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We advance health and healthy living for children and families through cutting-edge research, innovative community-based programs, and dissemination of evidence-based practices.

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Disclosures & Accreditation

- This webinar awards **1.0 Entry-Level CHES/MCHES® credit.**

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Requirements for Completion:

- **Attend the session in its entirety**

Mapping the Interplay: How Obesity and Cardiometabolic Risk Factors Shapes Brain Health in a U.S. Pediatric Cohort Study

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Assistant Professor

Department of Epidemiology

Michael & Susan Dell Center for Healthy Living

Director, Cardiovascular-Brain Health and Lifestyle Epidemiology Laboratory (CABLES Lab)



Feb 24, 2026

1 Why Pediatrics Needs Prediction Now

Prevalence of High Blood Pressure in 122,053 Adolescents: A Systematic Review and Meta-Regression

Augusto César Ferreira de Moraes, PhD, Maria Beatriz Lacerda, BSc, Luis A. Moreno, PhD,
Bernardo L. Horta, PhD, and Heráclito Barbosa Carvalho, PhD



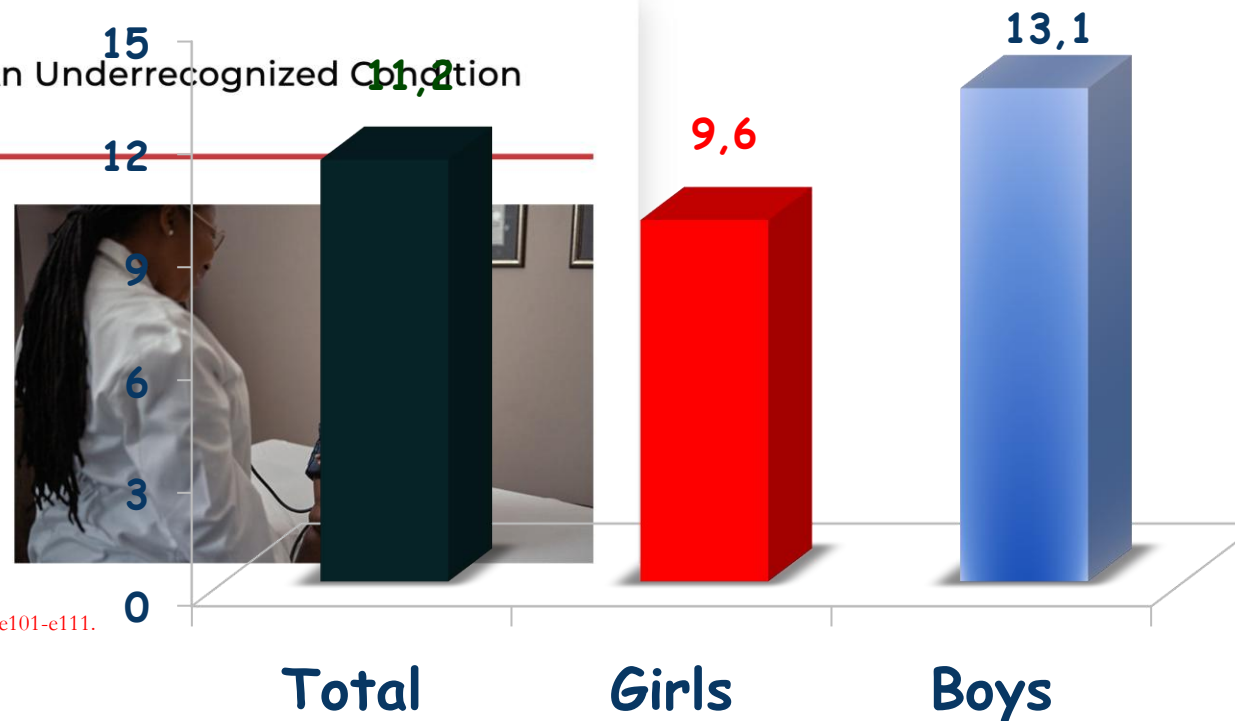
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Home / Science News / Pediatric Primary Hypertension

Pediatric Primary Hypertension: An Underrecognized Condition

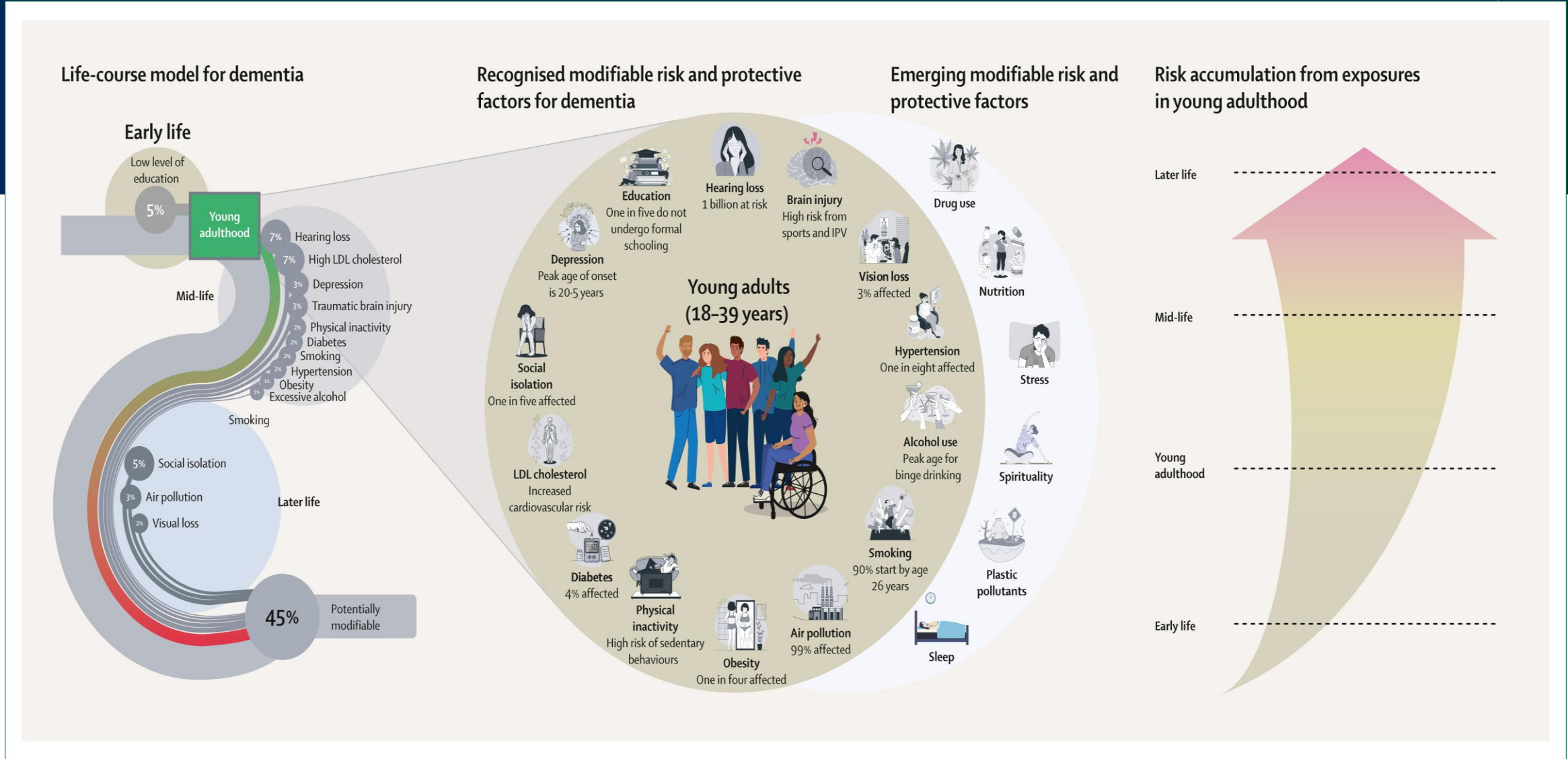
Published: March 30, 2023

- The overall prevalence of hypertension (HTN) during childhood is 2%-5%, with primary HTN being the leading type, especially in adolescence.
- For HTN during childhood, primordial prevention is the key through a healthier diet, reducing obesity in children and increasing physical activity.
- This scientific statement calls attention to a growing public health issue in the United States - pediatric hypertension.



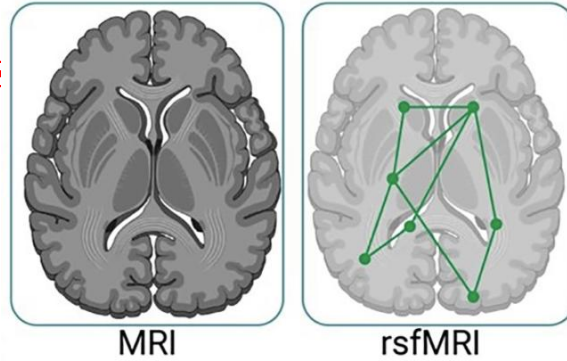
Falkner B, et al. Hypertension 2023; 80:e101-e111.

The life-course model of dementia



Brain Regions and Cognitive Function related with Heart Health

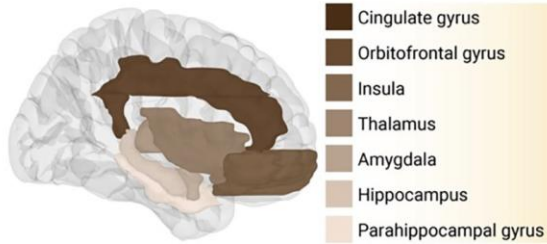
Brain Images



MRI

rsfMRI

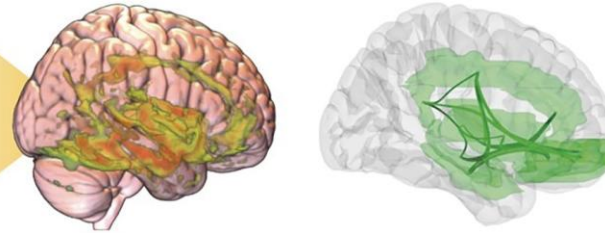
C Allostatic interoceptive network



D Brain-cardiovascular associations

AIN structure

AIN functional connectivity



Cognitive Function

Attention

Episodic Memory

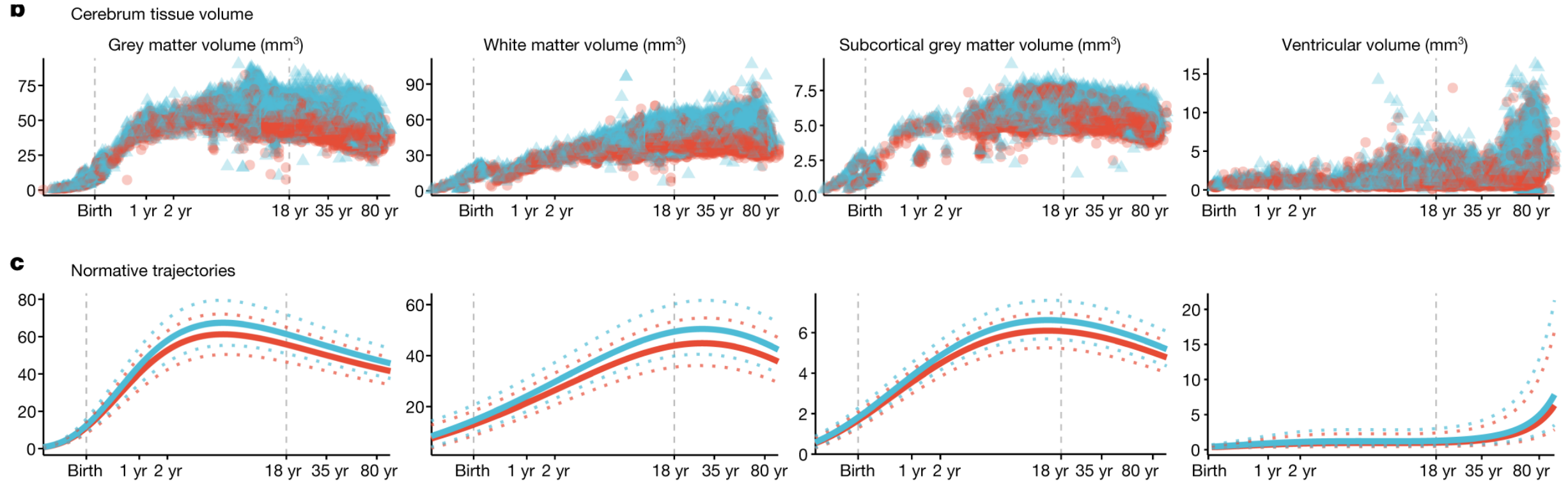
Working Memory

Language

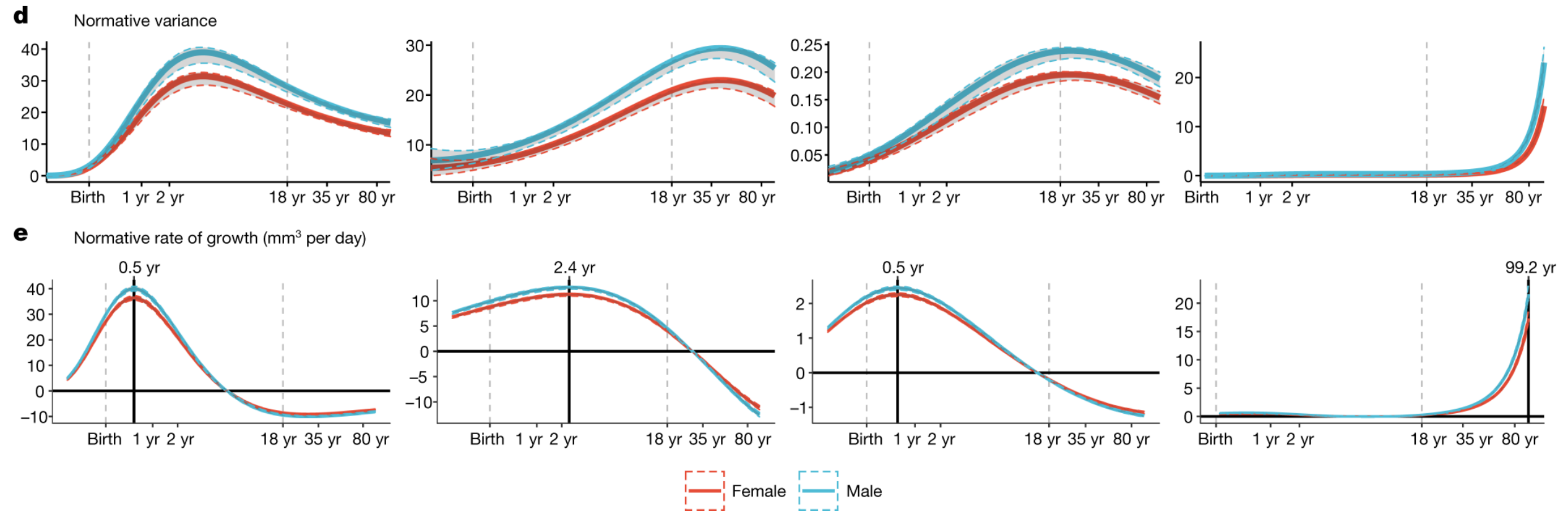
Executive Function

Processing Speed

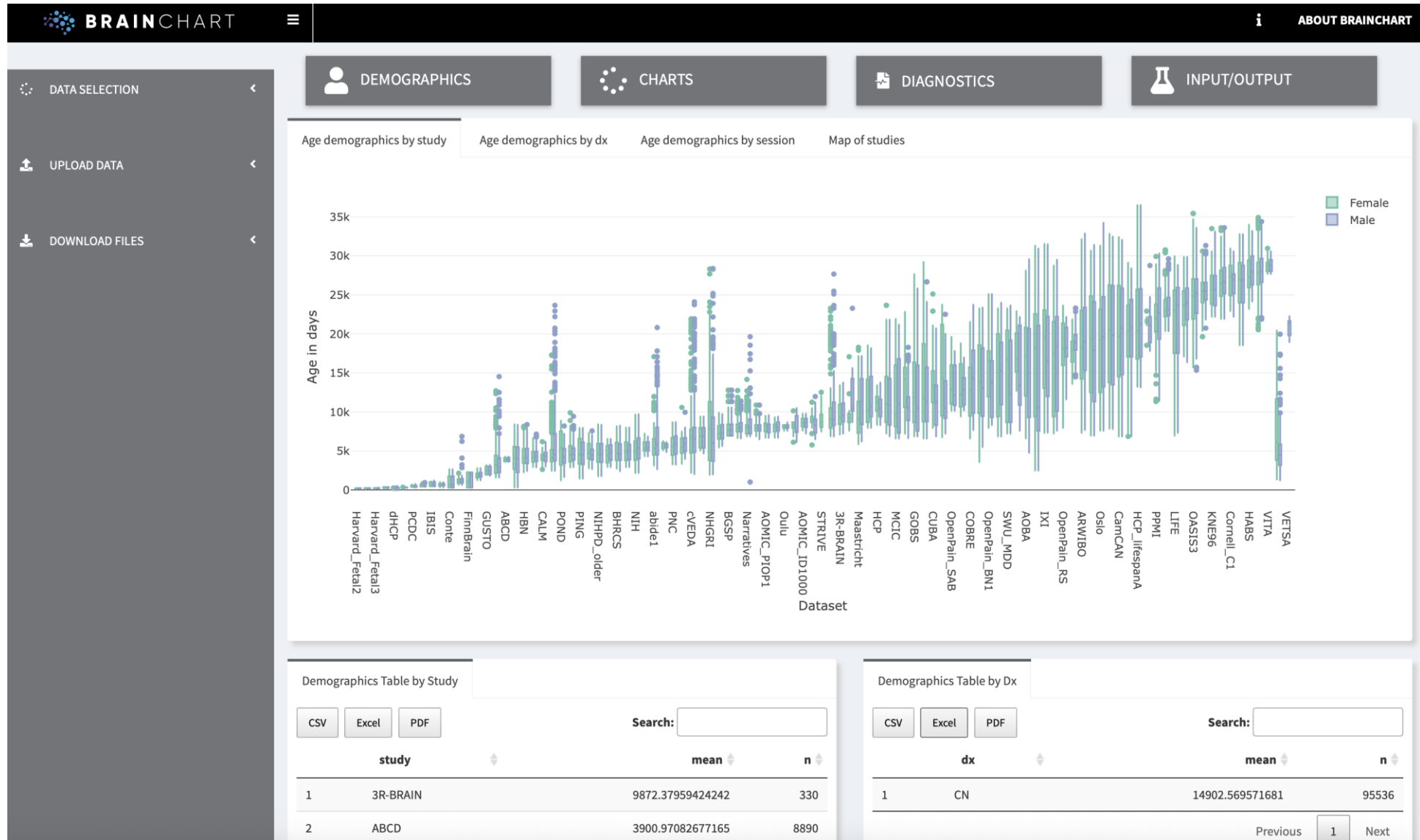
1 Brain Health in Pediatric Population



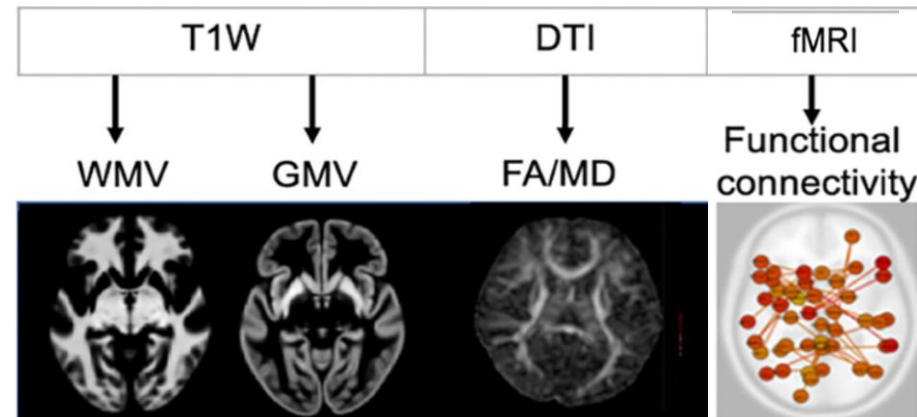
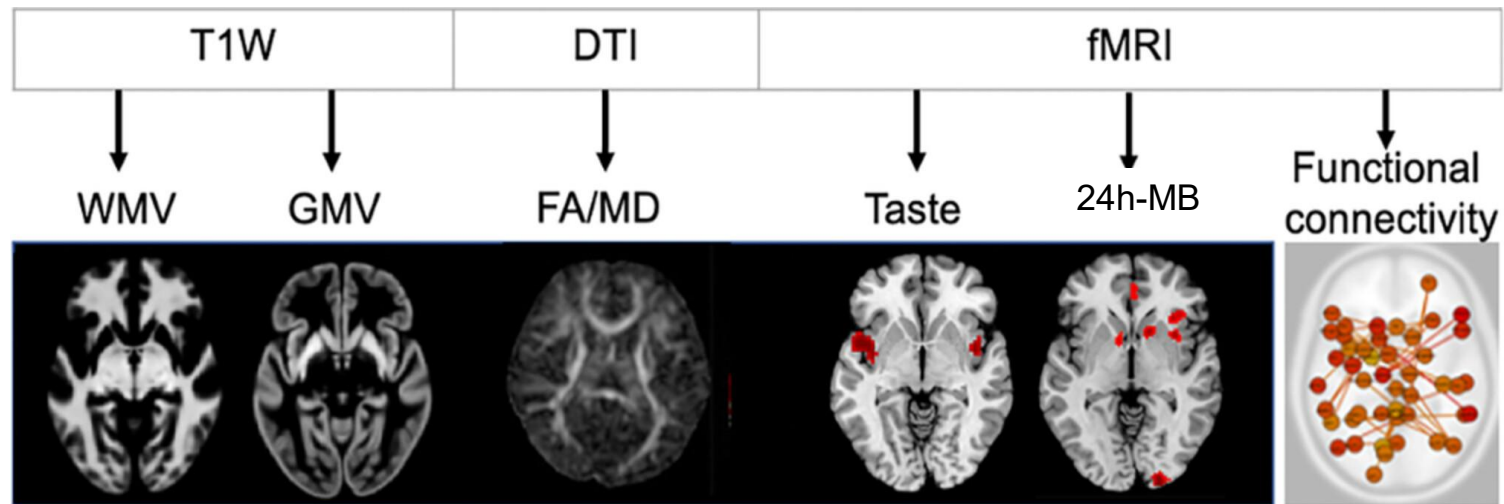
1 Brain Health in Pediatric Population



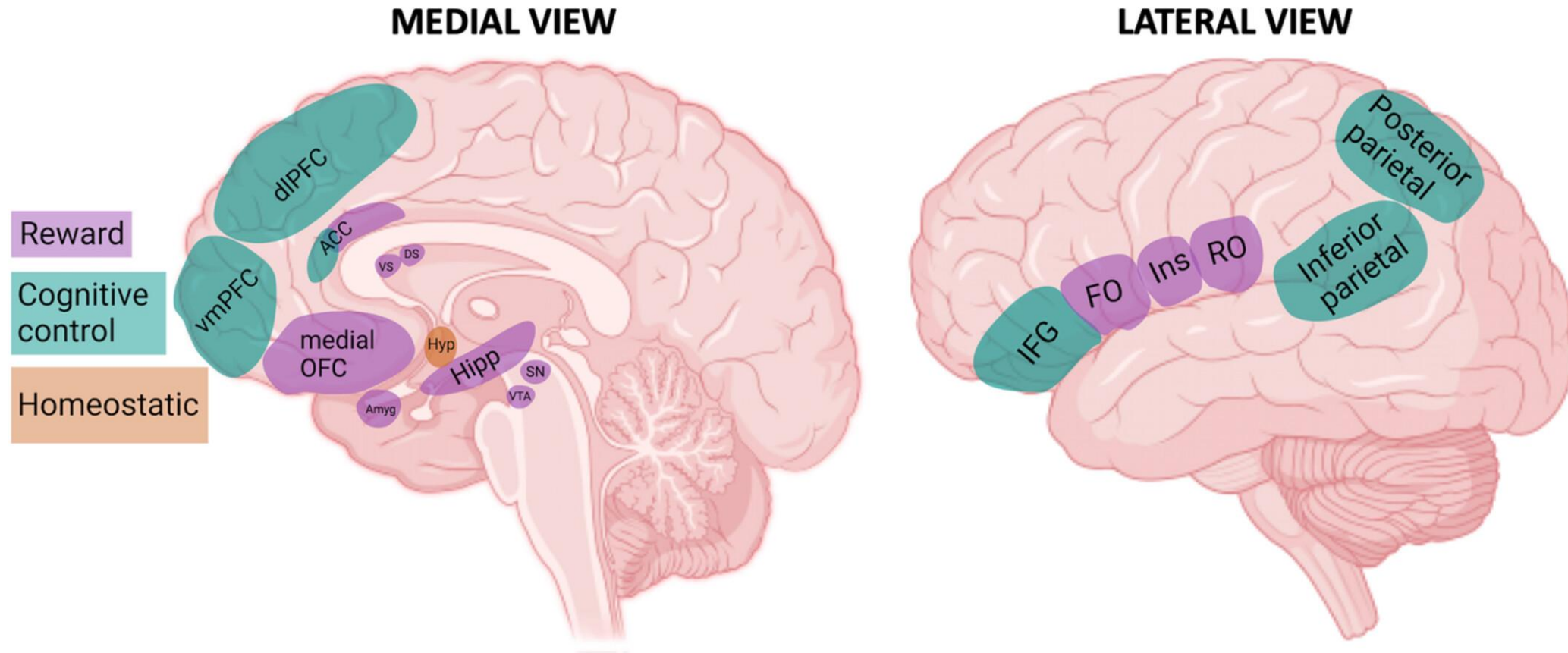
Brain Chart



24-hour movement associated with Brain Health

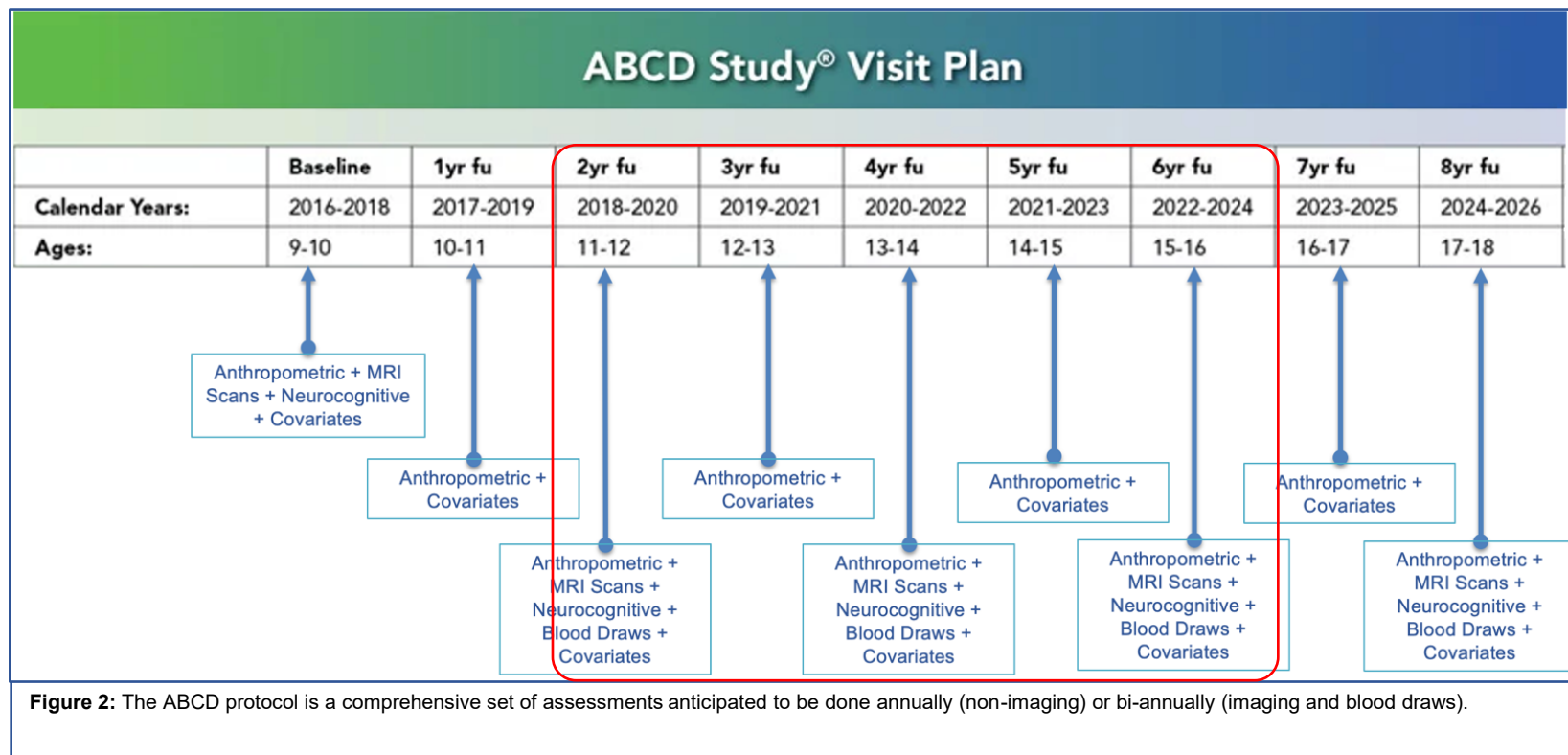


24-hour movement associated with Brain Health



ACC, anterior cingulate cortex; Amyg, amygdala; DS, dorsal striatum; dIPFC, dorsolateral prefrontal cortex; FO, frontal operculum; Hipp, hippocampus; Hyp, hypothalamus; IFG, inferior frontal gyrus; Ins, insula; RO, rolandic operculum; vmPFC, ventromedial prefrontal cortex; VS, ventral striatum; VTA, ventral tegmental area.

Largest Pediatrics US Cohort to See the Full Story



Cardiovascular health profile is favorably associated with brain health and neurocognitive development in adolescents

Augusto César F. De Moraes^{a,*}, Marcus V. Nascimento-Ferreira^{b,c}, Ethan H. Hunt^d, Gregory Knell^e, John Virostko^f, Susan S. Tapert^g, Harold W. Kohl, (In Memoriam)^{a,h}



◇ Health factors

 Body mass index (kg/m²)

 Blood pressure

 Blood lipids

 Blood glucose



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◇ Health factors

🔴 Blood glucose

Metric: FBG (mg/dL) or HbA1c (%), symptom-based screening at any age or risk-based screening starting at age ≥ 10 y of age or onset of puberty per clinician discretion

Scoring:

Points	Level
100	No history of diabetes and FBG <100 (or HbA1c < 5.7)
60	No diabetes and FBG 100–125 (or HbA1c 5.7–6.4) (prediabetes)
40	Diabetes with HbA1c <7.0
30	Diabetes with HbA1c 7.0–7.9
20	Diabetes with HbA1c 8.0–8.9
10	Diabetes with Hb A1c 9.0–9.9
0	Diabetes with HbA1c ≥ 10.0

◇ Health factors

🩺 Blood pressure

Metric: Systolic and diastolic BP (mmHg) percentiles for age through 12 y. For age ≥ 13 y, use adult scoring. Screening should start no later than age 3 y and earlier per clinician discretion

Scoring:

Points	Level
100	Optimal (<90th percentile)
75	Elevated (≥ 90 th–<95th percentile or $\geq 120/80$ mmHg to <95th percentile, whichever is lower)
50	Stage 1 hypertension (≥ 95 th–<95th percentile+12 mmHg, or 130/80 to 139/89 mmHg, whichever is lower)
25	Stage 2 hypertension (≥ 95 th percentile+12 mmHg, or $\geq 140/90$ mmHg, whichever is lower)
0	Systolic BP ≥ 160 or ≥ 95 th percentile+30 mmHg systolic BP, whichever is lower; and/or diastolic BP ≥ 100 or ≥ 95 th percentile+20 mmHg diastolic BP

Subtract 20 points if treated level

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◇ Health factors

🔴 Blood Lipids

Metric: Non-HDL cholesterol (mg/dL), starting no later than age 9–11 y and earlier per clinician discretion

Scoring:

Points	Level
100	<100
60	100–119
40	120–144
20	145–189
0	≥190

If drug-treated level, subtract 20 points

◇ Health factors

⚖️ BMI

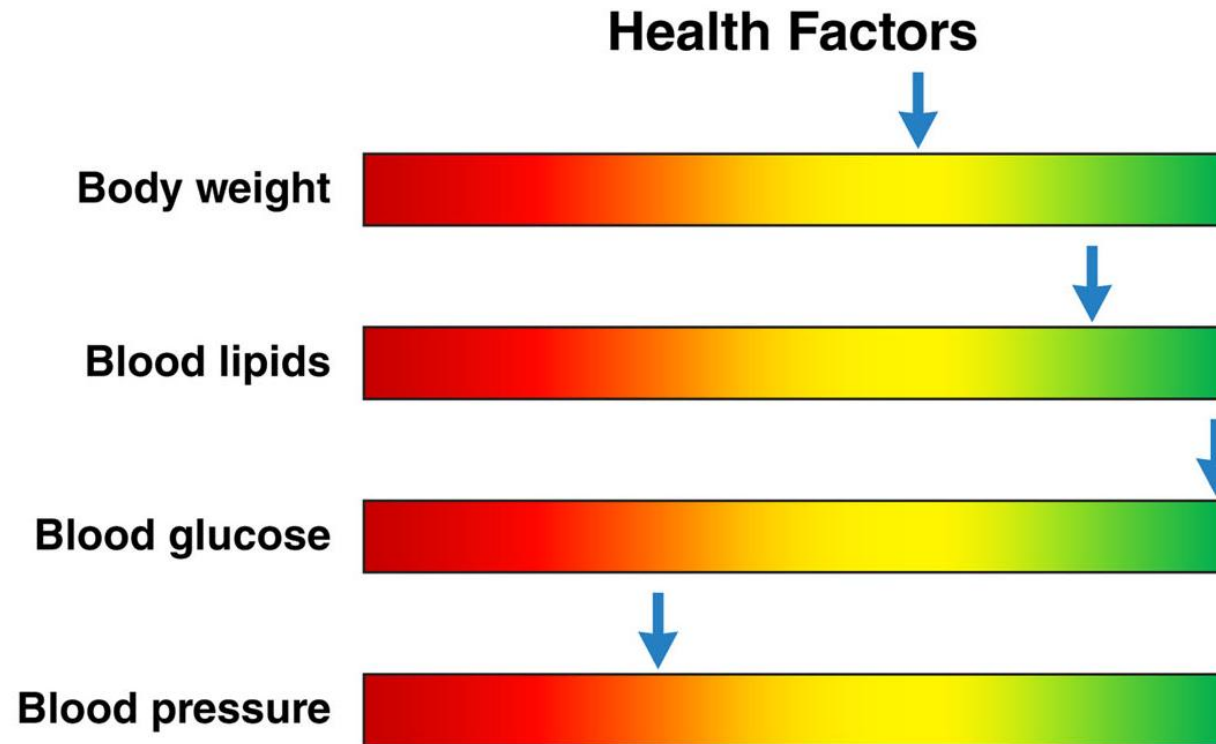
Metric: BMI percentiles for age and sex, starting in infancy; see [Supplemental Material](#) for suggestions for age <2 y

Scoring:

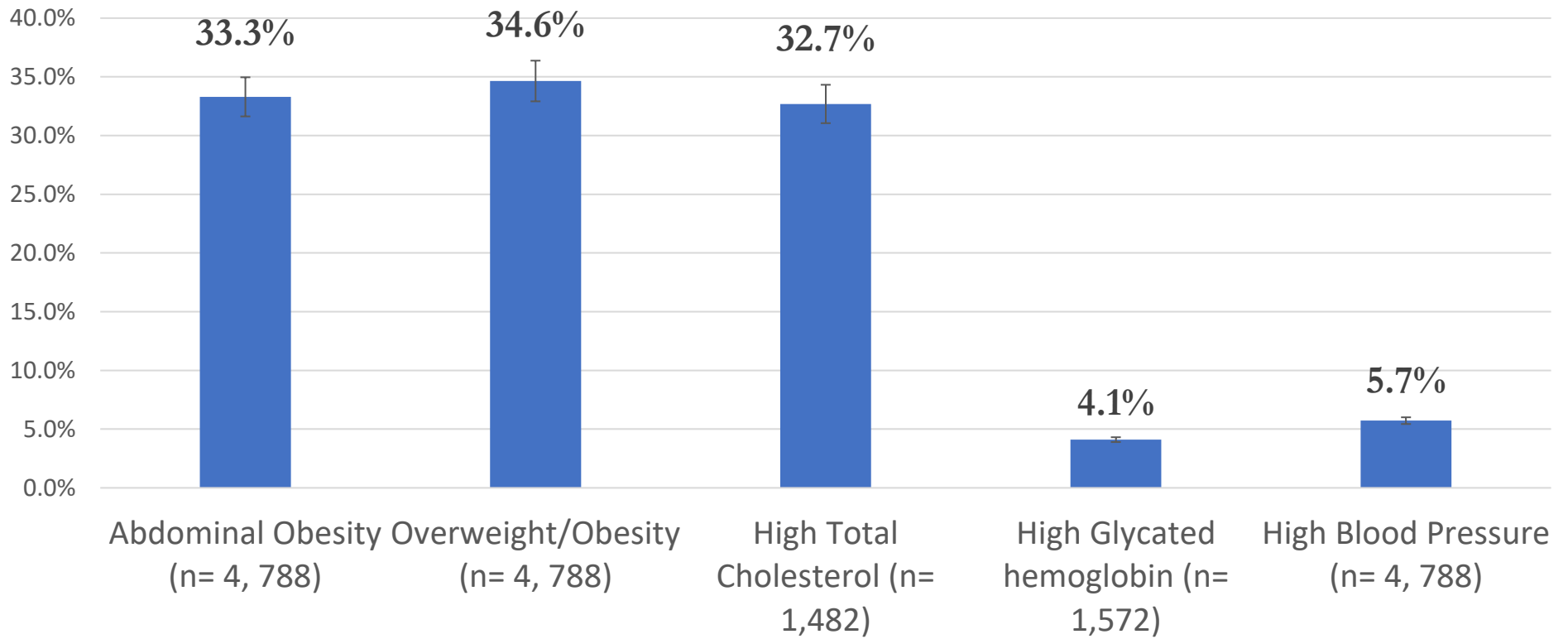
Points	Level
100	5th–<85th percentile
70	85th–<95th percentile
30	95th percentile–<120% of the 95th percentile
15	120% of the 95th percentile–<140% of the 95th percentile
0	≥140% of the 95th percentile

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- 😊 80 to 100 high CVH;
- 😞 50 to 79, moderate CVH;
- 😱 0 to 49 points, low CVH.



Prevalence (2018/2020)

Cardiovascular health profile is favorably associated with brain health and neurocognitive development in adolescents



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Beta coefficients^a (CI 95%) evaluating the association between Life's Essential 8 (LE8) metrics score of cardiovascular health and brain development outcomes, ABCD Study (2020).

	Total whole brain cortical volume in mm ³			Total whole brain cortical area in mm ²			Mean cortical thickness in mm for whole brain		
	β	(CI 95%)		β	(CI 95%)		β	(CI 95%)	
Physical activity LE8 score	85.1	-52.3	222.6	26.0	-19.3	71.2	0.0000	-0.0002	0.0003
Nicotine exposure LE8 score	-62.3	-929.7	805.1	-142.3	-437.5	152.9	0.0010	-0.0005	0.0024
Diet LE8 score	-22.9	-170.6	124.7	-12.0	-60.5	36.5	0.0000	-0.0003	0.0002
Sleep health LE8 score	294.9	82.8	506.9	94.2	24.7	163.7	0.0000	-0.0003	0.0004
Body Mass Index LE8 score	152.4	-44.3	349.2	-7.1	-71.8	57.5	0.0008	0.0004	0.0011
Blood Lipids LE8 score	-47.6	-304.0	208.7	-4.5	-89.4	80.3	-0.0001	-0.0005	0.0003
Glycated hemoglobin LE8 score	26.9	-464.6	518.4	-19.4	-180.6	141.8	0.0005	-0.0003	0.0013
Blood Pressure LE8 score	82.8	-133.3	299.0	12.7	-58.7	84.0	0.0001	-0.0003	0.0005
Life's Essential 8 – Health behaviors 1	365.0	36.6	693.4	103.1	-3.6	209.9	0.0001	-0.0005	0.0006
Life's Essential 8 – Health factors 2	460.3	61.1	859.5	11.1	-119.8	142.0	0.0018	0.0012	0.0025
Life's Essential 8 – Overall Score 3	738.5	247.9	1229.2	119.0	-40.2	278.2	0.0015	0.0006	0.0023

Significant associations are in bold.

- 1 = Healthy diet, participation in physical activity, avoidance of nicotine, healthy sleep.
- 2 = Healthy weight (BMI), and healthy levels of blood lipids, HbA1c, and blood pressure.
- 3 = Summarize 1 and 2.

Cardiovascular health profile is favorably associated with brain health and neurocognitive development in adolescents

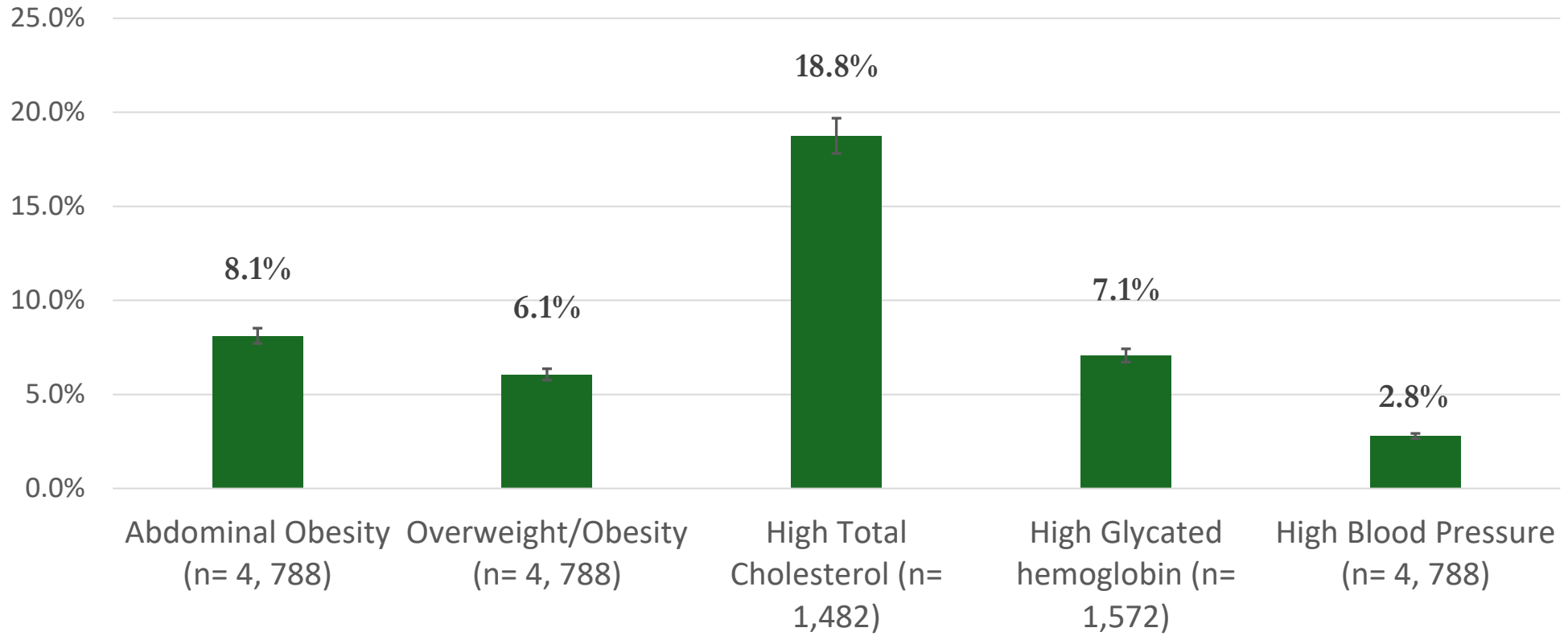


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Adjusted^a means and 95% CIs of neurocognitive outcomes in each category of the cardiovascular health (CVH) categories ABCD Study (2020).

Neurocognitive Outcomes	Low CVH (0–49)			Moderate CVH (50–79)			High CVH (Score 80 to 100)		
	mean	(CI 95%)		mean	(CI 95%)		mean	(CI 95%)	
Executive function (raw score)	87.6	81.0	94.2	89.0	88.3	89.8	90.9	89.3	92.6
Executive function (age-corrected)	102.4	89.7	115.1	102.8	101.3	104.2	107.1	103.9	110.3
Total whole brain cortical volume in mm ³	595195.1	553666.2	636724.0	591213.1	585747.8	596678.4	600977.6	588808.8	613146.5
Total whole brain cortical area in mm ²	198936.1	185543.6	212328.6	191743.1	189993.2	193493.1	193533.7	189617.8	197449.5
Mean cortical thickness in mm for whole brain	2.63	2.56	2.69	2.68	2.68	2.69	2.70	2.68	2.72

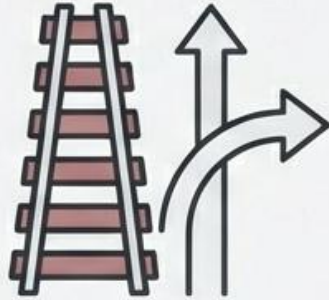
^a Adjusted means were estimated by potential confounders: population density, sex, ethnicity, age, family income.



 4 Years Incidence (2022/2024)

Decoding the Outcome Measures: The CANTAB Battery

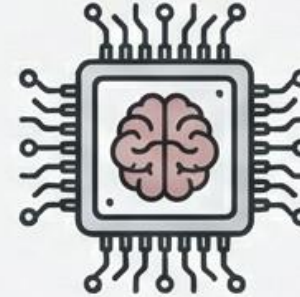
We isolated specific executive functions rather than general intelligence.



Cognitive Flexibility (AST).

The ability to switch attention and inhibit impulses.

The primary casualty of heart risk.



Information Processing (RVP).

Visual processing speed and sustained attention.



Verbal Memory (VRM).

Immediate and delayed word recall.



Working Memory (SWM).

Problem-solving and spatial memory.

The Risk-Outcome Matrix

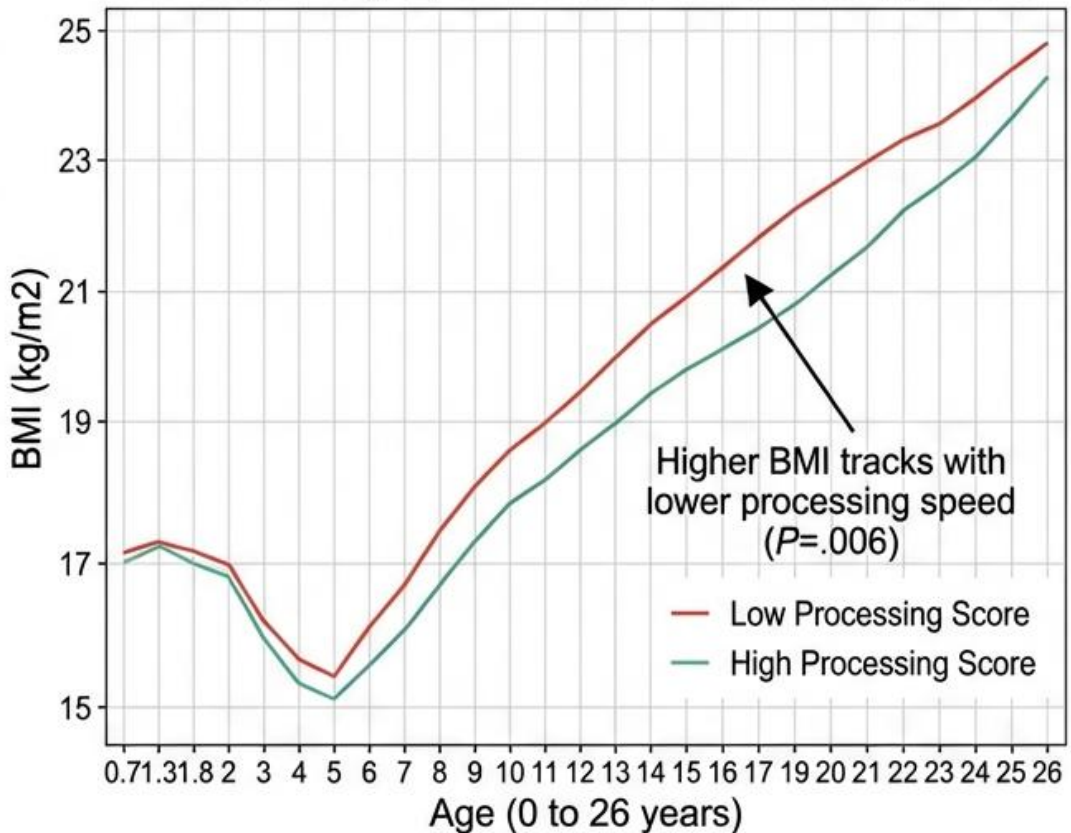
Cognitive Flexibility is the most sensitive target.

	Cognitive Flexibility	Info Processing	Verbal Memory	Working Memory
Childhood BMI				
Waist Circumference				
Systolic BP				
LDL Cholesterol				

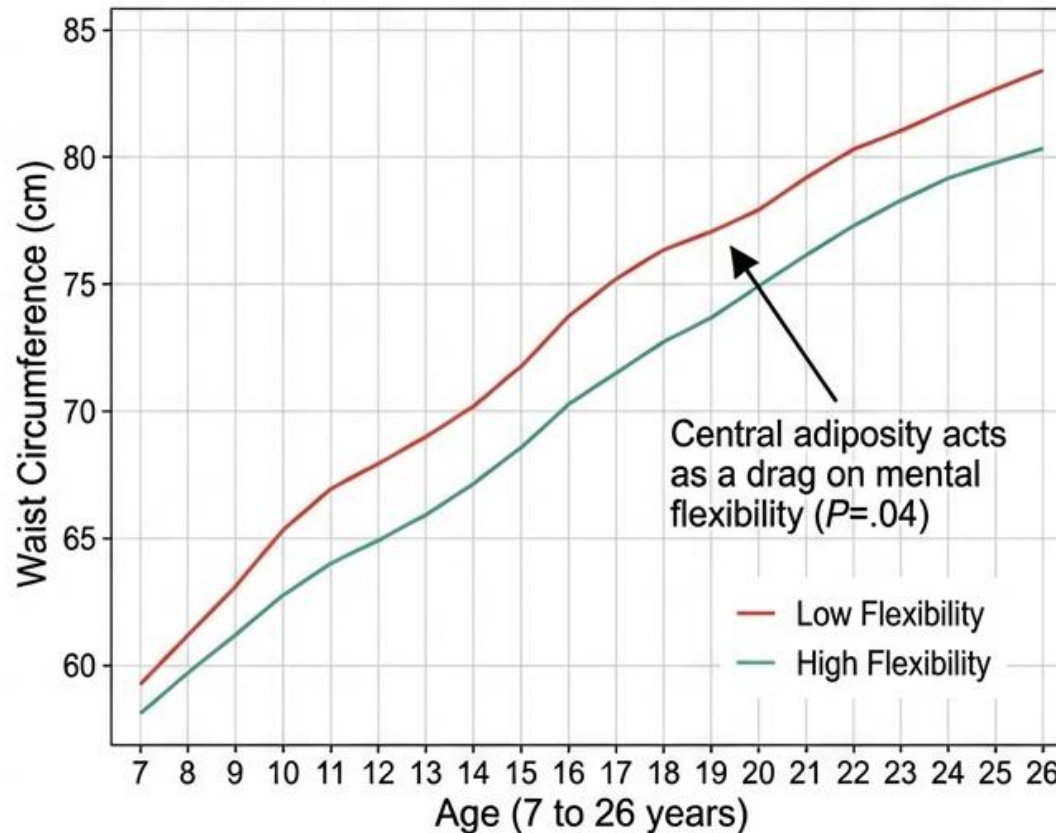
Darker Red = Stronger Inverse Association (Risk Factor lowers Performance).

Deep Dive: Body Composition & Processing Speed

BMI Trajectory by Information Processing Score



Waist Circumference by Cognitive Flexibility



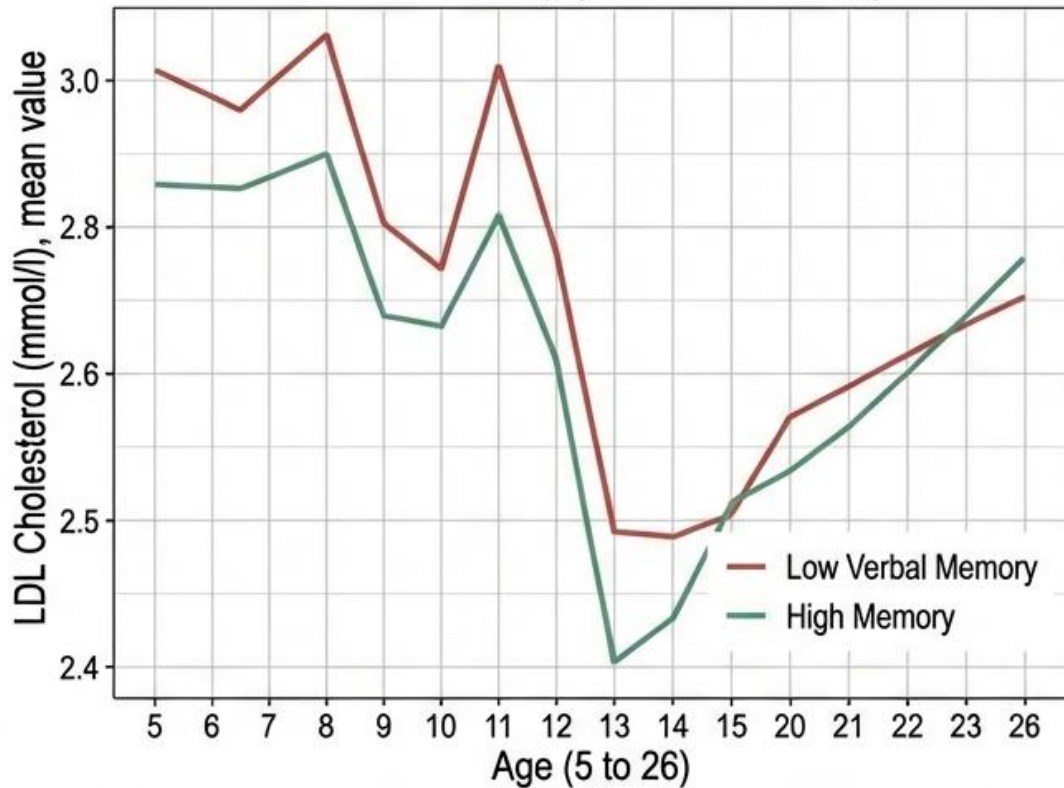
NotebookLM

Clinical Editorial

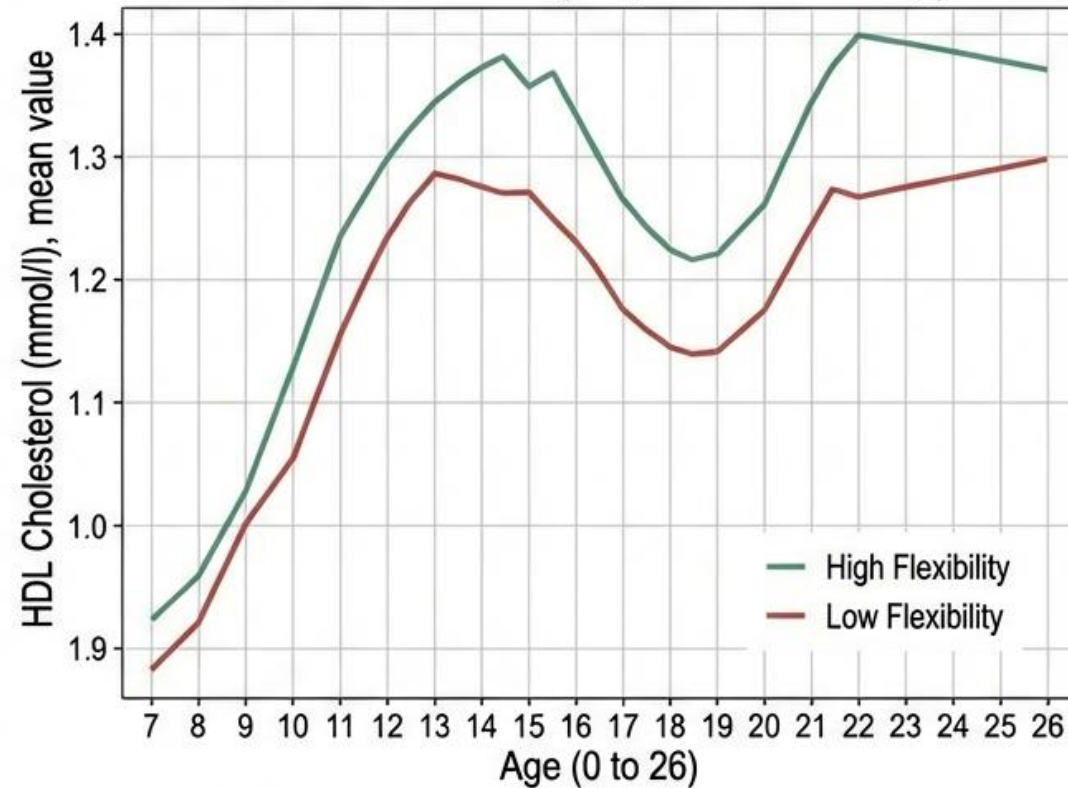
Deep Dive: The Lipid Profile


The internal chemical environment of the developing brain matters.

The LDL Drag (Verbal Memory)



The HDL Shield (Cognitive Flexibility)



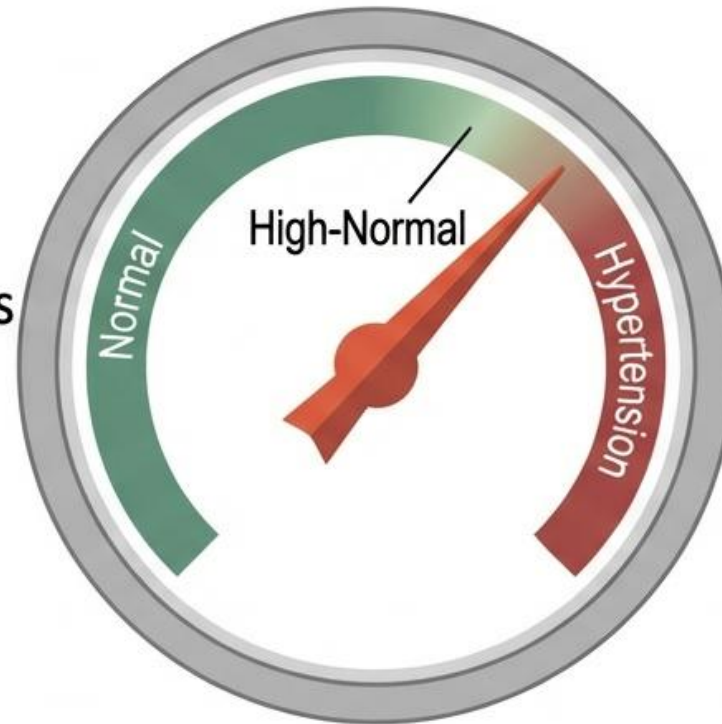
Adverse lipid profiles—high LDL and low HDL—are inversely associated with memory retention and mental flexibility. 

Clinical Editorial

Deep Dive: Blood Pressure

The silent dampener of cognitive potential.

- **Systolic Pressure:** Higher childhood readings correlate with reduced **Cognitive Flexibility** ($P=.02$).

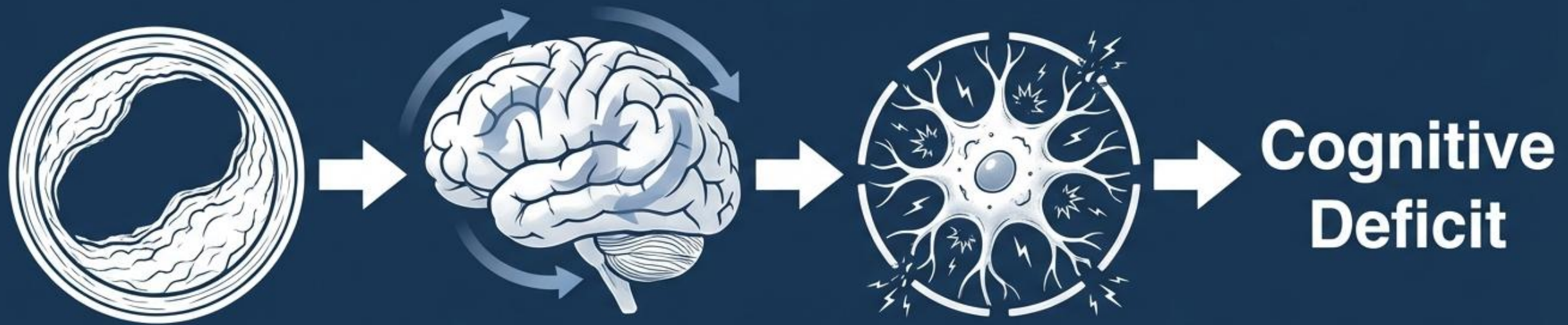


- **Diastolic Pressure:** Elevated early childhood levels link to poorer **Working Memory** ($P=.03$).

Crucial Context: These associations appear in children *without* clinical hypertension. Higher-end readings act as an early warning signal.

NotebookLM

The Mechanism: From Vessel to Neuron



Vascular Stiffness
(Accumulation of lipids/fibrosis)

Hypoperfusion
(Reduced blood flow efficiency)

Inflammation
(Blood-Brain Barrier dysfunction)

Cognitive Deficit

Systemic atherosclerosis triggers vascular aging, which disrupts the brain's nutrient supply and inflammatory environment over decades.

Building the Cognitive Reserve



“The roots of high cognitive reserve stem from factors contributing to cognitive development beginning from infancy.”

Cardiovascular health builds the reserve; risk factors deplete it before it is fully formed.

Call to Action: A New Standard for Pediatric Care



Monitor Early. Track BMI, Blood Pressure, and Lipids from early childhood. View these not just as heart metrics, but as brain metrics.



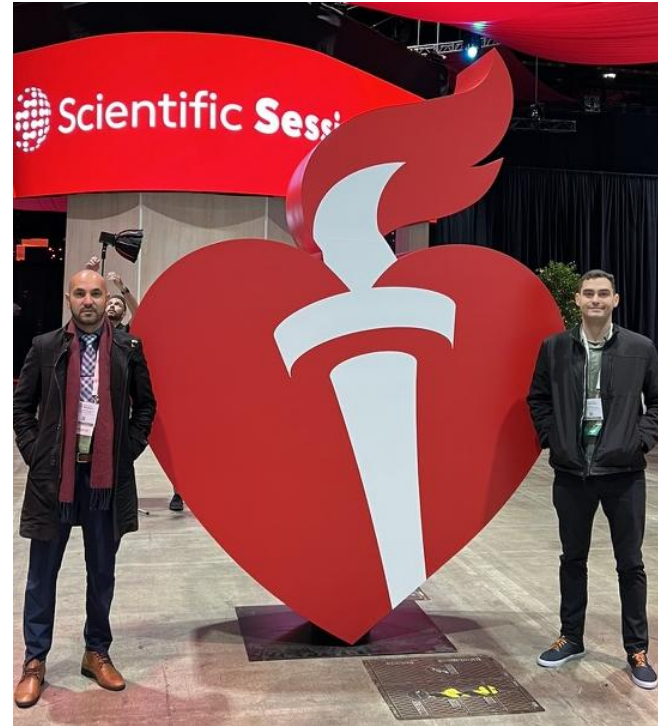
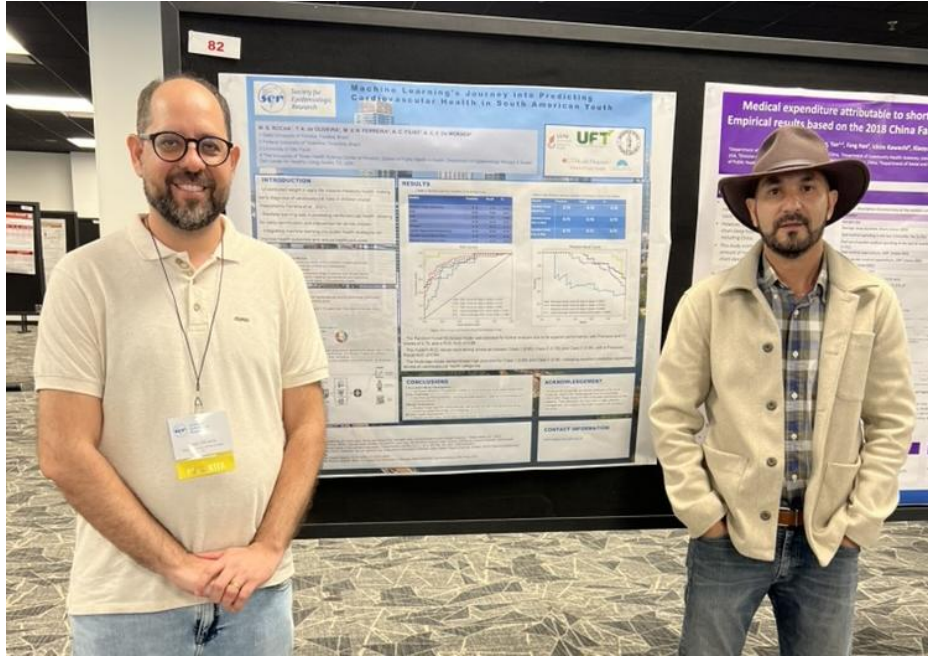
Aggressive Management. Do not ignore “slightly elevated” risks. Treat sub-clinical elevations seriously before they become clinical diseases.

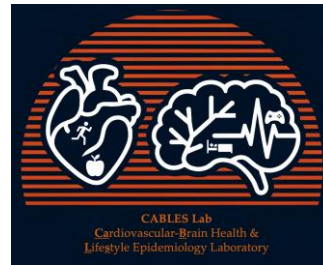
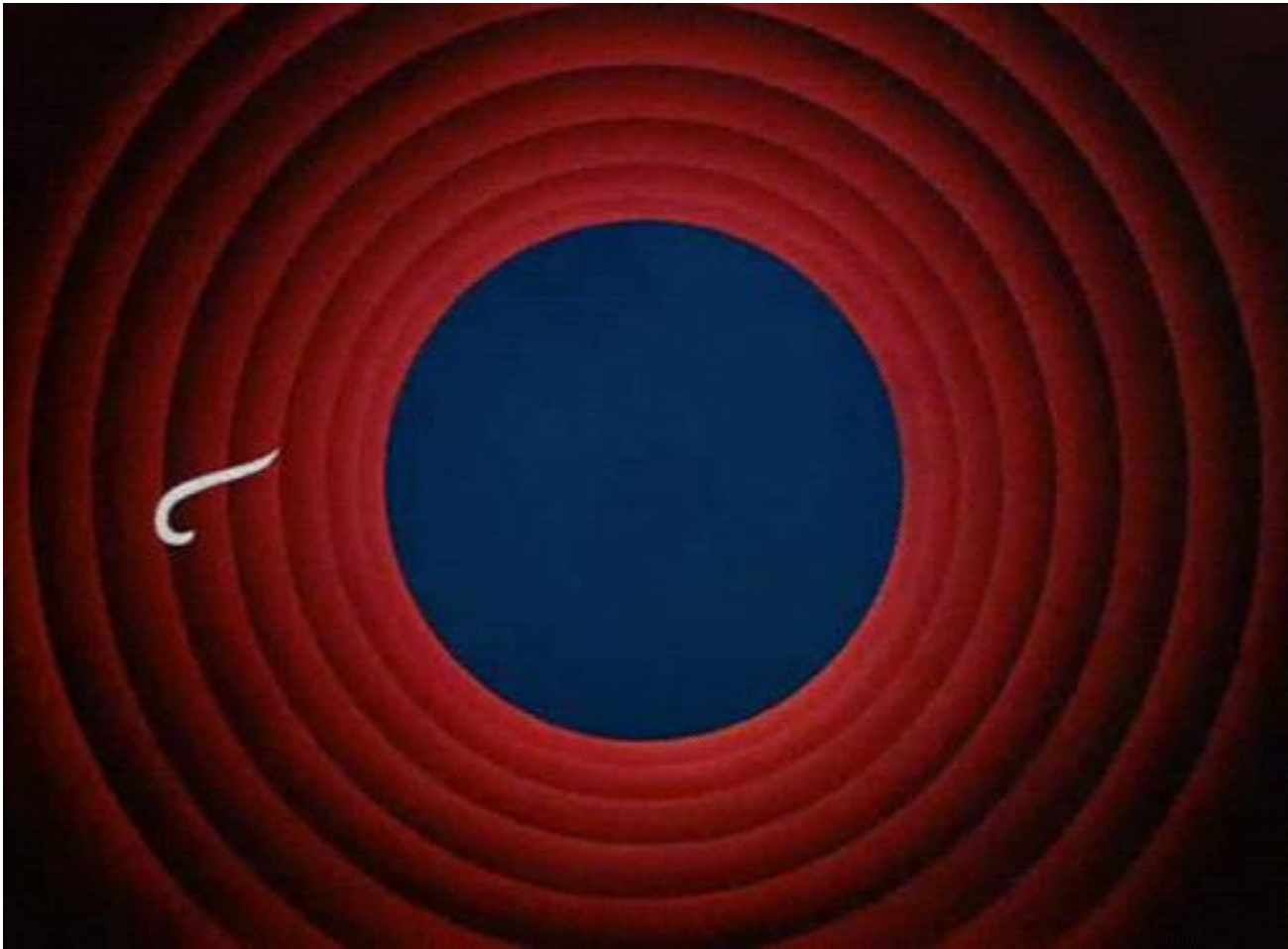


Holistic View. Recognize the child’s cardiovascular system as the engine of their future cognitive success.

Promoting heart health in the cradle protects the mind in the career.

ACKNOWLEDGMENT





Questions?

**Please post your Questions in
the Q&A !**

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Decisions are Your Destiny: Smart prioritization of interventions and research CAN change the world

Thursday, March 5
1 - 2 pm CT



Tony Kenck

President and Founder, Practical Portfolio Management LLC
Author, Strategic Business Portfolio Management



Deanna Hoelscher, PhD, RDN, LD, CNS, FISBNPA

Austin Regional Dean and John P. McGovern Professor of Health Promotion
Director, Michael & Susan Dell Center for Healthy Living
UTHealth Houston School of Public Health in Austin



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