Walsh, a small rural school with only 60 students in grades 7-12, the majority are poor. These and many other schools succeed because they understand it's different being poor, but it's no excuse for low achieving students.

Summary

In sum, we know that children of poverty often have suboptimal brains and we know that brains can change for the better. There are seven primary factors that drive positive change in the human brain (Jensen, 2006). They include novel complex learning, physical activity, hope, managed stress levels, and a supportive, hopeful social climate. Each factor feeds off of another; hence physical activity lowers stress and the hope feeds the academic skill-building. These factors are not new to most educators, but the real challenge comes with collaboration, consensus, commitment and compliance to use them. In short, it's the ability of each school staff to understand not just "what it takes" but also be "able and willing to deliver" the factors that actually drive positive change. While not the intent of this article to provide all the potential strategies for change, the message here

is that brains do change and by doing the right things at your school, resistance is futile. Brains from poverty can and will change for the better.

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