

Noncognitive Factors in Child Development

Chair/Discussant: David J. Armor

Presenters: Greg J. Duncan, W. Steven Barnett, Flavio Cunha

- **School Readiness and Later Achievement**

Greg J. Duncan, Chantelle J. Dowsett, Amy Claessens, Katherine Magnuson, Aletha C. Huston, Pamela Klebanov, Linda Pagani, Leon Feinstein, Mimi Engel, Jeanne Brooks-Gunn, Holly Sexton, Kathryn Duckworth, Crista Japel

- **Promoting Children's Social and Emotional Development Through Preschool**

Judi Boyd, W. Steven Barnett, Elena Bodrova, Deborah J. Leong, Deanna Gomby, Kenneth B. Robin, Jason T. Hustedt

- **Formulating, Identifying, and Estimating the Technology of Cognitive and Noncognitive Skill Formation**

Flavio Cunha, James J. Heckman

Duncan: Early achievement-related skills include reading letters and beginning and ending word sounds, and math such as counting, ordinality, and relative size. Attention and socioemotional behaviors include sustaining attention, externalizing or internalizing behavior problems, and social skills, meaning the ability to relate to other children and teachers in an appropriate manner. Economists label socioemotional behaviors as noncognitive tasks, but this is erroneous as many of these tasks require a great deal of cognition.

An analysis of six nonexperimental, longitudinal data sets related school-entry measures of academic attention and socioemotional skills to later achievement. All but one of the datasets have a measure of ability and behavior temperament prior to school entry. The Kindergarten Early Childhood Longitudinal Study (ECLS-K) was compared with five others. Unlike ECLS-K, these studies have measures of the children prior to school entry that serve as useful control variables. Each study used different measures; however there is usually a cognitive measure, a temperament or behavioral report. By running these regressions, measuring these issues at various points, it was possible to get standardized coefficients across variables in these categories: early math skills, attention related measures, internalizing behaviors, externalizing behaviors, and social skills.

A general pattern emerged from the ECLS-K across all six data sets. Almost all of the kindergarten entry reading measures had significant impacts on later math and reading achievement. Early math skills had an even higher average effect size. Most attention-related school entry measures were statistically significant although the effect sizes were on average smaller than for math or reading. In terms of impact, internalizing, externalizing, and social skills are all uniformly scattered around zero. After introducing either concurrent controls for the academic skills or the control variables, the socio-emotional behavior variables have coefficients that essentially fall to zero.

This data comes from a meta-analysis with the 236 coefficients as observations controlling for the time between school entry and when the given outcome was measured. The coefficients are weighted by the inverse of the variance of the estimated coefficients. If the 236 coefficients are divided according to whether the outcome in question is math or reading, there is much greater explanatory power of early math than later math. Surprisingly, early math is just as predictive of reading outcomes as early reading scores. There was not consistent evidence of interactions based on gender, socioeconomic status, or race of the child across these dimensions. These conclusions were concerning because they did not conform to what was expected.

Questions around issues of shared method variance were raised, however school entry academic skills were as predictive of teacher-reported as test-based outcomes. The possibility of non-linear effects were also examined and found to be insignificant. The reliability of test scores was high: reliability of the teacher reports of behavior was at least 0.79 and the reliability of maternal reports was at least 0.54. Another possible bias is that the highly reliable achievement tests on these behaviors were compared to less reliable reports from teachers and sometimes parents. After making adjustments, these error and variables adjustments did not have much effect. A lingering issue remains on the validity of the teacher report on children's behavior.

Another problem occurs if researchers are over controlling. If the behavior affects children's early achievement, then controlling for achievement concurrently robs the behaviors of some of their explanatory power. That seems to be true in the case of attention, but it is not the case in externalizing, internalizing, and social skills. Dependent variables such as achievement can be difficult to measure because as children grow older, outcomes like completing school are as much of a product of behavior as they are of achievement. It remains open whether certain kinds of learning-related behaviors might be more affected by the behavior baseline.

Finally, no intervention literature shows that improving behavior leads to better academic outcomes. For better academic outcomes, math is the most important followed by reading, and then attention. Socioemotional behaviors are generally insignificant in terms of academic outcomes.

Barnett: Socioemotional development is a complex, diverse set of factors including self-regulation, planning and forethought, social problem solving, relationship building, understanding feelings, attachment to society, responsibility, independence, autonomy, empathy, prosocial behavior, cooperation, antisocial behavior, aggression, and anxiety. These factors may be related in particular ways, but it is possible to have children who are both more aggressive than ideal and very sociable. Social and emotional development involves skills and knowledge, but it also involves values, dispositions, and sometimes behaviors with multiple and complex causes.

Self-regulation is linked to development of prefrontal cortex in prekindergarten years. It is possible that there is a use it or lose it effect. Early aggression and conduct problems are highly predictive of later problems. Additionally, negative cycles can develop early that can reinforce problems. There are large differences in these characteristics of child development by the time children enter school, and preschool programs have demonstrated an effect. Researchers examined a set of key randomized trials. In terms of effects on social and emotional

development, many of these studies find better behavior and less aggression for children that participated in preschool. Some of these studies find more aggression early on. Children who participated in preschool have better concentration, more independence and increased self-esteem. The size of these benefits varies considerably across programs. Some increase aggression as well as demonstrating cognitive and other socioemotional gains, some reduce delinquency and crime, while other programs do not have even cognitive gains. The economic benefits depend substantially on the size and type of these social and emotional outcomes.

The effects vary for a variety of reasons. Quality of the curriculum and the preschool, particularly the teacher, has an impact. There are different baseline rates of problems, population, and context. There are also issues of sample size and questions about research design.

Many of these models are direct instruction rather than child-initiated, with the potential to be a significant problem because children need to learn about peer interactions, when to take responsibility, and when to plan. Nearly half the children in this direct instruction model were eventually classified as emotionally impaired. In terms of teen misconduct, the rate is much higher for the direct instruction model. Children who had the two curriculum models with more child initiation were much more likely to engage in extracurricular activities, such as sports, as teenagers. They are more likely to volunteer or plan for advanced education, even if they are not actively working towards it or it is not a realistic goal.

A classroom needs balanced initiation to be effective. Functional skills need to be taught, as do concepts and problem solving related to socioemotional development. There needs to be thought provoking and divergent questions, opportunities for peer to peer learning, and explicit work helping children identify and cope with their feelings. All of this must be intentional rather than opportunistic. In addition, this needs to happen in the context of well-educated preschool teachers, adequate teacher compensation, small classes, and reasonable teacher-child ratios. There needs to be strong supervision, high standards, and accountability. While the evidence is not as strong as would be ideal, programs that have produced large improvements in children's socioemotional development share these characteristics.

Cunha: The role for cognitive skills has been understood for a long time, while noncognitive or socioemotional skills have not been discussed. As noncognitive skills increase, there is an increase in log wages. Keeping noncognitive skills fixed, and increasing cognitive skills, there is an increase in log wages; but when both are increased, there are much larger increases. This is not only a pattern for log wages, it turns out to be a pattern for many other dimensions for what is understood as success. Families at the top quartile of family income have children who are doing better in the math and reading test scores. The families from the bottom quartile of family income have children who are doing worse. Interestingly, when the home environment is controlled for, these gaps virtually disappear.

For the purposes of this research, childhood was divided into two periods of before school and after school. Economists use equations to get at the notions of critical and sensitive periods. Critical periods are periods in which it is important to invest, or certain skills will not develop.

Researchers are trying to understand patterns of remediation that are possible in cognitive and noncognitive skills. The idea is to understand the evolution of cognitive and noncognitive skills by looking at how investments made by the parents also influence the accumulation of these skills. The equations consider the stock of cognitive skill of the child at a certain age, the noncognitive stock of the child, parental investment, the mother's cognitive skill, and the mother's noncognitive skills. With these equations, the production functions of both the cognitive and noncognitive skills are estimated.

One of the findings is that both cognitive and noncognitive skills show strong persistence. That means that children who know a lot of math today will probably know a lot of math tomorrow too. Noncognitive skills also show strong persistence. This is called self-productivity. Researchers have not found evidence that cognitive skills of the child today affect the accumulation of noncognitive skills, however there is a small but statistically significant effect of noncognitive skills increasing the accumulation of cognitive skills.

Investments early on are important for the development of cognitive skills. The impact tends to decrease as age increases. For noncognitive skills, it is the opposite, as they tend to be unresponsive to parental investments early on; but as the child ages, parental investments become increasingly important. For cognitive skills, there is less possibility of remediation than for noncognitive skills.

Researchers did some simulations. The first simulation is of children 6 years of age who come from the bottom tenth percentile in the distribution of both cognitive and noncognitive skills. Their families also supplied them with investments that are at the bottom of the tenth percentile of the distribution of investments. The probability is 30 percent that these children will graduate from high school. When investment is increased when these children are 12 or 13 years of age, probability of graduating from high school increases to 42 percent. If all of the investment is done before the children come to school, the probability of graduating from high school goes to 53 percent. To increase initial conditions, one can provide some formal training or preschool training to these children.

A cost-benefit analysis was estimated by creating a simulation using two "fake" groups of people, a treatment group and a non-treatment group, both from these disadvantaged backgrounds. In the simulation, at age 3, 4, and 5 years, the group will get a large investment and nothing else except what their families provide them, similar to the preschool findings. Early conditions are important, and they influence the success people can have in life.

Discussion: An audience member commented that considering the small sample size, he found Barnett's presentation to be extremely misleading in terms of types of curriculum. He added that Barnett ignored the difficulty in changing socioemotional behavior in the preschool setting, stating that intensive interventions aimed at changing behavior have had virtually no success.

Barnett expressed his disagreement with the audience member acknowledging that the study he cited was small; however it had been replicated. He commented that there is a forthcoming randomized trial to be published on a different curriculum, which is highly focused on children's

self-regulation. Barnett also added that there is substantial literature, not just in preschool, but in the elementary years, that shows there are effective interventions on behavior.

Cunha affirmed that there would be more differences in interventions from birth to 3 years of age rather than birth to 5 years of age, in response to an audience question. He added that these skills are self-perpetuating so it would follow that earlier investment is better because skills will reproduce themselves for longer periods of time. He added that implementing a policy that will distribute investments over the entire life cycle is much better than investing in specific periods, but investments will be lost if not followed up. However, he added, if one must choose between investing earlier or later, it is better to invest earlier because of the self-productivity.

Discussion continued, and presenters agreed, that the term “noncognitive” skills is a misnomer as it actually requires a significant amount of cognitive skills. Duncan agreed wholeheartedly and added that his research attempted to distinguish the attention-related measures and the socioemotional measures. An audience member commented that researchers are better at assessing achievement but are still working on the socioemotional piece. She added there is a growing body of literature showing a connection between social and achievement skills.