

Highlights of Research Findings from the Abecedarian Studies

Craig T. Ramey

Distinguished Scholar of Human Development
Virginia Tech Carilion Research Institute

Professor of Psychology and Pediatrics
Virginia Tech

Joseph Sparling

Professor of Education
Melbourne Graduate School of Education,
The University of Melbourne

Investigator Emeritus
Frank Porter Graham Child Development Institute
The University of North Carolina

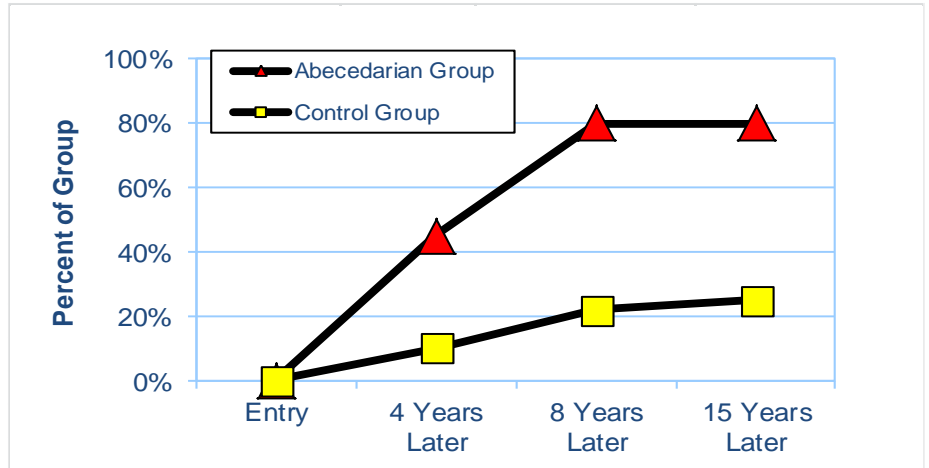
A series of Randomized Controlled Trials (RCT's) called the Abecedarian Studies demonstrate the significant benefits of high quality early childhood education for vulnerable and at-risk children and their families. Children in the studies included those at risk from multiple social conditions such as poverty, young maternal age, or low parental education. Other children in 2 orphanage studies were at risk due to parental abandonment. But, importantly, children in some of the studies came from a wide range of social classes. Many of these children had no additional risk other than being born at low birth weight or with cerebral palsy. The educational program or intervention in all of the studies was the full Abecedarian Approach (LearningGames, Conversational Reading, Language Priority, and Enriched Caregiving) except the Cerebral Palsy study which used only the LearningGames element of the Abecedarian Approach. The most recent study, initiated in February 2012, focuses on Aboriginal children and families in Winnipeg, Canada. These are the RCT's:

Randomized Samples		Location	N	Duration of Program	Type of Program	Oldest age of follow-up
Abecedarian 1 (The Abecedarian Project)		Chapel Hill, NC	111 children	Birth to age 5 years	Center + social work visits + health care	age 30
Abecedarian 2 (Project CARE)		Chapel Hill, NC	64 children	Birth to age 5 years	Center + social work + educational home visits + health care	age 21
Infant Health and Development Program (IHDP)	Abecedarian 3	Boston, MA	138 children	Birth to age 3 years	Center + educational home visits	age 18
	Abecedarian 4	New Haven, CT	112 children	Birth to age 3 years	Center + educational home visits	age 18
	Abecedarian 5	Bronx, NY	138 children	Birth to age 3 years	Center + educational home visits	age 18
	Abecedarian 6	Philadelphia, PA	101 children	Birth to age 3 years	Center + educational home visits	age 18
	Abecedarian 7	Miami, FL	100 children	Birth to age 3 years	Center + educational home visits	age 18
	Abecedarian 8	Little Rock, AK	128 children	Birth to age 3 years	Center + educational home visits	age 18
	Abecedarian 9	Dallas, TX	137 children	Birth to age 3 years	Center + educational home visits	age 18
	Abecedarian 10	Seattle, WA	131 children	Birth to age 3 years	Center + educational home visits	age 18
Abecedarian 11 (Cerebral Palsy Study)		Baltimore, MD	48 children	Age 1 to 2 years	Parent training for home intervention	age 2
Abecedarian 12 (Orphanage Study 1)		Iasi, Romania	65 children	Age 1 to 2 years	Home (small group in orphanage)	age 2
Abecedarian 13 (Orphanage Study 2)		Iasi, Romania	104 children	Age 2 to 3 years	Home (small group in orphanage)	age 3 years
Abecedarian 14 (CLIO Study)		USA, national	2,430 parents	Age 3 to 4 years	Preschool + daily parent education groups	age 5
Abecedarian 15 (Massachusetts Family Child Care Study)		Massachusetts, state-wide	150 family childcare providers	2 years (between Birth and 5 years)	Family child care homes	caregiver data only
Abecedarian 16 (Healthy Child Manitoba Evaluation)		Winnipeg, Manitoba	64 children (first cohort)	Birth to age 5 years	Center + educational home visits	Study began Feb. 2012

What were some of the outcomes for participants in these scientific investigations? The following figures and very brief paragraphs highlight some key findings: first for the parents of the children, then for the children in the early years of life, children in the middle and adolescent years, and in the young adult years. Finally, some results are shown for caregiver behavior effects of Abecedarian staff training.

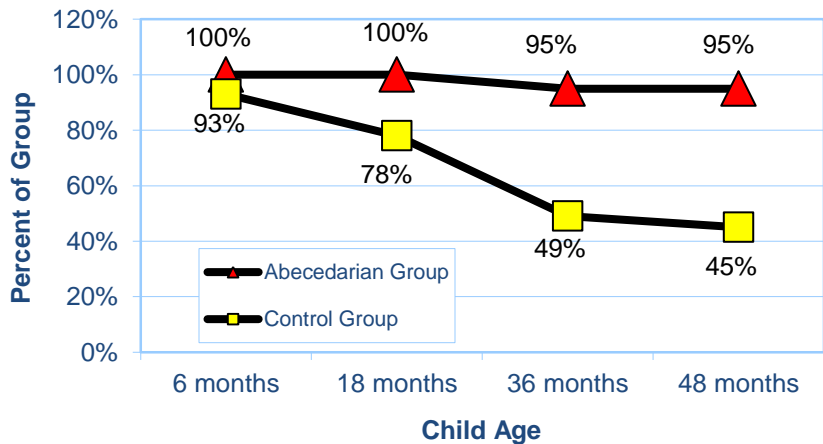
Post-high School Education for Teen Mothers whose Children Were in the Abecedarian Project

Many of the mothers in Abecedarian Study 1 were teen-agers. The percentages of teen parents who got education beyond high school over a 15 year period are shown in the first figure. Of the mothers whose children received the program (shown in the line with the red triangles), 80% had some education beyond high school. This was a substantial level of educational attainment, since these young mothers were from severely disadvantaged families (Ramey, et al., 2000).



Percent of Child Sample in Normal IQ Range (>84) by Age, Longitudinal Analysis

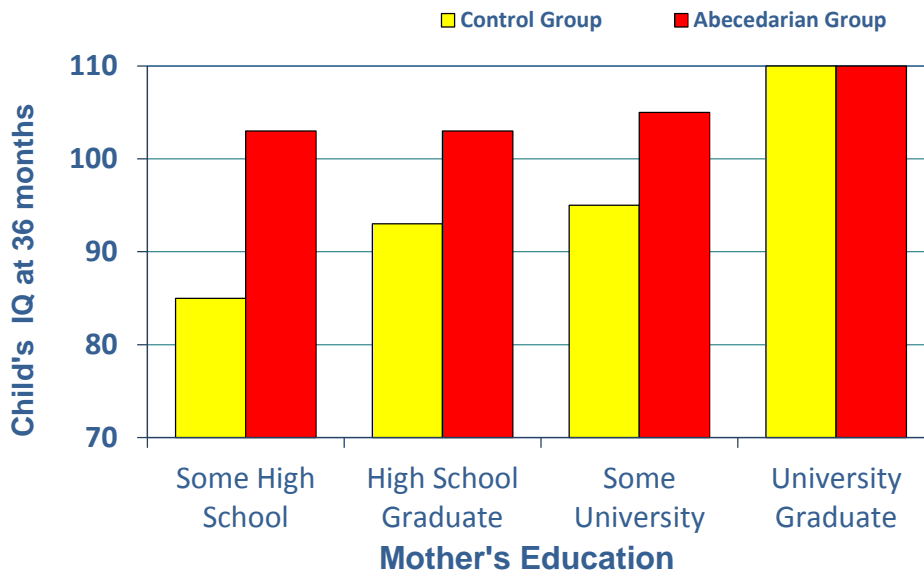
Almost all of the at-risk children in both the experimental and control groups of Abecedarian Study 1 were in the normal IQ range at the beginning of the study. Most of those who received the Abecedarian intervention continued to stay in the normal IQ range, while more than half of those who did not receive the intervention fell out of the normal range by 36 months of age. This decline is seen in the descending line with yellow squares in the accompanying figure. The difference between groups begins to be statistically significant at age 18 months (Martin, Ramey, & Ramey, 1990).



Child's Age-36-months Stanford-Binet IQ by Mother's Education

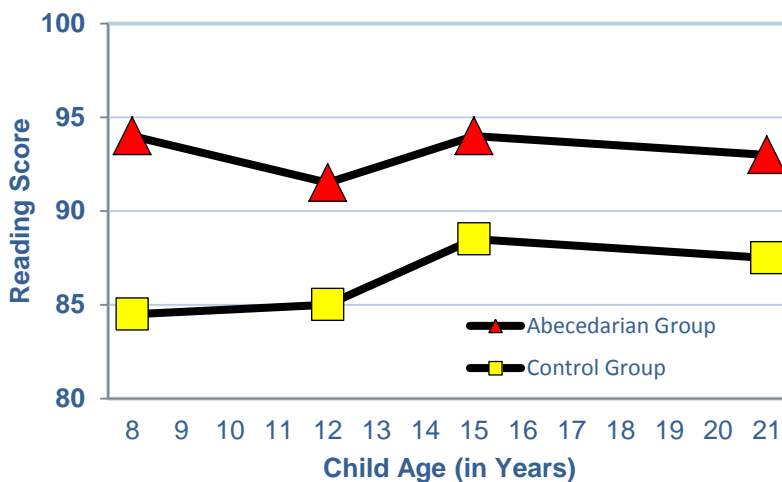
In one set of studies (Abecedarian Studies 3 - 10) there were nearly 1,000 babies, chosen by their birth weight. Dividing the children by their mother's educational level, produced a classic pattern in the control group (the yellow bars) with a clear, stair-step relationship between the children's Stanford Binet scores at age 3 and their

mother’s education. This “social gradient,” is common in a variety of child health and educational outcomes. But when we look at the randomly-assigned group that got the Abecedarian Approach for the first 3 years of life, the gradient is substantially flattened. The 3 red bars on the left are very close to the same height. To achieve this equalization, a substantial difference has to occur between the treated and untreated group of children of moms with the lowest education. So there is good news: Children from families who need it most, reap big benefits from a strong, early Abecedarian Approach program. And there is *more* good news: Children from *most* families benefit – although not quite as much as the neediest. The only children who did as well without the program were children of moms with university degrees (Ramey & Ramey, 1998). Curiously, even though evidence shows they do not really need it, those moms still valued and sought out this and other early childhood programs.



Reading and Math Achievement During the School Years

Using standardized tests, both reading and math achievement were measured for all children at 8, 12, 15, and 21 years of age in Abecedarian Study 1. The treatment group (those who received the Abecedarian Approach from birth to age 5) were significantly higher in both reading and math achievement at all ages. The accompanying figure shows reading achievement only. (Campbell & Ramey, 1995).



Special Education Placements by Age 15

When the at-risk young children entered public school, those who did not receive the Abecedarian Approach in the first 5 years of life in Abecedarian Study 1 were more than twice as likely to be placed in special education for 1 or more years by the time they reached age 15 (Ramey & Ramey, 1999).

Adolescent Outcomes for Low Birth Weight Babies

What about the later results for low birth weight babies who received the Abecedarian program? When the intervention and control groups (pooled from 8 sites in Abecedarian Studies 3-10) were compared at age 18, the intervention group in the 2000-2500 grams birth weight range had these characteristics:

- higher math achievement
- higher receptive vocabulary
- fewer risk-taking behaviors (McCormick, et al., 2006).

These long-term, positive findings are particularly encouraging because they were achieved in a program that lasted from birth to 36 months of age rather than from birth to 60 months of age as in Abecedarian Studies 1 and 2 – underscoring the importance of the first 3 years of life.

Young Adult Educational Attainment: Percent University Attendance and Graduation

In Abecedarian Study 1, at age 21, almost three times as many individuals in the treated group (39.5%) compared to the control group (13.7%) had attended, or were still attending, a 4-year university (Campbell et al., 2002). By the time these young adults had reached age 30, almost four times as many individuals in the treated group (23%) compared to the control group (6%) had **graduated** from a 4-year university (Campbell et al., 2012). Early intervention had allowed the percent of graduates in this extremely at-risk group to be almost exactly equal to the proportion of the general population of adults aged 25 to 64 with a university degree in a number of developed countries (e.g., 23% Canada, 23% United States, 24% Australia, and 22% New Zealand).¹

Effect of Training in the Abecedarian Approach on Child Care Workers

Abecedarian Study 15 focused on the behavior of child care workers (family child care providers) who received training in the Abecedarian Approach. The training had a positive effect over a 2-year period on the observed behaviors of the care providers. The training was delivered to leadership individuals in the family child care

Impacts of Abecedarian Approach Training on Caregiver Behavior					
	Control Group Mean	Treatment Group Mean	Treatment Effect	SE	Statistical Significance of Impact (t-value)
Rich oral language interactions	-0.18	0.22	0.40**	0.11	3.72
Support for development of vocabulary/comprehension	0.17	0.20	0.37**	0.10	3.58
Responsiveness to children	-0.19	0.23	0.47**	0.16	2.97
Key: *= $p < 0.05$; **= $p < 0.01$					

systems who, in turn, delivered training to the family child care home caregivers. The training was on the full Abecedarian Approach. The research has not yet been published and the following table is from the researchers' final report to the government funding agency (Administration for Children and Families, 2010).

¹ **Sources:** United States Department of Commerce, Census Bureau, Current Population Survey (CPS), Annual Social and Economic Supplement 2005. Chart titled "Status and trends in the education of racial and ethnic minorities," presented in National Center for Education Statistics [website], (Washington: DC), http://nces.ed.gov/pubs2007/minoritytrends/tables/table_26_1.asp (accessed Nov. 25, 2009). Measures adults aged 25 and over, by race ("American Indian/Alaskan native" and "white"). Australian Bureau of Statistics, "Education across Australia," Australian Social Trends, no. 4102 (Canberra: 2008), [http://www.ausstats.abs.gov.au/Ausstats/subscriber.nsf/0/E75F10B762B24193CA25748E00129FCA/\\$File/41020_2008_10.pdf](http://www.ausstats.abs.gov.au/Ausstats/subscriber.nsf/0/E75F10B762B24193CA25748E00129FCA/$File/41020_2008_10.pdf) (accessed Nov. 25, 2009). New Zealand, Ministry of Social Development, The Social Report 2008 (Wellington, NZ: n.d.), <http://www.socialreport.msd.govt.nz/documents/2008/social-report-2008.pdf> (accessed Nov. 25, 2009).

What Curriculum Approach Produced these Multiple, Long-term Results?

Since we attempted to equalize social services, health care, and to some degree early nutrition for both the control and experimental groups in the major longitudinal studies, the educational program received by children appears to be the source of experimental/control group differences. That educational program, called the Abecedarian Approach, was comprised of (1) LearningGames, (2) Conversational Reading, (3) Language Priority, and (4) Enriched Caregiving. In the various Abecedarian Studies these components were combined and delivered through a number of service delivery modalities:

- Child care centers
- Pre-K classrooms
- Home visiting
- Parent education sessions
- Family child care homes
- Family literacy programs
- Hospital clinic visits.

Since the Abecedarian Approach is a set of strategies and standards, not only can it be applied through various service modalities, it may be used in conjunction with any basic early childhood curriculum.

Partial List of Abecedarian Research Publications

(In chronological order)

- Ramey, C. T. & Campbell, F. A. (1984). Preventive education for at-risk children: Cognitive consequences of the Carolina Abecedarian Project. *American Journal of Mental Deficiency, 88*, 515-523.
- Ramey, C. T., Bryant, D. M., Sparling, J. J., & Wasik, B. H. (1985). Educational interventions to enhance intellectual development: Comprehensive daycare vs. family education. In S. Harel & N. Anastasiow (Eds.), *The "at risk" infant: Psychological, social and medical aspects*. Baltimore: Paul H. Brookes Publishing.
- Palmer, F.B, Shapiro, B.K., Wachtel, R.C., Allen, M.C., Hiller, J.E., Harryman, S.E., Mosher, B.S., Meinert, C.L., & Capute, A.J. (1988). The effects of physical therapy on cerebral palsy. A controlled trial in infants with spastic diplegia. *New England Journal of Medicine, 318*, 803-808.
- Sparling, J.J. (1989). Narrow- and broad-spectrum curricula, two necessary parts of the special child's program. *Infants and Young Children, 1*(4), 1-8.
- Ramey, C. T., Bryant, D. M., Campbell, F. A., Sparling, J. J., Wasik, B. H. (1988). Early intervention for high-risk children: The Carolina Early Intervention Program, In Price, R. H., Cowen, E. L., Lorion, R. P., Ramos-McKay, J. (Eds.). *Fourteen ounces of prevention: A casebook for practitioners*. Washington, DC: American Psychological Association.
- Martin, S.L., Ramey, C.T., & Ramey, S.L. (1990). The prevention of intellectual impairment in children of impoverished families: Findings of a randomized trial of educational day care. *American Journal of Public Health, 80*, 844-847.
- The Infant Health and Development Program. (1990). Enhancing the outcomes of low-birth-weight, premature infants: A multisite randomized trial. *Journal of the American Medical Association, 263*(22), 3035 -3042.
- Ramey, C. T., Bryant, D. M., Campbell, F. A., Sparling, J. J., & Wasik, B. H. (1990). Early intervention for high-risk children: The Carolina Early Intervention Program. In R. P. Lorion (Ed.), *Protecting the children: Strategies for optimizing emotional and behavioral development* (pp. 33-57). New York: Haworth Press.
- Wasik, B. H., Ramey, C. T., Bryant, D. M., & Sparling, J. J. (1990). A longitudinal study of two early intervention strategies: Project CARE. *Child Development, 61*(6), 1682-1696.
- Sparling, J., Lewis, I., Ramey, C. T., Wasik, B. H., Bryant, D. M., LaVange, L. M. (1991). Partners, a curriculum to help premature, low-birth-weight infants get off to a good start. *Topics in Early Childhood Special Education, 11*(1), 36-55.
- Ramey, C. T., Bryant, D. M., Wasik, B. H., Sparling, J. J., Fendt, K. H., & LaVange, L. M. (1992). The Infant Health and Development Program for low birthweight, premature infants: Program elements, family participation, and child intelligence. *Pediatrics, 3*, 454-465.

- Campbell, F.A. & Ramey, C.T. (1995). Cognitive and school outcomes for high-risk African-American students at middle adolescence: Positive effects of early intervention. *American Educational Research Journal*, 32, 743-772.
- Liaw, F., Meisels, S. J., Brooks-Gunn, J. (1995). The effects of experience of early intervention on low birth weight, premature children: The Infant Health and Development Program, *Early Childhood Research Quarterly*, 10, 405-431.
- Burchinal, M. R., Campbell, F. A., Bryant, D. M., Wasik, B. H., & Ramey, C. T. (1997). Early intervention and mediating processes in cognitive performance of children of low-income African American families. *Child Development*, 68, 935-954.
- Campbell, F. A., Helms, R., Sparling, J. J., & Ramey, C. T. (1998). Early childhood programs and success in school. In S. Barnett & S. Boocock (Eds.), *Early childhood care and education for Children in Poverty*. Albany, NY: State University of New York Press.
- Ramey, C.T., & Ramey, S.L. (1998). Prevention of intellectual disabilities: Early interventions to improve cognitive development. *Preventive Medicine*, 27, 224-232.
- Ramey, S.L., & Ramey, C.T. (1999). Early experience and early intervention for children "at risk" for developmental delay and mental retardation. [Special issue]. *Mental Retardation and Developmental Disabilities Research Reviews*, 5, 1-10.
- Ramey, C. T., Campbell, F. A., Burchinal, M., Skinner, M. L., Gardner, D. M., & Ramey, S. L. (2000). Persistent effects of early intervention on high-risk children and their mothers. *Applied Developmental Science*, 4, 2-14.
- Campbell, F. A., Pungello, E. P., Miller-Johnson, S., Burchinal, M., & Ramey, C. T. (2001). The Development of Cognitive and Academic Abilities: Growth Curves from an Early Childhood Educational Experiment. *Developmental Psychology*, 37, 231-242.
- Campbell, F.A., Ramey, C.T., Pungello, E., Sparling, J., & Miller-Johnson, S. (2002). Early childhood education: Young adult outcomes from the Abecedarian Project. *Applied Developmental Science*, 6(1), 42-57.
- Sparling, J., Dragomir, C., Ramey, S., & Florescu, L. (2005). An educational intervention improves developmental progress of young children in a Romanian orphanage. *Infant Mental Health Journal*, 26(2), 127-142.
- McCormick, M.C., Brooks-Gunn, J., Buka, S.L., Goldman, J., Yu, J., Salganik, M., Scott, D.T., Bennett, F.C., Kay, L.L., Bernbaum, J.C., Bauer, C.R., Martin, C., Woods, E.R., Martin, A., Casey, P. H. (2006). Early intervention in low birth weight premature infants: Results at 18 years of age for the Infant Health and Development Program. *Pediatrics*. 117(3), 771-780.
- McLaughlin, A., Campbell, F. A., Pungello, E.P., & Skinner, M. (2007). Early educational child care reduces depressive symptoms in young adults reared in low-income families. *Child Development*, 78(3), 746-756.
- Sparling, J., Ramey, C. T., Ramey, S. L. (2007). The Abecedarian experience. In M. E. Young, (Ed.) *Early Child Development - From Measurement to Action. A Priority for Growth and Equity* (pp. 81-99). Washington, DC: The World Bank. <http://www.worldbank.org/children>
- Campbell, F.A., Wasik, B.H., Pungello, E.P., Burchinal, M.R., Kainz, K., Barbarin, O., Sparling, J.J., & Ramey, C.T. (2008). Young adult outcomes from the Abecedarian and CARE early childhood educational interventions. *Early Childhood Research Quarterly*, 23, 452-466.
- Administration for Children and Families (2010). *Evaluation of Child Care Subsidy Strategies: Massachusetts Family Child Care Study*. Ann Collins, Barbara Goodson, Jeremy Luallen, Alyssa Rulf Fountain, & Amy Checkoway, Washington, DC: U.S. Department of Health and Human Services.
- Pungello, E.P., Kainz, K., Burchinal, M.R., Wasik, B.H., Sparling, J.J., Ramey, C.R., & Campbell, F.A. (2010). Early educational intervention, early cumulative risk, and the early home environment as predictors of young adult outcomes within a high-risk sample. *Child Development*. 81(1), 410-426.
- Sparling, J. (2011). The Abecedarian Approach. *Every Child*, 17(1), 28-29.
- Campbell, F.A., Pungello, E.P., Burchinal, M., Kainz, K., Pan, Y., Wasik, B.H., Barbarin, O.A., Sparling, J.J., & Ramey, C.T. (2012, January 16). Adult Outcomes as a Function of an Early Childhood Educational Program: An Abecedarian Project Follow-Up. *Developmental Psychology*. Advance online publication. doi: 10.1037/a0026644.

There are over 200 research publications, in juried journals and in book chapters, presenting the results of the Abecedarian Studies.

A book, summarizing the research results and elaborating the educational approach is forthcoming:

Ramey, C.T., Sparling, J., & Ramey, S.L. (in press). *Abecedarian: The Ideas, the Approach, and the Findings*. Los Altos, CA: Sociometrics Corporation.