HOW CONNECTIONS CHANGE THROUGHOUT THE LIFETIME

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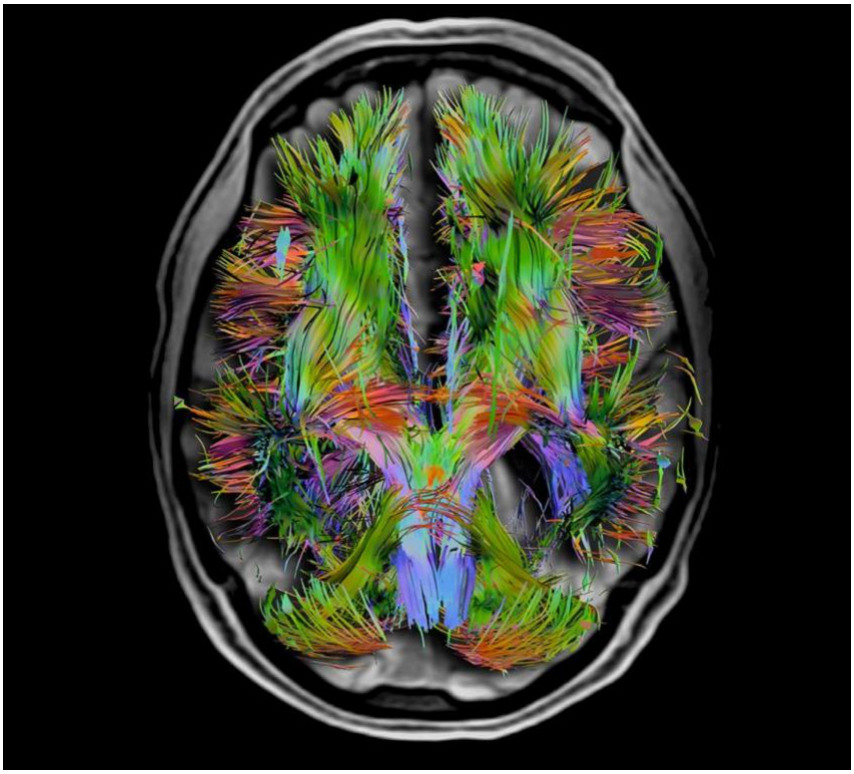


Introduction

Researchers at the University of Michigan found that young adults have higher connectivity in areas of the brain involved in cognition and motor control when compared to children and older adults. Cognition refers to the mental act of gaining knowledge; it includes thinking, knowing, remembering, judging and problem solving.

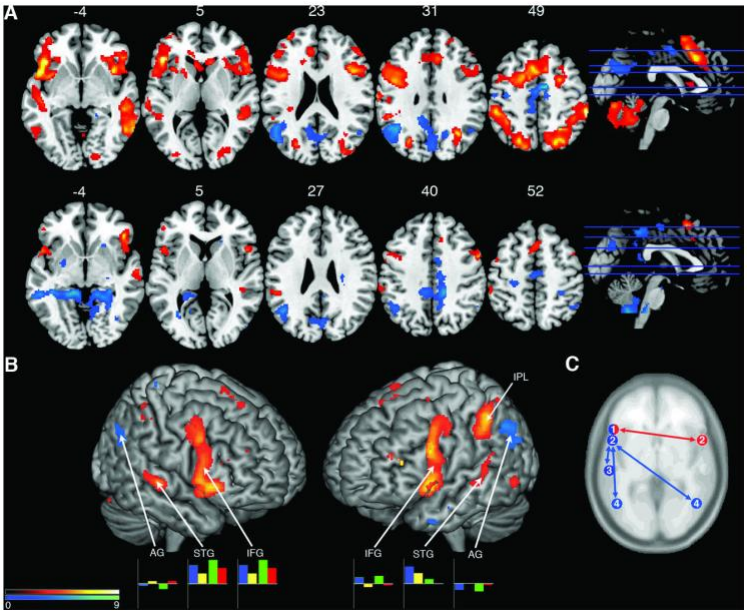
The brain is made of approximately one hundred billion neurons. These special brain cells are designed to relay information to each other and other parts of the body. Connectivity in psychology refers to the location and strength of theses neural connections. This study focused on how connectivity in cognition and motor circuits of the brain change through development.

Previous studies indicate that motor skills mature before cognitive functions, connectivity in children differ from young adults, and cognitive skills are the last to develop and first decline in old age. This was the first study to combine children, young adults, and older adults and create distinct cognitive and motor circuits to look at age differences.

Study

To figure this out, the researchers separated their 60 participants into three groups: children aged 10-17 years old, young adults aged 18-33, and older adults aged 53-74. Then each participant was placed into a rs-fcMRI machine that took pictures of the brain. This technology uses a strong magnetic field and radio frequencies to create

detailed images. It highlighted the areas that were hard at work. While in the scanner participants were asked to look at a cross and to not think about anything for about eight minutes. Then images of the brain were reconstructed and compared against each other. The brains were compared within their group (children compared to children etc.) and across groups (children, young adults, and older adults).

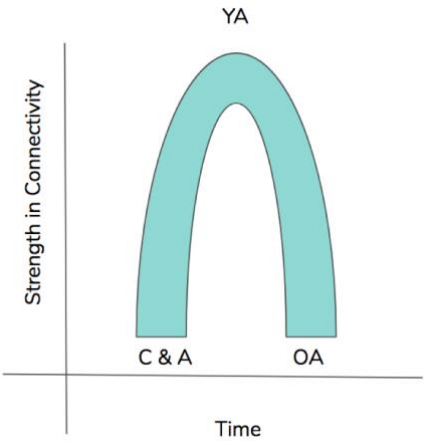


Pictures taken by an MRI

Previous research had proven certain parts of the brain to be involved with cognition and motor processes. In this study, the researchers carefully selected structures, which they called "seeds." Then they noted what became active when the "seeds" lit up. After comparing everyone's brains, they created two circuits or maps, one for cognition and the other for motor. They noticed that the maps were the same for all the groups, which tells us the circuits do not change through development. However, the strength of the connections was not consistent.

Results

They discovered that young adults have the strongest connections in both domains, suggesting that the brain peaks in early adulthood, then starts to decline. These circuits follow an upside down "U" pattern. Young adults would have the strongest connections at the top, and children and adolescences and older adults would be weaker at the bottom. These two circuits turned out to be more similar than what was predicted. According to the data, children and young adults had different motor and cognition connections. This means the brain is still developing into young adulthood.



C & A: Children and Adolescences

YA: Young Adults

OA: Older Adults

Limitations

This study did not have the participants do tasks while they were being scanned. It is tough to create a task that is the same level of difficulty for children and adults. Also, it is possible that the results could have been affected by social economic status or education level. However, every young and older adult completed a test to see if there was a difference in their education level, there was not.

Discussion

This study agrees with previous studies that found: similar patterns of connected networks between children and adults, that motor networks finish developing much earlier than cognitive networks, and even though there is a lot of overlap in neural systems children and young adults, they have developmental differences in their motor systems. This study found that children and adolescence had different motor and cognitive circuits, meaning that adolescences brains are still developing. This type of psychological research is important to understand human development, how people grow, develop and adapt. Future studies are needed to further understand the relationship between aging and brain connectivity.

Bo, J., Lee, C.M., Kwak, Y., Peltier, S.J., Bernard, J.A., Buschkuehl, M., Jaeggi, S., **Wiggins, J.L.**, Jonides, J., Monk, C.S., Seidler, R.D. (2014). Lifespan differences in cortico-striatal resting state connectivity. *Brain Connectivity*, 4(3), 166-180.