Toward a neuroscience of parenting : adult attachment and oxytocin affect neural and behavioral responses to infant attachment signals

Hendricx - Riem, M.M.E.

Dankwoord

Dit proefschrift was niet tot stand gekomen zonder de hulp, steun en inspanningen van vele anderen. Ik wil iedereen bedanken die hieraan heeft bijgedragen. Ten eerste wil ik de proefpersonen bedanken voor hun deelname aan de studies. Ook hartelijk dank aan de studenten die mee hebben geholpen met de verzameling van de fMRI data. Daarnaast wil ik mijn collega's van Algemene- en Gezinspedagogiek bedanken voor voor de prettige samenwerking. In het bijzonder wil ik Dorothée en Suzanne bedanken voor de hulp tijdens de eerste periode van mijn promotietraject. Claudia, Sandra, Rianne, Mariëlle en alle andere aio's: bedankt voor de ontspanning en afleiding. Lieve familie en vrienden, bedankt voor jullie steun, interesse, humor en belangstelling. Pap, mam en Daniëlle, heel erg bedankt voor de steun en het vertrouwen dat jullie altijd in mij hebben gehad. Last but not least, lieve Tom: bedankt voor alles!

Curriculum Vitae

Madelon Hendricx-Riem werd geboren op 22 september 1984 in Maastricht. In 2002 haalde zij haar VWO diploma aan het Trichter College in Maastricht. Aansluitend begon zij aan de opleiding Psychologie aan de Radboud Universiteit in Nijmegen waar zij koos voor de specialisatie Neuro- en Revalidatiepsychologie. Na het behalen van haar bachelor begon zij aan de twee-jarige researchmaster Cognitive Neuroscience die zij in 2008 met genoegen afrondde en de master Neuro- en Revalidatiepsychologie die zij in 2009 cum laude afrondde. Zij deed klinische ervaring op tijdens een stage op de afdeling klinische psychologie van het Canisius Wilhelmina Ziekenhuis in Nijmegen en schreef haar scriptie over spiegelneuronen en autisme. Tijdens haar studie deed zij onderzoekservaring op als student-assistent bij het Baby Research Center, Radboud Universiteit, Nijmegen. Sinds haar afstuderen is zij werkzaam bij de afdeling Algemene- en Gezinspedagogiek (AGP), Universiteit Leiden. Haar promotieonderzoek was gericht op de invloed van oxytocine en gehechtheidsrepresentaties op neurale reacties op babysignalen. De resultaten van haar onderzoek zijn beschreven in dit proefschrift. Naast haar aanstelling als promovenda is Madelon ook één dag in de week aangesteld als docent bij AGP. Daarnaast heeft zij ervaring opgedaan als psycholoog bij De Praktijk Leiderdorp.

Lijst van publicaties

Riem, M.M.E., Pieper, S., Out, D., Bakermans-Kranenburg, M.J., & Van IJzendoorn, M.H. (2011). Oxytocin receptor gene and depressive symptoms associated with physiological reactivity to infant crying. *Social Cognitive and Affective Neuroscience, 6*, 294-300.

Riem, M.M.E., Bakermans-Kranenburg, M.J., Pieper, S., Tops, M., Boksem, M.A.S., Vermeiren, R.R.J.M., Van IJzendoorn, M.H., Rombouts, S.A.R.B. (2011). Oxytocin modulates amygdala, insula and inferior frontal gyrus responses to infant crying: A randomized controlled trial. *Biological Psychiatry, 70*, 291-297.

Riem, M.M.E., Van IJzendoorn, M.H., Tops, M., Boksem, M.A.S., Rombouts, S.A.R.B., & Bakermans-Kranenburg, M.J. (2012). No laughing matter: intranasal oxytocin administration changes functional brain connectivity during exposure to infant laughter. *Neuropsychopharmacology, 37*, 1257-1266.

Riem, M.M.E., Bakermans-Kranenburg, M.J., Van IJzendoorn M.H., Out, D., & Rombouts, S.A.R.B. (2012). Attachment in the brain: adult attachment representations predict amygdala and behavioral responses to infant crying. *Attachment & Human Development, 14*, 533-551.

Riem, M.M.E., Bakermans-Kranenburg, M.J., Huffmeijer, R., Van IJzendoorn, M.H. (in press). Does intranasal oxytocin promote prosocial behavior to an excluded fellow player? A randomized controlled trial with Cyberball. *Psychoneuroendocrinology.*

Riem, M.M.E., Van IJzendoorn, M.H., Tops, M., Boksem, M.A.S., Rombouts, S.A.R.B., Bakermans-Kranenburg, M.J. (in press). Oxytocin effects on complex brain networks are moderated by experiences of maternal love withdrawal. *European Neuropsychopharmacology.*

Bakermans-Kranenburg, M.J., Van IJzendoorn, M.H., Riem, M.M.E., Tops, M., & Alink, L.R. (2012). Oxytocin decreases handgrip force in reaction to infant crying in females without harsh parenting experiences. *Social Cognitive and Affective Neuroscience, 7*, 951-957.

Tops, M., Van IJzendoorn, M.H., Riem, M.M.E., Boksem, M.A.S., & Bakermans-Kranenburg, M.J. (2011) Oxytocin receptor gene associated with the efficiencey of social auditory processing. *Frontiers in Psychiatry, 2*, 60.

Ingediende manuscripten

Riem, M.M.E., Alexandra Voorthuis, Bakermans-Kranenburg, M.J., Van IJzendoorn. Pity or Peanuts? Oxytocin affects neural response to sick and bored infant crying. *Submitted for publication*.

References

Ainsworth, A.D.S., Blehar, M.C., Waters, E., & Wall, S. (1978). *Patterns of attachment. A Psychological Study of the Strange Situation.* Hillsdale, NJ: Lawrence Erlbaum.

Alalade, E., Denny, K., Potter, G., Steffens, D., & Wang, L. (2011). Altered cerebellar-cerebral functional connectivity in geriatric depression. *PLoS One, 6*(5), e20035.

Al-Azzawi, F., & Palacios, S. (2009). Hormonal changes during menopause. *Maturitas, 63*(2), 135-137.

Altemus, M., Roca, C., Galliven, E., Romanos, C., & Deuster, P. (2001). Increased vasopressin and adrenocorticotropin responses to stress in the midluteal phase of the menstrual cycle. *Journal of Clinical Endocrinology & Metabolism, 86*(6), 2525-2530.

Amaral, D.G., & Price, J.L. (1984). Amygdalo-cortical projections in the monkey (Macaca fascicularis). *Journal of Comparative Neurology, 230(4)*, 465-496.

Andari E., Duhamel J.R., Zalla T., Herbrecht E., Leboyer M., & Sirigu A. (2010). Promoting social behavior with oxytocin in high-functioning autism spectrum disorders. *Proceedings of the National Academy of Sciences of the United States of America, 107,* 4389-4394.

Anticevic, A., Cole, M.W., Murray, J.D., Corlett, P.R., Wang, X.J., & Krystal, J.H. (2012). The role of default network deactivation in cognition and disease. *Trends in Cognitive Sciences, 16*(12), 584-592.

Arteche, A., Joormann, J., Harvey, A., Craske, M., Gotlib, I. H., Lehtonen, A., . . . Stein, A. (2011). The effects of postnatal maternal depression and anxiety on the processing of infant faces. *Journal of Affective Disorders, 133*(1–2), 197-203.

Atique, B., Erb, M., Gharabaghi, A., Grodd, W., & Anders, S. (2011). Task-specific activity and connectivity within the mentalizing network during emotion and intention mentalizing. *Neuroimage, 55*(4), 1899-1911.

Atzil, S., Hendler, T., & Feldman, R. (2011). Specifying the neurobiological basis of human attachment: brain, hormones, and behavior in synchronous and intrusive mothers. *Neuropsychopharmacology, 36*, 2603-2615.

Banks, S.J., Eddy, K.T., Angstadt, M., Nathan, P.J., & Phan, K.L. (2007). Amygdala-frontal connectivity during emotion regulation. *Social Cognitive and Affective Neuroscience, 2*(4), 303-312.

Bakermans-Kranenburg, M.J., & Van IJzendoorn, M.H. (1993). A psychometric study of the Adult Attachment Interview: Reliability and discriminant validity. *Developmental Psychology, 29*, 870-879.

Bakermans-Kranenburg, M.J., & Van IJzendoorn, M.H. (2008). Oxytocin receptor (OXTR) and serotonin transporter (5-HTT) genes associated with observed parenting. *Social Cognitive and Affective Neuroscience, 3*(2), 128-134.

Bakermans-Kranenburg, M.J., & Van IJzendoorn, M.H. (2009). The first 10,000 Adult Attachment Interviews: distributions of adult attachment representations in clinical and non-clinical groups. *Attachment & Human Development, 11*, 223-263.

Bakermans-Kranenburg, M.J., & Van IJzendoorn, M.H. (2012). Sniffing around oxytocin: review and meta-analyses of trials in healthy and clinical groups with implications for pharmacotherapy. *Translational Psychiatry.*

Bakermans-Kranenburg, M.J., Van IJzendoorn, M.H., Riem, M.M.E., Tops, M., & Alink, L.R. (2012). Oxytocin decreases handgrip force in reaction to infant crying in females without harsh parenting experiences. *Social Cognitive and Affective Neuroscience, 7*, 951-957.

Banks, S.J., Eddy, K.T., Angstadt, M., Nathan, P.J., & Phan, K.L. (2007). Amygdala-frontal connectivity during emotion regulation. *Social Cognitive and Affective Neuroscience, 2*, 303-312.

Baron-Cohen, S., Ring, H.A., Wheelwright, S., Bullmore, E.T., Brammer, M.J., Simmons, A., & Williams, S.C.R. (1999). Social intelligence in the normal and autistic brain: an fMRI study. *European Journal of Neuroscience, 11*(6), 1891-1898.

Barr, R.G., Trent, R.B., & Cross, J. (2006). Age-related incidence curve of hospitalized Shaken Baby Syndrome cases: Convergent evidence for crying as a trigger to shaking. *Child Abuse & Neglect, 30*, 7-16.

Barraza, J. A., & Zak, P. J. (2009). Empathy toward Strangers Triggers Oxytocin Release and Subsequent Generosity. *Annals of the New York Academy of Sciences, 1167*(1), 182-189.

Bartels, A., & Zeki, S. (2004). The neural correlates of maternal and romantic love. *Neuroimage, 21*(3), 1155-1166.

Bartz, J.A., & Hollander, E. (2008). Oxytocin and experimental therapeutics in autism spectrum disorders. In D. N. Inga & L. Rainer (Eds.), *Progress in Brain Research, 170,* 451-462.

Bartz, J.A., Zaki, J., Bolger, N., Hollander, E., Ludwig, N.N., Kolevzon, A., & Ochsner, K.N. (2010). Oxytocin selectively improves empathic accuracy. *Psychological Science, 21*(10), 1426-1428.

Bartz, J.A., Zaki, J., Bolger, N., & Ochsner, K.N. (2011). Social effects of oxytocin in humans: context and person matter. *Trends in Cognitive Sciences, 15*, 301-309.

Bartz, J.A., Zaki, J., Ochsner, K.N., Bolger, N., Kolevzon, A., Ludwig, N., & Lydon, J.E. (2010). Effects of oxytocin on recollections of maternal care and closeness. *Proceedings of the National Academy of Sciences of the United States of America, 107*(50), 21371-21375.

Bauer, P.M., Hanson, J.L., Pierson, R.K., Davidson, R.J., & Pollak, S.D. (2009). Cerebellar volume and cognitive functioning in children who experienced early deprivation. *Biological Psychiatry, 66*(12), 1100-1106.

Baumgartner, T., Heinrichs, M., Vonlanthen, A., Fischbacher, U., & Fehr, E. (2008). Oxytocin shapes the neural circuitry of trust and trust adaptation in humans. *Neuron, 58*(4), 639-650.

Beach, S.R., Brody, G.H., Todorov, A.A., Gunter, T.D., & Philibert, R.A. (2011). Methylation at 5HTT mediates the impact of child sex abuse on women's antisocial behavior: an examination of the Iowa adoptee sample. *Psychosomatic Medicine, 73*(1), 83-87.

Beeney, J.E., Franklin, R.G., Jr., Levy, K.N., & Adams, R.B., Jr., (2011). I feel your pain: emotional closeness modulates neural responses to empathically experienced rejection. *Social Neuroscience, 6*, 369-376.

Beery, A.K., Lacey, E.A., & Francis, D.D. (2008). Oxytocin and vasopressin receptor distributions in a solitary and a social species of tuco-tuco (Ctenomys haigi and Ctenomys sociabilis). *Journal of Comparative Neurology, 507*(6), 1847-1859.

Beijersbergen, M.D., Bakermans-Kranenburg, M.J., Van IJzendoorn, M.H., & Juffer, F. (2008). Stress regulation in adolescents: Physiological reactivity during the Adult Attachment Interview and conflict interaction. *Child Development, 79*, 1707-1720.

Benoit, D., & Parker, K.C.H. (1994). Stability and transmission of attachment across 3 generations. *Child Development, 65*, 1444-1456.

Bernal, J. (1972). Crying during the first 10 days of life, and maternal responses. *Developmental Medicine and Child Neurology, 14*, 362-372.

Berridge, K.C. (2007). The debate over dopamine's role in reward: the case for incentive salience. *Psychopharmacology (Berl), 191*(3), 391-431.

Berridge, K.C., & Kringelbach, M.L. (2008). Affective neuroscience of pleasure: reward in humans and animals. *Psychopharmacology (Berl), 199*(3), 457-480.

Beyers, W., Goossens, L. (2003). Psychological separation and adjustment to university: Moderating effects of gender, age, and perceived parenting style. *Journal of Adolescent Research, 18*, 363-382.

Biswal, B.B., Mennes, M., Zuo, X.N., Gohel, S., Kelly, C., Smith, S. M., . . . Milham, M.P. (2010). Toward discovery science of human brain function. *Proceedings of the National Academy of Sciences of the United States of America, 107*(10), 4734-4739.

Born, J., Lange, T., Kern, W., McGregor, G.P., Bickel, U., & Fehm, H.L. (2002). Sniffing neuropeptides: a transnasal approach to the human brain. *Nature Neuroscience, 5*(6), 514-516.

Bos, P.A., Hermans, E.J., Montoya, E.R., Ramsey, N.F., & Van Honk, J. (2010). Testosterone administration modulates neural responses to crying infants in young females. *Psychoneuroendocrinology, 35*(1), 114-121.

Bos, P.A., Panksepp, J., Bluthé, R.-M., & Van Honk, J. (2012). Acute effects of steroid hormones and neuropeptides on human social–emotional behavior: A review of single administration studies. *Frontiers in Neuroendocrinology, 33*(1), 17-35.

Bowlby, J. (1969). *Attachment and Loss, volume 1: Attachment*. London: Random House.

Boyes, M.E., & French, D.J., (2009). Having a Cyberball: using a ball-throwing game as an experimental social stressor to examine the relationship between neuroticism and coping. *Personality and Individual Differences, 47*, 396- 401.

Bradley, M.M., & Lang, P.J. (1999). *International Affective Digitized Sounds (IADS): Stimuli, Instruction Manual and Affective Ratings.* Technical Report B-2, Gainsville, FL: The Center for Research in Psychophysiology, University of Florida.

Buchheim, A., Erk, S., George, C., Kachele, H., Ruchsow, M., Spitzer, M., … Walter, H. (2006). Measuring attachment representation in an fMRI environment: A pilot study. *Psychopathology, 39*, 144-152.

Buckner, R.L., Sepulcre, J., Talukdar, T., Krienen, F.M., Liu, H., Hedden, T., . . . Johnson, K.A. (2009). Cortical hubs revealed by intrinsic functional connectivity: Mapping, assessment of stability, and relation to alzheimer's disease. *The Journal of Neuroscience, 29*(6), 1860-1873.

Bugental, D.B., Lewis, J.C., Lin, E., Lyon, J., & Kopeikin, H. (1999). In charge but not in control: The management of teaching relationships by adults with low perceived power. *Developmental Psychology, 35*, 1367-1378.

Cabrera, N.J., Fagan, J., Wight, V., & Schadler, C. (2011). Influence of Mother, Father, and Child Risk on Parenting and Children's Cognitive and Social Behaviors. *Child Development, 82*(6), 1985-2005.

Campbell, P., Ophir, A.G., & Phelps, S.M. (2009). Central vasopressin and oxytocin receptor distributions in two species of singing mice. *Journal of Comparative Neurology, 516*(4), 321-333.

Carmichael, S.T., & Price, J.L. (1995). Limbic connections of the orbital and medial prefrontal cortex in macaque monkeys. *Journal of Comparative Neurology, 363*(4), 615-641.

Carter, C.S. (1998). Neuroendocrine perspectives on social attachment and love. *Psychoneuroendocrinology, 23*(8), 779-818.

Cavanna, A.E., (2007). The precuneus and consciousness. *CNS Spectrums, 12*(7), 545-552.

Cavanna, A.E., & Trimble, M.R. (2006). The precuneus: a review of its functional anatomy and behavioural correlates. *Brain: A Journal of Neurology, 129*(3), 564-583.

Chakrabarti, B., Bullmore, E., & Baron-Cohen, S. (2006). Empathizing with basic emotions: Common and discrete neural substrates. *Social Neuroscience, 1*(3-4), 364-384.

Champagne, F.A. (2008). Epigenetic mechanisms and the transgenerational effects of maternal care. *Frontiers in Neuroendocrinology, 29*(3), 386-397.

Chen Z., DeWall C.N., Poon K.-T., & Chen E.-W. (2012). When destiny hurts: Implicit theories of relationships moderate aggressive responses to ostracism. *Journal of Experimental Social Psychology, 48,* 1029-1036.

Cherkassky, V.L., Kana, R.K., Keller, T.A., & Just, M.A. (2006). Functional connectivity in a baseline resting-state network in autism. *Neuroreport, 17*(16), 1687-1690.

Choleris, E., Devidze, N., Kavaliers, M., & Pfaff, D.W. (2008). Steroidal/neuropeptide interactions in hypothalamus and amygdala related to social anxiety. *Advances in Vasopressin and Oxytocin: From Genes to Behaviour to Disease, 170*, 291-303.

Chow R.M., Tiedens L.Z., & Govan C.L. (2008). Excluded emotions: The role of anger in antisocial responses to ostracism. *Journal of Experimental Social Psychology, 44,* 896-903.

Churchland, P.S., & Winkielman, P. (2012). Modulating social behavior with oxytocin: How does it work? What does it mean? *Hormones and Behavior, 61*(3), 392-399.

Coan, J.A. (2008). Toward a neuroscience of attachment. In J. Cassidy & P.R. Shaver (Eds.), *Handbook of attachment: Theory, research, and clinical applications (2nd ed)* (pp. 241-265). New York: Guilford.

Cole, D.M., Oei, N.Y.L., Soeter, R.P., Both, S., Van Gerven, J.M.A., Rombouts, S.A.R.B., & Beckmann, C.F. (in press). Dopamine-dependent architecture of cortico-subcortical network connectivity. *Cerebral Cortex.*

Cornil, C. A., Ball, G. F., & Balthazart, J. (2006). Functional significance of the rapid regulation of brain estrogen action: Where do the estrogens come from? *Brain Research, 1126*, 2-26.

Crouch, J.L., Skowronski, J.J., Milner, J.S., & Harris, B. (2008). Parental responses to infant crying: The influence of child physical abuse risk and hostile priming. *Child Abuse & Neglect, 32*, 702-710.

Crowell, J.A., Waters, E., Treboux, D., Oconnor, E., ColonDowns, C., Feider, O., … Posada, G. (1996). Discriminant validity of the adult attachment interview. *Child Development, 67*, 2584-2599.

Crowley, M.J., Wu, J., Molfese, P.J., & Mayes, L.C. (2010). Social exclusion in middle childhood: Rejection events, slow-wave neural activity, and ostracism distress. *Social Neuroscience, 5*(5-6), 483-495.

Dannlowski, U., Ohrmann, P., Konrad, C., Domschke, K., Bauer, J., Kugel, H., . . . Suslow, T. (2009). Reduced amygdala-prefrontal coupling in major depression: association with MAOA genotype and illness severity. *The International Journal of Neuropsychopharmacology, 12*(1), 11-22.

Davis, M., & Whalen, P.J. (2001). The amygdala: vigilance and emotion. *Molecular Psychiatry, 6*, 13-34.

De Dreu, C.K.W. (2012). Oxytocin modulates cooperation within and competition between groups: An integrative review and research agenda. *Hormones and Behavior, 61*, 419-428.

De Dreu, C.K.W., Greer, L.L., Handgraaf, M.J.J., Shalvi, S., & Van Kleef, G.A. (2012). Oxytocin modulates selection of allies in intergroup conflict. *Proceedings of the Royal Society B: Biological Sciences, 279*, 1150-1154.

De Dreu, C.K., Greer, L.L., Handgraaf, M.J., Shalvi, S., Van Kleef, G.A., Baas, M., . . . Feith, S.W. (2010). The neuropeptide oxytocin regulates parochial altruism in intergroup conflict among humans. *Science, 328*(5984), 1408-1411.

Decety, J., & Jackson, P.L. (2004). The functional architecture of human empathy. *Behavorial and Cognitive Neuroscience Reviews, 3*(2), 71-100.

Declerck, C.H., Boone, C., & Kiyonari, T. (2010). Oxytocin and cooperation under conditions of uncertainty: The modulating role of incentives and social information. *Hormones and Behavior, 57*, 368-374.

Dessureau, B.K., Kurowski, C.O., & Thompson, N.S. (1998). A reassessment of the role of pitch and duration in adults' responses to infant crying. *Infant Behavior & Development, 21*(2), 367-371.

Dix, T. (1991). The affective organization of parenting: Adaptive and maladaptive processes. *Psychological Bulletin, 110*(1), 3-25.

Dix, T., Gershoff, E.T., Meunier, L.N., & Miller, P.C. (2004). The affective structure of supportive parenting: Depressive symptoms, immediate emotions, and child-oriented motivation. *Developmental Psychology, 40*(6), 1212-1227.

Domes, G., Heinrichs, M., Glascher, J., Buchel, C., Braus, D.F., & Herpertz, S.C. (2007). Oxytocin attenuates amygdala responses to emotional faces regardless of valence. *Biological Psychiatry, 62*, 1187-1190.

Domes, G., Heinrichs, M., Michel, A., Berger, C., & Herpertz, S.C. (2007). Oxytocin improves "mind-reading" in humans. *Biological Psychiatry, 61*(6), 731-733.

Domes, G., Lischke, A., Berger, C., Grossmann, A., Hauenstein, K., Heinrichs, M., & Herpertz, S.C. (2010). Effects of intranasal oxytocin on emotional face processing in women. *Psychoneuroendocrinology, 35*(1), 83-93.

Dozier, M., & Kobak, R.R. (1992). Psychophysiology in attachment interviews - Converging evidence for deactivating strategies *Child Development, 63*, 1473-1480.

Dykas, M.J., & Cassidy, J. (2011). Attachment and the processing of social information across the life span: Theory and evidence. *Psychological Bulletin, 137*, 19-46.

Eisenberger, N.I., Jarcho, J.M., Lieberman, M.D., & Naliboff, B.D. (2006). An experimental study of shared sensitivity to physical pain and social rejection. *Pain, 126*, 132-138.

Eisenberger, N.I., Lieberman, M.D. (2004). Why rejection hurts: a common neural alarm system for physical and social pain. *Trends in Cognitive Sciences, 8*, 294-300.

Elliot, A.J., Thrash, T.M. (2004). The intergenerational transmission of fear of failure. *Personality & Social Psychology Bulletin, 30*, 957-971.

Euser, E.M., Van IJzendoorn, M.H., Prinzie, P., Bakermans-Kranenburg, M.J. (2010). Prevalence of child maltreatment in The Netherlands. *Child Maltreatment, 15*, 5-17.

Feifel, D. (2012). Oxytocin as a potential therapeutic target for schizophrenia and other neuropsychiatric conditions. *Neuropsychopharmacology, 37*(1), 304-305.

Feldman, R. (2003). Infant-mother and infant-father synchrony: The coregulation of positive arousal. *Infant Mental Health journal, 24*(1), 1-23.

Feldman, R. (2007). On the origins of background emotions: From affect synchrony to symbolic expression. *Emotion, 7*(3), 601-611.

Feldman, R. (2007). Parent-infant synchrony and the construction of shared timing; physiological precursors, developmental outcomes, and risk conditions. *Journal of Child Psychology and Psychiatry, 48*, 329-354.

Feldman, R., Gordon, I., Schneiderman, I., Weisman, O., & Zagoory-Sharon, O. (2010). Natural variations in maternal and paternal care are associated with systematic changes in oxytocin following parent-infant contact. *Psychoneuroendocrinology, 35*(8), 1133-1141.

Feldman, R., Weller, A., Zagoory-Sharon, O., & Levine, A. (2007). Evidence for a neuroendocrinological foundation of human affiliation: plasma oxytocin levels across pregnancy and the postpartum period predict mother-infant bonding. *Psychological Science, 18*(11), 965-970.

Fox, M.D., & Raichle, M.E. (2007). Spontaneous fluctuations in brain activity observed with functional magnetic resonance imaging. *Nature Reviews Neuroscience*, *8*(9), 700-711.

Fraedrich, E.M., Lakatos, K., & Spangler, G. (2010). Brain activity during emotion perception: the role of attachment representation. *Attachment & Human Development, 12,* 231-248.

Fries, A. B., Ziegler, T. E., Kurian, J. R., Jacoris, S., & Pollak, S. D. (2005). Early experience in humans is associated with changes in neuropeptides critical for regulating social behavior. *Proceedings of the National Academy of Sciences of the United States of America, 102*(47), 17237-17240.

Friston, K.J., Buechel, C., Fink, G.R., Morris, J., Rolls, E., & Dolan, R.J. (1997). Psychophysiological and modulatory interactions in neuroimaging. *Neuroimage, 6*(3), 218-229.

Fusar-Poli, P., Placentino, A., Carletti, F., Landi, P., Allen, P., Surguladze, S., … Politi, P. (2009). Functional atlas of emotional faces processing: a voxel-based meta-analysis of 105 functional magnetic resonance imaging studies. *Journal of Psychiatry & Neuroscience, 34*, 418-432.

Galbally, M., Lewis, A.J., Van IJzendoorn, M.H., & Permezel, M. (2011). The role of oxytocin in mother-infant relations: a systematic review of human studies. *Harvard Review of Psychiatry, 19(1)*, 1-14.

Gallese, V., Keysers, C., & Rizzolatti, G. (2004). A unifying view of the basis of social cognition. *Trends in Cognitive Sciences, 8*(9), 396-403.

Gallup, A.C., O'Brien, D.T., White, D.D., & Wilson, D.S. (2010). Handgrip strength and socially dominant behavior in male adolescents. *Evolutionary Psychology, 8,* 229-243.

Galynker, I.I., Yaseen, Z. S., Katz, C., Zhang, X., Jennings-Donovan, G., Dashnaw, S., … Winston, A. (2012). Distinct but overlapping neural networks subserve depression and insecure attachment. *Social Cognitive and Affective Neuroscience, 7*, 896-908.

Gamer, M., Zurowski, B., & Buchel, C. (2010). Different amygdala subregions mediate valence-related and attentional effects of oxytocin in humans. *Proceedings of the National Academy of Sciences of the United States of America, 107*(20), 9400-9405.

George, C., Kaplan, N., & Main, M. (1985). *Adult Attachment Interview.* Unpublished manuscript, Berkeley, University of California.

George, C., West, M., & Pettem, O. (1999). The Adult Attachment Projective: disorganization of adult attachment at the level of representation. In J. Solomon & C. George (Eds.), *Attachment Disorganization* (pp. 462-507). New York: Guilford.

Giedd, J.N., Schmitt, J.E., & Neale, M.C. (2007). Structural brain magnetic resonance imaging of pediatric twins. *Human brain mapping, 28*(6), 474-481.

Goldman, A. (1992). In defense of the simulation theory. *Mind and Language 7(1-2),* 104-119.

Goldstein, M., & Heaven, P.C.L. (2000). Perceptions of the family, delinquency, and emotional adjustment among youth. *Personality and Individual Differences, 29*, 1169-1178.

Gondoli, D.M., & Silverberg, S.B. (1997). Maternal emotional distress and diminished responsiveness: The mediating role of parenting efficacy and parental perspective taking. *Developmental Psychology, 33*(5), 861-868.

Gonsalkorale, K., & Williams, K.D. (2007). The KKK won't let me play: ostracism even by a despised outgroup hurts. *European Journal of Social Psychology, 37*(6), 1176-1186.

Greicius, M. (2008). Resting-state functional connectivity in neuropsychiatric disorders. *Current Opinion in Neurology, 21*(4), 424-430.

Groh, A.M., & Roisman, G.I. (2009). Adults' autonomic and subjective emotional responses to infant vocalizations: the role of secure base script knowledge. *Devevlopmental Psychology, 45*(3), 889-893.

Graustella, A. J., & MacLeod, C. (2012). A critical review of the influence of oxytocin nasal spray on social cognition in humans: Evidence and future directions. *Hormones and Behavior, 61*, 410-418.

Guastella, A.J., Mitchell, P.B., & Mathews, F. (2008). Oxytocin enhances the encoding of positive social memories in humans. *Biological Psychiatry, 64*(3), 256-258.

Gustafson, G.E., Wood, R.M., & Green, J.A. (2000). Can we hear the causes of infant crying? In Barr, R.G., Hopkins, B., Green, J.A.(Eds), *Crying as a sign, a symptom, and a signal*. (pp 8-23). London: Mac Keith Press.

Haber, S.N., Knutson, B. (2010). The reward circuit: linking primate anatomy and human imaging. *Neuropsychopharmacology, 35*(1), 4-26.

Hafkemeijer, A., Van der Grond, J., & Rombouts, S.A.R.B. (2011). Imaging the default mode network in aging and dementia. *Biochimica et biophysica acta*.

Hahn, A., Stein, P., Windischberger, C., Weissenbacher, A., Spindelegger, C., Moser, E., . . . Lanzenberger, R. (2011). Reduced resting-state functional connectivity between amygdala and orbitofrontal cortex in social anxiety disorder. *Neuroimage, 56*(3), 881-889.

Harmon-Jones E., Peterson C.K., & Harris C.R. (2009). Jealousy: Novel methods and neural correlates. *Emotion, 9,* 113-117.

Harris, L.J., Cardenas, R.A., Spradlin, M.P., & Almerigi, J.B. (2010). Why are infants held on the left? A test of the attention hypothesis with a doll, a book, and a bag. *Laterality, 15*(5), 548-571.

Heath, R.G., & Harper, J.W. (1974). Ascending projections of the cerebellar fastigial nucleus to the hippocampus, amygdala, and other temporal lobe sites: evoked potential and histological studies in monkeys and cats. *Experimental Neurology, 45(2),* 268-287.

Heim, C., Young, L.J., Newport, D.J., Mletzko, T., Miller, A.H., Nemeroff, C.B., (2009). Lower CSF oxytocin concentrations in women with a history of childhood abuse. *Molecular Psychiatry, 14,* 954-958.

Heinrichs, M., Baumgartner, T., Kirschbaum, C., & Ehlert, U. (2003). Social support and oxytocin interact to suppress cortisol and subjective responses to psychosocial stress. *Biological Psychiatry, 54*(12), 1389-1398.

Heinrichs, M., & Domes, G. (2008). Neuropeptides and social behaviour: effects of oxytocin and vasopressin in humans. *Progress in Brain Research, 170*, 337-350.

Heinrichs, M., Meinlschmidt, G., Neumann, I., Wagner, S., Kirschbaum, C., Ehlert, U., & Hellhammer, D. H. (2001). Effects of suckling on hypothalamic-pituitary-adrenal axis responses to psychosocial stress in postpartum lactating women. *The Journal of Clinical Endocrinology and Metabolism, 86*(10), 4798-4804.

Heinrichs, M., Neumann, I., & Ehlert, U. (2002). Lactation and stress: Protective effects of breast-feeding in humans. *Stress-the International Journal on the Biology of Stress, 5*(3), 195-203.

Hesse, E. (2008). The adult attachment interview: Protocol, method of analysis, and empirical studies. In J. Cassidy & P.R. Shaver (Eds.), *Handbook of attachment: Theory, research, and clinical applications (2nd ed.)* (pp 552-598). New York: Guilford.

Hsu, M., Bhatt, M., Adolphs, R., Tranel, D., & Camerer ,C.F. (2005). Neural systems responding to degrees of uncertainty in human decision-making. *Science, 310,* 1680-1683.

Hua, Q.P., Zeng, X.Z., Liu, J.Y., Wang, J.Y., Guo, J.Y., & Luo, F. (2008). Dynamic changes in brain activations and functional connectivity during affectively different tactile stimuli. *Cellular and molecular neurobiology, 28*(1), 57-70.

Hubbard, F.O.A., & Van IJzendoorn, M.H. (1991). Maternal Unresponsiveness and Infant Crying across the 1st 9 Months - a Naturalistic Longitudinal-Study. *Infant Behavior & Development, 14*(3), 299-312.

Huffmeijer, R., Alink, L.R., Tops, M., Grewen, K.M., Bakermans-Kranenburg, M.J., & Van IJzendoorn, M.H. (2012). Salivary levels of oxytocin remain elevated for more than two hours after intranasal oxytocin. *Neuro Endocrinology Letters, 33,* 21-25.

Hurlemann, R., Patin, A., Onur, O.A., Cohen, M. ., Baumgartner, T., Metzler, S., . . . Kendrick, K.M. (2010). Oxytocin Enhances Amygdala-Dependent, Socially Reinforced Learning and Emotional Empathy in Humans. *Journal of Neuroscience, 30*(14), 4999-5007.

Iacoboni, M. (2009). Imitation, Empathy, and Mirror Neurons. *Annual Review of Psychology, 60*, 653-670.

Insel, T.R. (2010). The challenge of translation in social neuroscience: a review of oxytocin, vasopressin, and affiliative behavior. *Neuron, 65*(6), 768-779.

Jabbi, M., Swart, M., & Keysers, C. (2007). Empathy for positive and negative emotions in the gustatory cortex. *Neuroimage, 34*(4), 1744-1753.

Jenkinson, M., Bannister, P., Brady, M., & Smith, S. (2002). Improved optimization for the robust and accurate linear registration and motion correction of brain images. *Neuroimage, 17*(2), 825-841.

Jenkinson, M., & Smith, S. (2001). A global optimisation method for robust affine registration of brain images. *Medical Image Analysis, 5*(2), 143-156.

Juffer, F., Bakermans-Kranenburg, M.J., & Van IJzendoorn, M.H. (2008). *Promoting positive parenting: An attachment-based intervention*. New York: Lawrence Erlbaum.

Kanetsuna, T., & Smith, P. K. (2002). Pupil Insights into Bullying, and Coping with Bullying. *Journal of School Violence, 1*(3), 5-29.

Khalili-Mahani, N., Zoethout, R.M., Beckmann, C. F., Baerends, E., de Kam, M. L., Soeter, R.P., . . . Rombouts, S.A.R.B. (2012). Effects of morphine and alcohol on functional brain connectivity during "resting state":A placebo-controlled crossover study in healthy young men. *Human brain mapping, 33,* 1003-1018.

Kirsch, P., Esslinger, C., Chen, Q., Mier, D., Lis, S., Siddhanti, S., . . . Meyer-Lindenberg, A. (2005). Oxytocin modulates neural circuitry for social cognition and fear in humans. *The Journal of Neuroscience, 25*(49), 11489-11493.

Kosfeld, M., Heinrichs, M., Zak, P. J., Fischbacher, U., & Fehr, E. (2005). Oxytocin increases trust in humans. *Nature, 435*(7042), 673-676.

Krienen, F.M., & Buckner, R.L. (2009). Segregated fronto-cerebellar circuits revealed by intrinsic functional connectivity. *Cerebral cortex, 19*(10), 2485-2497.

Kringelbach, M.L. (2005). The human orbitofrontal cortex: linking reward to hedonic experience. *Nature Reviews Neuroscience, 6*, 691-702.

Kringelbach, M.L., Lehtonen, A., Squire, S., Harvey, A. G., Craske, M. G., Holliday, I. E., … Stein, A. (2008). A specific and rapid neural signature for parental instinct. *PLoS One, 3*, e1664.

Kringelbach, M.L., & Rolls, E.T. (2004). The functional neuroanatomy of the human orbitofrontal cortex: evidence from neuroimaging and neuropsychology. *Progress in Neurobiology, 72(5),* 341-372.

Labuschagne, I., Phan, K. L., Wood, A., Angstadt, M., Chua, P., Heinrichs, M., . . . Nathan, P. J. (2010). Oxytocin Attenuates Amygdala Reactivity to Fear in Generalized Social Anxiety Disorder. *Neuropsychopharmacology, 35*(12), 2403-2413.

Laird, A.R., Fox, P.M., Eickhoff, S.B., Turner, J.A., Ray, K.L., McKay, D.R., . . . Fox, P.T. (2011). Behavioral interpretations of intrinsic connectivity networks. *Journal of Cognitive Neuroscience, 23*(12), 4022-4037.

Lamm, C., Decety, J., & Singer, T. (2011). Meta-analytic evidence for common and distinct neural networks associated with directly experienced pain and empathy for pain. *Neuroimage, 54*(3), 2492-2502.

Lang, S., Yu, T., Markl, A., Müller, F., & Kotchoubey, B. (2011). Hearing others' pain: neural activity related to empathy. *Cognitive, Affective, & Behavioral Neuroscience, 11*, 1-10.

Latane B., & Nida S. (1981). 10 Years of research on group-size and helping. *Psychological Bulletin, 89,* 308-324.

Laurent, H.K., & Ablow, J.C. (2012). A cry in the dark: depressed mothers show reduced neural activation to their own infants cry. *Social Cognitive and Affective Neuroscience, 7*(2), 125-134.

Leake, R.D., Buster, J.E., & Fisher, D.A. (1984). The oxytocin secretory response to breast stimulation in women during the menstrual cycle. *American Journal of Obstetrics and Gynecology, 148*(4), 457-460.

LeDoux, J.E. (2000). Emotion circuits in the brain. *Annual Review of Neuroscience, 23,* 155-184.

Leerkes, E.M. (2010). Predictors of maternal sensitivity to infant distress. *Parenting-Science and Practice, 10*(3), 219-239.

Leerkes, E.M., & Siepak, K.J. (2006). Attachment linked predictors of women's emotional and cognitive responses to infant distress. *Attachment & Human Development, 8*, 11-32.

Leger, D.W., Thompson, R.A., Merritt, J.A., & Benz, J.J. (1996). Adult perception of emotion intensity in human infant cries: Effects of infant age and cry acoustics. *Child Development, 67*, 3238-3249.

Lenzi, D., Trentini, C., Pantano, P., Macaluso, E., Lenzi, G.L., & Ammaniti, M. (in press). Attachment models affect brain response in areas related to emotions and empathy in nulliparious women. *Human Brain Mapping.*

Leitman, D.I., Wolf, D.H., Ragland, J.D., Laukka, P., Loughead, J., Valdez, J.N., . . . Gur, R.C. (2010). "It's not what you say, but how you say it": A reciprocal temporo-frontal network for affective prosody. *Frontiers in Human Neuroscience, 4*, 19.

Leuner, B., Glasper, E.R., & Gould, E. (2010). Parenting and plasticity. *Trends inNeuroscience, 33*(10), 465-473.

Liedman, R., Hansson, S.R., Howe, D., Igidbashian, S., McLeod, A., Russell, R.J., & Akerlund, M. (2008). Reproductive hormones in plasma over the menstrual cycle in primary dysmenorrhea compared with healthy subjects. *Gynecological Endocrinology, 24*(9), 508-513.

Lorberbaum, J.P., Newman, J.D., Horwitz, A.R., Dubno, J.R., Lydiard, R.B., Hamner, M. B., . . . George, M.S. (2002). A potential role for thalamocingulate circuitry in human maternal behavior. *Biological Psychiatry, 51*(6), 431-445.

Lorenz, K. (1943). Die angeborenen Formen Moglicher Erfahrung. *Zeitschrift fur Tierpsychologie, 4*, 235-519.

Lupien, S.J., McEwen, B.S., Gunnar, M.R., & Heim, C. (2009). Effects of stress throughout the lifespan on the brain, behaviour and cognition. *Nature Reviews Neuroscience, 10*, 434-445.

MacLean, P.D. (1990). *The Triune Brain in Evolution: Role in Paleocerebral Functions.* New York: Plenum Press.

Magnus, P., Berg, K., & Nance, W.E. (1983). Predicting zygosity in Norwegian twin pairs born 1915-1960. *Clinical Genetics, 24*, 103-112.

Main, M. (2000). The organized categories of infant, child, and adult attachment: flexible vs. inflexible attention under attachment-related stress. *Journal of the American Psychoanalytic Association, 48*, 1055-1096.

Main, M., & Goldwyn, R. (1984). *Adult attachment scoring and classification system.* Unpublished manuscript, University of California at Berkeley.

Main, M., Goldwyn, R., & Hesse, E. (2003). *Adult Attachment Scoring and Classification Systems.* Unpublished manuscript, University of California at Berkeley.

Main, M., Hesse, E., & Goldwyn, R. (2008). Studying differences in language usage in recounting attachment history: An introduction to the AAI. In H. Steele & M. Steele (Eds.), *Clinical applications of the Adult Attachment Interview* (pp. 31–68). New York: Guilford.

Main, M., Kaplan, N., & Cassidy, J. (1985). Security in infancy, childhood and adulthood: A move to the level of representation. In I. Bretherton & E. Waters (Eds.), *Growing points in attachment theory and research. Monographs of the Society for Research in Child Development, 50,* 66–106.

Marsh, A.A., Yu, H.H., Pine, D.S., & Blair, R.J. (2010). Oxytocin improves specific recognition of positive facial expressions. *Psychopharmacology (Berl), 209*(3), 225-232.

Masten, C.L., Morelli, S.A., & Eisenberger, N.I. (2011). An fMRI investigation of empathy for 'social pain' and subsequent prosocial behavior. *Neuroimage, 55,* 381-388.

Masten, C.L., Eisenberger, N.I., Pfeifer, J.H., Dapretto, M. (2010). Witnessing peer rejection during early adolescence: neural correlates of empathy for experiences of social exclusion. *Social Neuroscience, 5,* 496-507.

McCabe, C., Rolls, E.T., Bilderbeck, A., & McGlone, F. (2008). Cognitive influences on the affective representation of touch and the sight of touch. *Social Cognitive and Affective Neuroscience, 3*(2), 97-108.

McCarthy, M.M., McDonald, C.H., Brooks, P J., & Goldman, D. (1996). An anxiolytic action of oxytocin is enhanced by estrogen in the mouse. *Physiology & Behavour, 60*(5), 1209-1215.

McElwain, N.L., & Booth-LaForce, C. (2006). Maternal sensitivity to infant distress and nondistress as predictors of infant-mother attachment security. *Journal of Family Psychology, 20*, 247-255.

McGowan, P.O., Sasaki, A., D'Alessio, A.C., Dymov, S., Labonte, B., Szyf, M., Turecki, G., & Meaney, M.J. (2009). Epigenetic regulation of the glucocorticoid receptor in human brain associates with childhood abuse. *Nature Neuroscience, 12*, 342-348.

Meinlschmidt, G., & Heim, C. (2007). Sensitivity to intranasal oxytocin in adult men with early parental separation. *Biological Psychiatry, 61*(9), 1109-1111.

Mendes, D., Seidl-de-Moura, M.L., Siqueira, J.D. (2009). The ontogenesis of smiling and its association with mothers' affective behaviors: A longitudinal study. *Infant Behavior & Development, 32*(4), 445-453.

Mesman, J., Oster, H., & Camras, L. (2012). Parental sensitivity to infant distress: what do discrete negative emotions have to do with it? *Attachment & Human Development*, 14, 337-348.

Meyer-Lindenberg, A., Domes, G., Kirsch, P., & Heinrichs, M. (2011). Oxytocin and vasopressin in the human brain: social neuropeptides for translational medicine. *Nature Reviews Neuroscience, 12*(9), 524-538.

Mikolajczak, M., Gross, J. J., Lane, A., Corneille, O., de Timary, P., & Luminet, O. (2010). Oxytocin makes people trusting, not gullible. *Psychological Science, 21*(8), 1072-1074.

Morris, J.S., Friston, K.J., Büchel, C., Frith, C.D., Young, A.W., Calder, A.J., & Dolan, R.J. (1998). A neuromodulatory role for the human amygdala in processing emotional facial expressions. *Brain, 121*, 47-57.

Morrison, S.E., Salzman, C.D. (2010). Re-valuing the amygdala. *Current Opinion in Neurobiology, 20*(2), 221-230.

Moses-Kolko, E.L., Fraser, D., Wisner, K.L., James, J.A., Saul, A.T., Fiez, J.A., & Phillips, M.L. (2011). Rapid habituation of ventral striatal response to reward receipt in postpartum depression. *Biological Psychiatry, 70*(4), 395-399.

Murray, A.D. (1979). Infant crying as an elicitor of parental behavior - examination of two models. *Psychological Bulletin, 86*(1), 191-215.

Naber, F., Van IJzendoorn, M.H., Deschamps, P., Van Engeland, H., & Bakermans-Kranenburg, M.J. (2010). Intranasal oxytocin increases fathers' observed responsiveness during play with their children: a double-blind within-subject experiment. *Psychoneuroendocrinology, 35*(10), 1583-1586.

Newman, J.D. (2007). Neural circuits underlying crying and cry responding in mammals. *Behavioural Brain Research, 182*, 155-165.

Noriuchi, M., Kikuchi, Y., Senoo, A. (2008). The functional neuroanatomy of maternal love: Mother's response to infant's attachment behaviors. *Biological Psychiatry, 63*(4), 415-423.

O'Reilly, J.X., Beckmann, C.F., Tomassini, V., Ramnani, N., & Johansen-Berg, H., (2010). Distinct and overlapping functional zones in the cerebellum defined by resting state functional connectivity. *Cerebral cortex, 20*(4), 953-965.

Out, D., Pieper, S., Bakermans-Kranenburg, M.J., & Van IJzendoorn, M.H. (2010). Physiological reactivity to infant crying: A behavioral genetic study. *Genes, Brain, Behavior, 9,* 868-876.

Out, D., Pieper, S., Bakermans-Kranenburg, M.J., Zeskind, P.S., & Van IJzendoorn, M.H. (2010). Intended sensitive and harsh caregiving responses to infant crying: the role of cry pitch and perceived urgency in an adult twin sample. *Child Abuse & Neglect, 34*(11), 863-873.

Owren, M.J., & Bachorowski, J.A. (2003). Reconsidering the evolution of nonlinguistic communication: The case of laughter. *Journal of Nonverbal Behavior, 27*(3), 183-200.

Parsons, C.E., Young, K.S., Murray, L., Stein, A., Kringelbach. M.L. (2010). The functional neuroanatomy of the evolving parent-infant relationship. *Progress in Neurobiology, 91(3),* 220-241.

Patrick, R.B., & Gibbs, J.C. (2007). Parental expression of disappointment: Should it be a factor in Hoffman's model of parental discipline? *The Journal of GeneticPsychology,* 168(2), 131-145.

Pessoa, L. (2008). On the relationship between emotion and cognition. *Nature Reviews Neuroscience, 9*(2), 148-158.

Petrovic, P., Kalisch, R., Singer, T., & Dolan, R. J. (2008). Oxytocin attenuates affective evaluations of conditioned faces and amygdala activity. *Journal of Neuroscience, 28*(26), 6607-6615.

Pierrehumbert, B., Torrisi, R., Ansermet, F., Borghini, A., & Halfon, O. (2012). Adult attachment representations predict cortisol and oxytocin responses to stress. *Attachment & Human Development, 14*(5), 453-476.

Pietrowsky, R., Struben, C., Molle, M., Fehm, H. L., & Born, J. (1996). Brain potential changes after intranasal vs. intravenous administration of vasopressin: evidence for a direct nose-brain pathway for peptide effects in humans. *Biological Psychiatry, 39*(5), 332-340.

Pillay, S.S., Gruber, S.A., Rogowska, J., Simpson, N., & Yurgelun-Todd, D.A. (2006). fMRI of fearful facial affect recognition in panic disorder: The cingulate gyrus-amygdala connection. *Journal of Affective Disorders, 94*, 173-181.

Pincus, D., Kose, S., Arana, A., Johnson, K., Morgan, P., Borckardt, J., . . . Nahas, Z. (2010). Inverse effects of oxytocin on attributing mental activity to others in depressed and healthy subjects: A double-blind placebo controlled fMRI study. *Frontiers in Psychiatry, 1,* 134.

Pitman, R. K., Orr, S. P., & Lasko, N. B. (1993). Effects of intranasal vasopressin and oxytocin on physiologic responding during personal combat imagery in Vietnam veterans with posttraumatic stress disorder. *Psychiatry Research, 48*(2), 107-117.

Porter, F.L., Porges, S.W., & Marshall, R.E. (1988). Newborn pain cries and vagal tone - parallel changes in response to circumcision. *Child Development, 59*(2), 495-505.

Price, C.J. (2010). The anatomy of language: a review of 100 fMRI studies published in 2009. *Annals of the New York Academy of Sciences, 1191*(1), 62-88.

Raichle, M.E. (2009). A brief history of human brain mapping. *Trends in Neurosciences, 32*(2), 118-126.

Raichle, M.E., MacLeod, A.M., Snyder, A.Z., Powers, W.J., Gusnard, D.A., & Shulman, G.L. (2001). A default mode of brain function. *Proceedings of the National Academy of Sciences of the United States of America, 98*(2), 676-682.

Rauch, S.L., Whalen, P. J., Shin, L.M., McInerney, S.C., Macklin, M.L., Lasko, N.B., … Pitman, R.K. (2000). Exaggerated amygdala response to masked facial stimuli in posttraumatic stress disorder: a functional MRI study. *Biological Psychiatry, 47*, 769-776.

Reck, C., Hunt, A., Fuchs, T., Weiss, R., Noon, A., Moehler, E., . . . Mundt, C. (2004). Interactive regulation of affect in postpartum depressed mothers and their infants: an overview. *Psychopathology, 37*, 272-280.

Reijneveld, S.A., Van der Wal, M.F., Brugman, E., Sing, R.A., & Verloove-Vanhorick, S.P. (2004). Infant crying and abuse. *Lancet, 364*(9442), 1340-1342.

Reissland, N., Hopkins, B., Helms, P., & Williams, B. (2009). Maternal stress and depression and the lateralisation of infant cradling. *Journal of Child Psychology and Psychiatry, 50*(3), 263-269.

Renk, K., McKinney, C., Klein, J., Oliveros, A. (2006). Childhood discipline, perceptions of parents, and current functioning in female college students. *Journal of adolescence, 29*, 73-88.

Riem, M.M.E., Pieper, S., Out, D., Bakermans-Kranenburg, M.J., & Van IJzendoorn, M.H. (2011). Oxytocin receptor gene and depressive symptoms associated with physiological reactivity to infant crying. *Social Cognitive and Affective Neuroscience, 6*, 294-300.

Riem, M.M.E., Bakermans-Kranenburg, M.J., Pieper, S., Tops, M., Boksem, M.A.S., Vermeiren, R.R.J.M., . . . Rombouts, S.A.R.B. (2011). Oxytocin modulates amygdala, insula, and inferior frontal gyrus responses to infant crying: A randomized controlled trial. *Biological Psychiatry, 70*, 291-297.

Riem, M.M.E., Van IJzendoorn, M.H., Tops, M., Boksem, M.A.S., Rombouts, S.A.R.B., & Bakermans-Kranenburg, M.J. (2012). No laughing matter: Intranasal oxytocin administration changes functional brain connectivity during exposure to infant laughter. *Neuropsychopharmacology, 37*, 1257-1266.

Riem, M.M.E., Van IJzendoorn, M.H., Tops, M., Boksem, M.A.S., Rombouts, S.A.R.B., Bakermans-Kranenburg, M.J. (in press). Oxytocin effects on complex brain networks are moderated by experiences of maternal love withdrawal. *European Neuropsychopharmacology*.

Rilling, J.K., Demarco, A.C., Hackett, P.D., Thompson, R., Ditzen, B., Patel, R., & Pagnoni, G. (2012). Effects of intranasal oxytocin and vasopressin on cooperative behavior and associated brain activity in men. *Psychoneuroendocrinology, 37*, 447-461.

Rimmele, U., Hediger, K., Heinrichs, M., & Klaver, P. (2009). Oxytocin makes a face in memory familiar. *Journal of Neuroscience, 29*, 38-42.

Rodrigues, S.M., Saslow, L.R., Garcia, N., John, O.P., & Keltner, D. (2009). Oxytocin receptor genetic variation relates to empathy and stress reactivity in humans. *Proceedings of the National Academy of Sciences of the United States of America, 106*(50), 21437-21441.

Sabatini, M.J., Ebert, P., Lewis, D.A., Levitt, P., Cameron, J.L., & Mirnics, K. (2007). Amygdala gene expression correlates of social behavior in monkeys experiencing maternal separation. *The Journal of Neuroscience, 27*, 3295-3304.

Sagi, A., Van IJzendoorn, M.H., Scharf, M., Korenkarie, N., Joels, T., & Mayseless, O. (1994). Stability and discriminant validity of the Adult Attachment Interview - a psychometric study in young Israeli adults. *Developmental Psychology, 30*, 771-777.

Salonia, A., Nappi, R. E., Pontillo, M., Daverio, R., Smeraldi, A., Briganti, A., . . . Montorsi, F. (2005). Menstrual cycle-related changes in plasma oxytocin are relevant to normal sexual function in healthy women. *Hormones and Behavior, 47*(2), 164-169.

Sander, K., Brechmann, A., & Scheich, H. (2003). Audition of laughing and crying leads to right amygdala activation in a low-noise fMRI setting. *Brain Research. Brain Research Protocols, 11*(2), 81-91.

Sander, K., Frome, Y., & Scheich, H. (2007). FMRI activations of amygdala, cingulate cortex, and auditory cortex by infant laughing and crying. *Human Brain Mapping, 28*(10), 1007-1022.

Sander, K., & Scheich, H. (2001). Auditory perception of laughing and crying activates human amygdala regardless of attentional state. *Brain Research. Cognitive Brain Research, 12*(2), 181-198.

Sander, K., & Scheich, H. (2005). Left auditory cortex and amygdala, but right insula dominance for human laughing and crying. *Journal of Cognitive Neuroscience, 17*(10), 1519-1531.

Salzman, C.D., & Fusi, S. (2010). Emotion, cognition, and mental state representation in amygdala and prefrontal cortex. *Annual Reviews Neuroscience, 33*, 173-202.

Schaefer, A., Gray, J.R. (2007). A role for the human amygdala in higher cognition. *Review in the Neurosciences, 18*(5), 355-363.

Schilbach, L., Eickhoff, S. B., Rotarska-Jagiela, A., Fink, G. R., & Vogeley, K. (2008). Minds at rest? Social cognition as the default mode of cognizing and its putative relationship to the "default system" of the brain. *Consciousness and Cognition, 17*(2), 457-467.

Schludermann, S., & Schludermann, E., (1983). Sociocultural change and adolescents perceptions of parent behavior. *Developmental Psychology, 19*, 674-685.

Schmahmann, J.D. (2010). The role of the cerebellum in cognition and emotion: personal reflections since 1982 on the dysmetria of thought hypothesis, and its historical evolution from theory to therapy. *Neuropsychology Review, 20*(3), 236-260.

Schore, A.N. (2001). Effects of a secure attachment relationship on right brain development, affect regulation, and infant mental health. *Infant Mental Health Journal, 22*, 7-66.

Schuetze, P., & Zeskind, P.S. (2001). Relations between women's depressive symptoms and perceptions of infant distress signals varying in pitch. *Infancy, 2*, 483-99.

Schuetze, P., Zeskind, P.S., & Das Eiden, R. (2003). The perceptions of infant distress signals varying in pitch by cocaine-using mothers. *Infancy, 4*(1), 65-83.

Sebastian C., Viding E., Williams K.D., & Blakemore S. (2010). Social brain development and the affective consequences of ostracism in adolescence. *Brain and Cognition, 72*, 134-145.

Seifritz, E., Esposito, F., Neuhoff, J.G., Luthi, A., Mustovic, H., Dammann, G., . . . Di Salle, F. (2003). Differential sex-independent amygdala response to infant crying and laughing in parents versus nonparents. *Biological Psychiatry, 54*, 1367-1375.

Shamay-Tsoory, S.G. (2011). The neural bases for empathy. *Neuroscientist, 17*(1), 18-24.

Sieratzki, J.S., & Woll, B. (1996). Why do mothers cradle babies on their left? *Lancet, 347*(9017), 1746-1748.

Silva, S., Alacoque, X., Fourcade, O., Samii, K., Marque, P., Woods, R., . . . Loubinouw, I. (2010). Wakefulness and loss of awareness. *Neurology, 74(4)*, 313-320.

Simeon, D., Bartz, J., Hamilton, H., Crystal, S., Braun, A., Ketay, S., & Hollander, E. (2011). Oxytocin administration attenuates stress reactivity in borderline personality disorder: a pilot study. *Psychoneuroendocrinology, 36*(9), 1418-1421.

Singer, T., Critchley, H.D., & Preuschoff, K. (2009). A common role of insula in feelings, empathy and uncertainty. *Trends in Cognitive Sciences, 13*(8), 334-340.

Smith, S.M. (2002). Fast robust automated brain extraction. *Human Brain Mapping, 17*, 143-155.

Smith, S.M., Fox, P.T., Miller, K.L., Glahn, D.C., Fox, P.M., Mackay, C.E., . . . Beckmann, C. F. (2009). Correspondence of the brain's functional architecture during activation and rest. *Proceedings of the National Academy of Sciences of the United States of America, 106*(31), 13040-13045.

Smith, S.M., Jenkinson, M., Woolrich, M.W., Beckmann, C.F., Behrens, T.E., Johansen-Berg, H., . . . Matthews, P.M. (2004). Advances in functional and structural MR image analysis and implementation as FSL. *Neuroimage, 23*, S208-219.

Soltis, J. (2004). The signal functions of early infant crying. *Behavioral and Brain Sciences, 27*, 443-490.

Sripada, S.C., Phan, K.L., Labuschagne, I., Welsh, R., Nathan, P.J., & Wood, A.G. (2012). Oxytocin enhances resting-state connectivity between amygdala and medial frontal cortex. *The International Journal ofNeuropsychopharmacology, 16*, 255-260.

Sroufe, L.A., & Waters, E. (1976). The ontogenesis of smiling and laughter: a perspective on the organization of development in infancy. *Psychological Review, 83*(3), 173-189.

Stark, R., Schienle, A., Walter, B., Kirsch, P., Sammer, G., Ott, U., . . . Vaitl, D. (2003). Hemodynamic responses to fear and disgust-inducing pictures: an fMRI study. *International Journal of Psychophysiology, 50*(3), 225-234.

Stein, J.L., Wiedholz, L.M., Bassett, D.S., Weinberger, D.R., Zink, C.F., Mattay, V.S., . . . Meyer-Lindenberg, A. (2007). A validated network of effective amygdala connectivity. *Neuroimage, 36*(3), 736-745.

Stock, S., Bremme, K., & Uvnasmoberg, K. (1991). Plasma-levels of oxytocin during the menstrual-cycle, pregnancy and following treatment with Hmg. *Human Reproduction, 6*(8), 1056-1062.

Strathearn, L., Fonagy, P., Amico, J., & Montague, P.R. (2009). Adult attachment predicts maternal brain and oxytocin response to infant cues. *Neuropsychopharmacology, 34*(13), 2655-2666.

Strathearn, L., Li, J., Fonagy, P., & Montague, P.R. (2008). What's in a smile? Maternal brain responses to infant facial cues. *Pediatrics, 122*(1), 40-51.

Strick, P.L., Dum, R.P., & Fiez, J.A. (2009). Cerebellum and nonmotor function. *Annual Reviews Neuroscience, 32*, 413-434.

Swain, J.E., Tasgin, E., Mayes, L.C., Feldman, R., Constable, R T., & Leckman, J.F. (2008). Maternal brain response to own baby-cry is affected by cesarean section delivery. *Journal of Child Psychology and Psychiatry, and allied disciplines, 49*(10), 1042-1052.

Tabachnik, B.G., & Fidell, L.S. (2001). *Using multivariate statistics (4th ed.)*. Boston: Allyn and Bacon.

Tamashiro, K.L., & Moran, T.H. (2010). Perinatal environment and its influences on metabolic programming of offspring. *Physiology & Behavior, 100*(5), 560-566.

Tanabe, J., Nyberg, E., Martin, L. F., Martin, J., Cordes, D., Kronberg, E., & Tregellas, J. R. (2011). Nicotine effects on default mode network during resting state. *Psychopharmacology, 216*(2), 287-295.

Taylor, S.E. (2006). Tend and befriend. Biobehavioral bases of affiliation under stress. *Current Directions in Psychological Science, 15*, 273-7.

Taylor, M.M., & Samson, W.K. (2005). Stress hormone secretion is altered by central administration of intermedin/adrenomedullin-2. *Brain Research*, 1045*(1-2),* 199-205.

Tomasi, D., & Volkow, N.D. (2010). Functional connectivity density mapping. *Proceedings of the National Academy of Sciences of the United States of America, 107*(21), 9885-9890.

Tomasi, D., & Volkow, N.D. (2011). Association between functional connectivity hubs and brain networks. *Cerebral cortex, 21*(9), 2003-2013.

Tottenham, N., Hare, T.A., Millner, A., Gilhooly, T., Zevin, J.D., & Casey, B.J. (2011). Elevated amygdala response to faces following early deprivation. *Developmental Science, 14*, 190-204.

Turken, A.U., & Dronkers, N.F. (2011). The neural architecture of the language comprehension network: Converging evidence from lesion and connectivity analyses. *Frontiers in Systems Neuroscience, 5*, 1-20.

Van Harmelen, A.L., Van Tol, M.J., Van der Wee, N.J., Veltman, D.J., Aleman, A., Spinhoven, P., . . . Elzinga, B.M. (2010). Reduced medial prefrontal cortex volume in adults reporting childhood emotional maltreatment. *Biological Psychiatry, 68*(9), 832-838.

Van Hooff, J. (1972). A comparative approach to the phylogeny of laughter and smiling. In: Hinde R.A. (ed). *Non-verbal Communication* (pp. 209-241). Cambridge: Cambridge University Press.

Van IJzendoorn, M.H. (1995). Adult attachment representations, parental responsiveness, and infant attachment - meta-analysis on the predictive validity of the adult attachment interview. *Psychological Bulletin, 117*, 387-403.

Van IJzendoorn, M.H., & Bakermans-Kranenburg, M.J. (2012). A sniff of trust: Meta-analysis of the effects of intranasal oxytocin administration on face recognition, trust to in-group, and trust to out-group. *Psychoneuroendocrinology, 37,* 438-443.

Van IJzendoorn, M.H., Bakermans-Kranenburg, M.J., & Ebstein, R.P. (2011). Methylation matters in child development: Toward developmental behavioral epigenetics. *Child Development Perspectives, 5*(4), 305-310.

Van IJzendoorn, M.H., Bhandari, R., Van der Veen, R., Grewen, K., & Bakermans-Kranenburg, M.J. (in press). Elevated salivary levels of oxytocin persist more than seven hours after intranasal administration. *Frontiers in Neuroscience*.

Van IJzendoorn M.H., Caspers K., Bakermans-Kranenburg M.J., Beach S.R., & Philibert R. (2010). Methylation matters: Interaction between methylation density and serotonin transporter genotype predicts unresolved loss or trauma. *Biological Psychiatry*, *68,* 405-407.

Van IJzendoorn, M.H., Huffmeijer, R., Alink, L.R., Bakermans-Kranenburg, M.J., & Tops, M. (2011). The impact of oxytocin administration on charitable donating is moderated by experiences of parental love-withdrawal. *Frontiers in Psychology, 2*, 258.

Van Wingen, G., Mattern, C., Verkes, R.J., Buitelaar, J., & Fernandez, G. (2010). Testosterone reduces amygdala-orbitofrontal cortex coupling. *Psychoneuroendocrinology, 35*(1), 105-113.

Veer, I. M., Beckmann, C.F., Van Tol, M.J., Ferrarini, L., Milles, J., Veltman, D.J., . . . Rombouts, S.A.R.B. (2010). Whole brain resting-state analysis reveals decreased functional connectivity in major depression. *Frontiers in Systems Neuroscience, 4*.

Vincent, J L., Snyder, A.Z., Fox, M.D., Shannon, B.J., Andrews, J.R., Raichle, M.E., & Buckner, R.L. (2006). Coherent spontaneous activity identifies a hippocampal-parietal memory network. *Journal of Neurophysiology, 96*(6), 3517-3531.

Vrtička, P., Andersson, F., Grandjean, D., Sander, D., & Vuilleumier, P. (2008). Individual attachment style modulates human amygdala and striatum activation during social appraisal. *PLoS One, 3*, e2868.

Waters, E., Hamilton, C.E., & Weinfield, N.S. (2000). The stability of attachment security from infancy to adolescence and early adulthood: General introduction. *Child Development, 71*, 678-683.

Weinfield, N.S., Sroufe, L.A., & Egeland, B. (2000). Attachment from infancy to early adulthood in a high-risk sample: Continuity, discontinuity, and their correlates. *Child Development, 71*, 695-702.

Williams, K. D., & Jarvis, B. (2006). Cyberball: a program for use in research on interpersonal ostracism and acceptance. *Behavior Research Methods, 38*(1), 174-180.

Wolf, I., Dziobek, I., & Heekeren, H.R. (2010). Neural correlates of social cognition in naturalistic settings: a model-free analysis approach. *Neuroimage, 49(1)*, 894-904.

Wood, R.M., & Gustafson, G.E. (2001). Infant crying and adults' anticipated caregiving responses: Acoustic and contextual influences. *Child Development, 72*, 1287-1300.

Worsley, K.J. (2001). Statistical analysis of activation images. In P. Jezzard, P.M. Matthews & S.M. Smith (Eds.), *Functional MRI: An introduction to methods* (pp. 251-270). New York: Oxford University Press.

Yang, T.T., Simmons, A.N., Matthews, S.C., Tapert, S.F., Frank, G.K., Max, J.E., … Paulus, M.P. (2010). Adolescents with major depression demonstrate increased amygdala activation. *Journal of the American Academy of Child and Adolescent Psychiatry, 49*, 42-51.

Zadro, L., Williams, K.D., & Richardson, R. (2004). How low can you go? Ostracism by a computer is sufficient to lower self-reported levels of belonging, control, self-esteem, and meaningful existence. *Journal of Experimental Social Psychology, 40*, 560-567.

Zak, P.J., Kurzban, R., & Matzner, W.T. (2005). Oxytocin is associated with human trustworthiness. *Hormones and Behavior, 48*(5), 522-527.

Zeskind, P. S., & Collins, V. (1987). Pitch of infant crying and caregiver responses in a natural setting. *Infant Behavior & Development, 10*(4), 501-504.

Zeskind, P.S., & Marshall, T.R. (1988). The relation between variations in pitch and maternal perceptions of infant crying. *Child Development, 59*(1), 193-196.

Zhang X., Li T.G., Zhou X.L. (2008). Brain responses to facial expressions by adults with different attachment-orientations. *Neuroreport 19*, 437–441.

Zhou, Y., Liang, M., Jiang, T., Tian, L., Liu, Y., Liu, Z., . . . Kuang, F. (2007). Functional dysconnectivity of the dorsolateral prefrontal cortex in first-episode schizophrenia using resting-state fMRI. *Neuroscience letters, 417*(3), 297-302.