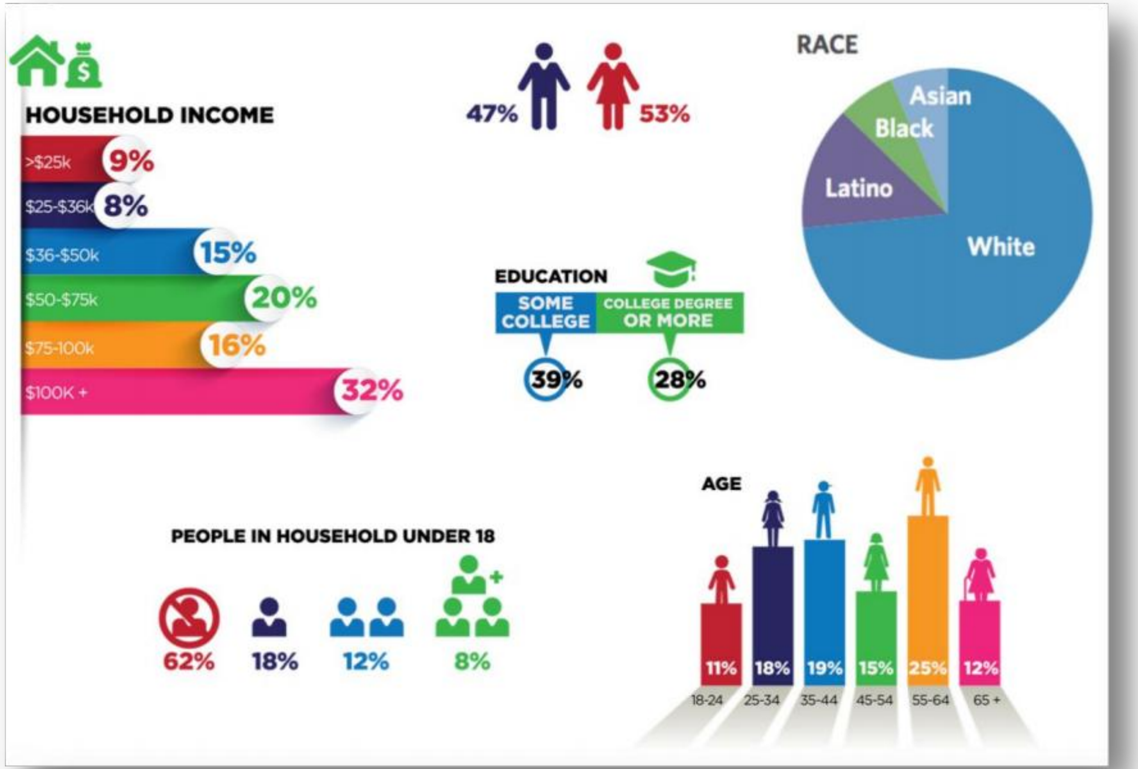


北京師範大學心理学部

Developmental Population Neuroscience

发展人口神经科学（个体人口统计资料）

左西年 (Xi-Nian Zuo)

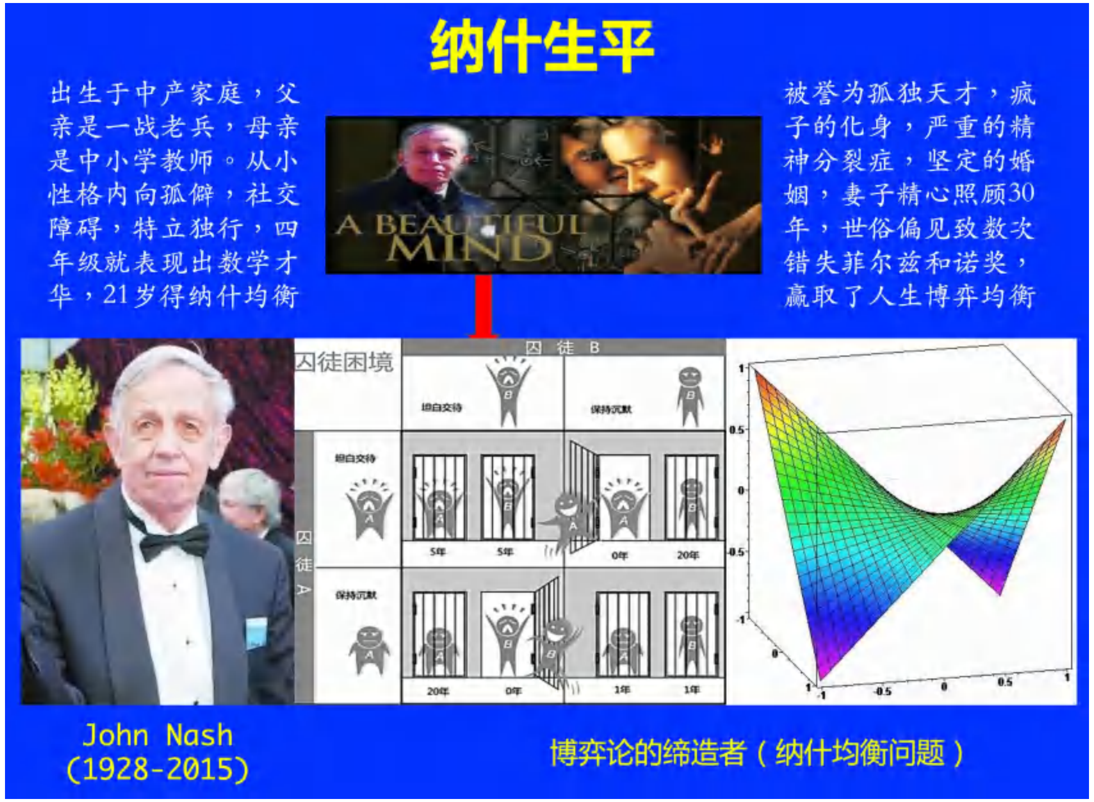
Beijing Normal University

State Key Lab of Cognitive Neuroscience & Learning

National Basic Science Data Center

Chinese Data-sharing Warehouse for In-vivo Imaging Brain

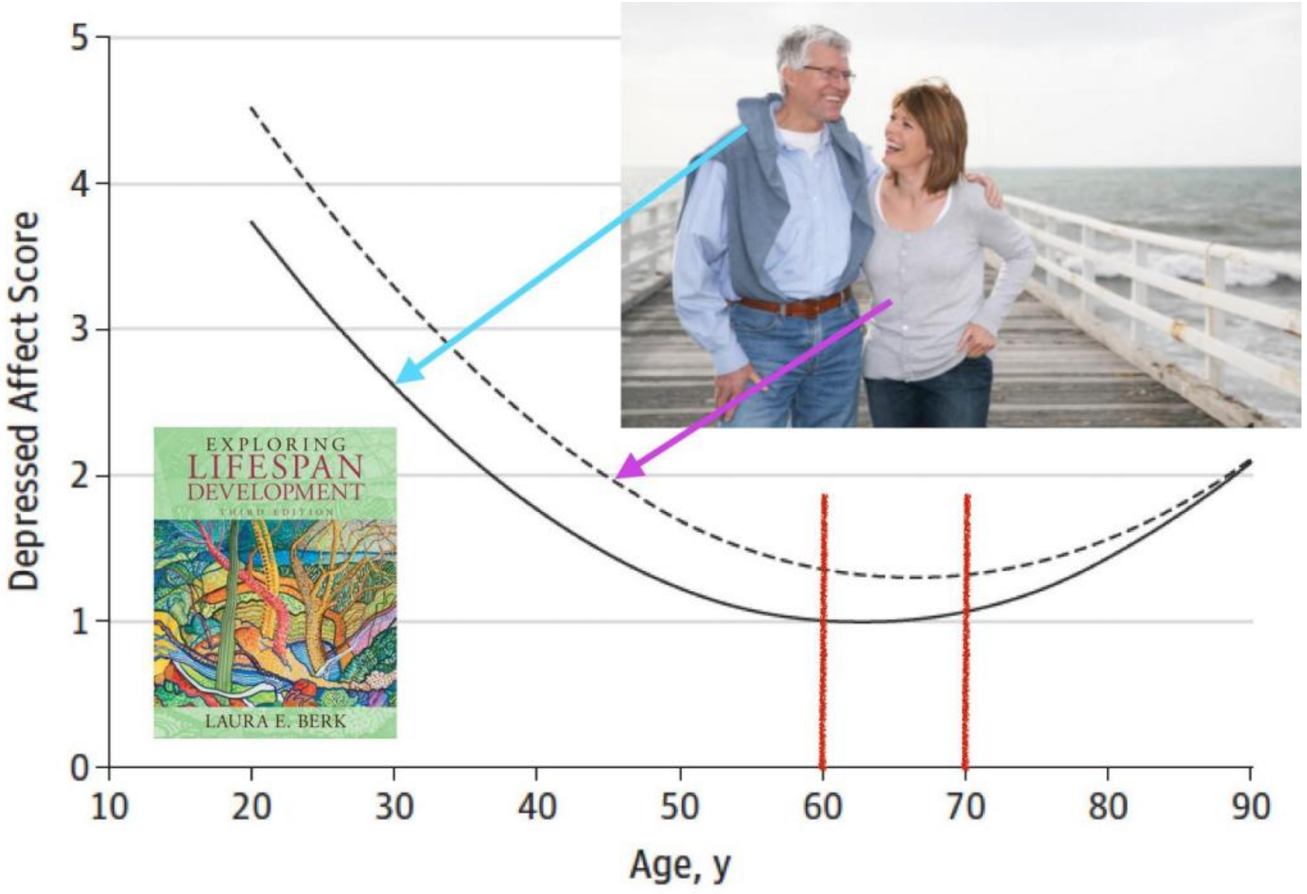
Lifespan Development: Population vs Individual

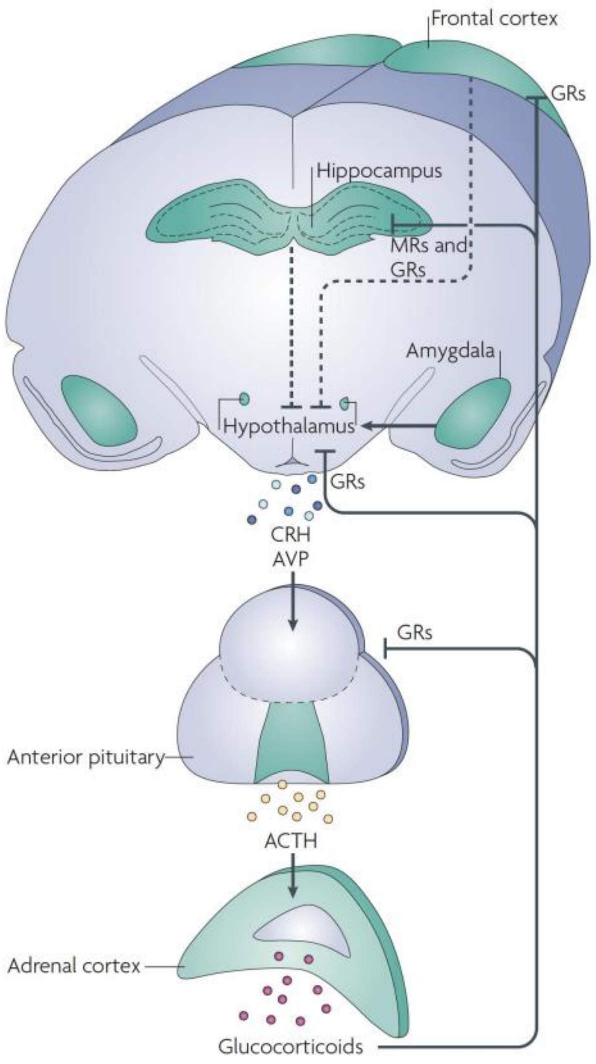


Keynote Address in Chinese Psychological Society (2018 Annual Meeting, Beijing)

[左西年-中国心理学会 (cpsbeijing.org)](cpsbeijing.org)

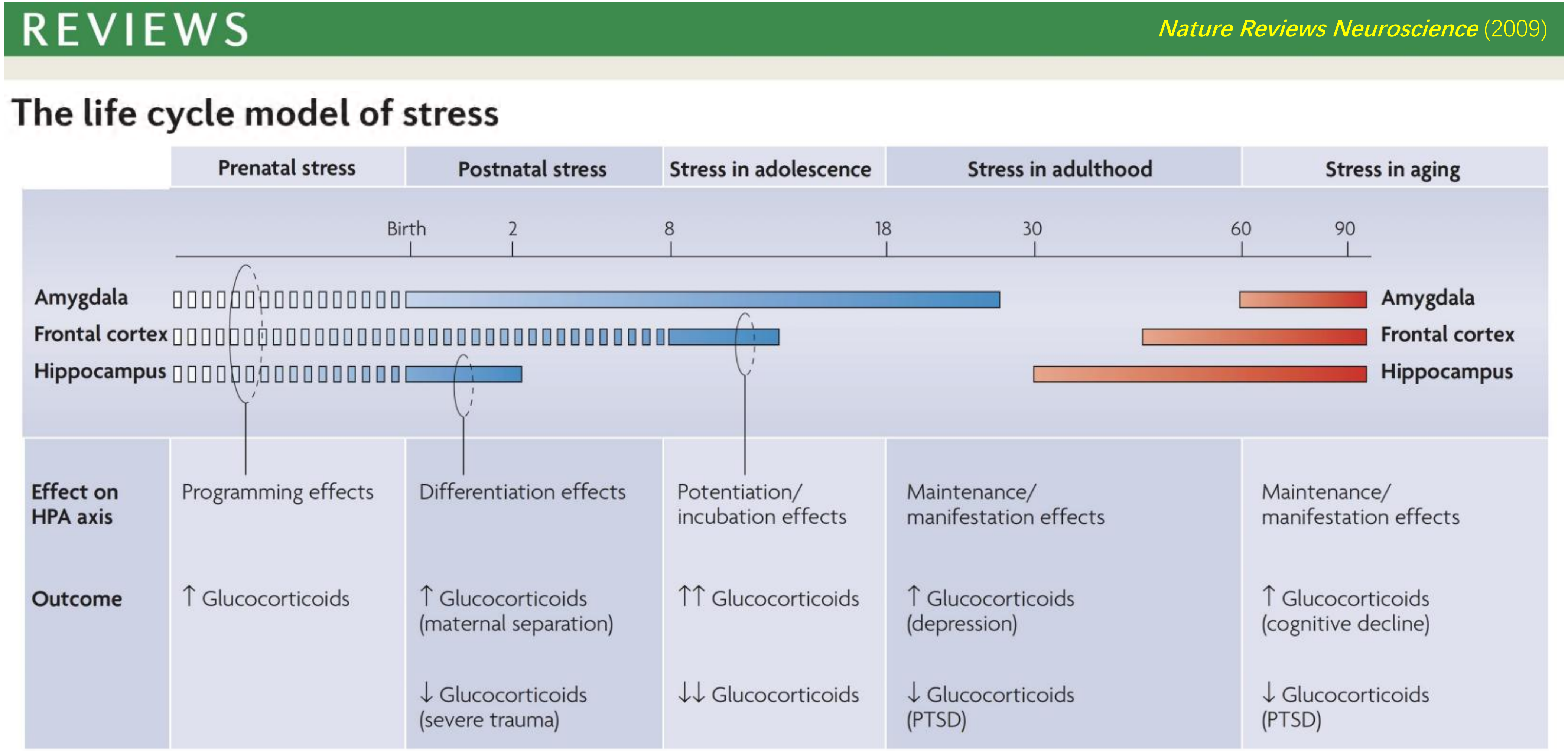
Lifespan Development: Population Neuroscience



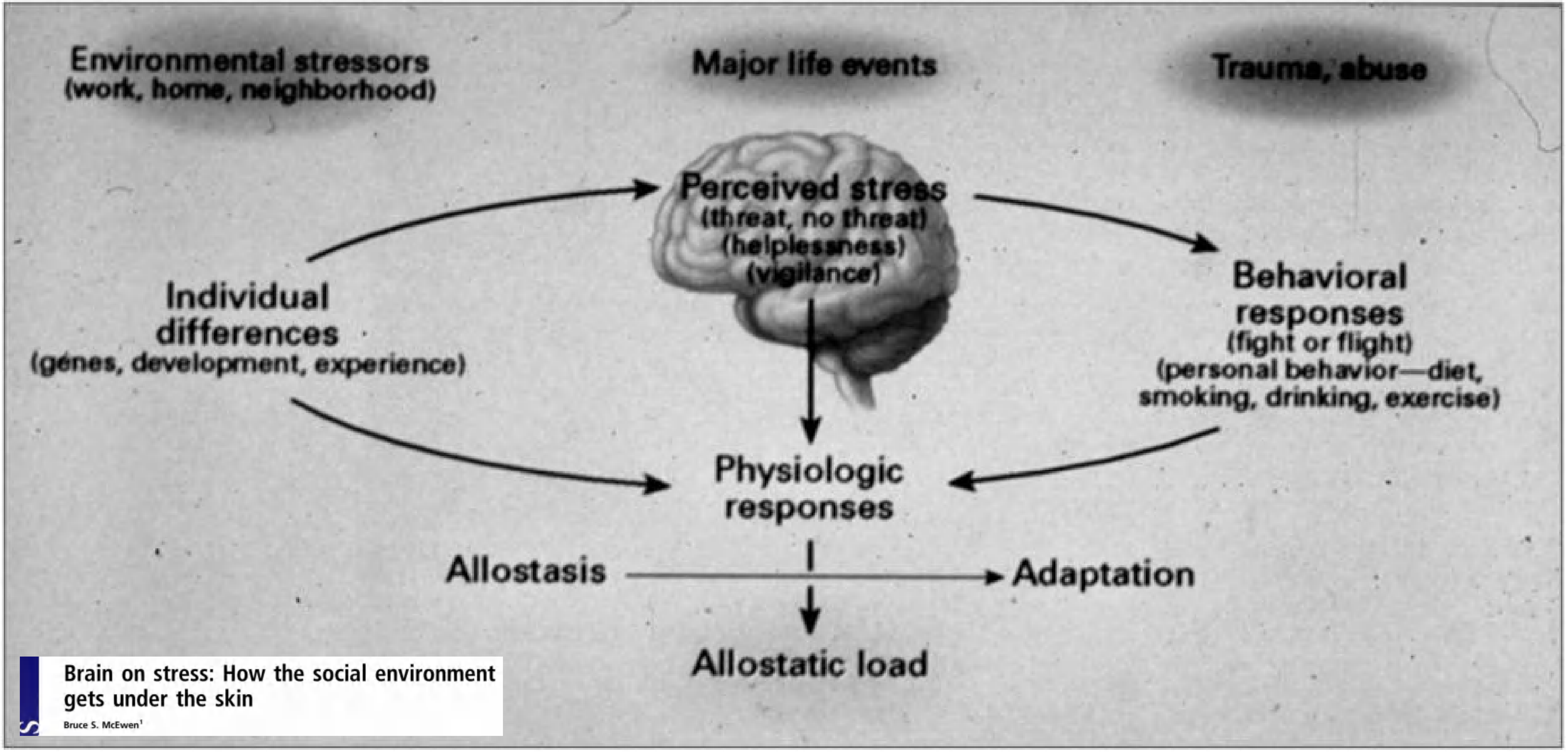


JAMA Psychiatry (2014); *Nature Reviews Neuroscience* (2009)

Lifespan Development: Multi-level Mechanisms



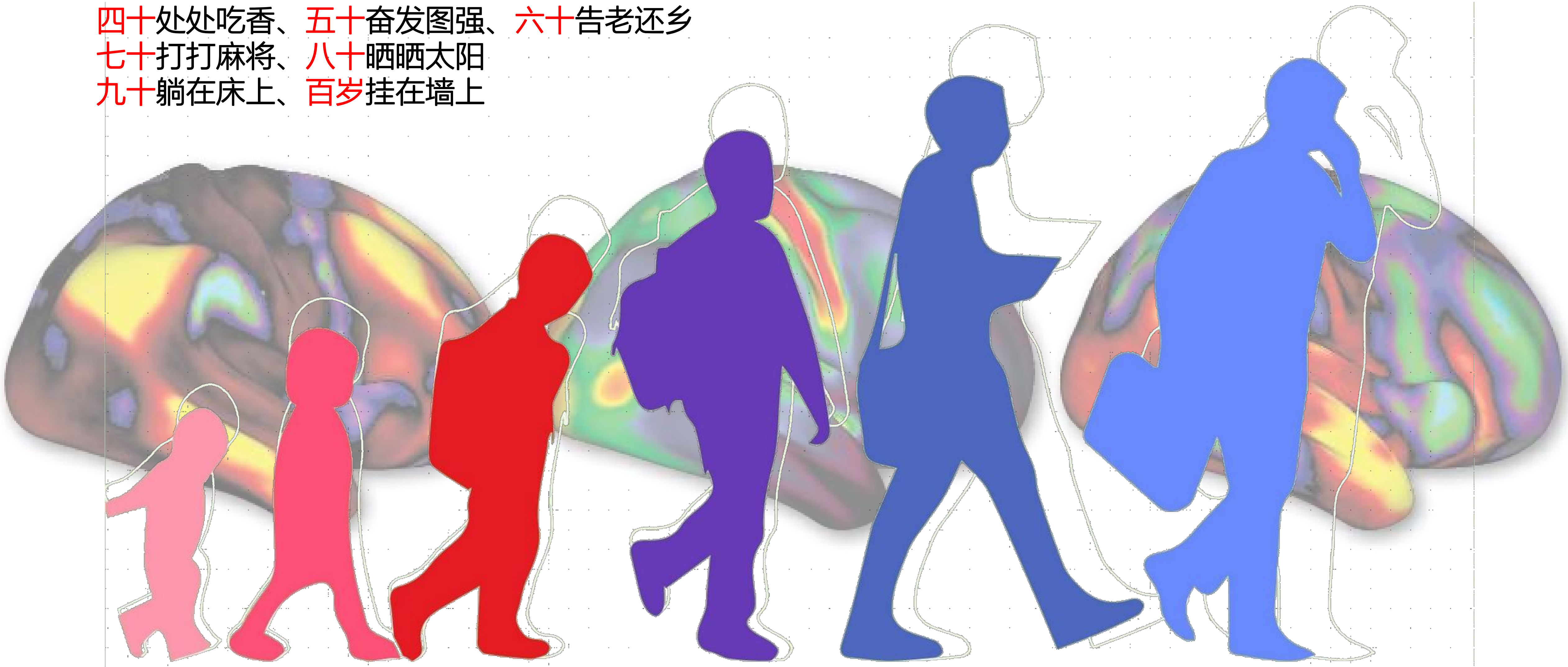
Lifespan Development: Multi-level Mechanisms



Brain Demography

Age

零岁出场亮相、十岁天天向上、二十远大理想、三十基本定向
四十处处吃香、五十奋发图强、六十告老还乡
七十打打麻将、八十晒晒太阳
九十躺在床上、百岁挂在墙上



Brain Demography

Age

一、古代女子1岁：牙牙

此时的属于刚出生的女子，还没有学会说话，但是有着极大的求知欲，已经可以跟着大人咿咿呀呀的开始学习如何说话，虽然此时的女子一句完整的话也说不出来，但是在母亲眼中却是全世界最可爱的小宝贝。

二、古代女子2-3岁：孩提

孩提之年就是指两到三岁之间的孩子，也是指还处于能跑与不能跑之间的年龄段，此时的女孩子跟男孩子之间的称谓是一样的。

孩提当中的提其实是指“用双手抓住小孩子的两腋之间，然后用力将其抱起来这个动作。”也可以被称之为“提孩”或“孩提包”等称谓。

三、古代女子7岁：童龀（chen）是四声哦

一般来说女孩子都要比男孩子长得稍微快一点点，所以女孩子在七个月的时候就会长出牙齿，而到了七岁那个正好又处于换牙的阶段，而男孩子论是长牙的时候还是换牙都要比女孩子慢上一个月至一年的时间。

这个年龄段我们会经常看到女孩子一张嘴，口中出现一到两个大窟窿，其实就是自己的乳牙正在更换的缘故。

四、古代女子8-12岁：总角

因为现代人对于小孩子的美定义为可爱与漂亮两个方面，所以我们会看到千奇百怪的各种女童发型，而在古代其实大多数女孩子为了方便，直接就会在头上梳成两个发髻，看起来就跟山羊头上的两个角一样，所以被称之为总角，也可以称之为儿童时代。

五、古代女子12岁：金钗之年

古代的女孩子到了十二岁的时候就要跟自己的儿童时代区分开来，因为此时的女孩子要学会如何来装扮自己了，比如说弄一个复杂的头型，再在上面插上各种各样的头饰金钗。

六、古代女子13岁：豆蔻年华

豆蔻也被称之为“含胎花”，也就是山姜花的别名，可以理解为含苞待放的花骨朵，在古代的时候就是形容已经到了可以被人提亲的年纪，说白了就是我家有女初长成，就等郎君上门提亲。

其实就是说在古代，女孩子到了这个年纪也就是到了思春的年龄段。

七、古代女子15岁：及笄之年（jiji）

这个年龄段可以说已经正式到了女孩子嫁人的年龄段，这个“笄”字，就是所谓的结发而用笄贯之，表示年已及笄，并且古代为了鼓励民间百姓早日成婚，所以到了十五岁还没有嫁出去的女孩子，从这一年开始之后，如果还没有嫁出去，就一直要缴纳沉重的罚款。

八、古代女子16岁：碧玉年华

碧玉年华又被称之为二八年华，也就是两个八加起来十六岁的意思，同时还有一种说法叫破瓜年华，主要是因为旧时的文人会将瓜字拆分为两个八字，碧玉年华之中充满着无数的幻想。

九、古代女子20岁：桃李年华

桃李年华大多是指女子脸若桃李，属于粉面朱唇，说白了就是形容这个年纪的女子美丽好看的词语而已，并没有太多的含义，就跟青春活力是一个道理。

Brain Demography

十、古代女子24岁：花信年华

花信年华就是指女子正处于年轻貌美的年龄段，可以说这个年纪的女子正是一生当中最耀眼的时刻，表示花朵经过这么多年的培养终于展现出自己最美的一刻。

十一、古代女子30岁：半老徐娘

此时的女子已经将自己最美好的一面展现给了世人，却也因为年华的逝去，被岁月所催惨，姿色已经大不如从前，大多数女子开始依靠各种的浓妆艳抹来维持自己的美丽，但是在卸妆之后却再也找不到以前的靓丽，但是却还保留着一些风韵，也被称之为风韵犹存。

十二、古代女子40岁：人老珠黄

一般来说古代女子到了这个年龄段，几乎已经走到了下坡路，毕竟古代的女子地位本身就不高，大多数女人能得到自己的相公宠爱，无非是年轻貌美，尤其是在古代三妻四妾这样的情况下，如果没有一男半女，很可能生活就快要过不下去了。

大多数都会用“美人迟暮，人老珠黄”来形容古代四十岁的女子，毕竟古代跟我们现代相比，没有这么多化妆品，再加上保养方面更是无法跟现代相提并论，所以当古代女子四十来岁的时候，看起来相当的面老。

十三、古代女子50岁：知命之年

到了这个岁数的女子，一般都已经对自己的整个人生了解的相当透彻，毕竟自己的前五十年是怎么过的，自己是一定清楚的，再加上古代人的寿命因为各种原因大多数都不高，所以能活到五十岁的年纪，已经属于命好之人。

十四、古代女子60年：花甲之年

其实花甲这个词不光是形容古代女子，可以说是男女通用，在古代一般是以六十年为一个纪年，也可以被称为一甲子，所以但凡能活六十岁的老人，都被称为花甲之年。

十五、古代女子70年：古稀之年

人生七十古来稀，就是这么一个说法，意思就是人的年纪能活到七十岁已经属于相当稀少的那一部分，毕竟以古代的那种生活条件，普通人能活到七十岁已经是上辈子烧过多少高香才得到的福气。

十六、古代女子80-90岁：耄耋之年

当古代到了这个年纪一般会有两种说法，一种就是儿女们希望自己的长辈可以更加长寿，耄耋其实还有延长的意思。而另一种就不太好听了，如果运气好的话，这个年纪的人儿女都还在，也许还可以得到儿女们的赡养，可假如自己的儿女已经不太世了，孙子辈可能就会出现隔辈这种情况，毕竟亲情已经差了一辈人，再加上孙子辈的兄弟姐妹又分布众多，所以大家对于养老这种事会相当的抵触。

然后就会有人常常说耄耋之年的人都是一些土已经埋到了脖子的人，每天还这么硬撑什么。

十七、古代女子100岁：期颐之年

到了这个年纪就不一样了，毕竟百岁是一道坎，八九十岁的老人可能子孙辈不太代见，可是到了一百岁以上直接就相当于长寿的标准了，可以被称之为典型，表示自家人当中有着长寿之人，也就是说以后自己也是有可能达到这个长寿的标准。

所以到了这个年龄段，无论是子孙辈还是再往下一辈人都会出人出力来赡养老人，说白了这就已经达到了奇迹的地步，中国从古至今能真正活到百岁以上的老人屈指可数。

Brain Demography

Age

The pattern of human growth

Noël Cameron

Centre for Global Health and Human Development, School of Sport, Exercise and Health Sciences, Loughborough University, Leicestershire, United Kingdom

Introduction

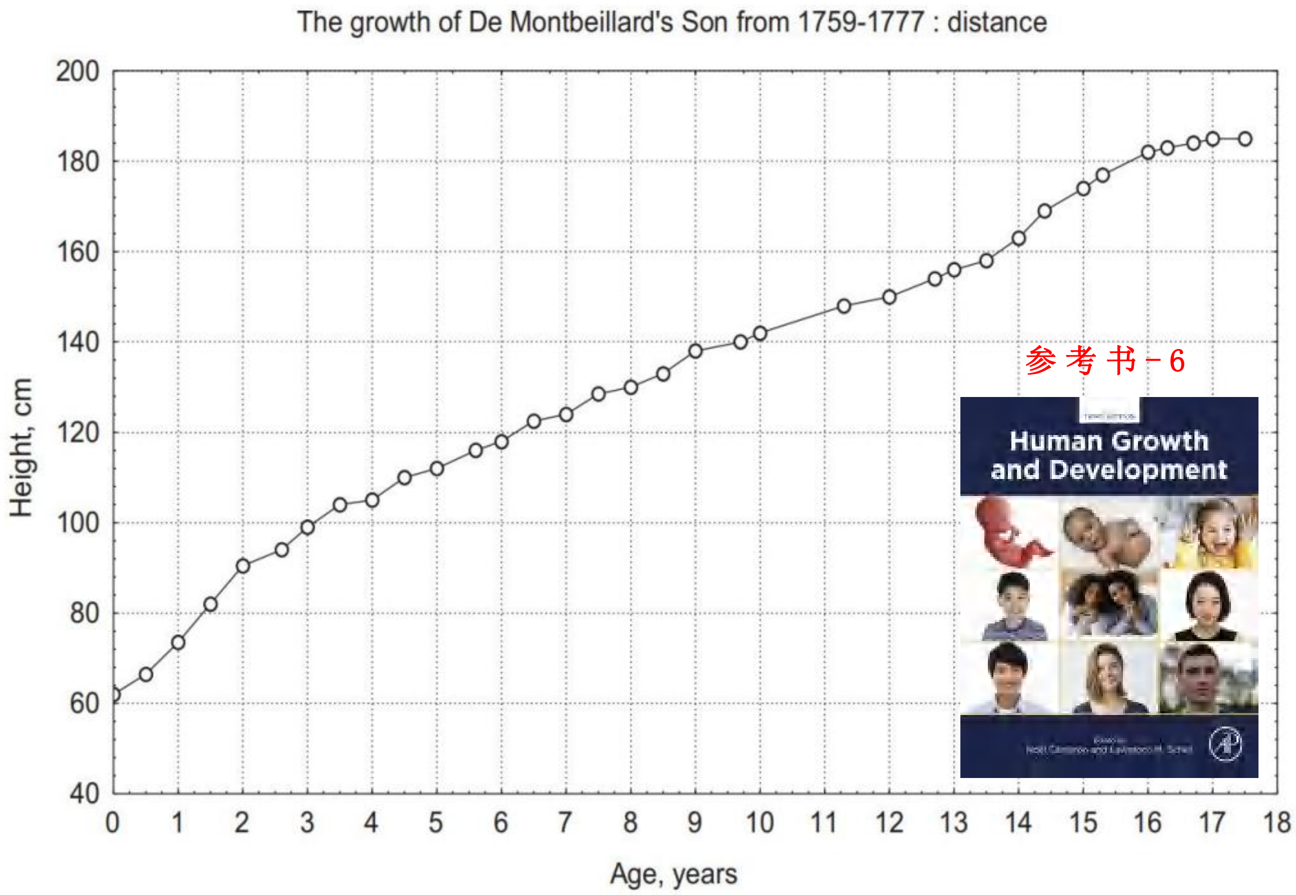
Human growth and development are characterized and defined by the way in which we change in size, shape, and maturity relative to the passage of time. It has been more common for the size of children to be assessed for reasons of classification and organization that requires assessment at certain ages for specific reasons. However, the first longitudinal record we have of the growth of a child *was* the result of a desire to apply scientific method to the natural world.

Historical background

The pursuit of natural science, and in particular the elucidation of the pattern of human growth, has its origins in the "Age of Enlightenment" in 18th century France. Between the death of Louis XIV in 1715, and the coup d'état of the November 9, 1799 that brought Napoleon Bonaparte to power, philosophy, science and art were dominated by "The Enlightenment"; a movement away from religious and monarchical authority and dogma and toward a more liberal and empirical attitude.[1] The natural scientists and philosophers of the Enlightenment believed that people's habits of thought were based on irrationality, polluted by religious dogma, superstition, and over-adherence to historical precedent and irrelevant tradition. The way to escape from this, to move forward, was to seek for true knowledge in every sphere of life, to establish the truth and build on it. People's minds were, literally, to be "enlightened".[2] Its primary impulse was in pre-Revolutionary France within a group of mostly aristocratic and bourgeois natural scientists and philosophers that included Rousseau, Voltaire, Diderot and Georges Louis LeClerc, the Compte de Buffon (Fig. 1.1). Their contributions to Diderot's Encyclopedia — the first literary monument to the Enlightenment — earned them the collective title of "the Encyclopedists".

Georges Louis LeClerc was born on September 7, 1707 at Montbard in Bourgogne, Central France. His father, Benjamin-Francois LeClerc, described by the biographer

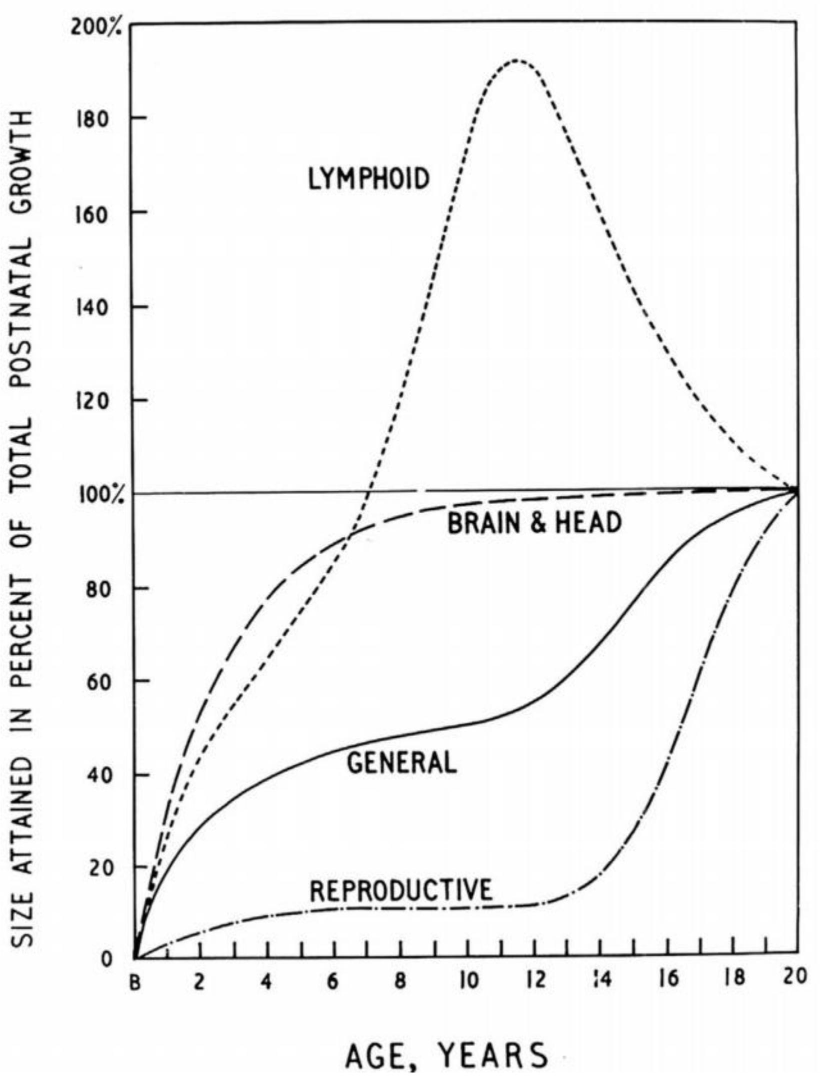
Human Growth and Development. https://doi.org/10.1016/B978-0-12-822652-0.00004-3

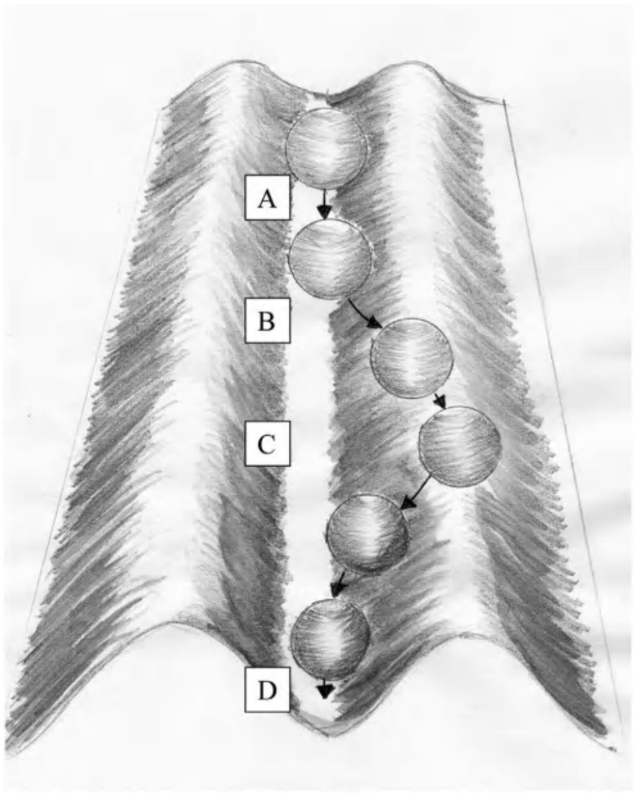


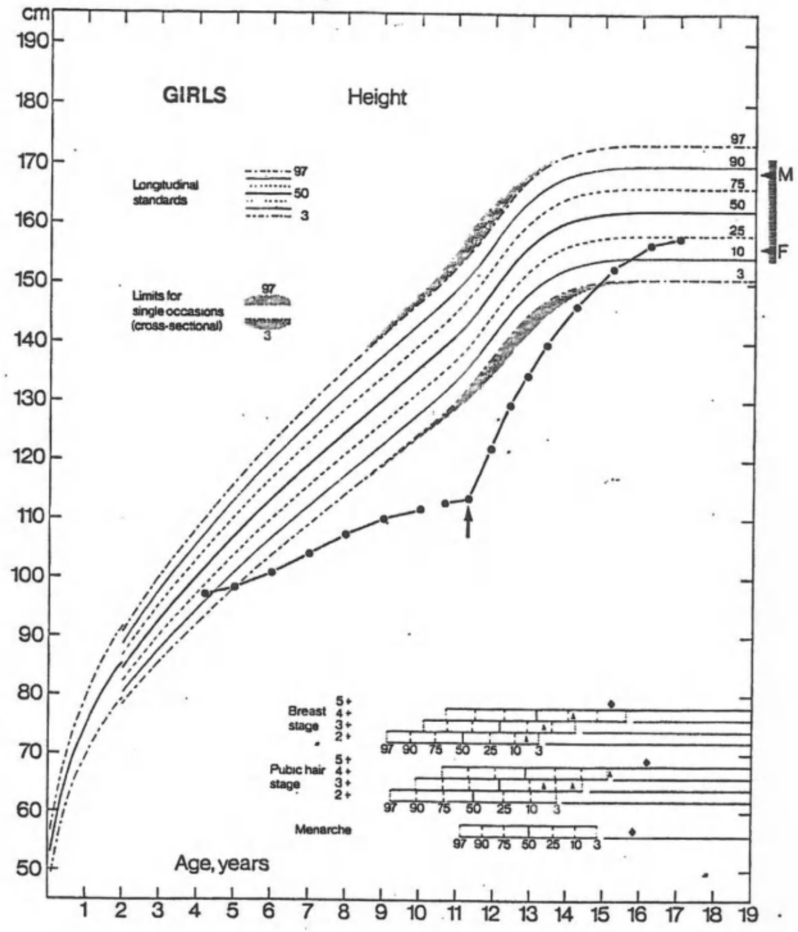
参考书－6

Fig. 1.2
The growth of François De Montbeillard 1759—77: distance. *Redrawn from Tanner JM.* Growth at Adolescence. *2nd ed. Oxford: Blackwell Scientific Publications; 1962.*

Brain Demography







Brain Demography

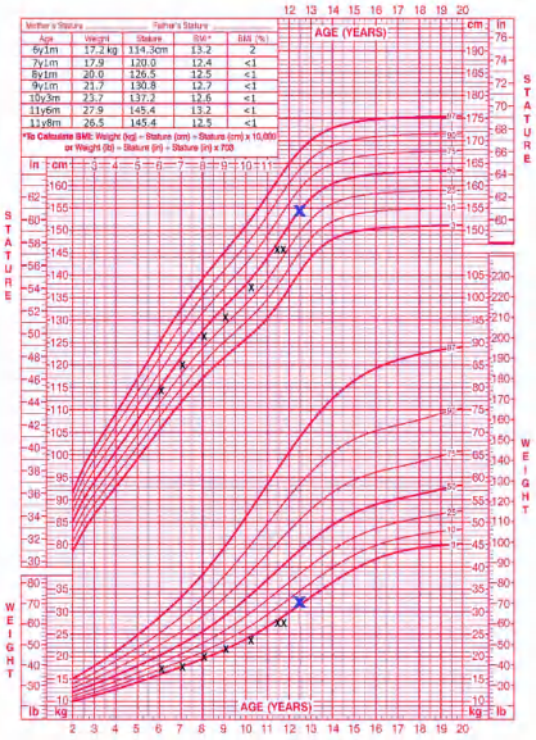
Age

JAMA PEDIATRICS PATIENT PAGE

World Health Organization

Growth and Growth Charts in Children

Growth is a result of your child's genetics, environment, and culture.



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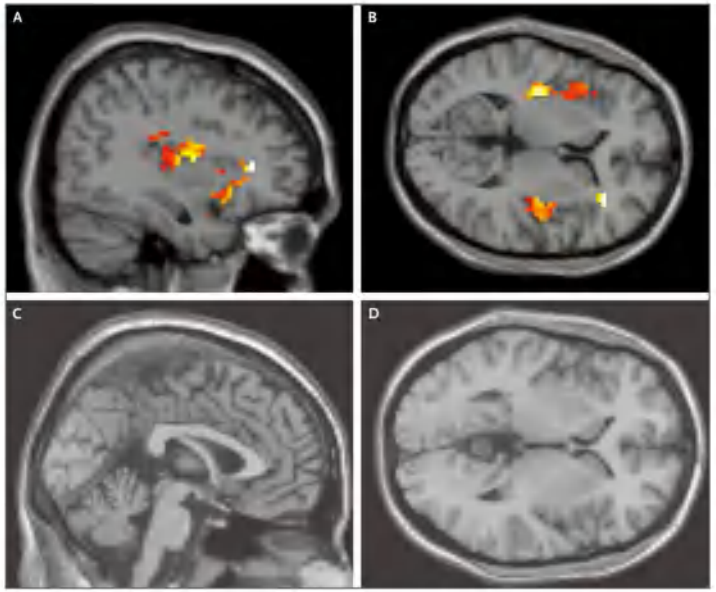
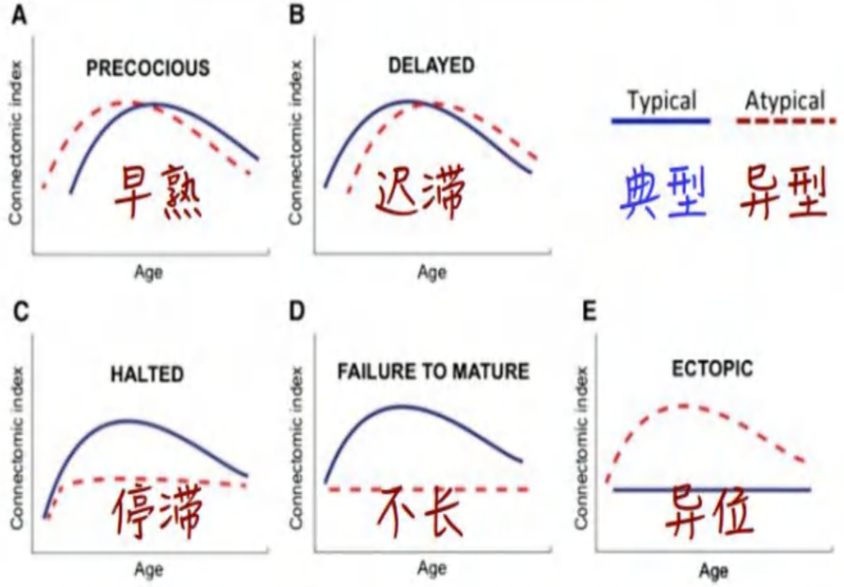
回避-限制性摄食障碍



REVIEW

Neuroimaging brain growth charts: A road to mental health

Li-Zhen Chen[1], Avram J. Holmes[2,3], Xi-Nian Zuo[1,4,5,6,*] and Qi Dong[1]

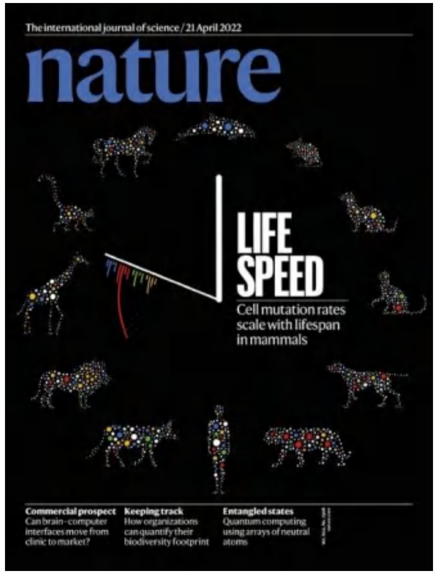


1、理解大脑结构功能；2、监测大脑发育进程
3、识别大脑发育异常；4、诊断大脑发育疾病
5、跟踪临床干预疗效；6、改革脑病临床实践

Brain Demography

Age

- > 100 datasets
- > 100k participants
- > 120k samples
- Ages: 115 days - 100 years
- Team work
- Open science
- Reproducibility



Brain Charts for The Human Lifespan; *Nature* (2022) **604**:525-533 (https://www.brainchart.io)

Brain Demography

FreeSurfer

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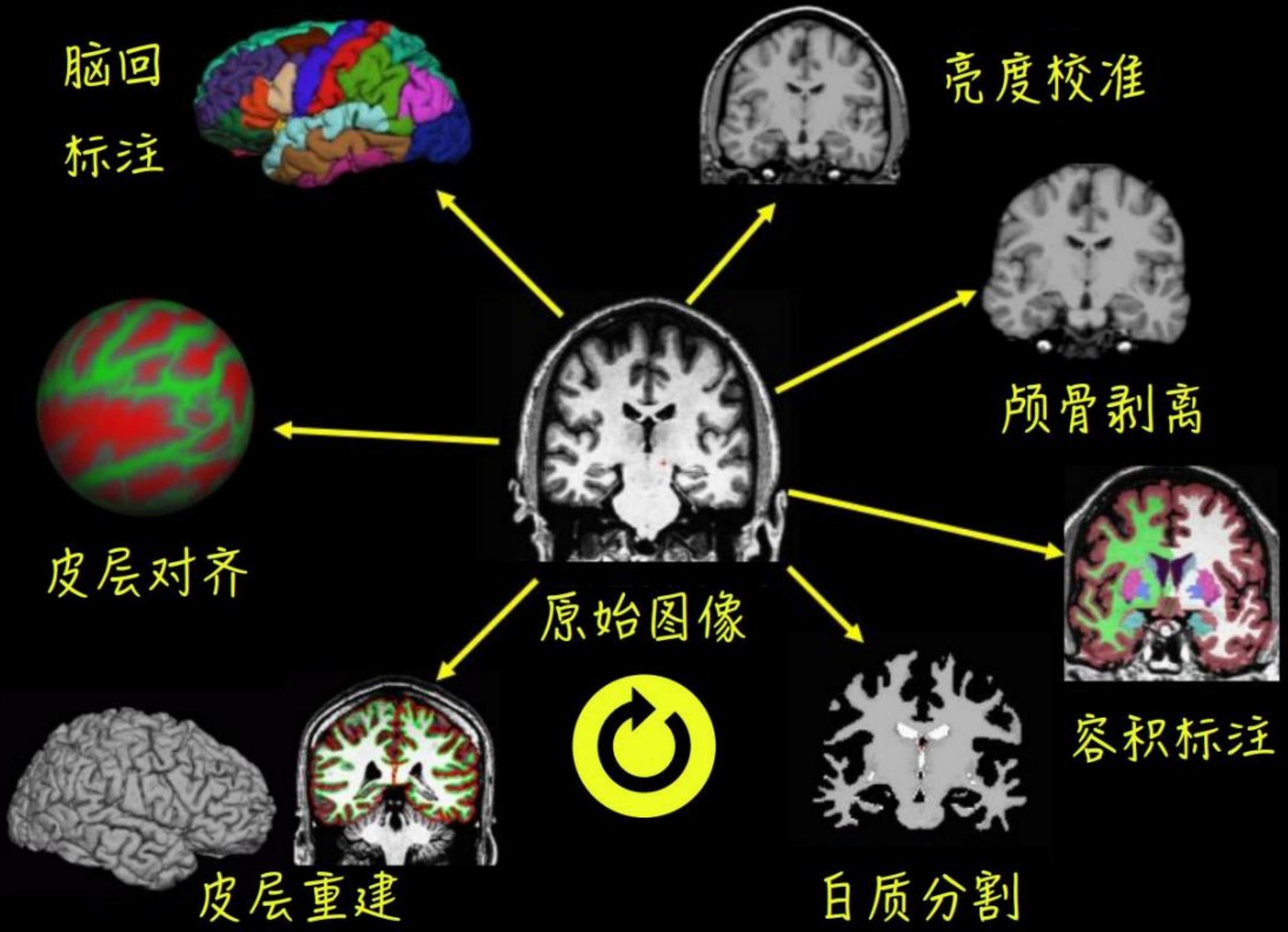
https://surfer.nmr.mgh.harvard.edu

FreeSurfer software suite

An open source neuroimaging toolkit for processing, analyzing, and visualizing human brain MR images

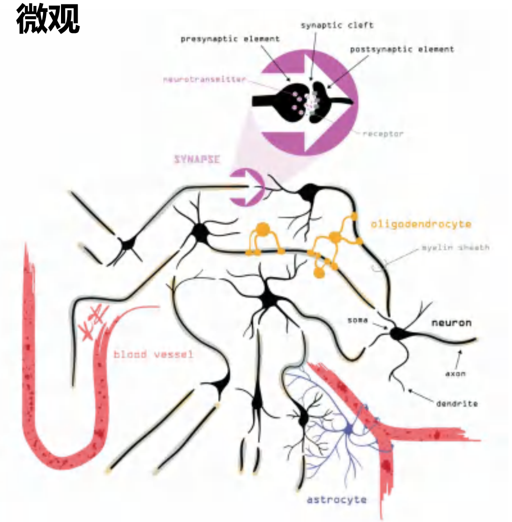
Visit the Wiki

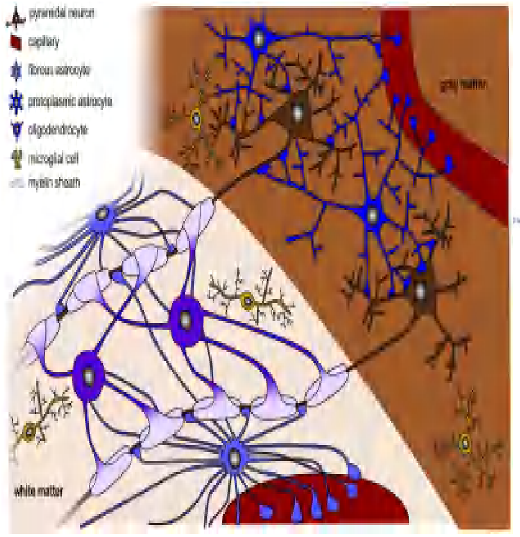


Brain Demography

Age

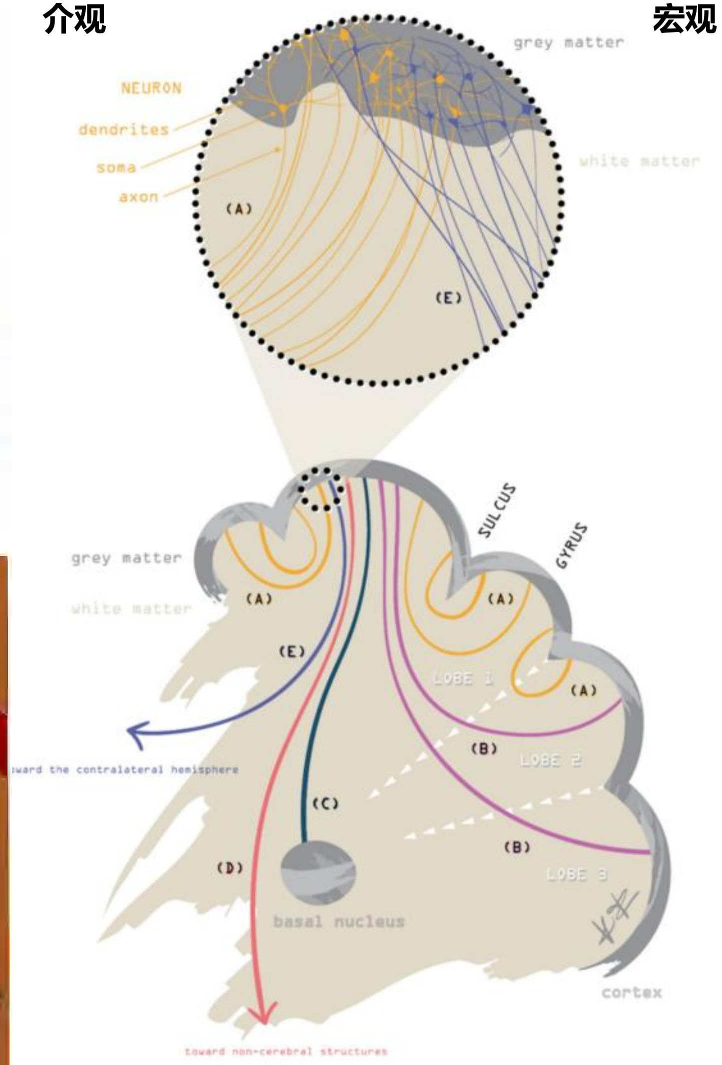
微观

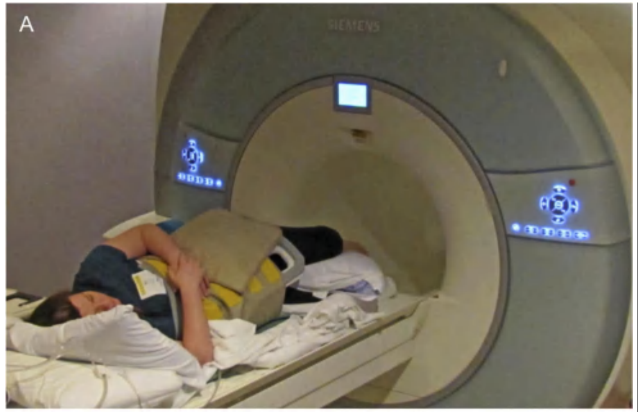


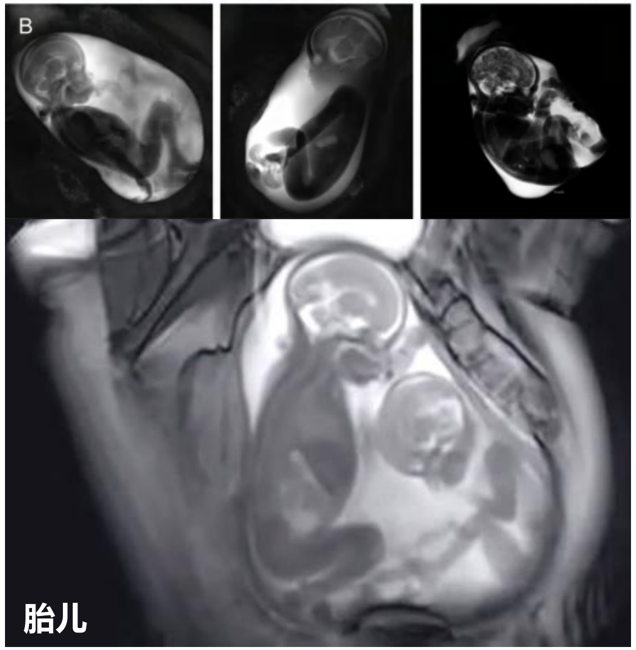


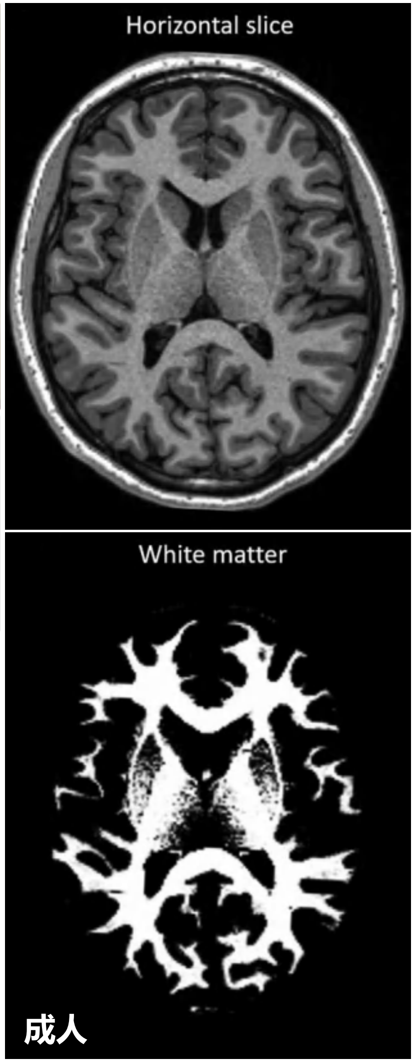
介观

宏观



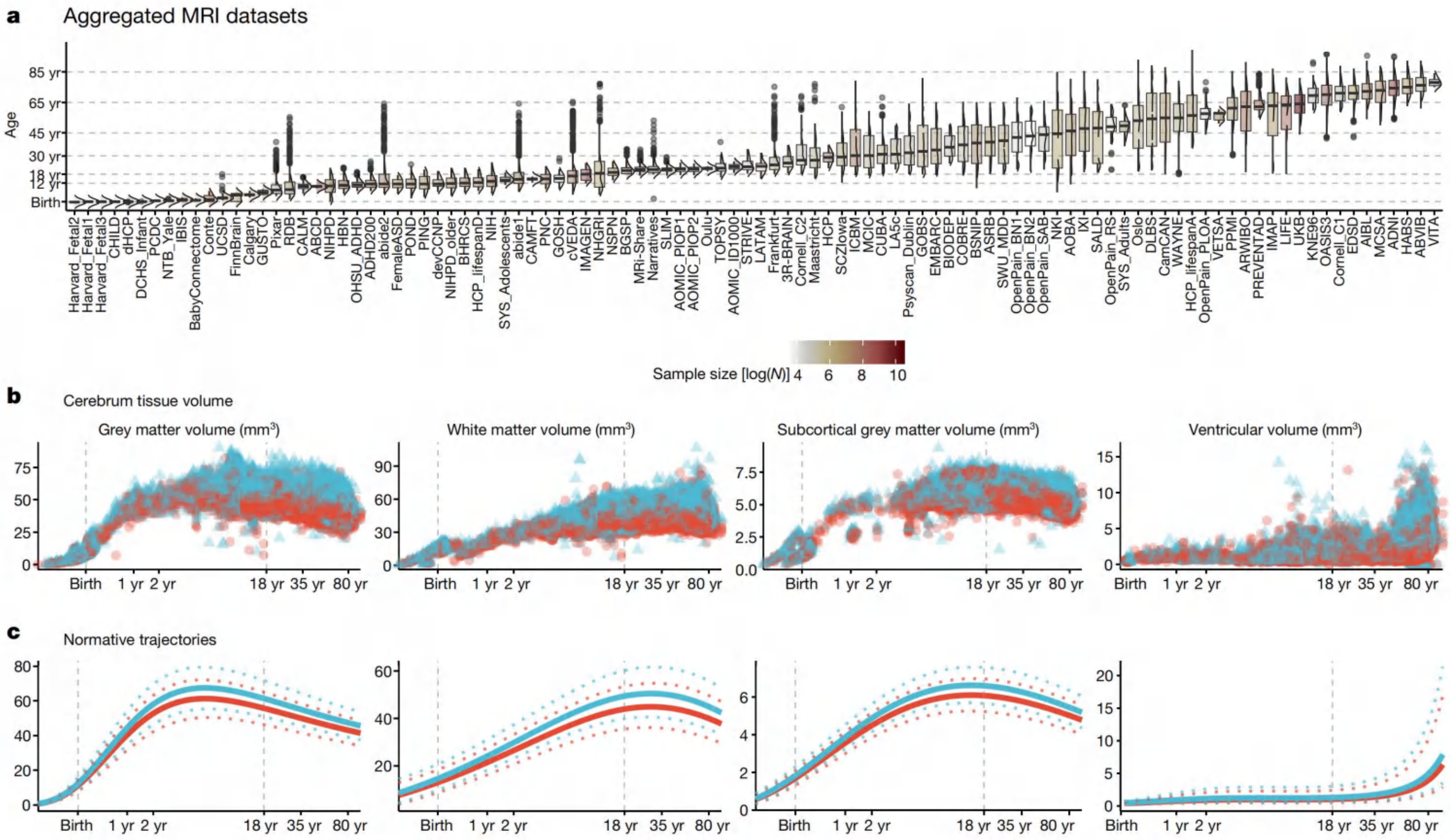






Brain Demography

Age



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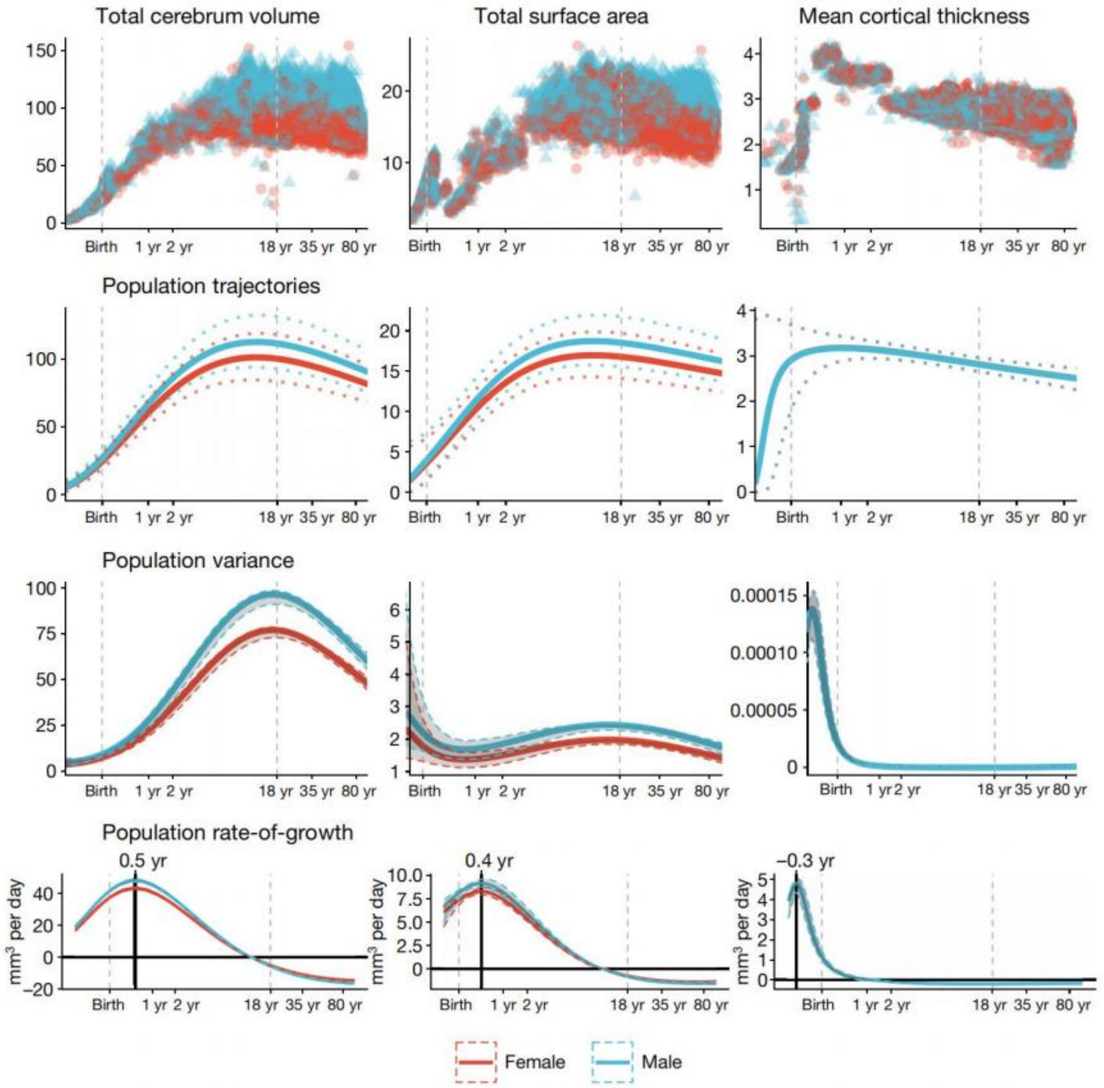
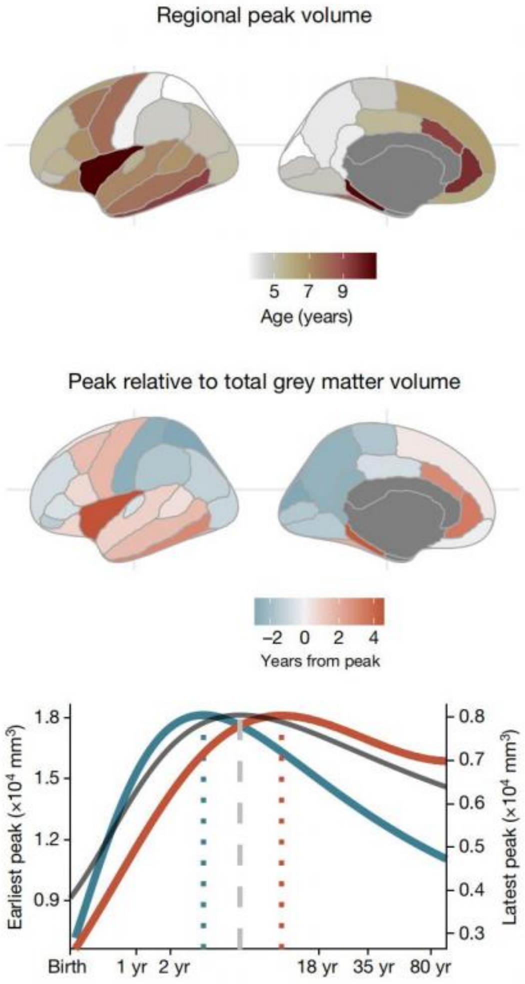
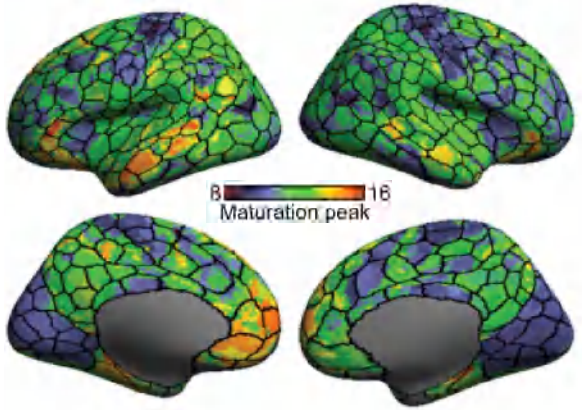
Brain Demography

Age







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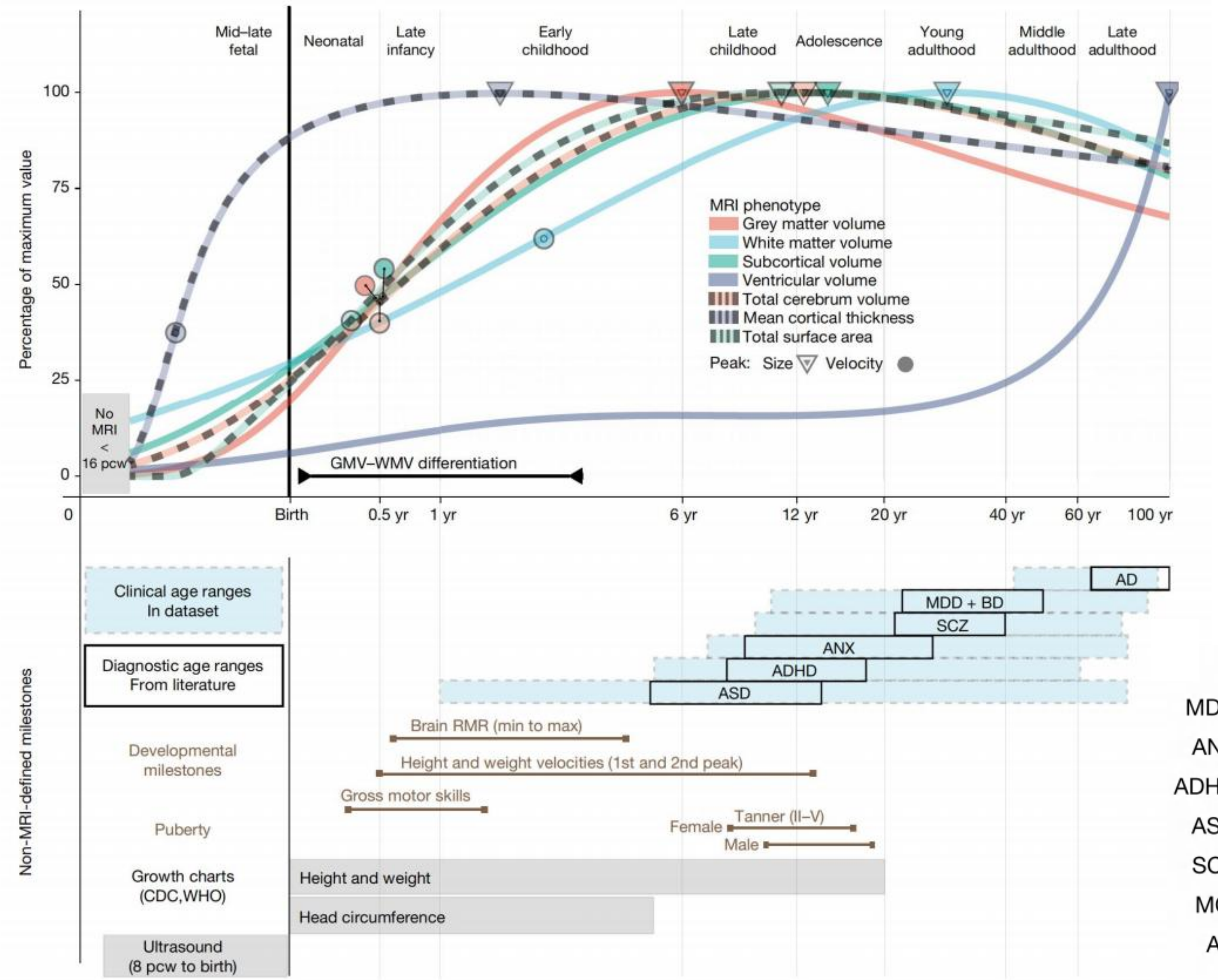

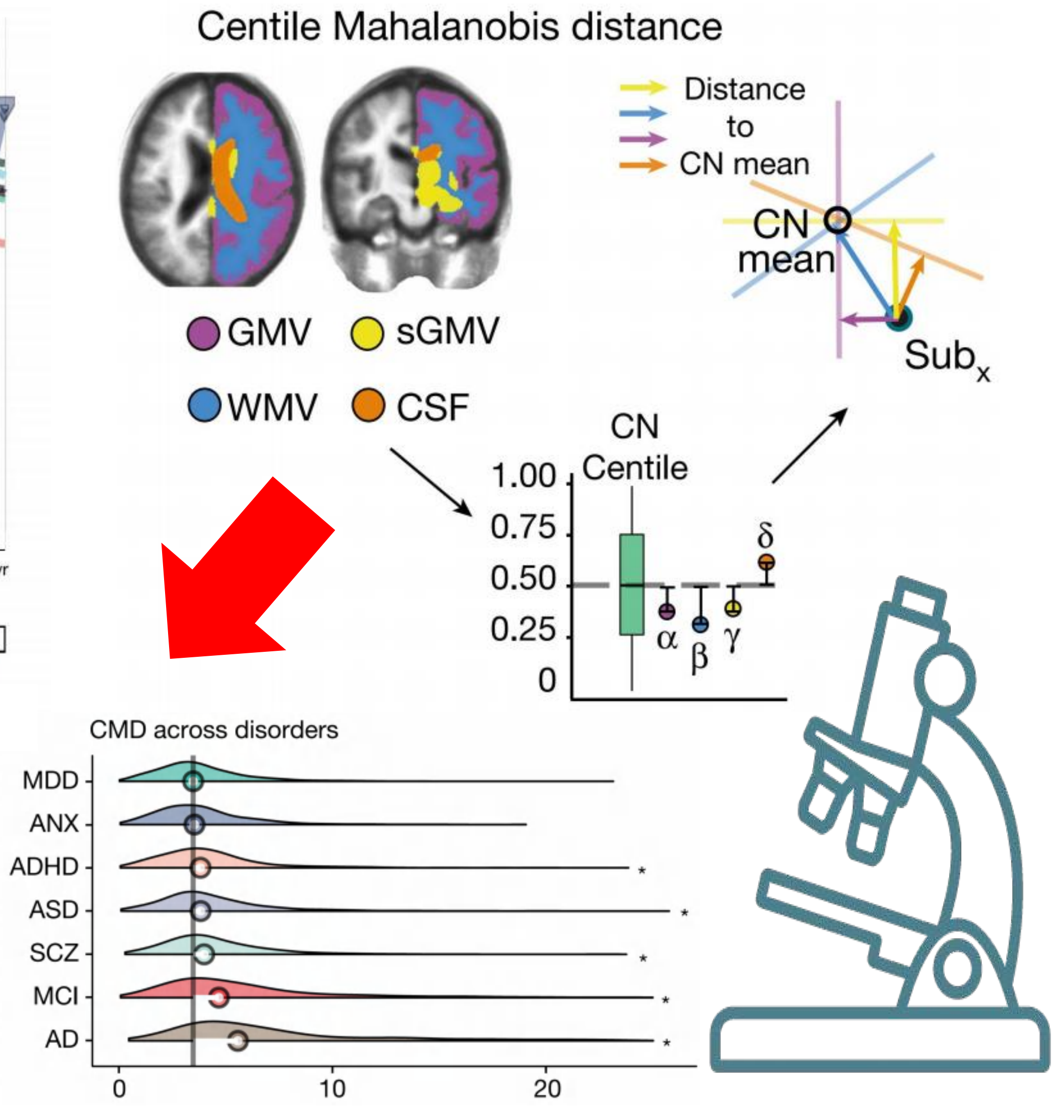

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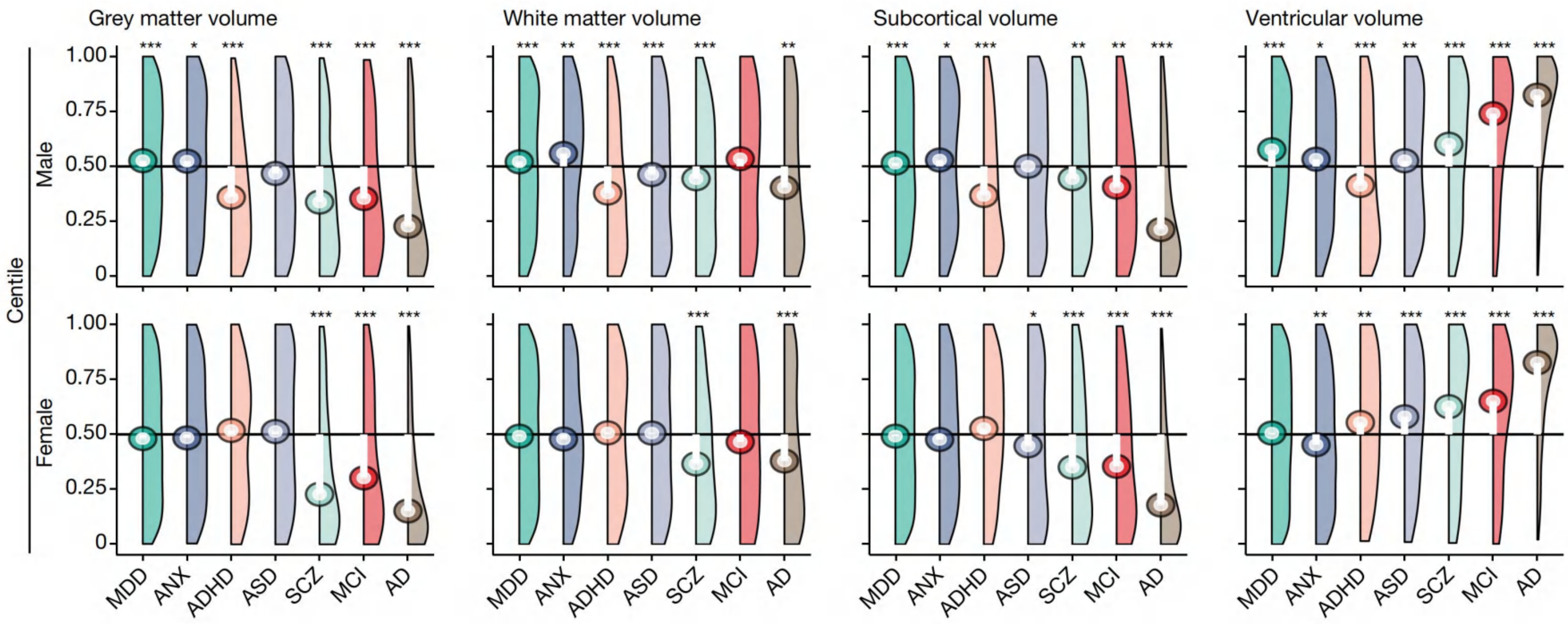

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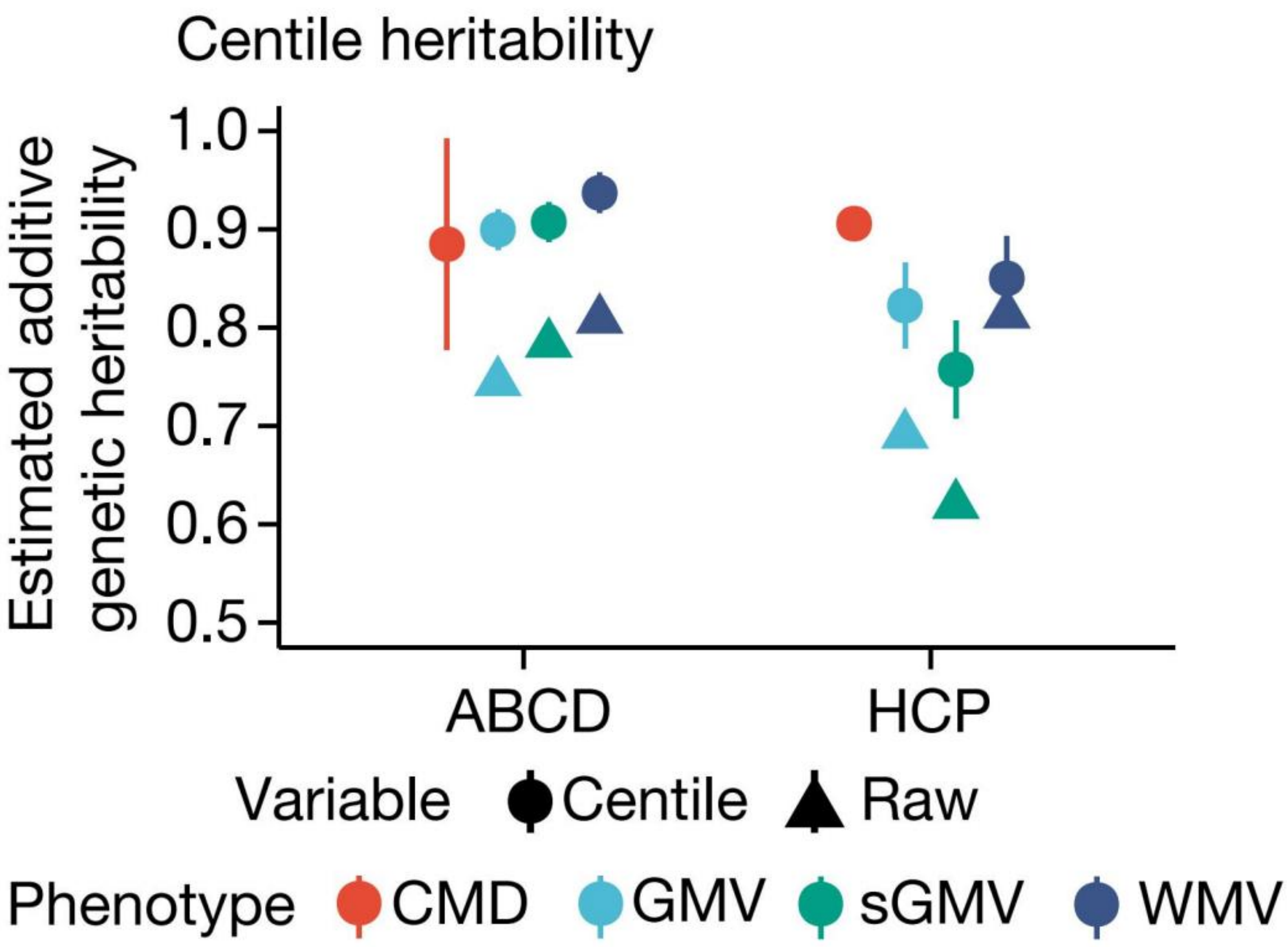

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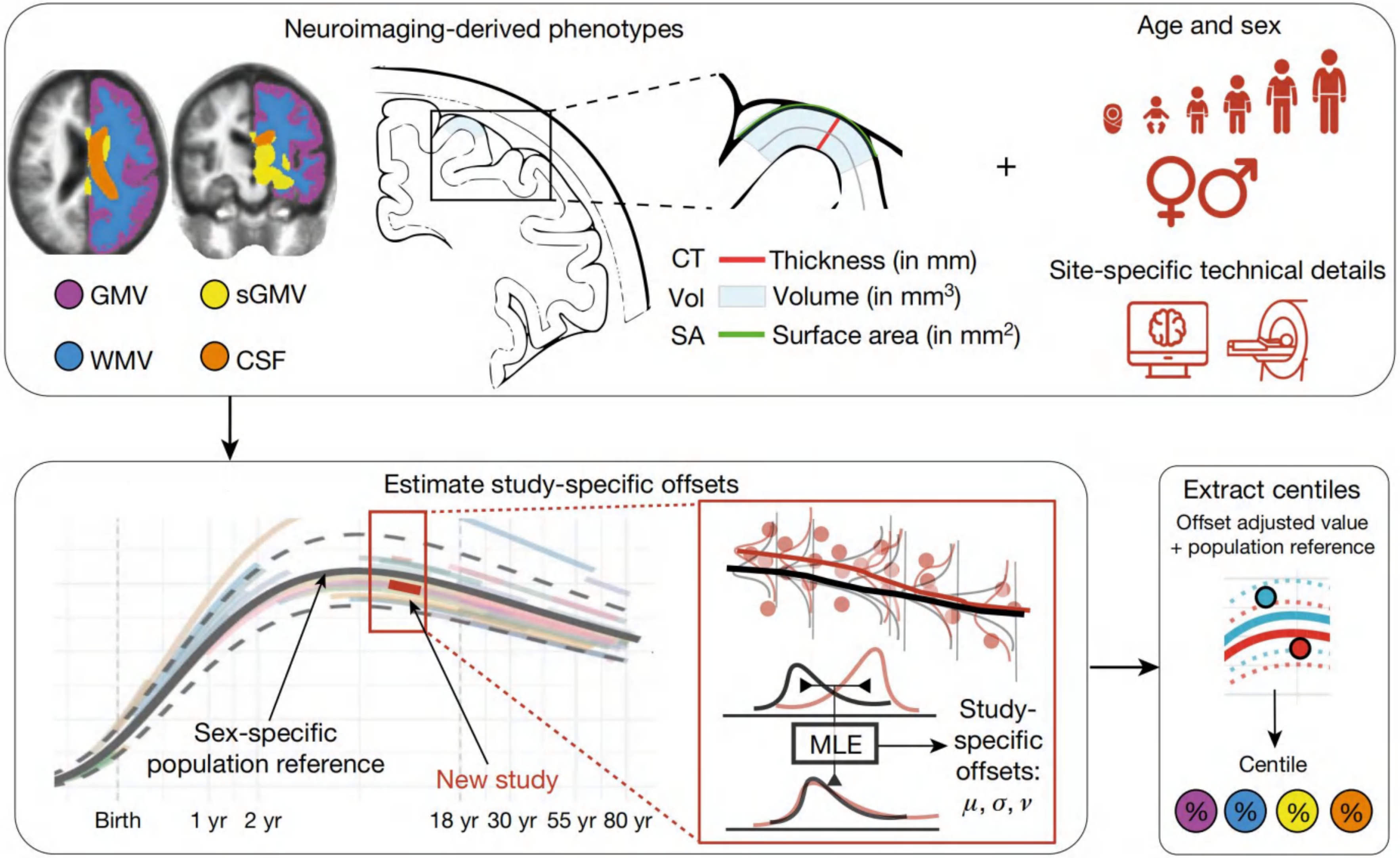

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Brain Demography

Age

Article

Brain charts for the human lifespan

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Over the past few decades, neuroimaging has become a ubiquitous tool in basic research and clinical studies of the human brain. However, no reference standards currently exist to quantify individual differences in neuroimaging metrics over time, in contrast to growth charts for anthropometric traits such as height and weight[1]. Here we assemble an interactive open resource to benchmark brain morphology derived from any current or future sample of MRI data (http://www.brainchart.io/). With the goal of basing these reference charts on the largest and most inclusive dataset available, acknowledging limitations due to known biases of MRI studies relative to the diversity of the global population, we aggregated 123,984 MRI scans, across more than 100 primary studies, from 101,457 human participants between 115 days post-conception to 100 years of age. MRI metrics were quantified by centile scores, relative to non-linear trajectories[2] of brain structural changes, and rates of change, over the lifespan. Brain charts identified previously unreported neurodevelopmental milestones[3], showed high stability of individuals across longitudinal assessments, and demonstrated robustness to technical and methodological differences between primary studies. Centile scores showed increased heritability compared with non-centiled MRI phenotypes, and provided a standardized measure of atypical brain structure that revealed patterns of neuroanatomical variation across neurological and psychiatric disorders. In summary, brain charts are an essential step towards robust quantification of individual variation benchmarked to normative trajectories in multiple, commonly used neuroimaging phenotypes.

Corrections & amendments

Publisher Correction: Brain charts for the human lifespan

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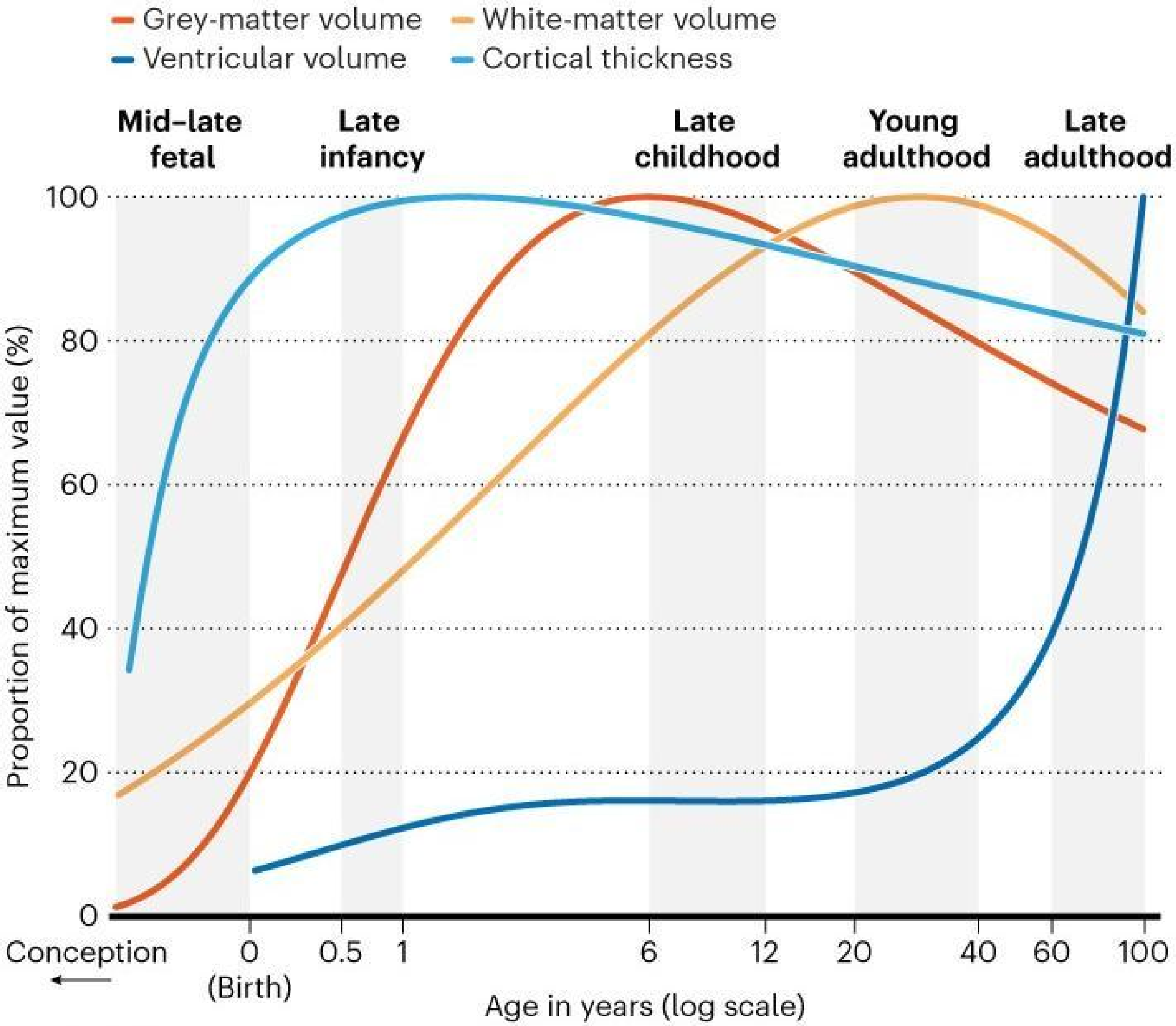
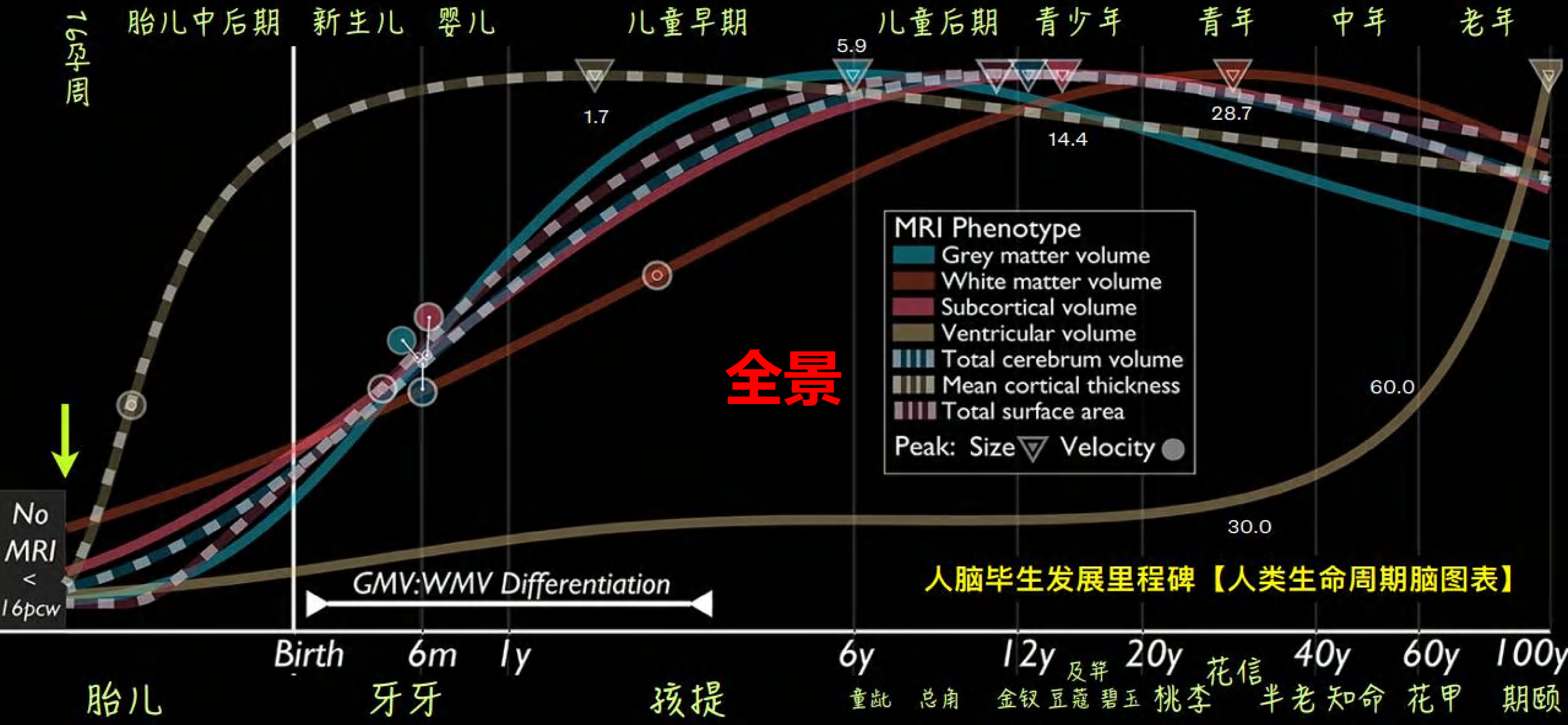


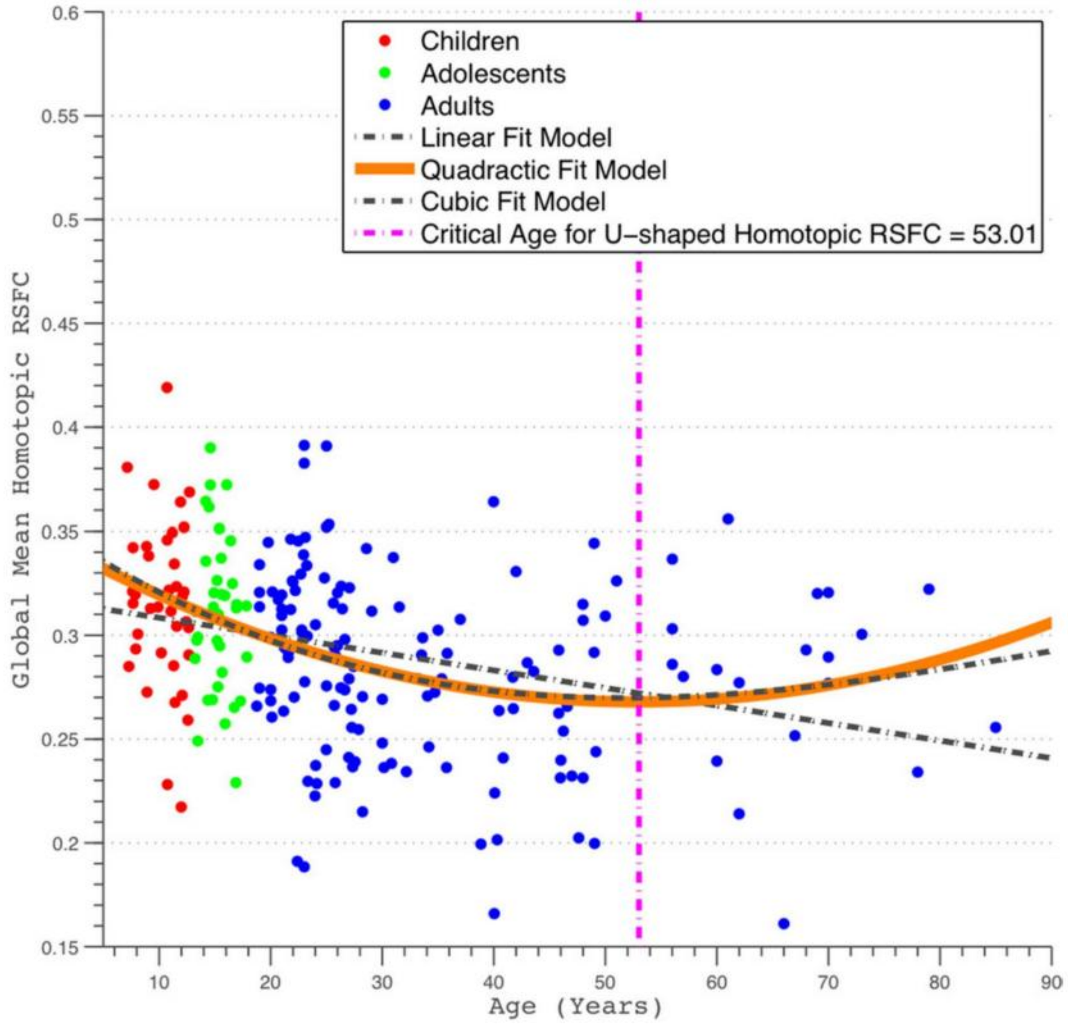
Brain Charts for The Human Lifespan; *Nature* (2022) **604**:525-533 (https://www.brainchart.io)

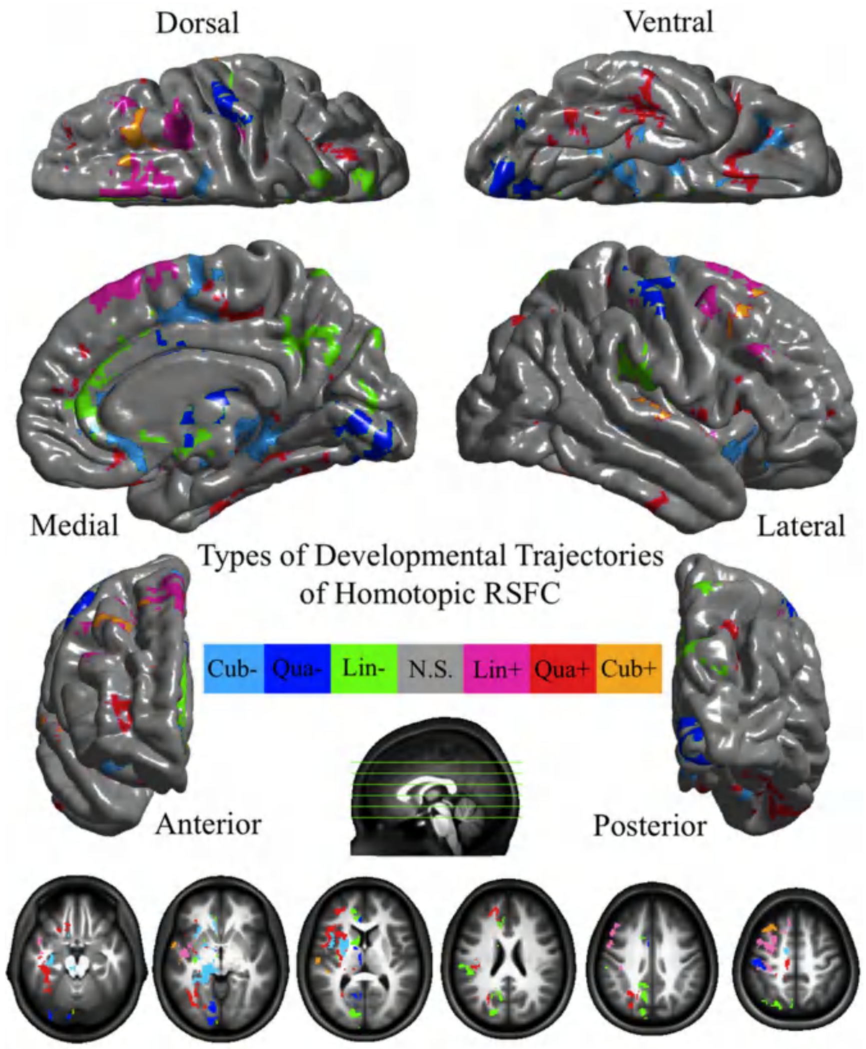
Brain Demography Age



Brain Charts for The Human Lifespan; *Nature* (2022) **604**:525-533 (*http://deepneuro.bnu.edu.cn/?p=625*)

Brain Demography

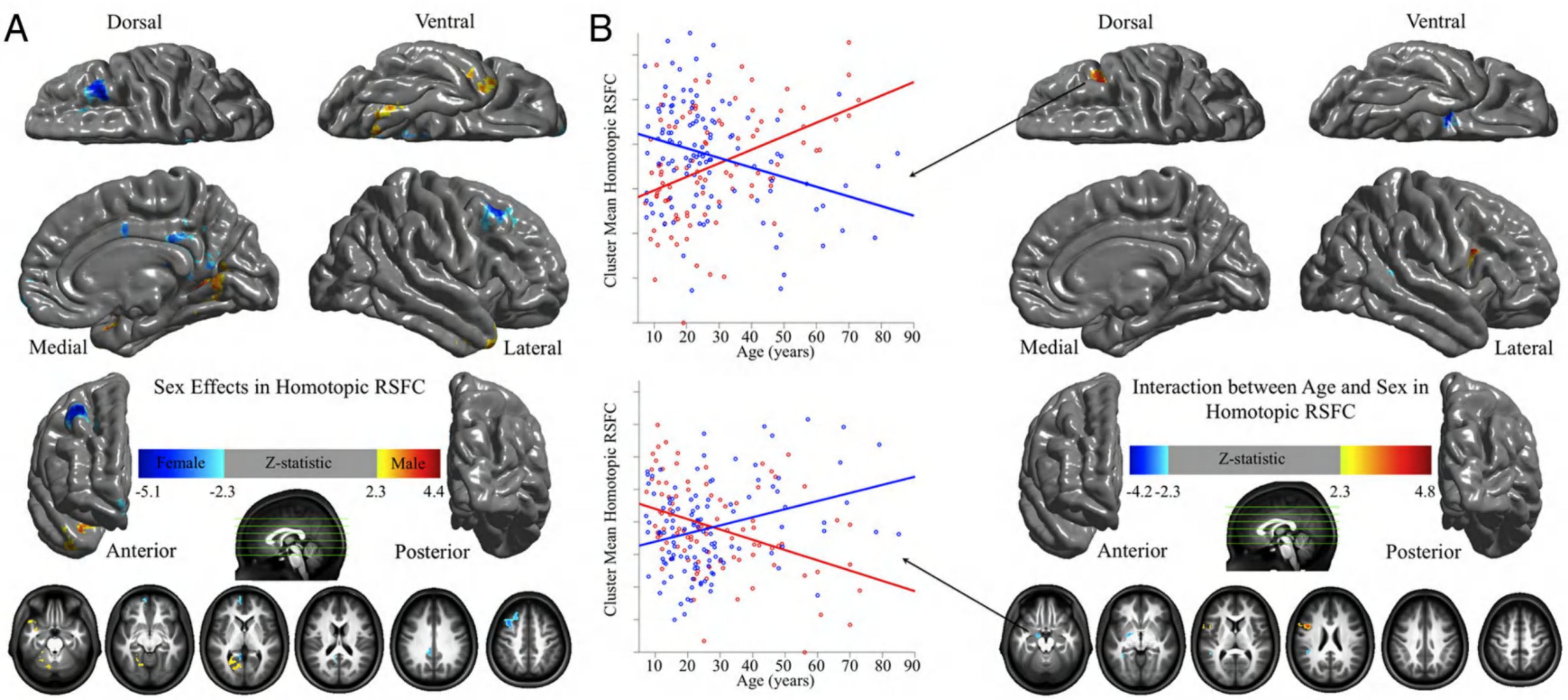




The Journal of Neuroscience (2010) **30**:15034-15043

Brain Demography

Sex



The Journal of Neuroscience (2010) **30**:15034-15043

Brain Demography

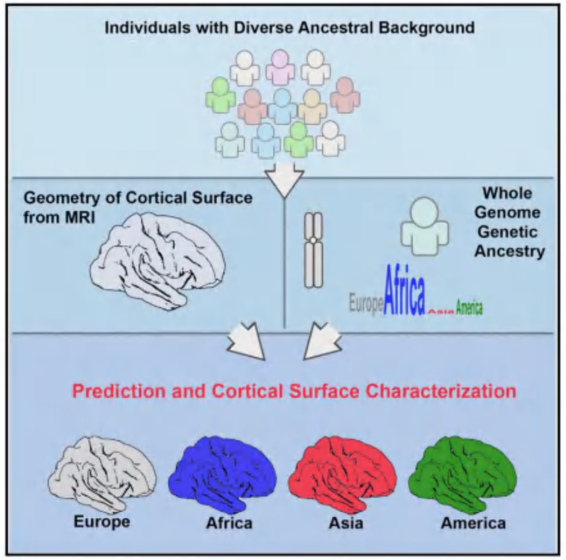
Ethnicity

Report

Current Biology

Modeling the 3D Geometry of the Cortical Surface with Genetic Ancestry

Graphical Abstract



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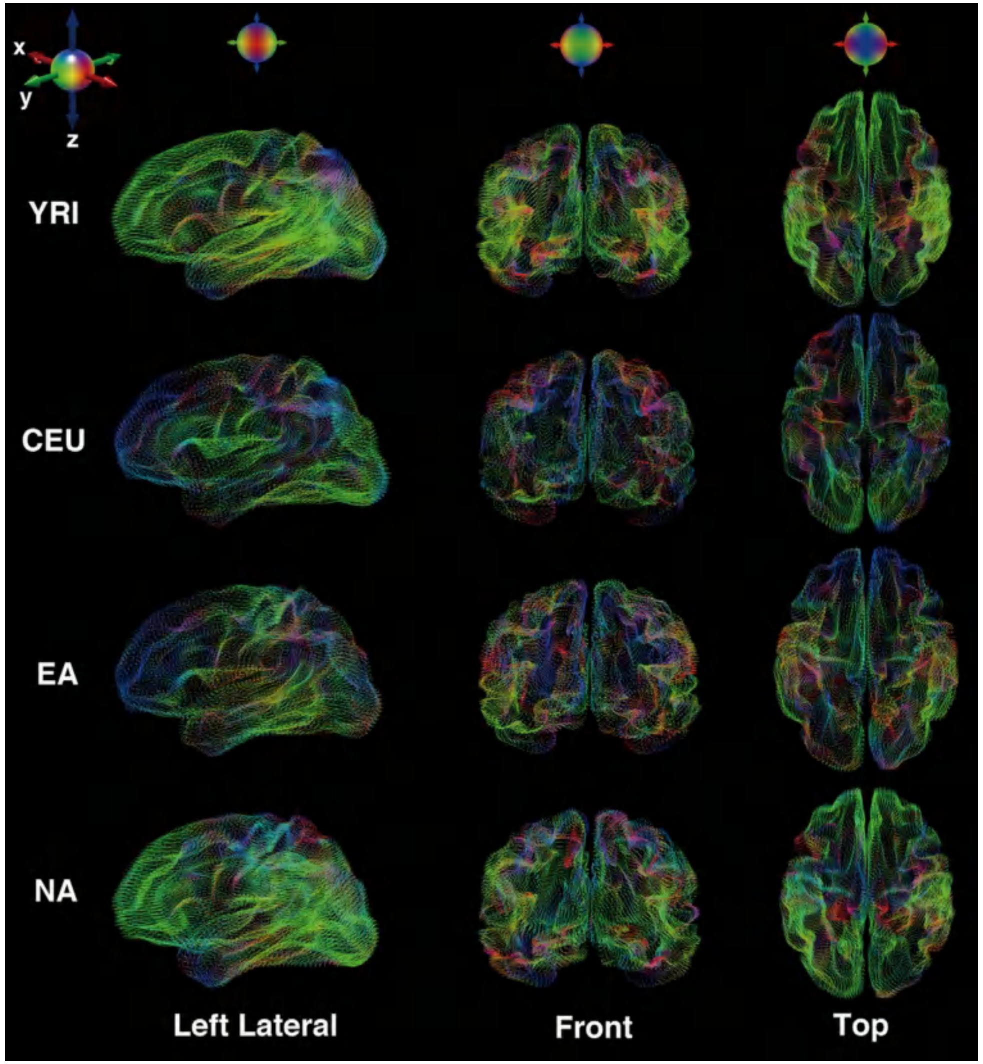
In Brief

Fan et al. show that human cortical surface robustly predicts an individual's genetic ancestry despite that populations have been shaped by waves of migrations and admixture events. For each continental ancestry, the regional patterns of cortical folding and gyrification are unique and complex.

Highlights

- Geometry of the human cortical surface contains rich ancestral information
- The most informative features are regional patterns of cortical folding and gyrification
- This study provides insight on the influence of population structure on brain shape

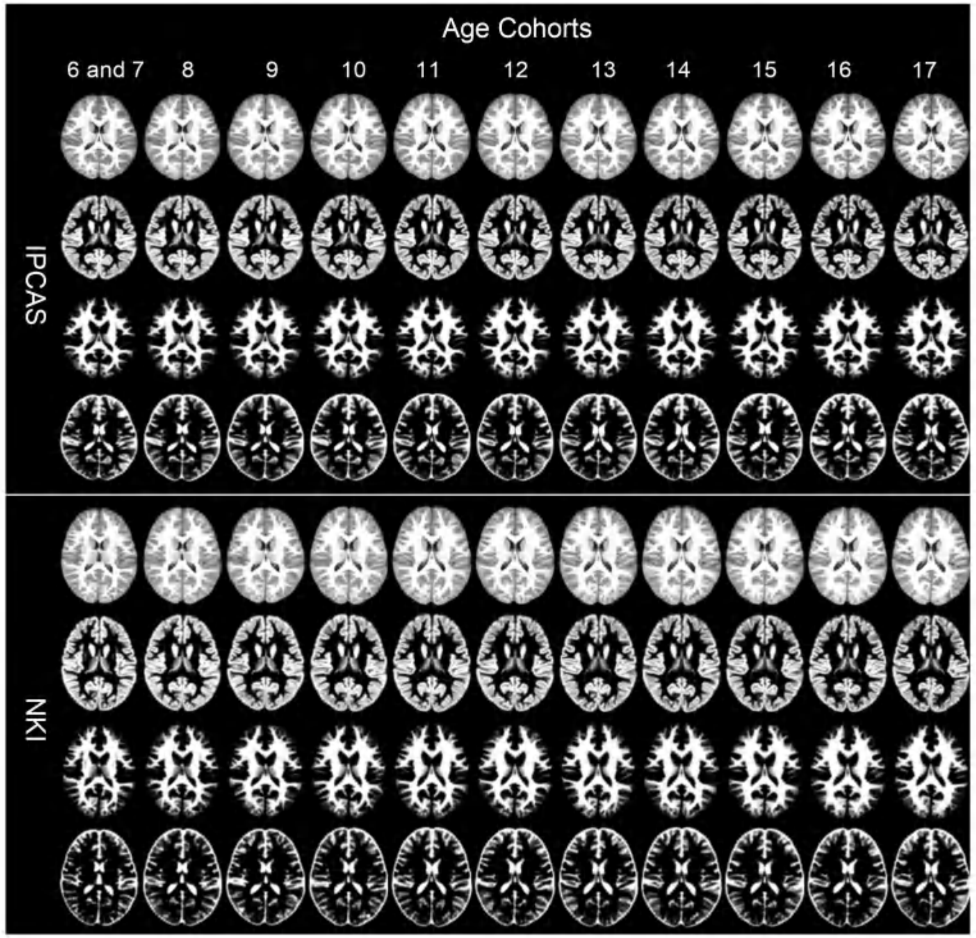
The proportions of genetic ancestry were estimated using principal component (PC) analysis with whole-genome SNP reference panels for ancestry [12–14]. Four continental populations were used as ancestral references: West Africa (YRI, Yoruba in Ibadan), Europe (CEU, Utah residents with Northern and Western European ancestry), East Asia (EA), and America (NA, Native American). The metrics for summarizing genetic ancestry in each ancestral component were standardized as proportions ranging from 0% to 100%. These proportions represent how genetically similar an individual is to the reference population [14].

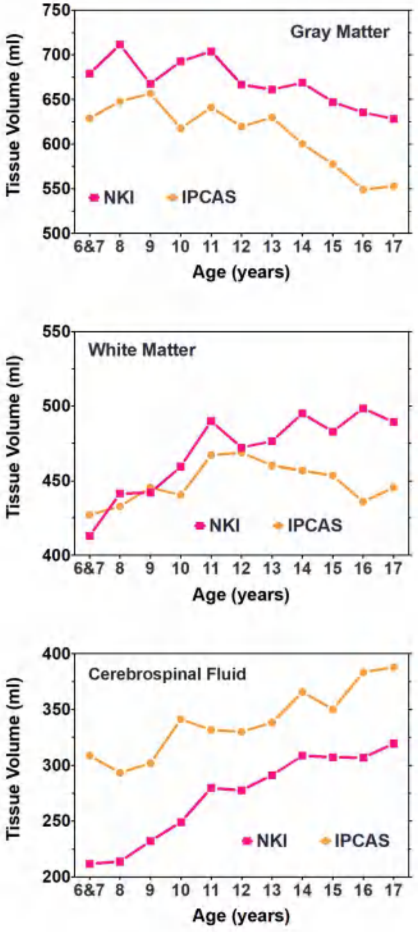


Current Biology (2015) **25**:1988-1992

Brain Demography

Ethnicity

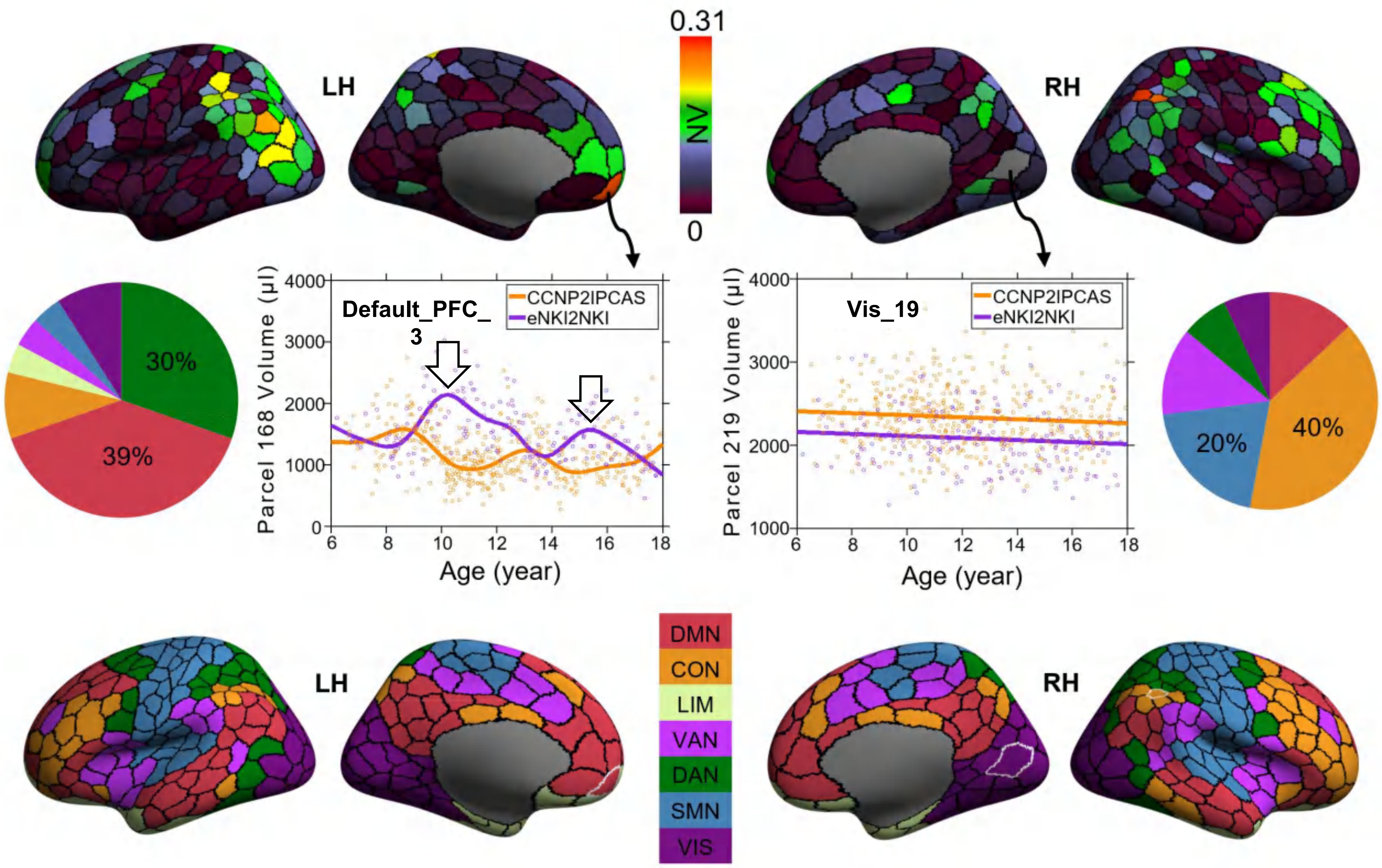




Science Bulletin (2020) **22**:1924-1934

Brain Demography

Ethnicity

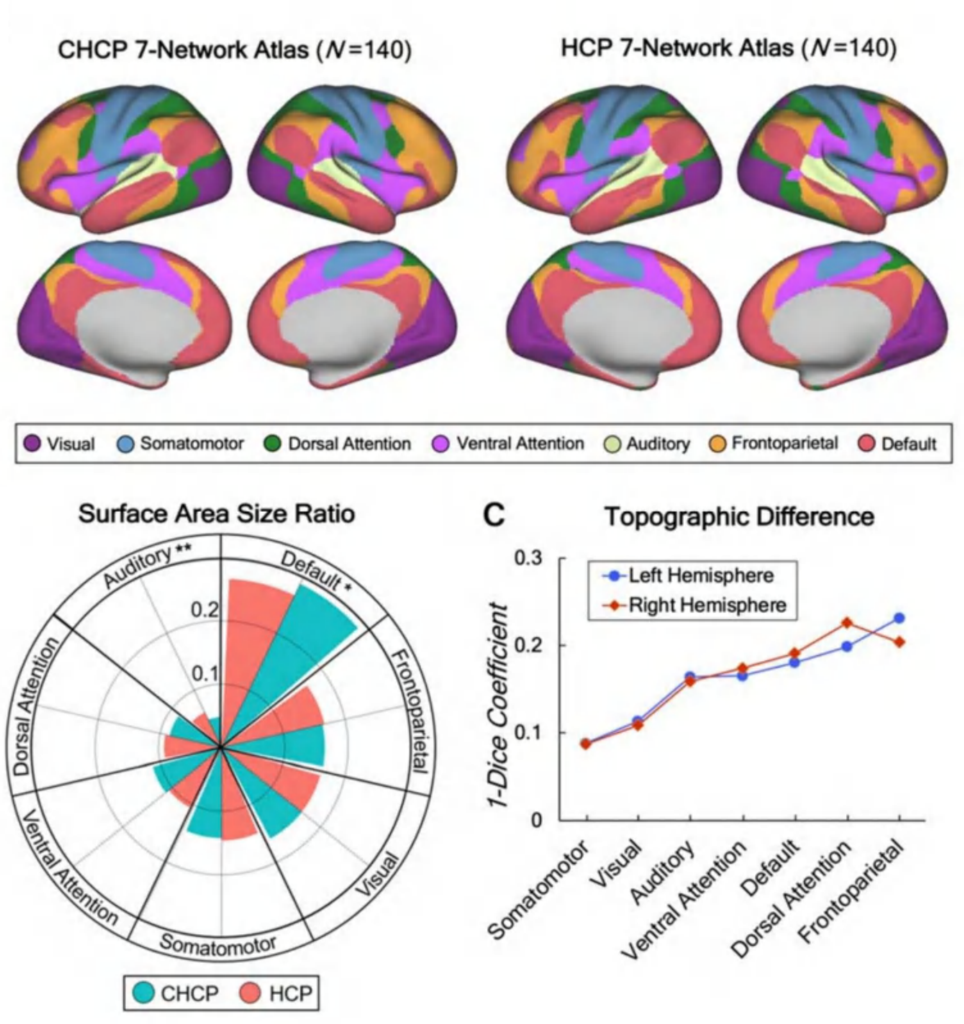


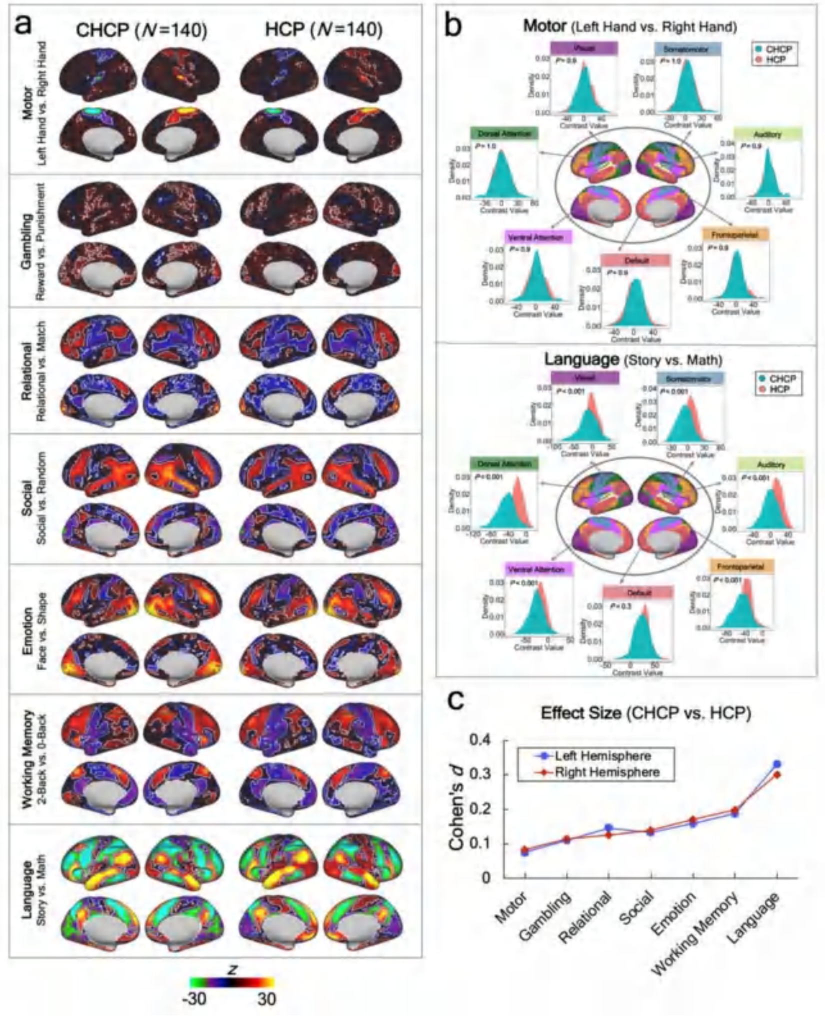
- Shape analyses revealed volumetric differences in growth curves between the two samples primarily in lateral frontal-parietal areas.
- These regions spatially distributed into default and control networks and are most variable across individuals in regard to their structure and function.
- Temporally, the shape distinction of growth mostly occurred around the puberty period.

Science Bulletin (2020) **22**:1924-1934

Brain Demography

Ethnicity

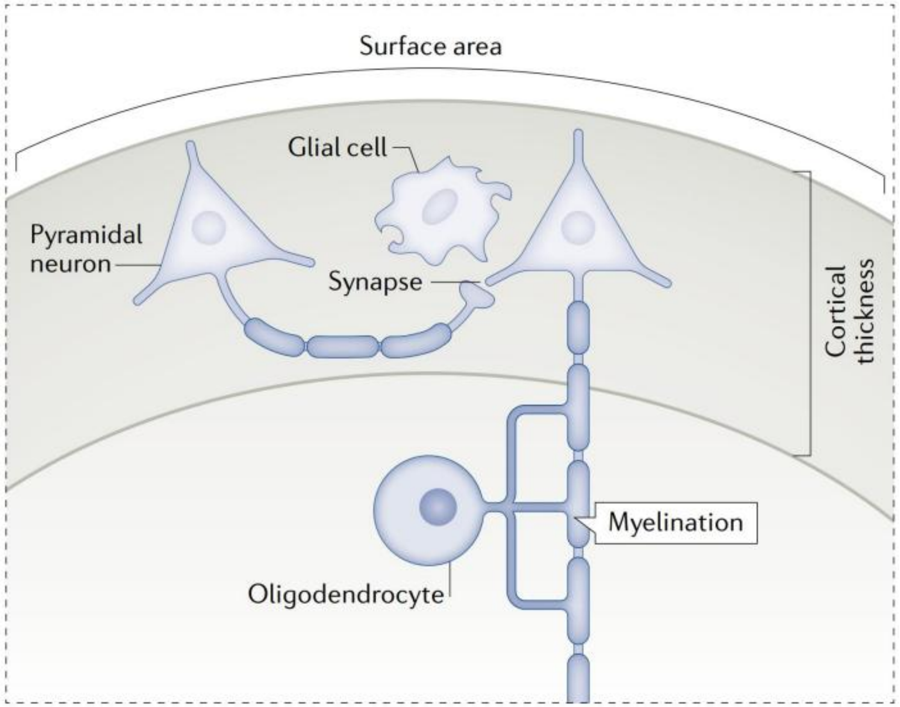




Nature Neuroscience (2022) **in revision**

Brain Demography

Socioeconomic Status



The weirdest people in the world?

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Psychological Science

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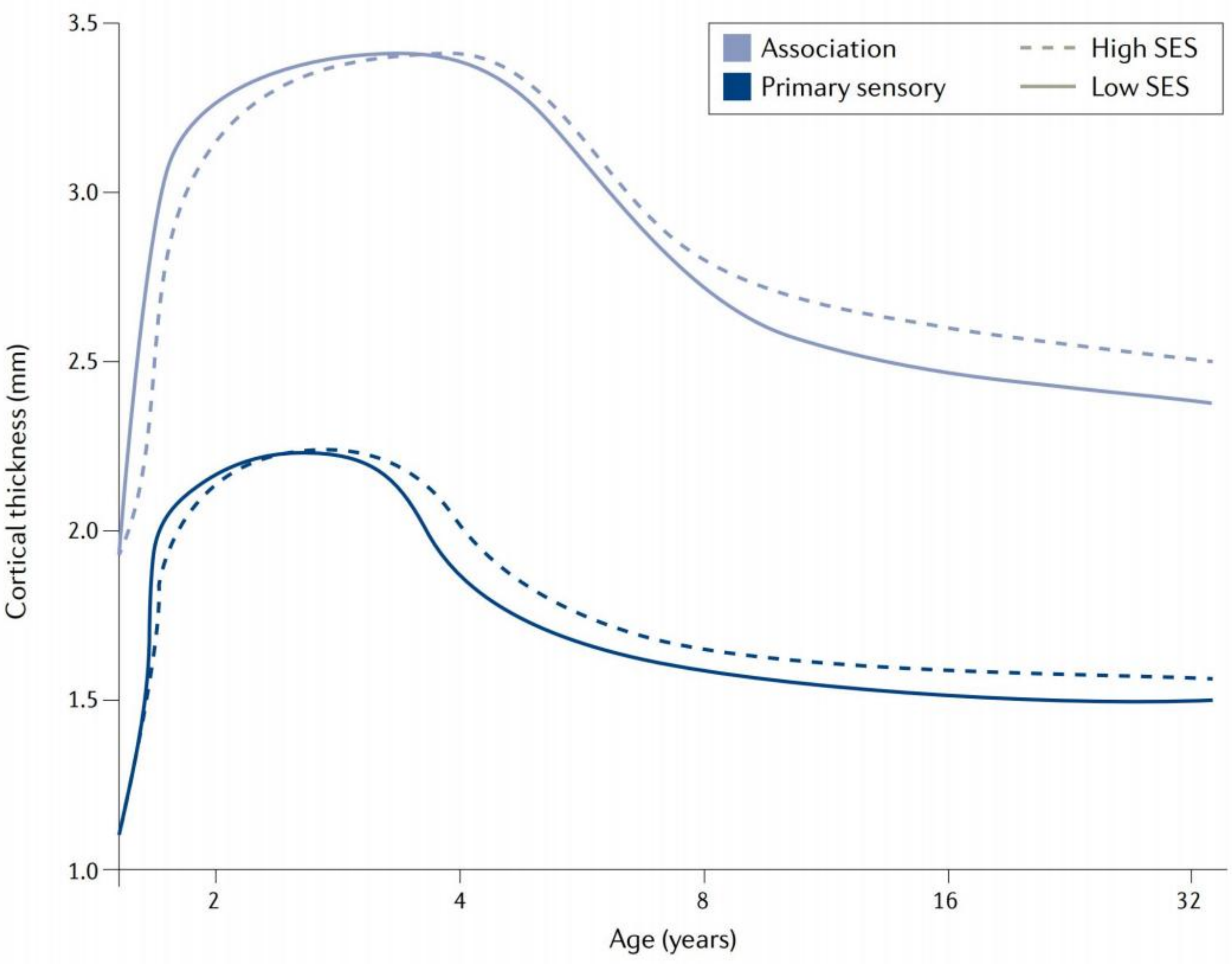
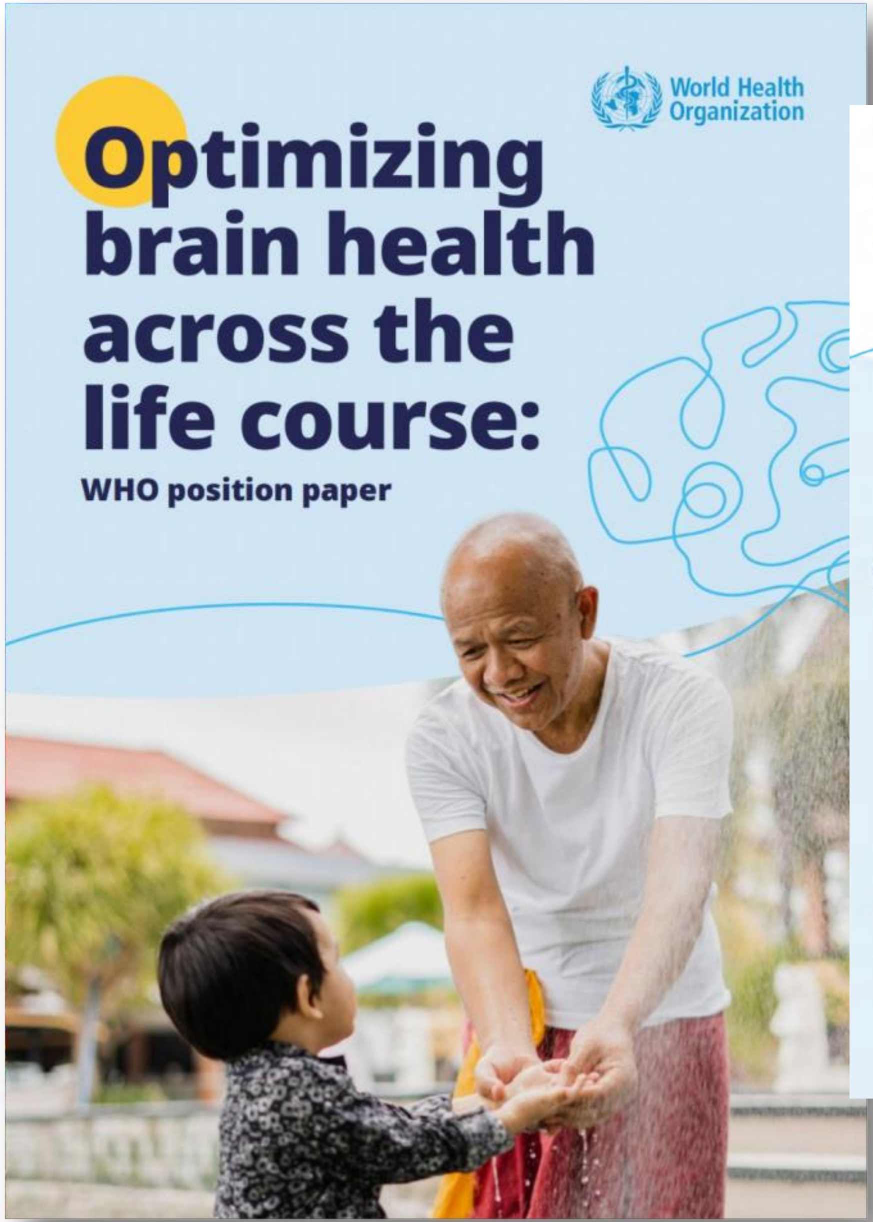
Socioeconomic Status Modifies Heritability of IQ in Young Children



Behavioral and Brain Sciences (2010) **33**:61-83; *Nature Reviews Neurosciences* (2021) **22**:372-384



Brain health determinants

Safety and security

Physical safety and financial security can also impact brain health over the life course in multiple ways. Physical safety is the absence of actual physical harm (including abuse, maltreatment and neglect) and the threat of physical harm; it requires stable and safe housing, and safety within the home and broader community. Financial security is not merely the absence of poverty, but also the absence of strain or stress due to financial concerns; it means that one can reasonably afford the necessities of life – including food, housing, health care, education and transport. Both physical safety and financial security can have impacts on individuals and their families, as well as the communities in which people live.

Physical health

A person's physical health and their health behaviours can impact their brain health in innumerable ways across their life course. This is because there are multi-directional interactions between the brain and the body. Important aspects of physical health that influence the brain include: maternal health and the intrauterine environment; genetic and epigenetic factors; nutrition; infections; noncommunicable diseases and sensory impairments; health behaviours (including good-quality sleep, physical activity and substance use); and traumatic injuries.

Learning and social connection

Access to opportunities for learning and social connection are important determinants for brain health across the life course and overlap in multiple ways. Learning in early life, for instance, is closely connected with responsive and nurturing caregiving. Similarly, formal learning relies on schools and other educational institutions, while cognitive stimulation in adulthood is often linked to employment and social networks within communities. Additionally, interventions aimed at optimizing brain health – especially in early life – may involve support for both learning and social connection.

Healthy environments

Healthy environments can also have a profound impact on brain health, especially during developmentally sensitive stages such as early childhood, adolescence and older age. There has been increasing information in recent years on environmental factors that affect brain health, including pollutants found in air, water and food. Neurotoxic chemicals include heavy metals and inorganic compounds, pesticides, organic solvents and other organic compounds. In addition, natural disasters (e.g. volcanic eruptions), man-made disasters (e.g. nuclear explosions or chemical spills), climate change contributing to ambient air pollution and increased risk of wildfires threaten the brain health of individuals and society as a whole.

Access to quality services

Managing many risk factors of brain health will require access to quality health and social services. Despite best efforts to minimize risk factors, many people still develop conditions that affect the CNS at some point in their lifetime. Therefore, access to quality services represents an important determinant of brain health and, similarly, strengthening health and social care systems so that they provide equitable access to diagnosis, treatment, care and rehabilitation, as and when needed, is crucial for optimizing brain health for all.