The real 'mommy brain': New mothers grew

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Motherhood may actually cause the brain to grow, not turn it into mush, as some have claimed. Exploratory research published by the American Psychological Association found that the brains of new mothers bulked up in areas linked to motivation and behavior, and that mothers who gushed the most about their babies showed the greatest growth in key parts of the mid-brain.

Led by neuroscientist Pilyoung Kim, PhD, now with the National Institute of Mental Health, the authors speculated that hormonal changes right after birth, including increases in estrogen, oxytocin and prolactin, may help make mothers' brains susceptible to reshaping in response to the baby. Their findings were published in the October issue of Behavioral Neuroscience.

The motivation to take care of a baby, and the hallmark traits of motherhood, might be less of an instinctive response and more of a result of active brain building, neuroscientists Craig Kinsley, PhD, and Elizabeth Meyer, PhD, wrote in a special commentary in the same journal issue.

The researchers performed baseline and follow-up high-resolution magnetic-resonance imaging on the brains of 19 women who gave birth at Yale-New Haven Hospital, 10 to boys and nine to girls. A comparison of images taken two to four weeks and three to four months after the women gave birth showed that gray matter volume increased by a small but significant amount in various parts of the brain. In adults, gray matter volume doesn't ordinarily change over a few months without

significant learning, brain injury or illness, or major environmental change.

The areas affected support maternal motivation (hypothalamus), reward and emotion processing (substantia nigra and amygdala), sensory integration (parietal lobe), and reasoning and judgment (prefrontal cortex).

In particular, the mothers who most enthusiastically rated their babies as special, beautiful, ideal, perfect and so on were significantly more likely to develop bigger mid-brains than the less awestruck mothers in key areas linked to maternal motivation, rewards and the regulation of emotions.

The mothers averaged just over 33 years in age and 18 years of school. All were breastfeeding, nearly half had other children and none had serious postpartum depression.

Although these early findings require replication with a larger and more representative sample, they raise intriguing questions about the interaction between mother and child (or parent and child, since fathers are also the focus of study). The intense sensory-tactile stimulation of a baby may trigger the adult brain to grow in key areas, allowing mothers, in this case, to "orchestrate a new and increased repertoire of complex interactive behaviors with infants," the authors wrote. Expansion in the brain's "motivation" area in particular could lead to more nurturing, which would help babies survive and thrive physically, emotionally and cognitively.

Further study using adoptive mothers could help "tease out effects of postpartum hormones versus mother-infant interactions," said Kim, and help resolve the question of whether the brain changes behavior or behavior changes the brain – or both.

The authors said that postpartum depression may involve reductions in the same brain areas that grew in mothers who were not depressed. "The abnormal changes may be associated with difficulties in learning the rewarding value of infant stimuli and in regulating emotions during the postpartum period," they said. Further study is expected to clarify what happens in the brains of mothers at risk, which may lead to improved interventions.

In their "Theoretical Comment," Kinsley and Meyer, of the University of Richmond, connected this research on human mothers to similar basic research findings in laboratory animals. All the scientists agreed that further research may show whether increased brain volumes are due to growth in nerve cells themselves, longer and more complex connections (dendrites and dendritic spines) between them, or bushier branching in nerve-cell networks.

More information: -- "The Plasticity of Human Maternal Brain: Longitudinal Changes in Brain Anatomy During the Early Postpartum Period," Pilyoung Kim, PhD, Cornell University and Yale University School of Medicine; James F. Leckman, MD, Yale University School of Medicine; Linda C. Mayes, MD, Yale University School of Medicine and The Anna Freud Centre; Ruth Feldman, PhD, Yale University School of Medicine and Bar-Ilan University; Xin Wang, MD, PhD, University of Michigan, James E. Swain, MD, PhD, FRCPS, Yale University School of Medicine and University of Michigan; *Behavioral Neuroscience*, Vol. 124, No. 5.
-- "The Plasticity of Human Maternal Brain: Longitudinal Changes in Brain Anatomy During the Early Postpartum Period: Theoretical Comment on Kim et al. (2010)," Craig H. Kinsley, PhD, and Elizabeth A. Meyer, PhD, University of Richmond; *Behavioral Neuroscience*, Vol. 124, No. 5.

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