

Considerations in Pediatric Traumatic Brain Injury (TBI)

John D. Strang, Ph.D., C.Psych. (April, 2016)
Director, *Ozad Institute*, Hotel-Dieu Grace Healthcare

www.hdgh.org/ozad



Topics

1. “Typical” predicted outcome expectations.
1. Importance of pre-injury neurodevelopmental status and neuroplasticity (brain reserve).
1. Significance of the type of brain injury and other sustained injuries.
1. Importance of the developmental and environmental contexts of the injuries.



TBI Classification and Recovery: Clinical Follow-Up Observations

- MILD: Glasgow Coma Scale (GCS) 13-15
Recovery: one day to two years with possible significant residual problems
- MODERATE: GCS 9-12
Recovery: at least two years for maximum recovery with mild to moderate residual problems
- SEVERE: GCS 3-8 two to three years with moderate to severe residual problems



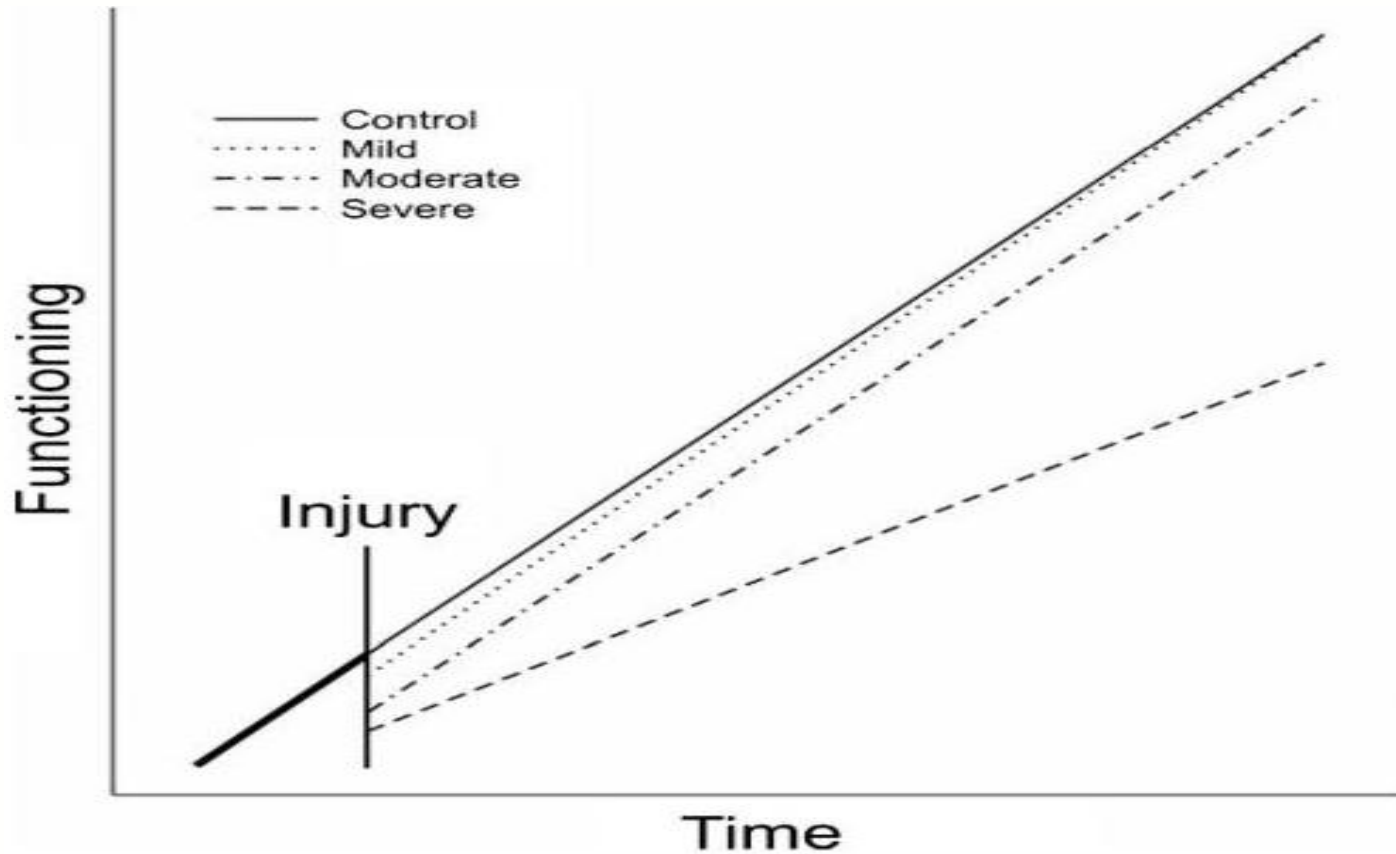
Neurocognitive Outcomes and Recovery After Pediatric TBI: Meta-Analytic Review

- 28 (of 115) published studies (1988 to 2007)
- 14 key neurocognitive domains
- Grouping variables: (1) injury severity, (2) time since injury, and (3) age at injury
- Assessment time since injury: 0–5 months; 6–23 months, and 24+ months.

Babikian & Asarnow, 2009



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Longitudinal Trajectories of Postconcussive Symptoms in Children

- 1) 64% of the mild TBI children experienced no significant postconcussive symptoms at any time.
- 2) 12% experienced moderate symptoms after 2 weeks that **continued** 12 months later.
- 3) 15% experienced severe symptoms after 2 weeks that resolved during the following 12 months.
- 4) 9% of the children experienced severe symptoms after 2 weeks that **continued** 12 months later.

Yeates, K., Taylor, H., Rusin, J., Bangert, B., Dietrich, A., Nuss, K., Wright, M., Nagin, D., & Jones, B. (2009).

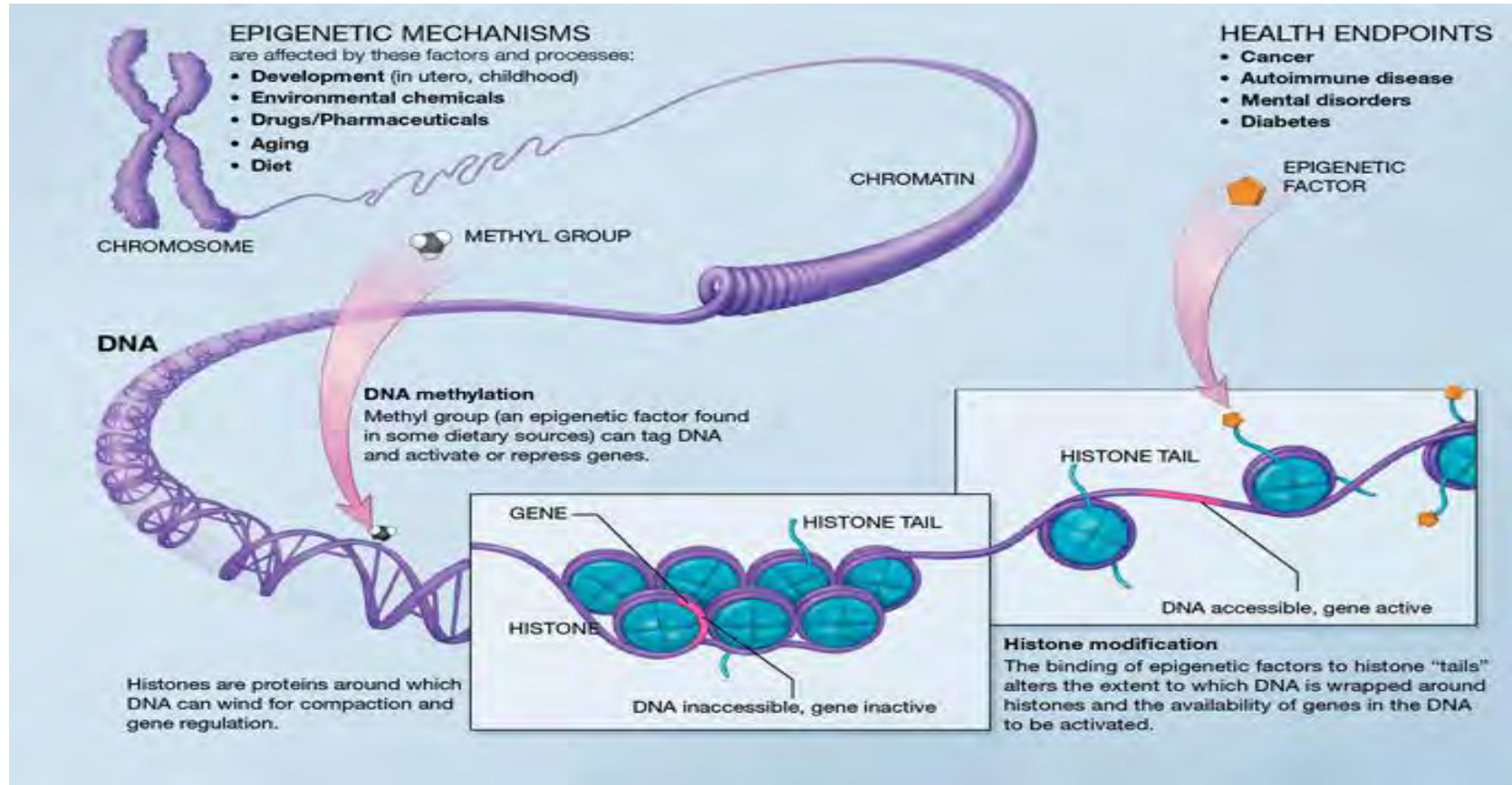


BASIC GENETIC CONSIDERATIONS

- High intelligence has significant genetic contributions and is a protective factor in child development
- ADHD, language disorders, specific learning disabilities, specific mental health disorders often have immediate or extended family members with neurodevelopmental or mental health disorders
- Genes with **de novo mutations** are shared by four neuropsychiatric disorders discovered from de novo database: Autism spectrum disorder, intellectual disability, epileptic encephalopathy, and schizophrenia (Li, J. et. al. 2015 *Molecular Psychiatry*)



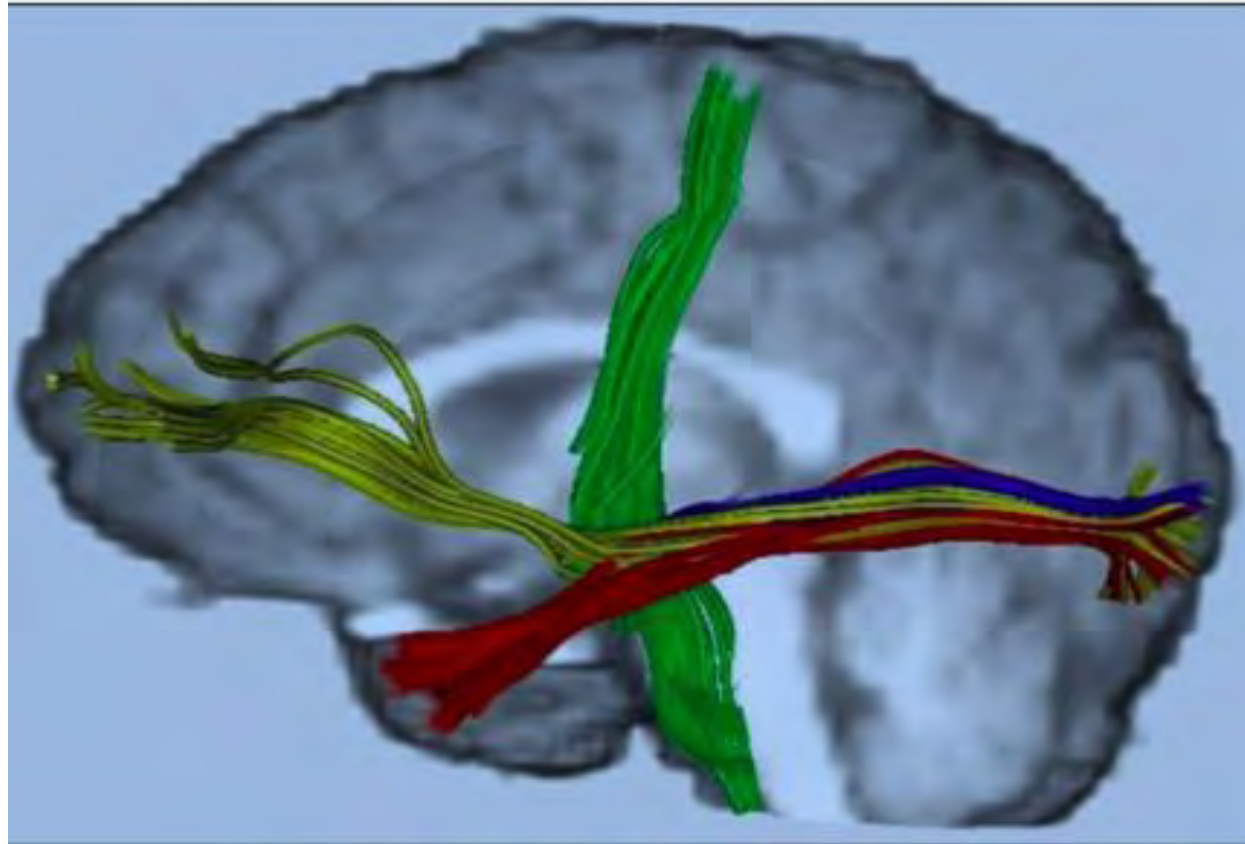
EPIGENETIC MECHANISMS



Courtesy of NIMH Public Access



Hard and Soft Wiring

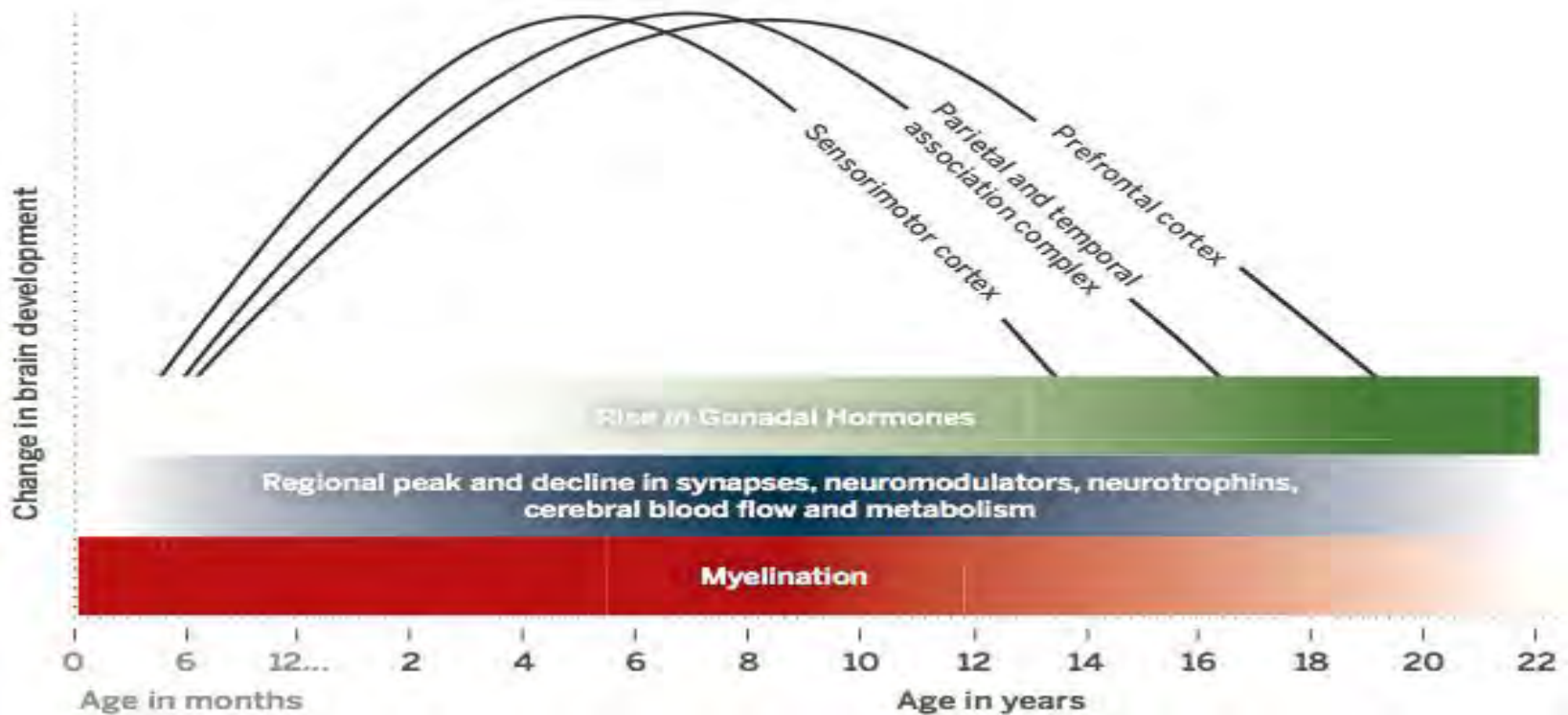


Magnetoencephalography & Diffusion Tensor Imaging results: Developmental white matter changes promoting increased visual-motor processing speed in children 4-13 years. (N. Scantlebury et. al. 2013)



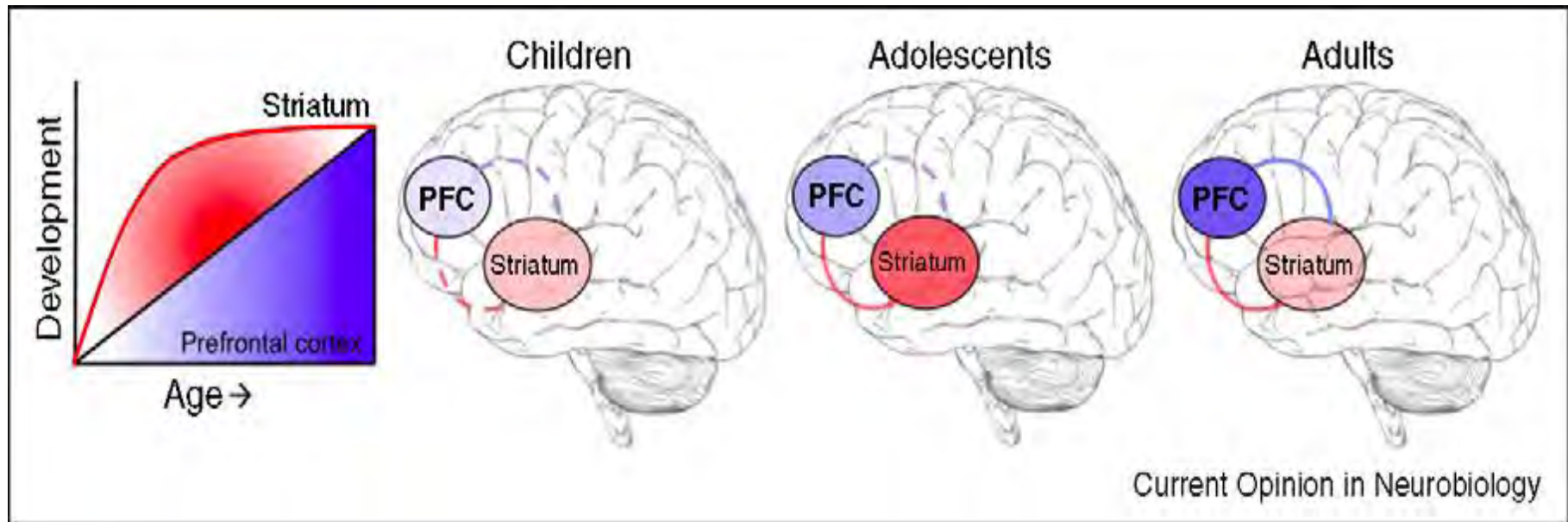
Developmental course of brain maturation during adolescence

Behavioral attributes are paralleled by hormonal and neurobiological changes that target specific brain regions and cell populations



Lee, Heimer, Giedd, Lein, Šestan, Weinberger & Casey, (2014)

Neural Maturation Changes in Emotional Regulation



Somerville & Casey, 2010



Stages of Psychosocial Development



Proposed by Erik Erikson



<i>COMPLEX ATTENTION</i>	Sustained attention, Divided attention, Selective attention, Processing speed.
<i>EXECUTIVE FUNCTION</i>	Planning, Decision making, Working memory, Feedback utilization, Inhibition, Mental flexibility.
<i>LEARNING & MEMORY</i>	Immediate memory, Recent memory
<i>LANGUAGE</i>	Expressive language, Grammar & syntax, Receptive Language.
<i>PERCEPTUAL-MOTOR</i>	Visual perception, Visuoconstructional, Perceptual-motor, Praxis, Gnosis.
<i>SOCIAL COGNITION</i>	Recognition of emotions, Theory of mind.



Neuropsychological Assessment

- Evaluates brain system integrity involved with perception, comprehension, learning, memory, and cognitive and emotional self direction, as well as current emotional-behavioural status
- Establishes brain-related strengths, weaknesses, and potentials
- Has limited therapeutic impact unless translated into tailored and shared expectations and interventions



Usual Observations & Findings

- Tiredness – especially in afternoon
- Decreased attention/concentration
- Exacerbation of pre-accident difficulties
- Decreased information processing speed
- Memory problems
- Problems with multi-step tasks and transitions
- Specific learning and performance problems associated with areas of deficit
- Change in behaviour, including self-regulation



The Child's Experience Post TBI

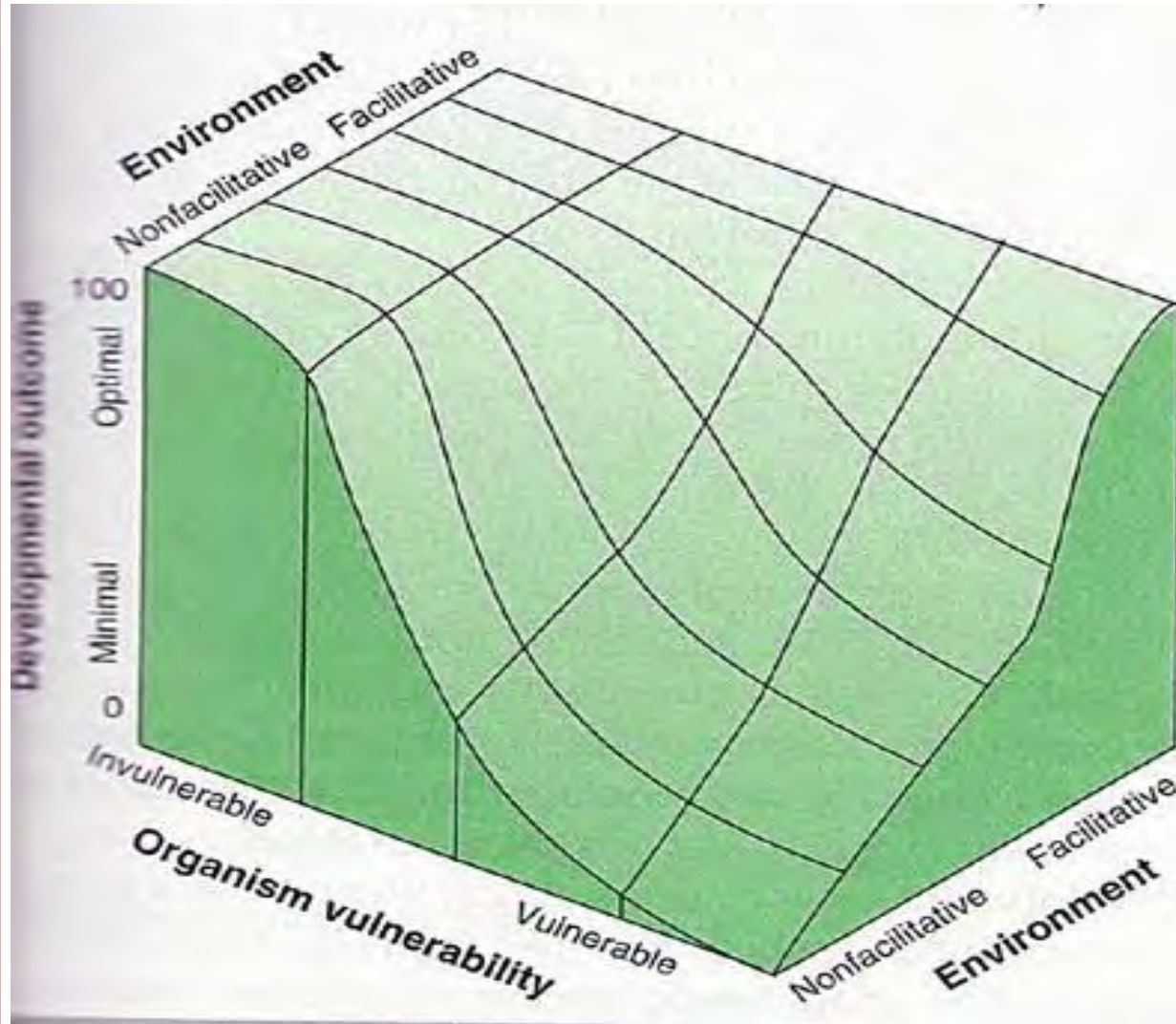
- Sleeping problems? Physical pain? headaches?
- Tiredness – especially in the afternoon
- Confusion: heard or seen but not understood
- Lack of self-control, self-regulation
- Loss of capabilities
- Loss of opportunities
- Loss of independence



- Family members are negatively impacted
- Parent perceptions range from minimization to over-rating child's difficulties
- Loss of dreams for parents and child



Individual-Environment “Goodness of Fit”



Optimal outcome dependent on “goodness of fit” between child’s needs and environmental demands and supports



Shared Expectations, Interventions, & Optimal Outcomes

To facilitate optimal an optimal outcome:

- i. appropriate expectations must be set,
- ii. paired with needed interventions and supports,
- iii. adjusted over time,
- iv. shared across relevant environments,
- v. to promote frequent, legitimate, ongoing success experiences
- vi. and skill building for children with TBIs

