How humans are unique! (as compared to chimps and macaques)

- Development patterns are delayed:
  - Certain types of Gene expression (postnatal development of prefrontal cortex)
  - Synapse maturation
  - Axon myelination
  - Aging (in terms of neural development)

Could the delay in our cortex development be related to our cognitive differences?
Whose Lin?

- By now you should know: Myelin is a fat guy with two coats and who hugs neurons, which protects them and insulates them.

- In science terms:
  - Promotes saltatory action potential conduction
  - Increases in response to excitation

- It develops in cortical areas before association areas, and we are born with fewer myelinated axons than chimps.

Myelin-related protein expression

- CNP: 2',3'-cyclic nucleotide 3'-phosphodiesterase
  - Helps oligodendrocytes differentiate as well as process outgrowth early in the myelination process

- MAG: myelin-associate glycoprotein
  - Helps maintain established axons (at the expense of novel growth); it does this by “regulating axon caliber”
This Study

Question: Does myelin growth differ in the neocortex of humans and chimpanzees?

Method: Compare myelinated fiber length density (MFLD) in 4 areas:

- Somatosensory Area (area 3b)
- Primary motor area (area 4)
- Frontopolar region (area 10)
- Prestriate visual cortex (area 18/V2)

This Study Continue…

- Analyzed changes in the CNP & MAG in these areas:
  - Somatosensory Areas (area 3b, 3a, 1, 2)
  - Primary motor area (area 4)
  - Frontopolar region (area 10)
  - Prestriate visual cortex (area 17/V1; 18/V2)
So what?

- This delay, which is unique to humans, may be associated with our vulnerability to psychiatric conditions, such as schizophrenia, and other “adolescence/early adulthood onset”.

- It may also be related to our ability to be so cognitively advanced, by extending the window of great plasticity and learning (at the expense of longer duration of other-dependence for survival).

Questions?