CHILD DEVELOPMENT: BIOLOGY

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Infancy: Development of Object Recognition I

- Orienting of head/eyes toward objects reflects attention in early infancy
- Infants follow movement at birth, but poorly discriminate objects
- "Obligatory looking"—pathway from basal ganglia to superior colliculus at end of first month—gaze into eyes
- Maturation of parietal lobe (increased metabolism seen) later allows disengagement (2-4 months) toward periphery

Infancy: Development of Object Recognition II

- Subcortical (mid brain) visual mechanisms develop before cortical
- Novelty: Inhibition of return (IOR) favors searching in new locations: seen in newborns, not at 2-3 months, again at 4 months (reflects cortical development 4-6 months of visual system). Sustained fixation then declines, and ability to orient without shifting eye movement.
- Superior colliculus lesion interferes

Development of Self-Regulation and Soothing

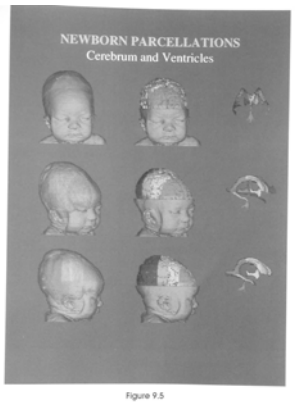
- Caregiver behavior reflects how infant attention is used
- Prior to 3 months: holding and rocking
- 3 months: distraction used, seen at time infants can disengage fixation from central objects and shift to periphery
- Distress initially at overstimulation by light/sound, reduced when they orient toward novel stimuli

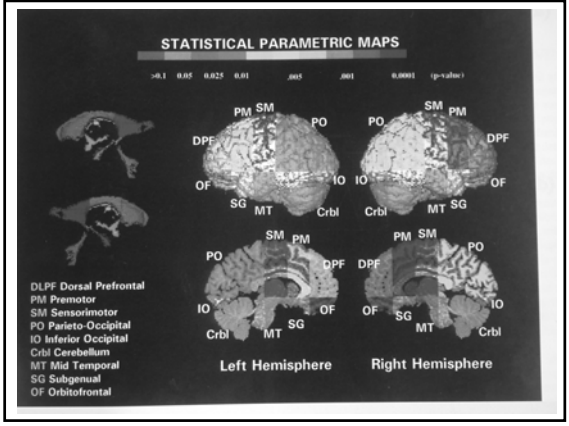
Learning

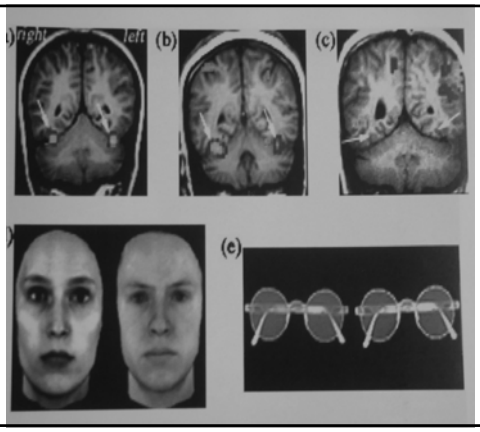
- 3-4 month olds can learn to anticipate the locations of visual stimuli by moving their eyes to them in advance of their presentation (triangle experiment: sequence of three successive spatial locations)
- May depend on maturation of basal ganglia and parietal structures

Imaging Studies

- Reduced cortical gray and white matter volumes/increased CSF in preterm infants, and are associated with poorer cognitive outcome.
- Autism: temporal lobe, amygdala, medial/orbital subdivisions of frontal lobe affected
- Volumetric imaging of infant brains (Brad Peterson)
- Interpretation of facial expression and identifying facial identity—face related activation in fusiform gyrus along ventral surface of temporal lobe (Robert Schultz)







Psychoneuroimmunology

- Links b/t behavior, CNS, PNS, neuroendocrine hormones, immune system
- Aversive stressors and disease susceptibility (viral, parasitic, neoplastic): shown in a variety of animal models
- Effects depend on virulence of illness and psychosocial stressors: e.g. Macaque monkeys infected with SIV: leukopenia, wt loss and survival affected by rearing conditions (with mother or peers), number of changes in housing (familiar social group, unfamiliar group, or isolation).

Effects of Stressors on Immune Responses

- Dose and time response of stressor influences immune effects, which in animals have affected lymphocyte responses, T-cell suppression, delayed hypersensitivity, GvH response, and NK activity
- Social isolation: decreased proliferative responses, NKCA, macrophage-mediated cytotoxicity, increased tumor metastases.
- Stressor predictability and control over stressor influence immune effects; fear determines level of immunosuppression.

Immunologic Consequences of Early Life Experiences (nonhuman primates)

- Immune responses and cell numbers are sensitive to psychosocial stressors
- Time at which immunity measured following stressor, environment, and age of animal influence mediate immune effects
- Immunologic consequences may be long-term
- Vulnerability may begin prenatally

Stress and Immunity: Clinical Studies I

- Asthma and allergic rhinitis (mediated by humoral immune responses) occur more frequently in stressed children with limited coping abilities
- Strep infections and ASLO titers in family members w/ high stress levels
- Stress in children associated w/ recurrent colds, flu and lower salivary IgA
- Separation and loss—one of multiple factors associated with childhood leukemia

Stress and Immunity: Clinical Studies II

- Med students--lower NKCA and blastogenesis during finals, along with stress-related decreases in total T cells, helper T, suppressor T, and increases in IgG, IgM, IgA. Ab titers to EBV, CMV, HSV elevated and decreases in number and synthesis of IL-2 receptors on peripheral WBC's.

Stress and Immunity: Clinical Studies III

- Higher WBC, lymphs, reduced B-cell function in psychiatry trainees taking oral boards
- Lifetime and past year adverse events predictive of lower NKCA in adolescents.
- Parental divorce/separation associated with lower granulocyte killing of staph aureus.

Depression and Immunity in Children

- Correlation b/t severity of depression and lower NKCA in hospitalized adolescents
- Increased B cells, lower NKCA in CD pt's c/w MDD and normals aged 11-18.
- Depressed pre-pubertal children had lower NKCA c/w controls.

Stress and Immunity

- Kindergarten Study: Children with increases in immune measures (CD4+/CD8+, response to PWM) following entrance into kindergarten had more respiratory infections following a concurrent earthquake.

Neuroendocrine Axis and Stress

- (Huizink et al, 2002)--Increased maternal prenatal stress associated with temperamental changes in infants at 8 months (new situations, unfamiliar persons, more behavioral problems); may be mediated by altered HPA axis reactivity found in prenatally stressed offspring
- Pregnancy anxiety associated with decreased attention at 3 mos; PA and perceived stress—dec. attention at 8 mos.
- May increase risk of future anxiety, mood and behavioral disorders

Effects of Early Handling and Maternal Deprivation

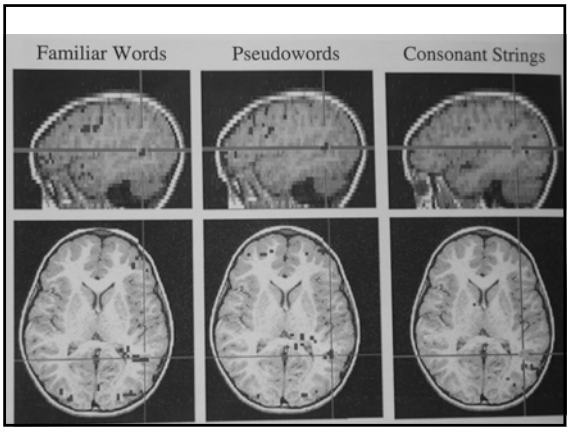
- Adult rats subjected to neonatal handling
  - Decreased HPA axis responses to stress
    - mediated by up-regulation of glucocorticoid receptors in the hippocampus (Meaney et al)
- Rat pups sep. from mothers in 1st 3 wks have higher corticosterone levels and greater cort responses to acute stress.
- Chronic stress can result in damage to hippocampal neurons due to high circulating corticosterone levels
- Increased CRF may result from maternal deprivation, increase risk of depression (found in adult monkeys whose mothers were subjected to variable foraging conditions—Coplan et al, 1996)

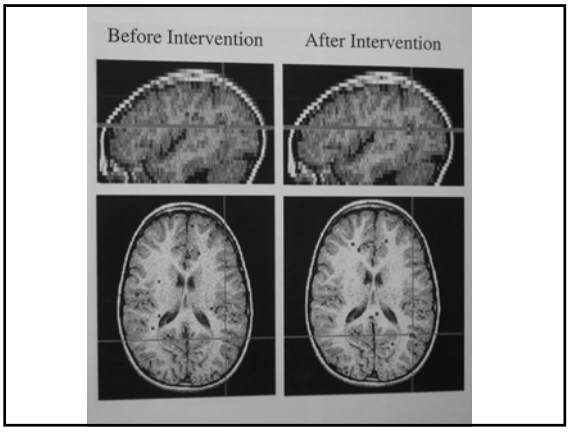
Alterations in Childhood Psychiatric and Behavioral Disorders I

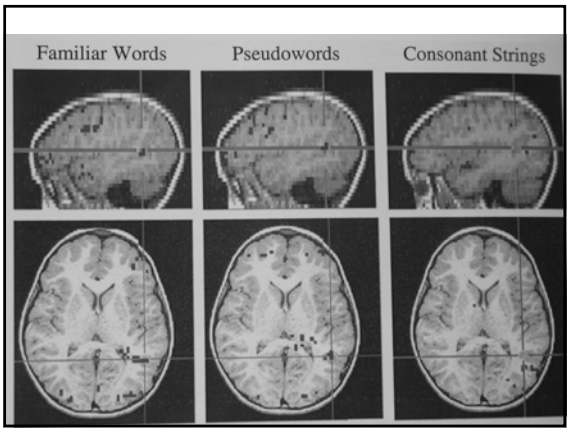
- In pathologically shy children, hypothalamic and amygdala-mediated responses to novel situations are hyperreactive
- This may involve CRF, which is primary regulator of limbic sites, and may cause behavioral inhibition, increased HPA/ catecholamine/ CV responses.

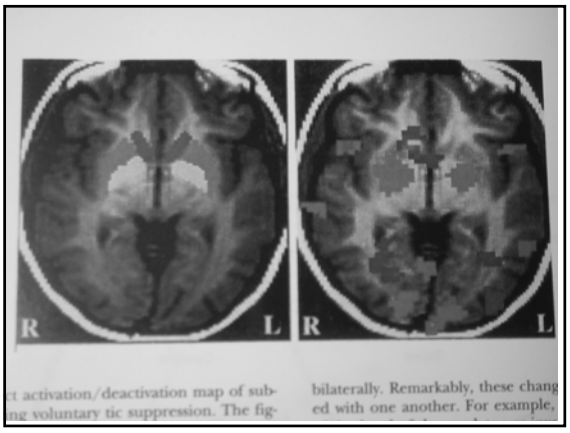
Alterations in Childhood Psychiatric and Behavioral Disorders II

- Cortisol hypersecretion occurs in severely depressed and suicidal children/adol requiring hosp., and during recurrence of MDD.
- Increased urinary catecholamines and decreased urinary cortiosol levels seen in children/adolescents with PTSD
- Autistic pt's: decreased activity in serotonergic pathways, and alterations in DA system, GH responses and abnormal stress responses of HPA axis.









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