

Children's Emotional Development Is Built into the Architecture of Their Brains

WORKING PAPER 2



NATIONAL SCIENTIFIC COUNCIL ON THE DEVELOPING CHILD

MEMBERS

PARTNERS

FrameWorks Institute

Johnson & Johnson Pediatric Institute

National Governors Association Center for Best Practices

National Conference of State Legislatures

SPONSORS

Birth to Five Policy Alliance

Buffett Early Childhood Fund

Susan A. Buffett Foundation

Casey Family Programs

The John D. and Catherine T. MacArthur Foundation

Norlien Foundation

Jack P. Shonkoff, M.D., Chair

Julius B. Richmond FAMRI Professor of Child Health and Development, Harvard School of Public Health and Harvard Graduate School of Education; Professor of Pediatrics, Harvard Medical School and Children's Hospital Boston; Director, Center on the Developing Child, Harvard University

Pat Levitt, Ph.D., Science Director

Director, Zilkha Neurogenetic Institute; Provost Professor of Neuroscience, Psychiatry & Pharmacy; Chair, Department of Cell and Neurobiology, Keck School of Medicine, University of Southern California

W. Thomas Boyce, M.D.

Sunny Hill Health Centre/BC Leadership Chair in Child Development; Professor, College for Interdisciplinary Studies and Faculty of Medicine, University of British Columbia

Nathan A. Fox, Ph.D.

Distinguished University Professor; Director, Child Development Laboratory, University of Maryland College Park

Megan Gunnar, Ph.D.

Regents Professor and Distinguished McKnight University Professor, Institute of Child Development, University of Minnesota

Linda C. Mayes, M.D.

Arnold Gesell Professor of Child Psychiatry, Pediatrics, and Psychology, Yale Child Study Center; Special Advisor to the Dean, Yale School of Medicine

Bruce S. McEwen, Ph.D.

Alfred E. Mirsky Professor; Head, Harold and Margaret Milliken Hatch Laboratory of Neuroendocrinology, The Rockefeller University

Charles A. Nelson III, Ph.D.

Richard David Scott Chair in Pediatric Developmental Medicine Research, Children's Hospital Boston; Professor of Pediatrics and Neuroscience, Harvard Medical School

Ross Thompson, Ph.D.

Professor of Psychology, University of California, Davis

About the Authors

The National Scientific Council on the Developing Child, housed at the Center on the Developing Child at Harvard University, is a multidisciplinary collaboration designed to bring the science of early childhood and early brain development to bear on public decision-making. Established in 2003, the Council is committed to an evidence-based approach to building broad-based public will that transcends political partisanship and recognizes the complementary responsibilities of family, community, workplace, and government to promote the well-being of all young children. For more information, go to www.developingchild.net.

CONTRIBUTING MEMBERS

Susan Nall Bales

President, FrameWorks Institute

Judy Cameron, Ph.D.

Professor of Psychiatry, University of Pittsburgh

Greg Duncan, Ph.D.

Distinguished Professor, Department of Education, University of California, Irvine

Philip A. Fisher, Ph.D.

Professor of Psychology and Director, Stress Neurobiology and Prevention Research Laboratory, University of Oregon; Senior Scientist, Oregon Social Learning Center

William Greenough, Ph.D.

Swanlund Professor of Psychology, Psychiatry, and Cell and Developmental Biology; Director, Center for Advanced Study at University of Illinois, Urbana-Champaign

Eric Knudsen, Ph.D.

Edward C. and Amy H. Sewall Professor of Neurobiology, Stanford University School of Medicine

Deborah Phillips, Ph.D.

Professor of Psychology and Associated Faculty, Public Policy Institute; Co-Director, Research Center on Children in the U.S., Georgetown University

Arthur J. Rolnick, Ph.D.

Senior Fellow and Co-Director, Human Capital Research Collaborative, Humphrey School of Public Affairs, University of Minnesota

FORMER MEMBERS

James Heckman, Ph.D.

Henry Schultz Distinguished Service Professor of Economics; Director, Economics Research Center, Department of Economics; Director, Center for Social Program Evaluation, University of Chicago

Betsy Lozoff, M.D.

Professor of Pediatrics, University of Michigan Medical School; Research Professor, Center for Human Growth and Development, University of Michigan

Please note: The content of this paper is the sole responsibility of the authors and does not necessarily represent the opinions of the funders or partners.

Suggested citation: National Scientific Council on the Developing Child (2004). *Children's Emotional Development Is Built into the Architecture of Their Brains: Working Paper No. 2*. <http://www.developingchild.net>

© 2004, National Scientific Council on the Developing Child, Center on the Developing Child at Harvard University

The Issue

A GROWING BODY OF SCIENTIFIC EVIDENCE TELLS US THAT EMOTIONAL DEVELOPMENT BEGINS EARLY in life, that it is a critical aspect of the development of overall brain architecture, and that it has enormous consequences over the course of a lifetime. These findings have far-reaching implications for policymakers and parents, and, therefore, demand our attention.

From birth, children rapidly develop their abilities to experience and express different emotions, as well as their capacity to cope with and manage a variety of feelings.^{1,2,3} The development of these capabilities occurs at the same time as a wide range of highly visible skills in mobility (motor control), thinking (cognition), and communication (language).⁴

Yet, emotional development often receives relatively less recognition as a core emerging capacity in the early childhood years. The foundations of social competence that are developed in the first five years are linked to emotional well-being and affect a child's later ability to functionally adapt in school and to form successful relationships throughout life.^{5,6,7,8}

As a person develops into adulthood, these same social skills are essential for the formation of lasting friendships and intimate relationships, effective parenting, the ability to hold a job and work well with others, and for becoming a contributing member of a community.^{9,10}

Disregarding this critical aspect of the

developing child can lead parents and policymakers to underestimate its importance and to ignore the foundation that emotions establish for later

As young children develop, their early emotional experiences literally become embedded in the architecture of their brains.

growth and development. Thus, it is essential that young children's feelings get the same level of attention as their thinking. Indeed, learning to manage emotions is more difficult for some children than learning to count or read and may, in some cases, be an early warning sign of future psychological problems. The failure to address difficulties in this equally important domain can result in missed opportunities for interventions. Had they been initiated early, these interventions could have yielded tremendous benefits for large numbers of children and for society.

What Science Tells Us

THE CORE FEATURES OF EMOTIONAL DEVELOPMENT include the ability to identify and understand one's own feelings, to accurately read and comprehend emotional states in others, to manage strong emotions and their expression in a constructive manner, to regulate one's own behavior, to develop empathy for others, and to establish and sustain relationships.^{2,11,12}

Emotional development is actually built into the architecture of young children's brains in response to their individual personal experiences and the influences of the environments in which they live. Indeed, emotion is a biologically based aspect of human functioning that is "wired" into multiple regions of the central

nervous system that have a long history in the evolution of our species.^{13,14,15,16,17}

These growing interconnections among brain circuits support the emergence of increasingly mature emotional behavior, particularly in the preschool years. Stated simply, as young children develop, their early emotional experiences literally become embedded in the architecture of their brains. Here is what we know:

The emotional experiences of newborns and young infants occur most commonly during periods of interaction with a caregiver (such as feeding, comforting, and holding).^{8,11,18,19} Infants display distress and cry when they are hungry,

cold, wet, or in other ways uncomfortable, and they experience positive emotions when they are fed, soothed, and held. During this early period, children are incapable of modulating the expression of overwhelming feelings, and they have limited ability to control their emotions in the service of focusing or sustaining attention.¹³ Associations between positive emotions and the availability of sensitive and responsive caregiving are strengthened during infancy in both behavior and brain architecture.²⁰

The emotional states of toddlers and preschoolers are much more complex.²⁴ They depend on their emerging capacities to interpret their own

The emotional health of young children is closely tied to the social and emotional characteristics of the environments in which they live.

personal experiences and understand what others are doing and thinking, as well as to interpret the nuances of how others respond to them.^{2,11,22,23} As they (and their brains) build on foundations that are established earlier, they mature and acquire a better understanding of a range of emotions. They also become more capable of managing their feelings, which is one of the most challenging tasks of early childhood.^{3,24,25,26,27}

By the end of the preschool years, children who have acquired a strong emotional foundation have the capacity to anticipate, talk about, and use their awareness of their own and others' feelings to better manage everyday social interactions.²⁴ Their emotional repertoires have expanded dramatically and now include such feelings as pride, shame, guilt, and embarrassment — all of which influence how individuals function as contributing members of a society.^{21,28} Throughout the early childhood years, children develop increasing capacities to use language to communicate how they feel and to gain help without “melting down,” as well as to inhibit the expression of emotions that are inappropriate for a particular setting.^{3,29}

When feelings are not well managed, thinking can be impaired. Recent scientific advances have

shown how the interrelated development of emotion and cognition relies on the emergence, maturation, and interconnection of complex neural circuits in multiple areas of the brain, including the prefrontal cortex, limbic cortex, basal forebrain, amygdala, hypothalamus, and brainstem.³⁰ The circuits that are involved in the regulation of emotion are highly interactive with those that are associated with “executive functions” (such as planning, judgment, and decision-making), which are intimately involved in the development of problem-solving skills during the preschool years.³¹ In terms of basic brain functioning, emotions support executive functions when they are well regulated but interfere with attention and decision-making when they are poorly controlled.^{19,32,33,34,35}

We now know that differences in early childhood temperament — ranging from being extremely outgoing and adventurous to being painfully shy and easily upset by anything new or unusual — are grounded in one's biological makeup.^{36,37}

These variations lead to alternative behavioral pathways for young children as they develop individual strategies to control their emotions during the preschool years and beyond. They also present diverse challenges for parents and other adults who must respond differently to different kinds of children.³⁸ When it comes to finding the “best” approach for raising young children, scientists tell us that one size does not fit all.³⁹

Young children are capable of surprisingly deep and intense feelings of sadness (including depression), grief, anxiety, and anger (which can result in unmanageable aggression), in addition to the heights of joy and happiness for which they are better known.^{40,41,42,43} For some children, the preschool years mark the beginning of enduring emotional difficulties and mental-health problems that may become more severe than earlier generations of parents and clinicians ever suspected.

The emotional health of young children — or the absence of it — is closely tied to the social and emotional characteristics of the environments in which they live, which include not only their parents but also the broader context of their families and communities.^{44,45,46,47,48}

Young children who grow up in homes that are troubled by parental mental-health

problems, substance abuse, or family violence face significant threats to their own emotional development. The experience of chronic, extreme, and/or uncontrollable maltreatment has been documented as producing measurable changes in the immature brain.^{49,50}

Children’s early abilities to deal with their emotions are important not only for the foundation

these capacities provide for the future, but also for the children’s current social functioning with their parents, teachers, and peers. Indeed, differences in how young children understand and regulate their own emotions are closely associated with peer and teacher perceptions of their social competence, as well as with how well-liked they are in a child-care setting or preschool classroom.^{51,52,53}

Correcting Popular Misrepresentations of Science

AS THE PUBLIC’S APPETITE FOR SCIENTIFIC INFORMATION about the development of young children is whetted by exciting new findings, the risk of exaggerated or misleading messages grows. Within this context, it is essential that scientific fact be differentiated from popularly accepted fiction.

There is no credible scientific evidence that young children who have been exposed to violence will invariably grow up to be violent adults themselves. Although these children clearly are at greater risk for adverse impacts on brain development and later problems with aggression, they are not doomed to poor outcomes, and they can be helped substantially if provided with early and appropriate treatment, combined with reliable and nurturing relationships with supportive caregivers.⁵⁴

Science does not support the claim that infants and toddlers are too young to have serious mental-health problems. Young children who have experienced significant maltreatment

Science does not support the claim that infants and toddlers are too young to have serious mental-health problems.

exhibit an early childhood equivalent of post-traumatic stress disorder, which presents a predictable array of clinical symptoms that are amenable to successful therapeutic intervention.⁵⁵ (See Working Paper 6, “Mental Health Problems in Early Childhood Can Impair Learning and Behavior for Life.”)

The Science-Policy Gap

THE FACT THAT YOUNG CHILDREN HAVE FEELINGS is old news. The extent to which infants can experience deep emotional pain as a result of early traumas and losses is less understood. The realization that young children can have serious mental-health problems, including anxiety disorders and signs of depression accompanied by the same kind of brain changes seen on electroencephalograms in clinically depressed adults, is startling news to most people.^{40,44,56,57}

The fact that significant and prolonged emotional distress can affect the emerging architecture of a young child’s brain should be a sobering wake-up call for society as a whole. Despite the availability of rich and extensive knowledge on the emotional and social development

of young children, including its underlying neurobiology, current early-childhood policies focus largely on cognition, language, and early literacy. Policies addressing children’s emotional and behavioral needs have been the exception, not the rule. This gap between what we “know” about healthy emotional development and the management of behavioral difficulties, and what we “do” through public policies and programs, is illustrated by the following examples:

Uneven availability of support for parents and providers of early care and education to deal with common, age-appropriate behavioral challenges, such as discipline and limit setting.⁵⁸

Limited caregiver and teacher training to evaluate and deal with children who present significant emotional and/or behavioral problems in early care and education programs. This is particularly alarming in the face of recent evidence of dramatic increases in prescriptions for behavior-modifying medications to treat preschoolers.^{59,60}

Minimal expertise in early childhood development or “infant mental health” within

child-welfare agencies that assess and treat children who have been the victims of serious maltreatment, despite extensive evidence that very young children can experience debilitating anxiety and trauma from parental abuse or neglect or from witnessing violence in their family or neighborhood, as well as data illustrating that early interventions can moderate the effects of these traumas.⁶¹

Implications for Policy and Programs

THE SCIENCE OF EARLY CHILDHOOD DEVELOPMENT is sufficiently mature at the present time to support a number of well-documented, evidence-based implications for those who develop and implement policies that affect the health and well-being of young

All early childhood programs, including Head Start, must balance their focus on cognition and literacy skills with significant attention to emotional and social development.

children. Five compelling messages are particularly worthy of thoughtful consideration:

All early childhood programs, including Head Start, must balance their focus on cognition and literacy skills with significant attention to emotional and social development. Children clearly need the social and emotional capabilities that enable them to sit still in a classroom, pay attention, and get along with their classmates just as much as they need the cognitive skills required to master the reading and math concepts taught in kindergarten.⁶²

The rich and growing science of early emotional and social development must be incorporated into services to support parents who are struggling to manage routine behavioral difficulties in their young children, as well as those who are trying to figure out whether, when, and how to deal with more serious social or emotional problems.⁶³

Providers of early care and education must have sufficient knowledge and skills to help children who present common behavior problems early on, particularly those who exhibit significant aggression or difficulties with attention and “hyperactivity.” The achievement of this goal requires a two-pronged approach. First, greater attention must be focused on the social and emotional development of children in both pre-professional training programs and continuing professional education. Second, all early childhood programs must have access to specialized mental-health services that have professionals available to meet the needs of young children whose problems cannot be addressed adequately by front-line staff.¹⁹

Expertise in early identification, assessment, and clinical treatment must be incorporated into existing intervention programs to address the complex and currently unmet needs of young children with serious mental-health problems such as depression, anxiety, and significant antisocial behaviors. Central to this challenge is the need to accurately differentiate transient emotional difficulties that reflect a “phase” that the child will outgrow from diagnosable disorders that require clinical treatment.¹⁹

All child-welfare agencies that have responsibility for investigating suspected abuse or neglect must include a sophisticated assessment of the child’s developmental status, including cognitive, linguistic, emotional, and social competence. This could be accomplished through closer collaboration between child-protective services and early intervention programs

for children with developmental delays or disabilities, as mandated by the Keeping Children and Families Safe Act of 2003 (Public Law 108-36).⁶⁴

THESE IMPLICATIONS FOR POLICY AND PRACTICE are striking in their simplicity, the extent to

which they reflect common sense, and their solid grounding in the science of early childhood and brain development. Closing the science-policy gap as it affects the future of our children, and therefore our society, should be an important priority for all who are engaged in public life.

References

- Saarni, C., Mumme, D.L., & Campos, J.J. (1998). Emotional development: Action, communication, and understanding. In W. Damon (Ed.), & N. Eisenberg, *Handbook of Child Psychology, Vol. 3, (5th Ed.)*, Social, emotional and personality development (pp. 237-309). New York: Wiley.
- Thompson, R.A., & Lagattuta, K. (2006). Feeling and understanding: Early emotional development. In K. McCartney & D. Phillips (Eds.), *The Blackwell Handbook of Early Childhood Development* (pp. 317-337). Oxford, UK: Blackwell.
- Thompson, R.A. (1994). Emotion regulation: A theme in search of definition. In N.A. Fox (Ed.), *The development of emotion regulation and dysregulation: Biological and behavioral aspects. Monographs of the Society for Research in Child Development*, 59(2-3), 25-52 (Serial no. 240).
- Thompson, R.A. (2001). Development in the first years of life. *The Future of Children*, 11(1), 20-33.
- Collins, W.A., & Laursen, B. (1999). Relationships as developmental contexts. *The Minnesota Symposia on Child Psychology, Vol. 30*. Mahwah, NJ: Erlbaum.
- Dunn, J. (1993). *Young Children's Close Relationships: Beyond attachment*. Newbury Park, CA: Sage.
- Cassidy, J. & P.R. Shaver (Eds.) (1999). *Handbook of Attachment: Theory, research, and clinical applications* (pp. 89-111). New York: Guilford.
- Thompson, R.A. (1998). Early sociopersonality development. In W. Damon (Ed.), & N. Eisenberg (Vol. Ed.), *Handbook of Child Psychology, Vol. 3, (5th Ed.)*, Social, emotional, and personality development (pp. 25-104). New York: Wiley.
- Berscheid, E., & Reis, H.T. (1998). Attraction and close relationships. In D.T. Gilbert, S.T. Fiske, & G. Lindzey (Eds.), *Handbook of Social Psychology, Vol. 1, (2nd Ed.)*. New York: McGraw-Hill.
- Reis, H.T., Collins, W.A., & Berscheid, E. (2000). Relationships in human behavior and development. *Psychological Bulletin*, 126, 844-872.
- Denham, S. (1998). *Emotional Development in Young Children*. New York: Guilford.
- Harris, P.L. (1989). Children and Emotion: *The development of psychological understanding*. Oxford, UK: Blackwell.
- LeDoux, J. (2000). Emotion circuits in the brain. *Annual Review of Neuroscience*, 23, 155-184.
- Panksepp, J. (1998). *Affective Neuroscience*. London: Oxford University Press.
- Panksepp, J. (2000). Developing mechanisms of self-regulation. *Development and Psychopathology*, 12(3), 427-442.
- Dawson, G., & Fischer, K.W. (Eds.) (1994). *Human Behavior and the Developing Brain*. New York: Guilford.
- Gunnar, M.R., & Davis, E.P. (2003). Stress and emotion in early childhood. In R.M. Lerner & M.A. Easterbrooks (Eds.), *Handbook of Psychology, Vol. 6. Developmental Psychology* (pp. 113-134). New York: Wiley.
- Fogel, A. (1993). *Developing Through Relationships: Origins of communication, self, and culture*. Chicago: University of Chicago Press.
- Shonkoff, J.P., & Phillips, D. (Eds.) (2000). *From Neurons to Neighborhoods: The science of early childhood development. Committee on Integrating the Science of Early Childhood Development*. Washington, DC: National Academy Press.
- Cassidy, J. (1994). Emotion regulation: Influences of attachment relationships. In N.A. Fox (Ed.), *The development of emotion regulation and dysregulation: Biological and behavioral aspects. Monographs of the Society for Research in Child Development*, 59(2-3), 228-249 (Serial no. 240).
- Lewis, M. (2000). Self-conscious emotions: Embarrassment, pride, shame, and guilt. In M. Lewis & J.M. Haviland-Jones (Eds.), *Handbook of Emotions* (pp. 563-573). New York: Guilford.
- Banerjee, M. (1997). Peeling the onion: A multilayered view of children's emotional development. In S. Hala (Ed.), *The Development of Social Cognition* (pp. 241-272). Hove, UK: Psychology Press.
- Wellman, H.M., Harris, P.L., Banerjee, M., & Sinclair, A. (1995). *Early understanding of emotion: Evidence from natural language. Cognition and Emotion*, 9, 117-149.
- Eisenberg, N. & Morris, A.S. (2002). Children's emotion-related regulation. In R. Kail (Ed.), *Advances in Child Development and Behavior, Vol. 30* (pp. 190-229). San Diego: Academic.
- Buss, K.A., & Goldsmith, H.H. (1998). Fear and anger regulation in infancy: Effects on the temporal dynamics of affective expression. *Child Development*, 69, 359-374.
- Eisenberg, N., Fabes, R., Guthrie, I., & Reiser, M. (2000). Dispositional emotionality and regulation: Their role in predicting quality of social functioning. *Journal of Personality and Social Psychology*, 78, 136-157.
- Kopp, C.B. (1989). Regulation of distress and negative emotions: A developmental view. *Developmental Psychology*, 25(3), 343-355.
- Barrett, K. (1998). The origins of guilt in early childhood. In J. Bybee (Ed.), *Guilt and Children* (pp. 75-90). San Diego: Academic.

29. Lagattuta, K.H., & Wellman, H.M. (2002). Differences in early parent-child conversations about negative versus positive emotions: Implications for the development of emotion understanding. *Developmental Psychology, 38*, 564-580.
30. Davidson, R.J., Lewis, M., Alloy, L.B., Amaral, D.G., Bush, G., Cohen, J., et al. (2002). Neural and behavioral substrates of mood and mood regulation. *Biological Psychiatry, 52*(6), 478-502.
31. Posner, M., & Rothbart, M. (2000). Developing mechanisms of self-regulation. *Development and Psychopathology, 12*(3), 427-442.
32. Damasio A.R. (1999). *The Feeling of What Happened*. New York: Harcourt Brace.
33. Davis, M. (1992). The role of the amygdala in fear and anxiety. *Annual Review of Neuroscience, 15*, 353-375.
34. LeDoux, J.E. (1996). *The Emotional Brain*. New York: Simon & Schuster.
35. Bush, G., Luu, P., & Posner, M.I. (2000). Cognitive and emotional influences in anterior cingulate cortex. *Trends in Cognitive Sciences, 4*(6), 215-222.
36. Rothbart, M.K., & Bates, J.E. (1998). Temperament. In W. Damon (Ed.), & N. Eisenberg (Vol. Ed.), *Handbook of Child Psychology Vol. 3, (5th Ed.)*, Social, emotional and personality development (pp. 105-176). New York: Wiley.
37. Rothbart, M.K., Derryberry, D., & Posner, M.I. (1994). A psychobiological approach to the development of temperament. In J.E. Bates & T.D. Wachs (Eds.), *Temperament: Individual differences at the interface of biology and behavior* (pp. 83-116). Washington, DC: American Psychological Association.
38. Kochanska, G. (1997). Multiple pathways to conscience for children with different temperaments: From toddlerhood to age 5. *Developmental Psychopathology, 33*, 228-240.
39. Teti, D.M., & Candelaria, M.A. (2002). Parenting competence. In M.H. Bornstein (Ed.), *Handbook of Parenting, Vol. 4. Social conditions and applied parenting* (2nd Ed.) (pp. 149-180). Mahwah, NJ: Erlbaum.
40. Shaw, D.S., Owens, E.B., Giovannelli, J., & Winslow, E.B. (2001). Infant and toddler pathways leading to early externalizing disorders. *Journal of the American Academy of Child & Adolescent Psychiatry, 40*, 36-43.
41. Ashman, S.B., & Dawson, G. (2002). Maternal depression, infant psychobiological development, and risk for depression. In S.H. Goodman & I.H. Gotlib (Eds.), *Children of Depressed Parents* (pp. 37-58). Washington, DC: American Psychological Association.
42. Rubin, K.H., Burgess, K.B., Dwyer, K.M., & Hastings, P.D. (2003). Predicting preschoolers' externalizing behaviors from toddler temperament, conflict, and maternal negativity. *Developmental Psychology, 39*, 164-176.
43. Vasey, M.W., & Dadds, M.R. (2001). *The Developmental Psychopathology of Anxiety*. London: Oxford University Press.
44. Dawson, G., & Ashman, D.B. (2000). On the origins of a vulnerability to depression: The influence of the early social environment on the development of psychobiological systems related to risk of affective disorder. In C.A. Nelson (Ed.), *The effects of early adversity on neurobehavioral development. Minnesota Symposia on Child Psychology, Vol. 31* (pp. 245-279). Mahwah, NJ: Erlbaum.
45. Cummings, E.M., & Davies, P. (1994). *Children and Marital Conflict*. New York: Guilford.
46. Reid, J.B., Patterson, G.R., & Snyder, J. (2002). *Antisocial Behavior in Children and Adolescents: A developmental analysis and model for intervention*. Washington, DC: American Psychological Association.
47. Thompson, R.A., & Calkins, S. (1996). The double-edged sword: Emotional regulation for children at risk. *Development and Psychopathology, 8*(1), 163-182.
48. Davies, P.T., & Forman, E.M. (2002). Children's patterns of preserving emotional security in the interparental subsystem. *Child Development, 73*, 1880-1903.
49. Glaser, D. (2000). Child abuse and neglect and the brain - A review. *Journal of Child Psychology and Psychiatry, 41*, 97-118.
50. De Bellis, M.D., Keshavan, M.S., Clark, D.B., Casey, B.J., Giedd, J.B., Boring, A.M., et al. (1999). Developmental traumatology, Part 2: Brain development. *Biological Psychiatry, 45*, 1271-1284.
51. Denham, S.A., Blair, K.A., DeMulder, E., Levitas, J., Sawyer, K., Auerbach-Major, S., & Queenan, P. (2003). Preschool emotional competence: Pathway to social competence. *Child Development, 74*, 238-256.
52. Halberstadt, A.G., Denham, S.A., & Dunsmore, J.C. (2001). Affective social competence. *Social Development, 10*, 79-119.
53. Rubin, K.H., Coplan, R.J., Nelson, L.J., Cheah, C.S.L., & Lagace-Seguín, D.G. (1999). Peer relationships in childhood. In M.H. Bornstein & M.E. Lamb (Eds.), *Developmental Psychology: An advanced textbook* (4th Ed.) (pp. 451-501). Mahwah, NJ: Erlbaum.
54. Graham-Berman, S.A., & Hughes, H.M. (2003). Intervention for children exposed to interparental violence (IPV): Assessments of needs and research priorities. *Clinical Child & Family Psychology Review, 6*, 189-204.
55. Scheeringa, M.S., & Zeanah, C.H. (1995). Symptom expression and trauma variables in children under 48 months of age. *Infant Mental Health Journal, 16*(4), 259-270.
56. Dawson, G., Frey, K., Panagiotides, H., Yamada, E., Hessl, D., & Osterling, J. (1999). Infants of depressed mothers exhibit atypical frontal electrical brain activity during interactions with mother and with a familiar, nondepressed adult. *Child Development, 70*, 1058-1066.
57. Shaw, D.S., Gilliom, M., Ingoldsby, E.M., & Nagin, D.S. (2003). Trajectories leading to school-age conduct problems. *Developmental Psychology, 39*, 189-200.
58. Knitzer, J. (2001). *Building Services and Systems to Support the Healthy Emotional Development of Young Children: An action guide for policymakers*. New York: National Center for Children in Poverty, Columbia University Mailman School of Public Health.
59. Knitzer, J. (2000). Early childhood mental health services: A policy and systems development perspective. In J.P. Shonkoff & S.J. Meisels (Eds.), *Handbook of Early Childhood Intervention* (2nd Ed.) (pp. 416-438). New York: Cambridge University Press.
60. Zito, J., Safer, D., dosReis, S., Gardner, J., Boles, M., & Lynch, F. (2000). Trends in the prescribing of psychotropic medications to preschoolers. *Journal of the American Medical Association, 283*, 1025-1030.
61. Melton, G.B., & Thompson, R.A. (2002). The conceptual foundation: Why child protection should be neighborhood-based and child-centered. In G.B. Melton, R.A. Thompson, & M.A. Small (Eds.), *Toward a Child-centered, Neighborhood-based Child Protection System: A report of the Consortium on Children, Families, and the Law* (pp. 3-27). Westport, CT: Praeger.

62. Thompson, R.A., & Raikes, H.A. (2007). Early socio-emotional development and the roots of school readiness. In J. Knitzer, R. Kaufmann, & D. Perry (Eds.), *Early Childhood Mental Health* (pp.13-35). Baltimore, MD: Paul H. Brookes Publishing Co.
63. Brooks-Gunn, J., Berlin, L.J., & Fuligni, A.S. (2000). Early childhood intervention programs: What about the family? In J.P. Shonkoff & S.J. Meisels (Eds.), *Handbook of Early Childhood Intervention* (2nd Ed.) (pp. 549-577). New York: Cambridge University Press.
64. Thompson, R.A. & Flood, M.F. (2002). Toward a child-oriented child protection system. In G.B. Melton, R.A. Thompson, & M.A. Small (Eds.), *Toward a Child-centered, Neighborhood-based Child Protection System: A report of the Consortium on Children, Families, and the Law* (pp. 155-194). Westport, CT: Praeger.

Notes

WORKING PAPER SERIES

Working Paper #1

Young Children Develop in an Environment of Relationships (2004)

Working Paper #2

Children's Emotional Development Is Built into the Architecture of Their Brains (2004)

Working Paper #3

Excessive Stress Disrupts the Architecture of the Developing Brain (2005)

Working Paper #4

Early Exposure to Toxic Substances Damages Brain Architecture (2006)

Working Paper #5

The Timing and Quality of Early Experiences Combine to Shape Brain Architecture (2007)

Working Paper #6

Mental Health Problems in Early Childhood Can Impair Learning and Behavior for Life (2008)

Working Paper #7

Workforce Development, Welfare Reform, and Child Well-Being (2008)

Working Paper #8

Maternal Depression Can Undermine the Development of Young Children (2009)

Working Paper #9

Persistent Fear and Anxiety Can Affect Young Children's Learning and Development (2010)

Working Paper #10

Early Experiences Can Alter Gene Expression and Affect Long-Term Development (2010)

Working Paper #11

Building the Brain's "Air Traffic Control" System: How Early Experiences Shape the Development of Executive Function (2011)

ALSO FROM THE CENTER ON THE DEVELOPING CHILD

The Foundations of Lifelong Health Are Built in Early Childhood (2010)

A Science-Based Framework for Early Childhood Policy: Using Evidence to Improve Outcomes in Learning, Behavior, and Health for Vulnerable Children (2007)

The Science of Early Childhood Development: Closing the Gap Between What We Know and What We Do (2007)

Early Childhood Program Evaluations: A Decision-Maker's Guide (2007)

NATIONAL SCIENTIFIC COUNCIL ON THE DEVELOPING CHILD

Center on the Developing Child  HARVARD UNIVERSITY

50 Church Street, 4th Floor, Cambridge, MA 02138

617.496.0578

www.developingchild.harvard.edu

www.developingchild.net