



References

1. Farah, M. J. The neuroscience of socioeconomic status: Correlates, causes, and consequences. *Neuron* **96**, 56–71 (2017).
2. Chan, M. Y. *et al.* Socioeconomic status moderates age-related differences in the brain's functional network organization and anatomy across the adult lifespan. *Proc. Natl. Acad. Sci.* **115**, E5144–E5153 (2018).
3. Noble, K. G. *et al.* Family income, parental education and brain structure in children and adolescents. *Nat. Neurosci.* **18**, 773–780 (2015).
4. Immordino-Yang, M. H. & Gotlieb, R. Embodied brains, social minds, cultural meaning: Integrating neuroscientific and educational research on social-affective development. *Am. Educ. Res. J.* **54**, 344S–367S (2017).
5. Haft, S. L., Myers, C. A. & Hoeft, F. Socio-emotional and cognitive resilience in children with reading disabilities. *Curr. Opin. Behav. Sci.* **10**, 133–141 (2016).
6. Hahn, T., Nierenberg, A. A. & Whitfield-Gabrieli, S. Predictive analytics in mental health: Applications, guidelines, challenges and perspectives. *Mol. Psychiatry* **22**, 37–43 (2017).
7. Odegard, T. N., Ring, J., Smith, S., Biggan, J. & Black, J. Differentiating the neural response to intervention in children with developmental dyslexia. *Ann. Dyslexia* **58**, 1–14 (2008).
8. Raizada, R. D. S. & Kishiyama, M. M. Effects of socioeconomic status on brain development, and how cognitive neuroscience may contribute to levelling the playing field. *Front. Hum. Neurosci.* **4**, 1–11 (2010).
9. Gogtay, N. *et al.* Dynamic mapping of human cortical development during childhood through early adulthood. *Proc. Natl. Acad. Sci.* **101**, 8174–8179 (2004).
10. Dennis, E. L. *et al.* Development of brain structural connectivity between ages 12 and 30: A 4-Tesla diffusion imaging study in 439 adolescents and adults. *Neuroimage* **64**, 671–684 (2013).
11. Zielinski, B. A., Gennatas, E. D., Zhou, J., Seeley, W. W. & Raichle, M. E. Network-level structural covariance in the developing brain. *Proc. Natl. Acad. Sci.* **107**, 18191–18196 (2010).
12. International Human Genome Sequencing Consortium. Initial sequencing and analysis of the human genome. *Nature* **409**, 860–921 (2001).
13. International Human Genome Sequencing Consortium. Finishing the euchromatic sequence of the human genome. *Nature* **431**, 931–945 (2004).
14. Deacon, T. W. A role for relaxed selection in the evolution of the language capacity. *Proc. Natl. Acad. Sci.* **107**, 9000–9006 (2010).
15. Deacon, T. W. *Incomplete nature: How mind emerged from matter*. (W. W. Norton & Company, 2011).
16. Herrmann, E., Call, J., Hernández-Lloreda, M. V., Hare, B. & Tomasello, M. Humans have evolved specialized skills of social cognition: The cultural intelligence hypothesis. *Science* **317**, 1360–1366 (2007).

- 
17. Tomasello, M., Carpenter, M., Call, J., Behne, T. & Moll, H. Understanding and sharing intentions: The origins of cultural cognition. *Behav. Brain Sci.* **28**, 675–735 (2005).
 18. Rogoff, B. *The cultural nature of human development*. (Oxford University Press, 2003).
 19. Butler, O., Yang, X.-F., Laube, C., Kühn, S. & Immordino-Yang, M. H. Community violence exposure correlates with smaller gray matter volume and lower IQ in urban adolescents. *Hum. Brain Mapp.* **39**, 2088–2097 (2018).
 20. Hackman, D. A. & Farah, M. J. Socioeconomic status and the developing brain. *Trends Cogn. Sci.* **13**, 65–73 (2009).
 21. Nelson, C. A. *et al.* Cognitive recovery in socially deprived young children: The Bucharest Early Intervention Project. *Science* **318**, 1937–1940 (2007).
 22. Diamond, M. C., Krech, D. & Rosenzweig, M. R. The effects of an enriched environment on the histology of the rat cerebral cortex. *J. Comp. Neurol.* **123**, 111–120 (1964).
 23. Neville, H. J. *et al.* Family-based training program improves brain function, cognition, and behavior in lower socioeconomic status preschoolers. *Proc. Natl. Acad. Sci.* **110**, 12138–12143 (2013).
 24. Schore, A. N. Effects of a secure attachment relationship on right brain development, affect regulation, and infant mental health. *Infant Ment. Health J.* **22**, 7–66 (2001).
 25. Watamura, S. E., Donzella, B., Alwin, J. & Gunnar, M. R. Morning-to-afternoon increases in cortical concentrations for infants and toddlers at child care: Age differences and behavioral correlates. *Child Dev.* **74**, 1006–1020 (2003).
 26. Zimmer, C. *She has her mother's laugh: The powers, perversions, and potential of heredity*. (Dutton, 2018).
 27. Carey, N. *The epigenetics revolution: How modern biology is rewriting our understanding of genetics, disease and inheritance*. (Columbia University Press, 2012).
 28. Francis, R. C. *Epigenetics: How environment shapes our genes*. (W. W. Norton & Company, 2011).
 29. Parrington, J. *The deeper genome: Why there is more to the human genome than meets the eye*. (Oxford University Press, 2015).
 30. Plomin, R. & Spinath, F. M. Intelligence: Genetics, genes, and genomics. *J. Pers. Soc. Psychol.* **86**, 112–129 (2004).
 31. Bates, T. C., Lewis, G. J. & Weiss, A. Childhood socioeconomic status amplifies genetic effects on adult intelligence. *Psychol. Sci.* **24**, 2111–2116 (2013).
 32. Farah, M. J. *et al.* Environmental stimulation, parental nurturance and cognitive development in humans. *Dev. Sci.* **11**, 793–801 (2008).
 33. Oh, D. L. *et al.* Systematic review of pediatric health outcomes associated with childhood adversity. *BMC Pediatr.* **18**, 1–19 (2018).
 34. Pakulak, E. *et al.* Cultural adaptation of a neurobiologically informed intervention in local and international contexts. *New Dir. Child Adolesc. Dev.* **2017**, 81–92 (2017).
 35. Semple, R. J., Lee, J., Dinelia, A., Ae, R. & Miller, L. F. A randomized trial of mindfulness-based cognitive therapy for children: Promoting mindful attention to enhance social-emotional resiliency in children. *J. Child Fam. Stud.* **19**, 218–229 (2010).

- 
36. Gunnar, M. R. Quality of early care and buffering of neuroendocrine stress reactions: potential effects on the developing human brain. *Prev. Med.* **27**, 208–211 (1998).
 37. Swain, J. E. *et al.* Parent-child intervention decreases stress and increases maternal brain activity and connectivity during own baby-cry: An exploratory study. *Dev. Psychopathol.* **29**, 535–553 (2017).
 38. Feldman, R. The adaptive human parental brain: Implications for children's social development. *Trends Neurosci.* **38**, 387–399 (2015).
 39. Curley, J. P. & Champagne, F. A. Influence of maternal care on the developing brain: Mechanisms, temporal dynamics and sensitive periods. *Front. Neuroendocrinol.* **40**, 52–66 (2016).
 40. Gerhardt, S. *Why love matters: How affection shapes a baby's brain*. (Routledge, 2014).
 41. Sethna, V. *et al.* Mother-infant interactions and regional brain volumes in infancy: An MRI study. *Brain Struct. Funct.* **222**, 2379–2388 (2017).
 42. Helm, J. L., Sbarra, D. A. & Ferrer, E. Coregulation of respiratory sinus arrhythmia in adult romantic partners. *Emotion* **14**, 522–531 (2014).
 43. Kramer, A. D. I., Guillory, J. E. & Hancock, J. T. Experimental evidence of massive-scale emotional contagion through social networks. *Proc. Natl. Acad. Sci.* **111**, 8788–8790 (2014).
 44. Lunkenheimer, E. *et al.* Coregulation of respiratory sinus arrhythmia between parents and preschoolers: Differences by children's externalizing problems. *Dev. Psychobiol.* **57**, 994–1003 (2015).
 45. Saxbe, D. & Repetti, R. L. For better or worse? Coregulation of couples' cortisol levels and mood states. *J. Pers. Soc. Psychol.* **98**, 92–103 (2010).
 46. Belsky, J., Houts, R. M. & Fearon, R. M. P. Infant attachment security and the timing of puberty: Testing an evolutionary hypothesis. *Psychol. Sci.* **21**, 1195–1201 (2010).
 47. Sapolsky, R. M. *Behave: The biology of humans at our best and worst*. (Penguin Press, 2017).
 48. Sonuga-Barke, E. J. S. *et al.* Child-to-adult neurodevelopmental and mental health trajectories after early life deprivation: The young adult follow-up of the longitudinal English and Romanian Adoptees study. *Lancet* **389**, 1539–1548 (2017).
 49. Fox, N. A., Zeanah, C. H. & Nelson, C. A. A matter of timing: Enhancing positive change for the developing brain. *Zero to Three* **34**, 4–9 (2014).
 50. Babenko, O., Kovalchuk, I. & Metz, G. A. S. Stress-induced perinatal and transgenerational epigenetic programming of brain development and mental health. *Neurosci. Biobehav. Rev.* **48**, 70–91 (2015).
 51. Kim, D.-J. *et al.* Prenatal maternal cortisol has sex-specific associations with child brain network properties. *Cereb. Cortex* **27**, 5230–5241 (2017).
 52. Yehuda, R. *et al.* Transgenerational effects of posttraumatic stress disorder in babies of mothers exposed to the World Trade Center attacks during pregnancy. *Endocrinol. Metab.* **90**, 4115–4118 (2005).
 53. McLaughlin, K. A. *et al.* Causal effects of the early caregiving environment on development of stress response systems in children. *Proc. Natl. Acad. Sci.* **112**, 5637–5642 (2015).



54. Nelson, C. A. *Romania's abandoned children*. (Harvard University Press, 2014).
55. Bick, J., Fox, N., Zeanah, C. & Nelson, C. A. Early deprivation, atypical brain development, and internalizing symptoms in late childhood. *Neuroscience* **342**, 140–153 (2017).
56. Kiecolt-Glaser, J. K. *et al.* Childhood adversity heightens the impact of later-life caregiving stress on telomere length and inflammation. *Psychosom. Med.* **73**, 16–22 (2011).
57. Koenen, K. C., Moffitt, T. E., Poulton, R., Martin, J. & Caspi, A. Early childhood factors associated with the development of post-traumatic stress disorder: Results from a longitudinal birth cohort. *Psychol. Med.* **37**, 181–192 (2007).
58. Norman, R. E. *et al.* The long-term health consequences of child physical abuse, emotional abuse, and neglect: A systematic review and meta-analysis. *PLoS Med.* **9**, e1001349 (2012).
59. Shonkoff, J. P. & Garner, A. S. The lifelong effects of early childhood adversity and toxic stress. *Pediatrics* **129**, e232–e246 (2012).
60. Bucci, M., Marques, S. S., Oh, D. & Harris, N. B. Toxic stress in children and adolescents. *Adv. Pediatr.* **63**, 403–428 (2016).
61. Dong, M. *et al.* Insights into causal pathways for ischemic heart disease: Adverse childhood experiences study. *Circulation* **110**, 1761–1766 (2004).
62. Saxbe, D. E. & Repetti, R. L. Fathers' and mothers' marital relationship predicts daughters' pubertal development two years later. *J. Adolesc.* **32**, 415–423 (2009).
63. Tottenham, N. & Galván, A. Stress and the adolescent brain: Amygdala-prefrontal cortex circuitry and ventral striatum as developmental targets. *Neurosci. Biobehav. Rev.* **70**, 217–227 (2016).
64. Negriff, S., Saxbe, D. E. & Trickett, P. K. Childhood maltreatment, pubertal development, HPA axis functioning, and psychosocial outcomes: An integrative biopsychosocial model. *Dev. Psychobiol.* **57**, 984–993 (2015).
65. Braams, B. R., Van Duijvenvoorde, A. C. K., Peper, J. S. & Crone, E. A. Longitudinal changes in adolescent risk-taking: A comprehensive study of neural responses to rewards, pubertal development, and risk-taking behavior. *J. Neurosci.* **35**, 7226–7238 (2015).
66. Baams, L., Dubas, J. S., Overbeek, G. B. & Van Aken, M. A. G. Transitions in body and behavior: a meta-analytic study on the relationship between pubertal development and adolescent sexual behavior. *J. Adolesc. Heal.* **56**, 586–598 (2015).
67. Harris, N. B. *The deepest well: Healing the long-term effects of childhood adversity*. (Houghton Mifflin Harcourt Publishing, 2018).
68. Levy, D. J., Heissel, J. A., Richeson, J. A. & Adam, E. K. Psychological and biological responses to race-based social stress as pathways to disparities in educational outcomes. *Am. Psychol.* **71**, 455–473 (2016).
69. Royle, N. J., Russell, A. F. & Wilson, A. J. The evolution of flexible parenting. *Science* **345**, 776–781 (2014).
70. Wang, S. W. & Campos, B. Cultural experiences, social ties, and stress: Focusing on the HPA axis. in *The Handbook of Culture and Biology* (eds. Causadias, J. M., Telzer, E. H. & Gonzales, N. A.) (John Wiley & Sons, 2017).

- 
71. Saxbe, D. E. *et al.* Cortisol covariation within parents of young children: Moderation by relationship aggression. *Psychoneuroendocrinology* **62**, 121–128 (2015).
 72. Peisner-Feinberg, E. S. *et al.* The relation of preschool child-care quality to children's cognitive and social developmental trajectories through second grade. *Child Dev.* **72**, 1534–1553
 73. NICHD Early Child Care Research Network. Early child care and children's development prior to school entry: Results from the NICHD Study of Early Child Care. *Am. Educ. Res. J.* **39**, 133–164 (2002).
 74. Shonkoff, J. P. & Phillips, D. A. *From neurons to neighborhoods: The science of early childhood development*. (National Academy Press, 2000).
 75. Brody, B. A., Kinney, H. C., Kloman, A. S. & Gilles, F. H. Sequence of central nervous system myelination in human infancy. I. An autopsy study of myelination. *J. Neuropathol. Exp. Neurol.* **46**, 283–301 (1987).
 76. Deoni, S. C. L., Dean, D. C., Remer, J., Dirks, H. & O'muircheartaigh, J. Cortical maturation and myelination in healthy toddlers and young children. *Neuroimage* **115**, 147–161 (2015).
 77. Yakovlev, P. I. & Lecours, A. R. The myelogenetic cycles of regional maturation of the brain. in *Regional development of the brain in early life* (ed. Minkowski, A.) 3–70 (Blackwell Publishing Ltd, 1967).
 78. Shonkoff, J. P. Protecting brains, not simply stimulating minds. *Science* **333**, 982–983 (2011).
 79. Grazzani, I., Ornaghi, V., Conte, E., Pepe, A. & Caprin, C. The relation between emotion understanding and theory of mind in children aged 3 to 8: The key role of language. *Front. Psychol.* **9**, 1–10 (2018).
 80. Shtulman, A. & Carey, S. Improbable or impossible? How children reason about the possibility of extraordinary events. *Child Dev.* **78**, 1015–1032 (2007).
 81. Onishi, K. H. & Baillargeon, R. Do 15-month-old infants understand false beliefs? *Science* **308**, 255–258 (2005).
 82. Spelke, E. S., Breinlinger, K., Macomber, J. & Jacobson, K. Origins of knowledge. *Psychol. Rev.* **99**, 605–632 (1992).
 83. Hirsh-Pasek, K., Golinkoff, R. M., Berk, L. E. & Singer, D. G. *A mandate for playful learning in preschool: Presenting the evidence*. (Oxford University Press, 2009).
 84. Golinkoff, R. M. & Hirsch-Pasek, K. *Becoming brilliant: What science tells us about raising successful children*. (American Psychological Association, 2016).
 85. Wechsler, M., Melnick, H., Maier, A. & Bishop, J. *The building blocks of high-quality early childhood education programs*. (Learning Policy Institute, 2016).
 86. Barker, J. E. & Munakata, Y. Developing self-directed executive functioning: Recent findings and future directions. *Mind, Brain, Educ.* **9**, 92–99 (2015).
 87. Diamond, A. & Lee, K. Interventions shown to aid executive function development in children 4 to 12 years old. *Science* **333**, 959–964 (2011).
 88. Paradise, R. & Rogoff, B. Side by side: Learning by observing and pitching in. *Ethos* **37**, 102–138 (2009).

- 
89. Darling-Hammond, L., Flook, L., Cook-Harvey, C., Barron, B. J. & Osher, D. Science of learning and development: Implications for educational practice. *Appl. Dev. Sci.* (forthcoming).
90. Zembar, M. J. & Blume, L. B. *Middle childhood development: A contextual approach*. (Pearson, 2009).
91. Crone, E. A. & Dahl, R. E. Understanding adolescence as a period of social–affective engagement and goal flexibility. *Nat. Rev. Neurosci.* **13**, 636–650 (2012).
92. Silvers, J. A. *et al.* Age-related differences in emotional reactivity, regulation, and rejection sensitivity in adolescence. *Emotion* **12**, 1235–1247 (2012).
93. Foulkes, L. & Blakemore, S.-J. Studying individual differences in human adolescent brain development. *Nat. Neurosci.* **21**, 315–323 (2018).
94. Mychasiuk, R. & Metz, G. A. S. Epigenetic and gene expression changes in the adolescent brain: What have we learned from animal models? *Neurosci. Biobehav. Rev.* **70**, 189–197 (2016).
95. Lichenstein, S. D., Verstynen, T. & Forbes, E. E. Adolescent brain development and depression: A case for the importance of connectivity of the anterior cingulate cortex. *Neurosci. Biobehav. Rev.* **70**, 271–287 (2016).
96. Albert, D., Chein, J. & Steinberg, L. The teenage brain: Peer influences on adolescent decision making. *Curr. Dir. Psychol. Sci.* **22**, 114–120 (2013).
97. Sherman, L., Steinberg, L. & Chein, J. Connecting brain responsivity and real-world risk taking: Strengths and limitations of current methodological approaches. *Dev. Cogn. Neurosci.* 1–15 (2017). doi:10.1016/j.dcn.2017.05.007
98. Dahl, R. E. Adolescent brain development: A period of vulnerabilities and opportunities. *Ann. N. Y. Acad. Sci.* **1021**, 1–22 (2004).
99. Meyer, H. C., Lee, F. S. & Gee, D. G. The role of the endocannabinoid system and genetic variation in adolescent brain development. *Neuropsychopharmacol. Rev.* **43**, 21–33 (2018).
100. Suleiman, A. B., Galván, A., Harden, K. P. & Dahl, R. E. Becoming a sexual being: The ‘elephant in the room’ of adolescent brain development. *Dev. Cogn. Neurosci.* **25**, 209–220 (2017).
101. Carskadon, M. A. *Adolescent sleep patterns: Biological, social, and psychological influences*. (Cambridge University Press, 2002).
102. Farrington, C. A. *et al.* *Teaching adolescents to become learners: The role of noncognitive factors in shaping school performance: A critical literature review*. (University of Chicago Consortium On Chicago School Research, 2012).
103. Giedd, J. N. *et al.* Brain development during childhood and adolescence: a longitudinal MRI study. *Nat. Neurosci.* **2**, 861–863 (1999).
104. Immordino-Yang, M. H. & Yang, X.-F. Cultural differences in the neural correlates of social–emotional feelings: An interdisciplinary, developmental perspective. *Curr. Opin. Psychol.* **17**, 34–40 (2017).
105. Kundu, P. *et al.* The integration of functional brain activity from adolescence to adulthood. *J. Neurosci.* **38**, 3559–3570 (2018).



106. Fair, D. A. *et al.* Functional brain networks develop from a “local to distributed” organization. *PLoS Comput. Biol.* **5**, e1000381 (2009).
107. Zarrett, N. & Eccles, J. The passage to adulthood: Challenges of late adolescence. *New Dir. Youth Dev.* **111**, 13–28 (2006).
108. Tian, L. & Ma, L. Microstructural changes of the human brain from early to mid-adulthood. *Front. Hum. Neurosci.* **11**, 1–12 (2017).
109. Eriksson, P. S. *et al.* Neurogenesis in the adult human hippocampus. *Nat. Med.* **4**, 1313–1317 (1998).
110. Lledo, P. M., Alonso, M. & Grubb, M. S. Adult neurogenesis and functional plasticity in neuronal circuits. *Nat. Rev. Neurosci.* **7**, 179–193 (2006).
111. Zhao, C., Deng, W. & Gage, F. H. Mechanisms and functional implications of adult neurogenesis. *Cell* **132**, 645–660 (2008).
112. Mirescu, C. & Gould, E. Stress and adult neurogenesis. *Hippocampus* **16**, 233–238 (2006).
113. Mirescu, C., Peters, J. D. & Gould, E. Early life experience alters response of adult neurogenesis to stress. *Nat. Neurosci.* **7**, 841–846 (2004).
114. Lucassen, P. J. *et al.* Regulation of adult neurogenesis by stress, sleep disruption, exercise and inflammation: Implications for depression and antidepressant action. *Neuropsychopharmacology* **20**, 1–17 (2010).
115. Meerlo, P., Mistlberger, R. E., Jacobs, B. L., Heller, H. C. & McGinty, D. New neurons in the adult brain: The role of sleep and consequences of sleep loss. *Sleep Med. Rev.* **13**, 187–194 (2009).
116. Poulose, S. M., Miller, M. G., Scott, T. & Shukitt-Hale, B. Nutritional factors affecting adult neurogenesis and cognitive function. *Adv. Nutr.* **8**, 804–811 (2017).
117. Stangl, D. & Thuret, S. Impact of diet on adult hippocampal neurogenesis. *Genes Nutr.* **4**, 271–282 (2009).
118. Kramer, A. F. & Erickson, K. I. Capitalizing on cortical plasticity: Influence of physical activity on cognition and brain function. *Trends Cogn. Sci.* **11**, 342–348 (2007).
119. Charles, S. T. & Carstensen, L. L. Social and emotional aging. *Annu. Rev. Psychol.* **61**, 383–409 (2009).
120. Jennings, P. A. & Greenberg, M. T. The prosocial classroom: Teacher social and emotional competence in relation to student and classroom outcomes. *Rev. Educ. Res.* **79**, 491–525 (2009).
121. Meiklejohn, J. *et al.* Integrating mindfulness training into K-12 education: Fostering the resilience of teachers and students. *Mindfulness* **3**, 291–307 (2012).
122. Kolb, D. A. *Experiential learning: Experience as the source of learning and development*. (Prentice Hall, 1984).
123. Darling-Hammond, L., Hyler, M. E. & Gardner, M. *Effective teacher professional development*. (Learning Policy Institute, 2017).
124. Jennings, P. A., Snowberg, K. E., Coccia, M. A. & Greenberg, M. T. Improving classroom learning environments by Cultivating Awareness and Resilience in Education (CARE): Results of two pilot studies. *J. Classr. Interact.* **46**, 37–48 (2011).



125. Jennings, P. A., Frank, J. L., Snowberg, K. E., Coccia, M. A. & Greenberg, M. T. Improving classroom learning environments by Cultivating Awareness and Resilience in Education (CARE): Results of a randomized controlled trial. *Sch. Psychol. Q.* **28**, 374–390 (2013).
126. Benn, R., Akiva, T., Arel, S. & Roeser, R. W. Mindfulness training effects for parents and educators of children with special needs. *Dev. Psychol.* **48**, 1476–1487 (2012).
127. Roeser, R. W. *et al.* Mindfulness training and reductions in teacher stress and burnout: Results from two randomized, waitlist-control field trials. *J. Educ. Psychol.* **105**, 787–804 (2013).
128. Immordino-Yang, M. H. Emotion, sociality, and the brain's default mode network: Insights for educational practice and policy. *Policy Insights from Behav. Brain Sci.* **3**, 211–219 (2016).
129. Sporns, O., Honey, C. J. & Kotter, R. Identification and classification of hubs in brain networks. *PLoS One* **2**, e1049 (2007).
130. Gao, W. *et al.* Evidence on the emergence of the brain's default network from 2-week-old to 2-year-old healthy pediatric subjects. *Proc. Natl. Acad. Sci.* **106**, 6790–6795 (2009).
131. Hoff, G. E. A.-J., Van den Heuvel, M. P., Benders, M. J. N. L., Kersbergen, K. J. & De Vries, L. S. On development of functional brain connectivity in the young brain. *Front. Hum. Neurosci.* **7**, 1–7 (2013).
132. Lin, W. *et al.* Functional connectivity MR imaging reveals cortical functional connectivity in the developing brain. *Am. J. Neuroradiol.* **29**, 1883–1889 (2008).
133. Liu, W.-C., Flax, J. F., Guise, K. G., Sukul, V. & Benasich, A. A. Functional connectivity of the sensorimotor area in naturally sleeping infants. *Brain Res.* **1223**, 42–29 (2008).
134. Supekar, K., Musen, M. & Menon, V. Development of large-scale functional brain networks in children. *PLoS Biol.* **7**, e1000157 (2009).
135. Thomason, M. E., Hamilton, J. P. & Gotlib, I. H. Stress-induced activation of the HPA axis predicts connectivity between subgenual cingulate and salience network during rest in adolescents. *J. Child Psychol. Psychiatry* **52**, 1026–1034 (2011).
136. Greicius, M. D., Supekar, K., Menon, V. & Dougherty, R. F. Resting-state functional connectivity reflects structural connectivity in the default mode network. *Cereb. Cortex* **19**, 72–78 (2009).
137. Honey, C. J. *et al.* Predicting human resting-state functional connectivity from structural connectivity. *Proc. Natl. Acad. Sci.* **106**, 2035–2040 (2009).
138. Sporns, O., Chialvo, D. R., Kaiser, M. & Hilgetag, C. C. Organization, development and function of complex brain networks. *Trends Cogn. Sci.* **8**, 418–425 (2004).
139. Buckner, R. L., Andrews-Hanna, J. R. & Schacter, D. L. The brain's default network: Anatomy, function, and relevance to disease. *Ann. N. Y. Acad. Sci.* **1124**, 1–38 (2008).
140. van den Heuvel, Martijn P., Stam, C. J., Kahn, R. S. & Hulshoff Pol, H. E. Efficiency of functional brain networks and intellectual performance. *J. Neurosci.* **29**, 7619–7624 (2009).
141. Menon, V. & Uddin, L. Q. Saliency, switching, attention and control: A network model of insula function. *Brain Struct. Funct.* **214**, 655–667 (2010).
142. Niendam, T. A. *et al.* Meta-analytic evidence for a superordinate cognitive control network subserving diverse executive functions. *Cogn Affect Behav Neurosci* **12**, 241–268 (2012).



143. Noble, K. G., Houston, S. M., Kan, E. & Sowell, E. R. Neural correlates of socioeconomic status in the developing human brain. *Dev. Sci.* **15**, 516–527 (2012).
144. Rosario Rueda, M., Rothbart, M. K., McCandliss, B. D., Saccomanno, L. & Posner, M. I. Training, maturation, and genetic influences on the development of executive attention. *Proc. Natl. Acad. Sci. U. S. A.* **102**, 14931–14936 (2005).
145. Tang, Y.-Y. & Posner, M. I. Training brain networks and states. *Trends Cogn. Sci.* **18**, 345–350 (2014).
146. Anguera, J. A. *et al.* Video game training enhances cognitive control in older adults. *Nature* **501**, 97–101 (2013).
147. Beaty, R. E., Benedek, M., Kaufman, S. B. & Silvia, P. J. Default and executive network coupling supports creative idea production. *Sci. Rep.* **5**, 10964 (2015).
148. Seeley, W. W. *et al.* Dissociable intrinsic connectivity networks for salience processing and executive control. *J. Neurosci.* **27**, 2349–2356 (2007).
149. Raichle, M. E. *et al.* A default mode of brain function. *Proc. Natl. Acad. Sci.* **98**, 676–682 (2001).
150. Gilbert, D. T. & Wilson, T. D. Prospection: Experiencing the future. *Science* **317**, 1351–1354 (2007).
151. Immordino-Yang, M. H., Christodoulou, J. A. & Singh, V. Rest is not idleness implications of the brain’s default mode for human development and education. *Perspect. Psychol. Sci.* **7**, 352–364 (2012).
152. Spreng, R. N. & Grady, C. L. Patterns of brain activity supporting autobiographical memory, prospection, and theory of mind, and their relationship to the default mode network. *J. Cogn. Neurosci.* **22**, 1112–1123 (2010).
153. Smallwood, J., Brown, K., Baird, B. & Schooler, J. W. Cooperation between the default mode network and the frontal-parietal network in the production of an internal train of thought. *Brain Res.* **1428**, 60–70 (2012).
154. Kucyi, A. & Davis, K. D. Dynamic functional connectivity of the default mode network tracks daydreaming. *Neuroimage* **100**, 471–480 (2014).
155. Beaty, R. E. *et al.* Creativity and the default network: A functional connectivity analysis of the creative brain at rest. *Neuropsychologia* **64**, 92–98 (2014).
156. Kühn, S. *et al.* The importance of the default mode network in creativity: A structural MRI study. *J. Creat. Behav.* **48**, 152–163 (2014).
157. Immordino-Yang, M. H., McColl, A., Damasio, H. & Damasio, A. Neural correlates of admiration and compassion. *Proc. Natl. Acad. Sci.* **106**, 8021–8026 (2009).
158. Supekar, K. *et al.* Development of functional and structural connectivity within the default mode network in young children. *Neuroimage* **52**, 290–301 (2010).
159. Molnar-Szakacs, I. & Uddin, L. Q. Self-processing and the default mode network: Interactions with the mirror neuron system. *Front. Hum. Neurosci.* **7**, 1–11 (2013).
160. Tamir, D. I., Bricker, A. B., Dodell-Feder, D. & Mitchell, J. P. Reading fiction and reading minds: The role of simulation in the default network. *Soc. Cogn. Affect. Neurosci.* **11**, 215–224 (2015).
161. Bressler, S. L. & Menon, V. Large-scale brain networks in cognition: emerging methods and principles. *Trends Cogn. Sci.* **14**, 277–290 (2010).

- 
162. Goulden, N. *et al.* The salience network is responsible for switching between the default mode network and the central executive network: Replication from DCM. *Neuroimage* **99**, 180–190 (2014).
 163. Uddin, L. Q. Salience processing and insular cortical function and dysfunction. *Nat. Rev. Neurosci.* **16**, 55–61 (2015).
 164. Ackermann, K. *et al.* Diurnal rhythms in blood cell populations and the effect of acute sleep deprivation in healthy young men. *Sleep* **35**, 933–940 (2012).
 165. Van Dongen, H. P. A., Maislin, G., Mullington, J. M. & Dinges, D. F. The cumulative cost of additional wakefulness: Dose-response effects on neurobehavioral functions and sleep physiology from chronic sleep restriction and total sleep deprivation. *Sleep* **26**, 117–126 (2003).
 166. Walker, M. P. & Stickgold, R. Sleep, memory, and plasticity. *Annu. Rev. Psychol.* **57**, 139–166 (2006).
 167. Potkin, K. T. & Bunney, W. E. Sleep improves memory: The effect of sleep on long term memory in early adolescence. *PLoS One* **7**, 1–4 (2012).
 168. Rasch, B. & Born, J. About sleep's role in memory. *Physiol. Rev.* **93**, 681–766 (2013).
 169. Xie, L. *et al.* Sleep drives metabolite clearance from the adult brain. *Science* **342**, 373–377 (2013).
 170. De Havas, J. A., Parimal, S., Soon, C. S. & Chee, M. W. L. Sleep deprivation reduces default mode network connectivity and anti-correlation during rest and task performance. *Neuroimage* **59**, 1745–1751 (2012).
 171. Drummond, S. P. *et al.* Altered brain response to verbal learning following sleep deprivation. *Nature* **403**, 655–657 (2000).
 172. Yeung, M. K., Lee, T. L., Cheung, W. K. & Chan, A. S. Frontal underactivation during working memory processing in adults with acute partial sleep deprivation: A near-infrared spectroscopy study. *Front. Psychol.* **9**, 1–15 (2018).
 173. Yoo, S.-S., Gujar, N., Hu, P., Jolesz, F. A. & Walker, M. P. The human emotional brain without sleep—a prefrontal amygdala disconnect. *Curr. Biol.* **17**, R877–R878 (2007).
 174. Durmer, J. S. & Dinges, D. F. Neurocognitive consequences of sleep deprivation. *Semin. Neurol.* **25**, 117–129 (2005).
 175. Todorich, B., Pasquini, J. M., Garcia, C. I., Paez, P. M. & Connor, J. R. Oligodendrocytes and myelination: The role of iron. *Glia* **57**, 467–478 (2009).
 176. Francis, H. & Stevenson, R. The longer-term impacts of Western diet on human cognition and the brain. *Appetite* **63**, 119–128 (2013).
 177. Molteni, R., Barnard, R. J., Ying, Z., Roberts, C. K. & Gomez-Pinilla, F. A high-fat, refined sugar diet reduces hippocampal brain-derived neurotrophic factor, neuronal plasticity, and learning. *Neuroscience* **112**, 803–814 (2002).
 178. Wu, A., Ying, Z. & Gomez-Pinilla, F. The interplay between oxidative stress and brain-derived neurotrophic factor modulates the outcome of a saturated fat diet on synaptic plasticity and cognition. *Eur. J. Neurosci.* **19**, 1699–1707 (2004).
 179. Ngure, F. M. *et al.* Water, sanitation, and hygiene (WASH), environmental enteropathy, nutrition, and early child development: Making the links. *Ann. N. Y. Acad. Sci.* **1308**, 118–128 (2014).

- 
180. Calderón-Garcidueñas, L. *et al.* Long-term air pollution exposure is associated with neuroinflammation, an altered innate immune response, disruption of the blood-brain barrier, ultrafine particulate deposition, and accumulation of amyloid β -42 and α -synuclein in children and young adult. *Toxicol. Pathol.* **36**, 289–310 (2008).
 181. Fonken, L. K. *et al.* Air pollution impairs cognition, provokes depressive-like behaviors and alters hippocampal cytokine expression and morphology. *Mol. Psychiatry* **16**, 987–995 (2011).
 182. Younan, D. *et al.* Longitudinal analysis of particulate air pollutants and adolescent delinquent behavior in Southern California. *J Abnorm Child Psychol* **46**, 1283–1293 (2018).
 183. Bellinger, D. C., Stiles, K. M. & Needleman, H. L. Low-level lead exposure, intelligence and academic achievement: A long-term follow-up study. *Pediatrics* **90**, 855–861 (1992).
 184. Koller, K., Brown, T., Spurgeon, A. & Levy, L. Recent developments in low-level lead exposure and intellectual impairment in children. *Environ. Health Perspect.* **112**, 987–994 (2004).
 185. Camchong, J., Lim, K. O. & Kumra, S. Adverse effects of cannabis on adolescent brain development: A longitudinal study. *Cereb. Cortex* **27**, 1922–1930 (2017).
 186. Spear, L. P. Effects of adolescent alcohol consumption on the brain and behaviour. *Nat. Rev. Neurosci.* **19**, 197–214 (2018).
 187. Erickson, K. I. *et al.* Exercise training increases size of hippocampus and improves memory. *Proc. Natl. Acad. Sci.* **108**, 3017–3022 (2011).
 188. Hillman, C. H., Erickson, K. I. & Kramer, A. F. Be smart, exercise your heart: Exercise effects on brain and cognition. *Nat. Rev. Neurosci.* **9**, 58–65 (2008).
 189. Krafft, C. E. *et al.* An 8-month randomized controlled exercise trial alters brain activation during cognitive tasks in overweight children. *Obesity* **22**, 232–242 (2014).
 190. Voss, M. W. *et al.* Plasticity of brain networks in a randomized intervention trial of exercise training in older adults. *Front. Aging Neurosci.* **2**, 1–17 (2010).
 191. Bherer, L., Erickson, K. I. & Liu-Ambrose, T. A review of the effects of physical activity and exercise on cognitive and brain functions in older adults. *J. Aging Res.* **2013**, 657508 (2013).
 192. Bunketorp Käll, L., Malmgren, H., Olsson, E., Lindén, T. & Nilsson, M. Effects of a curricular physical activity intervention on children's school performance, wellness, and brain development. *J. Sch. Health* **85**, 704–713 (2015).
 193. Koutsandréou, F., Wegner, M., Niemann, C. & Budde, H. Effects of motor versus cardiovascular exercise training on children's working memory. *Med. Sci. Sports Exerc.* **48**, 1144–1152 (2016).
 194. Lees, C. & Hopkins, J. Effect of aerobic exercise on cognition, academic achievement, and psychosocial function in children: A systematic review of randomized control trials. *Prev. Chronic Dis.* **10**, E174 (2013).
 195. Voss, M. W., Nagamatsu, L. S., Liu-Ambrose, T. & Kramer, A. F. Exercise, brain, and cognition across the life span. *J Appl Physiol* **111**, 1505–1513 (2011).
 196. Bowler, D. E., Buyung-Ali, L. M., Knight, T. M. & Pullin, A. S. A systematic review of evidence for the added benefits to health of exposure to natural environments. *BMC Public Health* **10**, 1–10 (2010).

- 
197. Hyvönen, K. *et al.* Profiles of nature exposure and outdoor activities associated with occupational well-being among employees. *Front. Psychol.* **9**, 1–13 (2018).
 198. Lupien, S. J., McEwen, B. S., Gunnar, M. R. & Heim, C. Effects of stress throughout the lifespan on the brain, behaviour and cognition. *Nat. Rev. Neurosci.* **10**, 434–445 (2009).
 199. McEwen, B. S. Brain on stress: How the social environment gets under the skin. *Proc. Natl. Acad. Sci.* **109**, 17180–17185 (2012).
 200. Zilkha, N. & Kimchi, T. Social isolation’s molecular signature. *Nature* **559**, 38–40 (2018).
 201. Beilock, S. L., Rydell, R. J. & McConnell, A. R. Stereotype threat and working memory: Mechanisms, alleviation, and spillover. *J. Exp. Psychol. Gen.* **136**, 256–276 (2007).
 202. Steele, C. M. *Whistling Vivaldi: How stereotypes affect us and what we can do.* (W. W. Norton & Company, 2011).
 203. Brody, G. H., Yu, T., Chen, E., Beach, S. R. H. & Miller, G. E. Family-centered prevention ameliorates the longitudinal association between risky family processes and epigenetic aging. *J. Child Psychol. Psychiatry Allied Discip.* **57**, 566–574 (2016).
 204. Miller, G. E., Yu, T., Chen, E. & Brody, G. H. Self-control forecasts better psychosocial outcomes but faster epigenetic aging in low-SES youth. *Proc. Natl. Acad. Sci.* **112**, 10325–10330 (2015).
 205. Flannery, J. E., Beauchamp, K. G. & Fisher, P. A. The role of social buffering on chronic disruptions in quality of care: Evidence from caregiver-based interventions in foster children. *Soc. Neurosci.* **12**, 86–91 (2017).
 206. Khoury, B., Sharma, M., Rush, S. E. & Fournier, C. Mindfulness-based stress reduction for healthy individuals: A meta-analysis. *J. Psychosom. Res.* **78**, 519–528 (2015).
 207. Roe, J. J. *et al.* Green space and stress: Evidence from cortisol measures in deprived urban communities. *Int. J. Environ. Res. Public Health* **10**, 4086–4103 (2013).
 208. Thompson, C. W. *et al.* More green space is linked to less stress in deprived communities: Evidence from salivary cortisol patterns. *Landscape Urban Plan.* **105**, 221–229 (2012).
 209. Twohig-Bennett, C. & Jones, A. The health benefits of the great outdoors: A systematic review of greenspace exposure and health outcomes. *Environ. Res.* **166**, 628–637 (2018).
 210. Gutiérrez, K. D. & Rogoff, B. Cultural ways of learning: Individual traits or repertoires of practice. *Educ. Res.* **32**, 19–25 (2003).
 211. Yip, T. Ethnic/racial identity—a double-edged sword? Associations with discrimination and psychological outcomes. *Curr. Dir. Psychol. Sci.* **27**, 170–175 (2018).
 212. Nasir, N. *Racialized identities: Race and achievement among African American youth.* (Stanford University Press, 2011).
 213. Gutiérrez, K. D. Studying cultural practices in urban learning communities. *Hum. Dev.* **45**, 312–321 (2002).
 214. Kirmayer, L. J., Groleau, D., Guzder, J., Blake, C. & Jarvis, E. Cultural consultation: A model of mental health service for multicultural societies. *Can. J. Psychiatry* **48**, 5230–5241 (2003).
 215. Raymond, J. P. *Wildflowers: A school superintendent’s challenge to America.* (Stuart Foundation, 2018).

- 
216. Patton, L. D. *Culture centers in higher education: Perspectives on identity, theory, and practice*. (Stylus Publishing, 2010).
 217. Vygotsky, L. S. *Thought and language*. (MIT Press, 1962).
 218. LePage, P., Darling-Hammond, L. & Akar, H. Classroom management. in *Preparing teachers for a changing world: What teachers should learn to do* (eds. Darling-Hammond, L. & Bransford, J.) 327–357 (Wiley, 2005).
 219. Barron, B. & Darling-Hammond, L. How can we teach for meaningful learning? in *Powerful Learning: What we Know about Teaching for Understanding* (Jossey-Bass, 2008).
 220. Immordino-Yang, M. H. A tale of two cases: Lessons for education from the study of two boys living with half their brains. *Mind, Brain, Educ.* **1**, 66–83 (2007).
 221. Immordino-Yang, M. H. *Emotions, learning, and the brain: Exploring the educational implications of affective neuroscience*. (W. W. Norton & Company, 2015).
 222. Dehaene, S. *Reading in the brain: The new science of how we read*. (Penguin Press, 2009).
 223. Dehaene, S. *The number sense: How the mind creates mathematics*. (Oxford University Press, 2011).
 224. Pearson, P. D., Cervetti, G. N. & Tilson, J. L. Reading for understanding. in *Powerful Learning: What we Know about Teaching for Understanding* (Jossey-Bass, 2008).
 225. Buchweitz, A. & Prat, C. The bilingual brain: Flexibility and control in the human cortex. *Phys. Life Rev.* **10**, 428–443 (2013).
 226. Bialystok, E. Bilingual education for young children: Review of the effects and consequences. *Int. J. Biling. Educ. Biling.* 1–14 (2016). doi:10.1080/13670050.2016.1203859
 227. Corrigall, K. A., Schellenberg, E. G. & Misura, N. M. Music training, cognition, and personality. *Front. Psychol.* **4**, 1–10 (2013).
 228. Martin, A. J. *et al.* The role of arts participation in students' academic and nonacademic outcomes: A longitudinal study of school, home, and community factors. *J. Educ. Psychol.* **105**, 709–727 (2013).
 229. Habibi, A., Damasio, A., Ilari, B., Elliott Sachs, M. & Damasio, H. Music training and child development: A review of recent findings from a longitudinal study. *Ann. N. Y. Acad. Sci.* (2018). doi:10.1111/nyas.13606
 230. Sachs, M., Kaplan, J., Der Sarkissian, A. & Habibi, A. Increased engagement of the cognitive control network associated with music training in children during an fMRI Stroop task. *PLoS One* **12**, e0187254 (2017).
 231. Hallam, S. The power of music: Its impact on the intellectual, social and personal development of children and young people. *Int. J. Music Educ.* **28**, 269–289 (2010).
 232. Perkins, D. *Teaching thinking: Issues and approaches*. (Routledge, 1990).
 233. Gardner, H. E., Csikszentmihalyi, M. & Damon, W. *Good work: When excellence and ethics meet*. (Basic Books, 2001).
 234. Baehr, J. S. *The inquiring mind: On intellectual virtues and virtue epistemology*. (Oxford University Press, 2011).

- 
235. Blankstein, A. & Noguera, P. *Excellence through equity: Five principles of courageous leadership to guide achievement for every student*. (Association for Supervision & Curriculum Development, 2015).
236. Dweck, C. *Mindset: The new psychology of success*. (Ballantine Books, 2006).
237. Johnson, D. W., Johnson, R. T. & Stanne, M. B. *Cooperative learning methods: A meta-analysis*. (2000).
238. Hantzopoulos, M. *Restoring dignity in public schools: Human rights education in action*. (Teachers College Press, 2016).
239. Hamedani, M. G., Zheng, X., Darling-Hammond, L., Andree, A. & Quinn, B. *Social emotional learning in high school: How three urban high schools engage, educate, and empower youth—Cross-case analysis*. (Stanford Center for Opportunity Policy in Education, 2015).
240. Cantor, P., Osher, D., Berg, J., Steyer, L. & Rose, T. Malleability, plasticity, and individuality: How children learn and develop in context. *Appl. Dev. Sci.* 1–31 (2017).
doi:10.1080/10888691.2017.1398649
241. Jones, S. M. & Kahn, J. *The evidence base for how we learn: Supporting students' social, emotional, and academic development*. (The Aspen Institute, 2017).
242. Osher, D. et al. Advancing the science and practice of social and emotional learning: Looking back and moving forward. *Rev. Res. Educ.* **40**, 644–681 (2016).