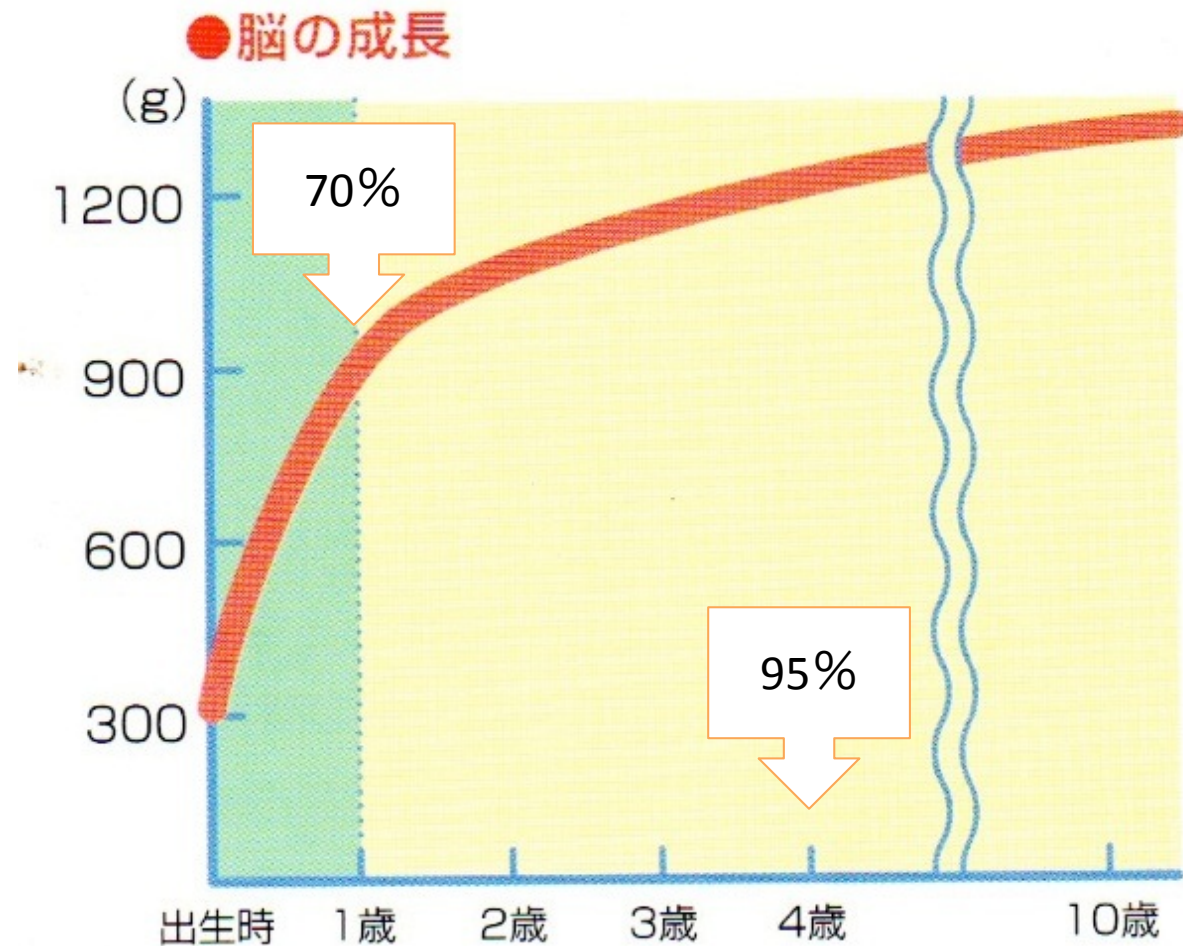


**若年者に対する
刑事法制の在り方に関する勉強会
第7回ヒアリング及び意見交換**

**福井大学 子どものこころの発達研究センター
友田 明 美**

乳幼児期に脳が育つ

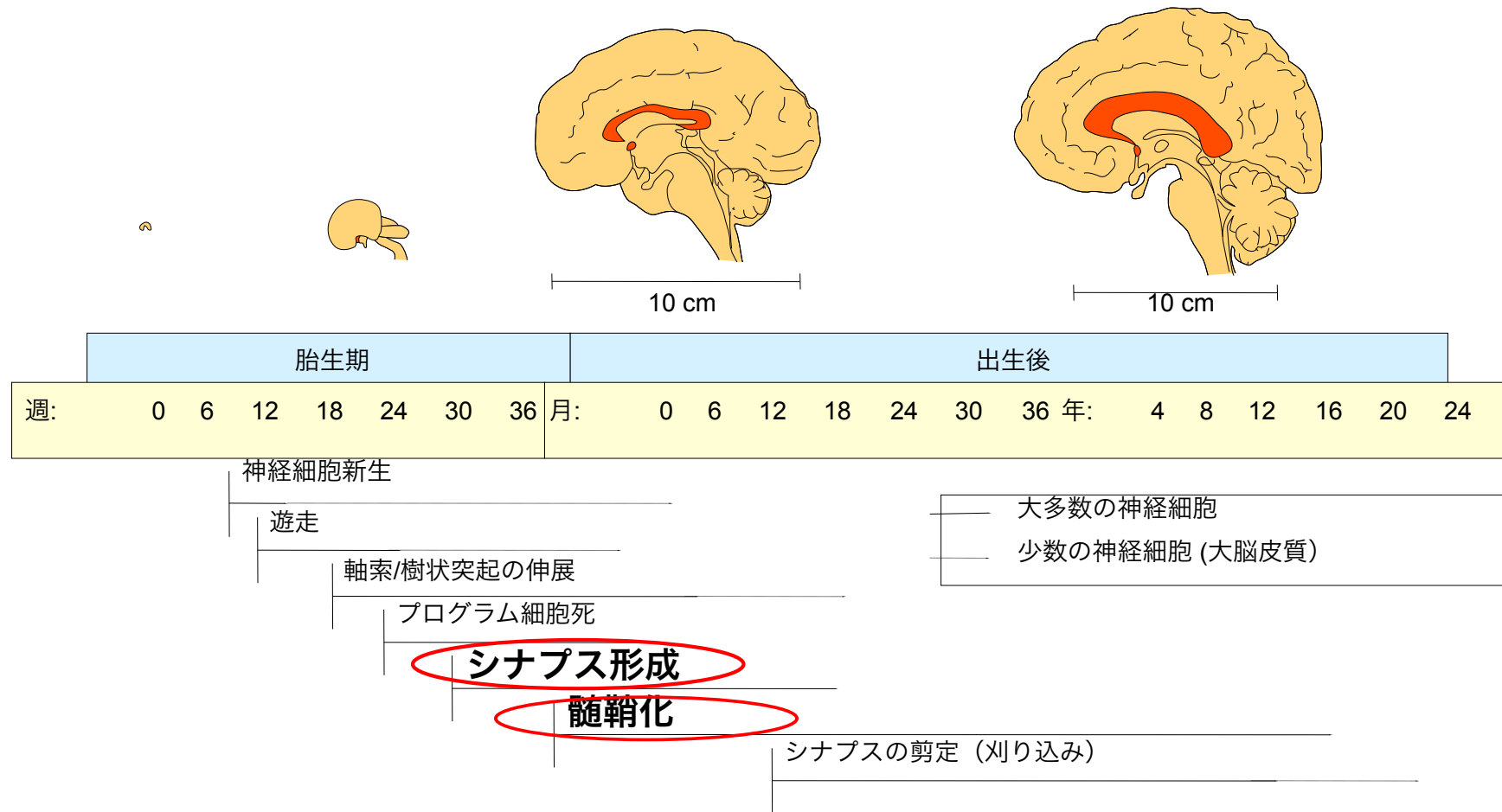
脳は1歳で大人の約70%に成長!



栄養
+
活動

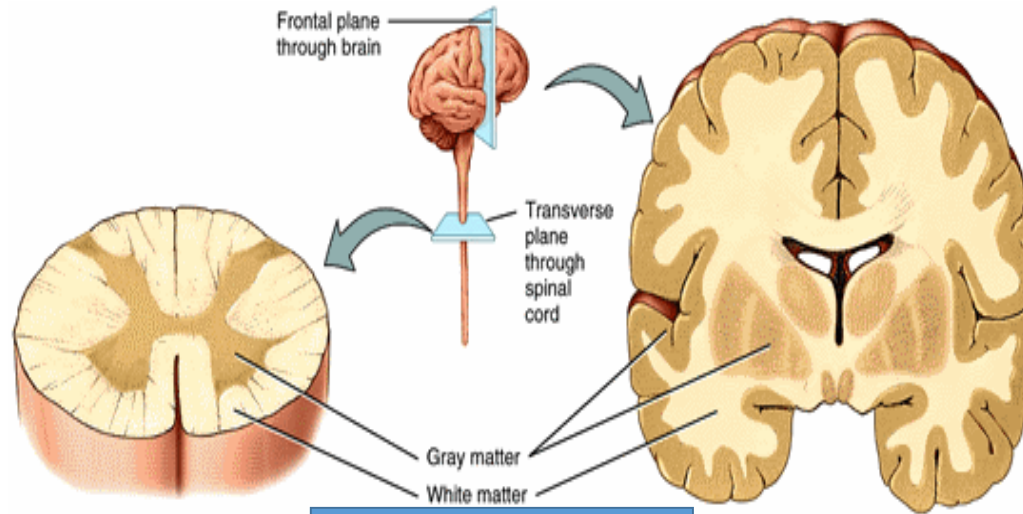
脳が育つ

ヒト脳の発達



児童虐待ストレス → 脳発達における2つの決定的な要素に影響

脳の成熟に必要なプロセス

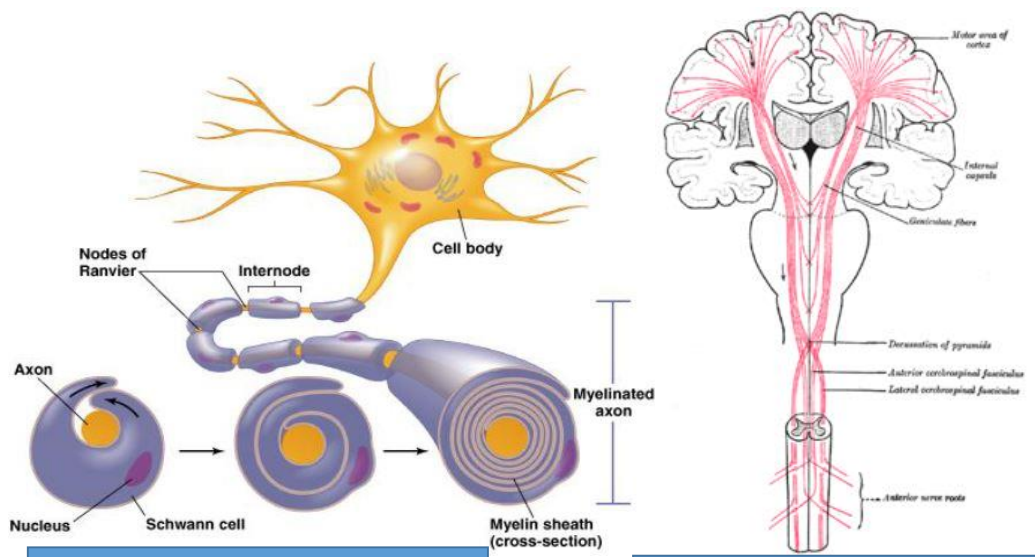


(a) Transverse section of spinal cord

(b) Frontal section of brain

Figure 17.09a Tortora - PHA 11/e
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灰白質における
プルーニング



髄鞘化イメージ

白質内の神経経路

Mapping cortical change across the human life span

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Published online 27 January 2003; doi:10.1038/nn1008

We used magnetic resonance imaging and cortical matching algorithms to map gray matter density (GMD) in 176 normal individuals ranging in age from 7 to 87 years. We found a significant, nonlinear decline in GMD with age, which was most rapid between 7 and about 60 years, over dorsal frontal and parietal association cortices on both the lateral and interhemispheric surfaces. Age effects were inverted in the left posterior temporal region, where GMD gain continued up to age 30 and then rapidly declined. The trajectory of maturational and aging effects varied considerably over the cortex. Visual, auditory and limbic cortices, which are known to myelinate early, showed a more linear pattern of aging than the frontal and parietal neocortices, which continue myelination into adulthood. Our findings also indicate that the posterior temporal cortices, primarily in the left hemisphere, which typically support language functions, have a more protracted course of maturation than any other cortical region.

Maturation of the adolescent brain

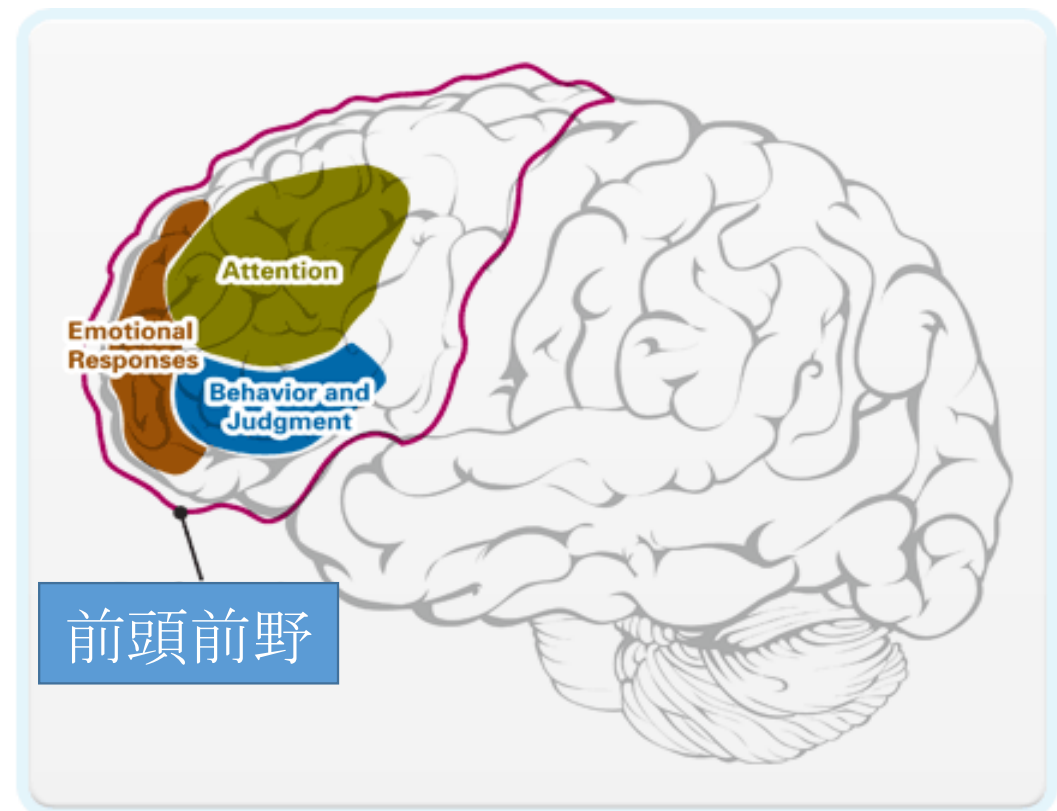
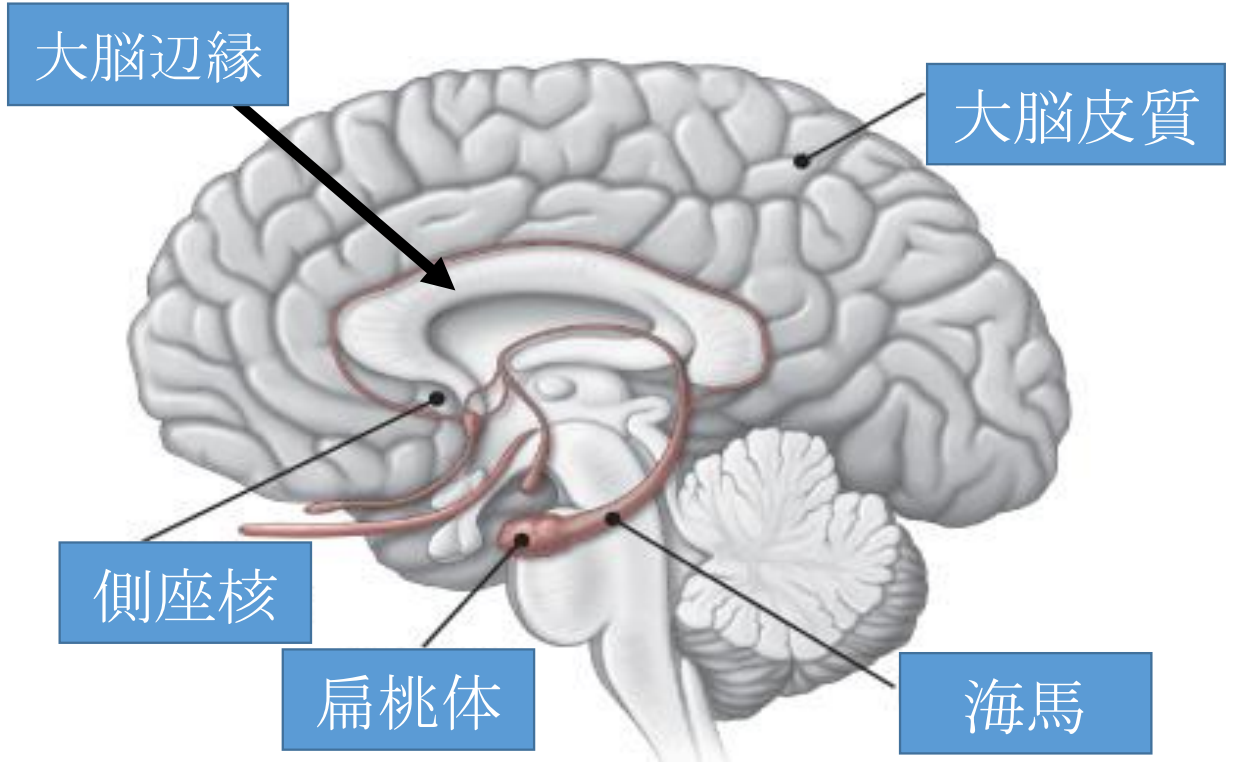
This article was published in the following Dove Press journal:
Neuropsychiatric Disease and Treatment
2 April 2013
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Mariam Arain
Maliha Haque
Lina Johal
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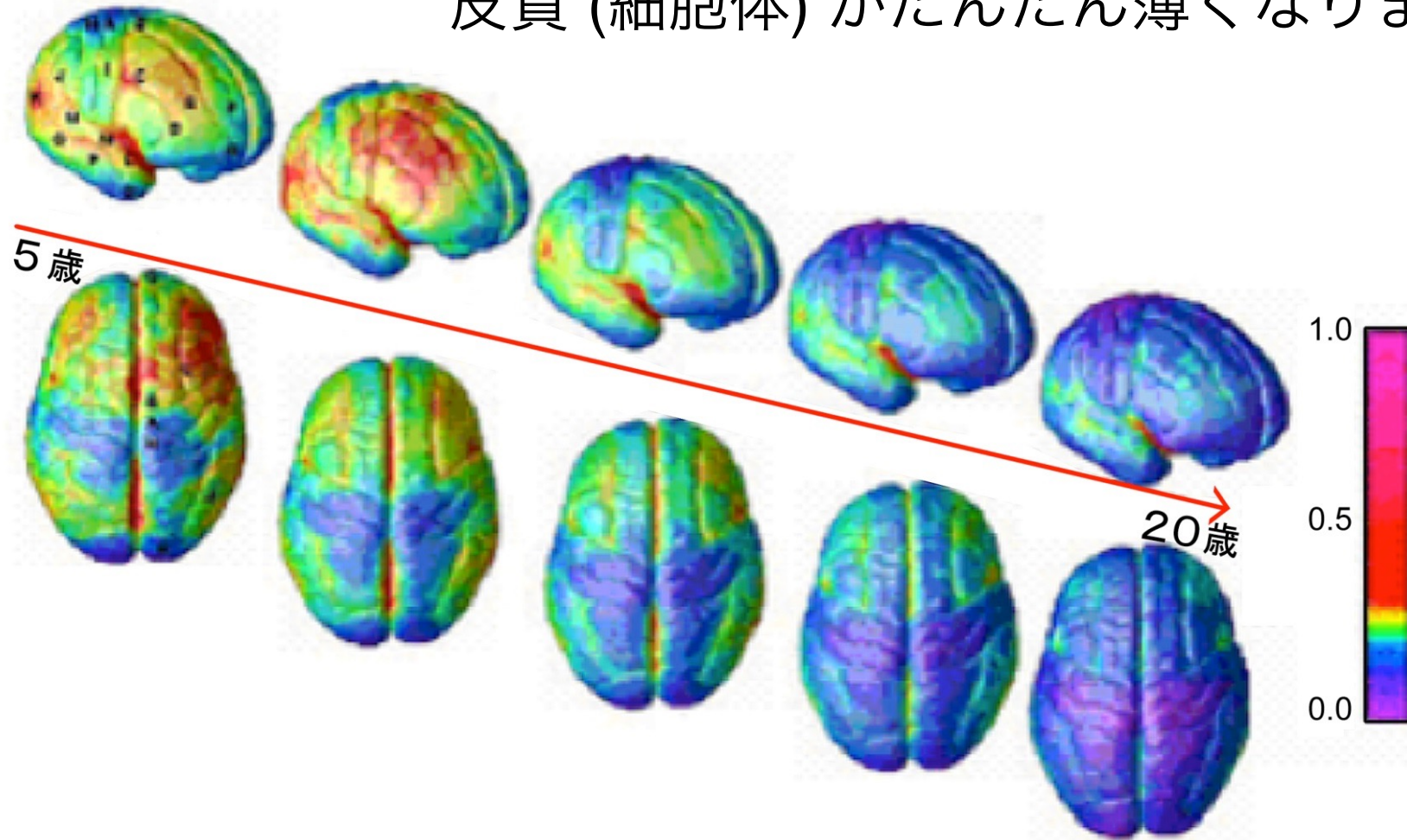
Abstract: Adolescence is the developmental epoch during which children become adults – intellectually, physically, hormonally, and socially. Adolescence is a tumultuous time, full of changes and transformations. The pubertal transition to adulthood involves both gonadal and behavioral maturation. Magnetic resonance imaging studies have discovered that myelinogenesis, required for proper insulation and efficient neurocybernetics, continues from childhood and the brain's region-specific neurocircuitry remains structurally and functionally vulnerable to impulsive sex, food, and sleep habits. The maturation of the adolescent brain is also influenced by heredity, environment, and sex hormones (estrogen, progesterone, and testosterone), which play a crucial role in myelination. Furthermore, glutamatergic neurotransmission predominates, whereas gamma-aminobutyric acid neurotransmission remains under construction, and this might be responsible for immature and impulsive behavior and neurobehavioral excitement during

脳の部位



5歳から20歳までの脳の成熟

皮質 (細胞体) がだんだん薄くなります!



年齢を重ねるに従って、だんだん青い部分が広がります。つまり、脳が成熟していることを表しています。前頭前野（自分の行動コントロールに関わる領域）が一番最後に成熟します。

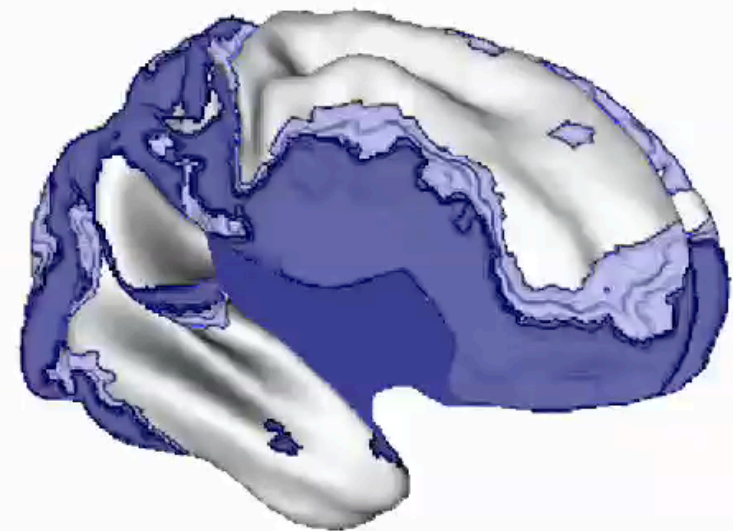
小児ADHDの脳発達の経年的変化

ADHD群 10.5歳 vs 定型発達群 7.5歳

AGE: 6



ADHD



HEALTHY CONTROLS

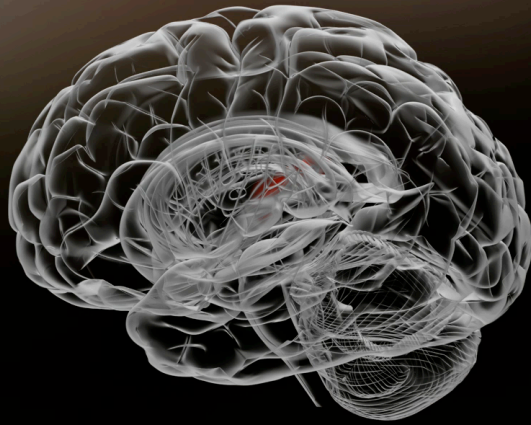
(NIMH • 2007)

親子のアタッチメント

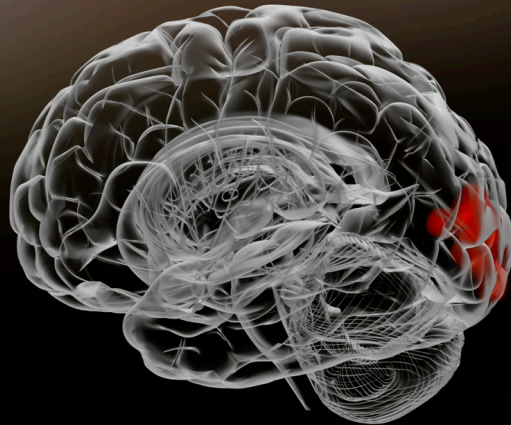
Sampson & Laub : Life-course Desisters

Actual Mean Number of Offenses for Total Crime
(Total Events = 9.548): Ages 7 to 70

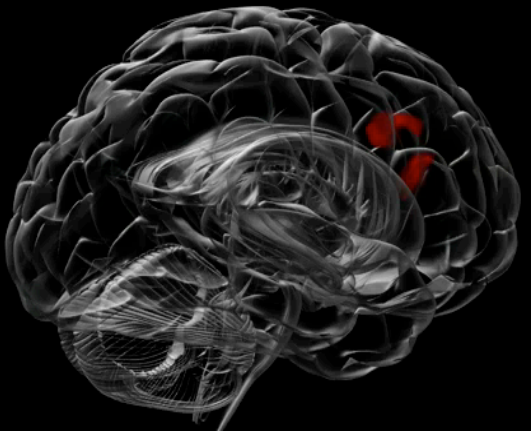




- 暴言虐待の脳への影響
(NeuroImage 2011)



- 性的虐待の脳への影響
(Biol Psychiatry 2009)



- DV目撃の脳への影響
(PLoS One 2012)
- 厳格体罰の脳への影響
(NeuroImage 2009)

子育て困難により傷つく脳

厳しい体罰で、
前頭前野が萎縮



暴言で、聴覚野が変形

親のDVを見聞きすると視覚野が縮小

子ども虐待 = 子育て困難

(Tomoda 2012)

発達性トラウマ障害

(Developmental trauma disorder, van der Kolk 2005)

- 幼児期に普遍的な愛着障害を呈する
- 学童期にADHD様の多動と破壊的行動障害が前面に表れる
- 思春期にPTSDと解離症状の明確化
- 青年期には解離性障害および素行障害へ展開
- 成人期に一部は複雑性PTSDに進展