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INSTITUT PASTEUR HELLENIQUE

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United Nations
Educational, Scientific and
Cultural Organization

UNESCO Chair on Adolescent Health Car
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UNIVERSITY
RESEARCH INSTITUTE
OF MATERNAL
AND CHILD HEALTH
& PRECISION MEDICINE

iGen and its Adaptation to the Digital Revolution

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What is Stress?

The state of threatened or disturbed homeostasis of any complex system

What is Culture?

The totality of the behavioral environment in a group of social beings

Thesis

Stress and Culture drive the Evolution and Development of the Human Brain

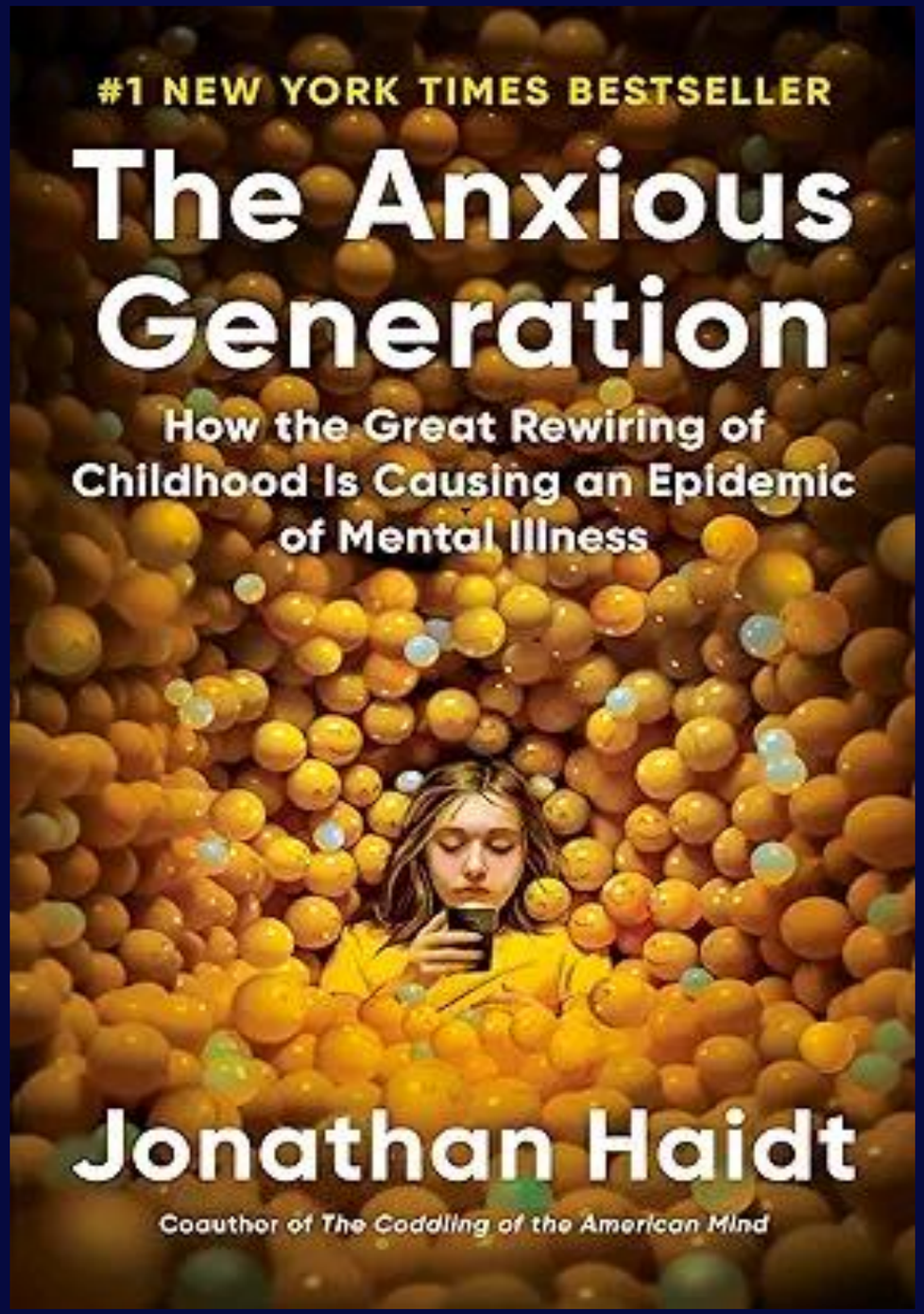
Three Related Issues

- *Increased Mental Health Problems*
- *Increased Violence Incidents*
- *Marked Characteriological Changes*

Two Changes

- *Increased Ambient Stress*
- *Accelerated Cultural Change*

iGen=
1995-present



Z= 1995-2012

Alpha=
2013-present

HUMAN COMPLEXITY: SOME HUMAN BRAIN NUMBERS

~ 100 billion neurons ($100x10^{12}$) x >10.000 synapses per neuron = $>10^{17}$ synapses, peak at 2y)

~ 100.000 km of fibers

~ 1 trillion or more glial cells

>4.25 terabytes

~ 15 Watt lamp (2% of BW uses 20% energy)

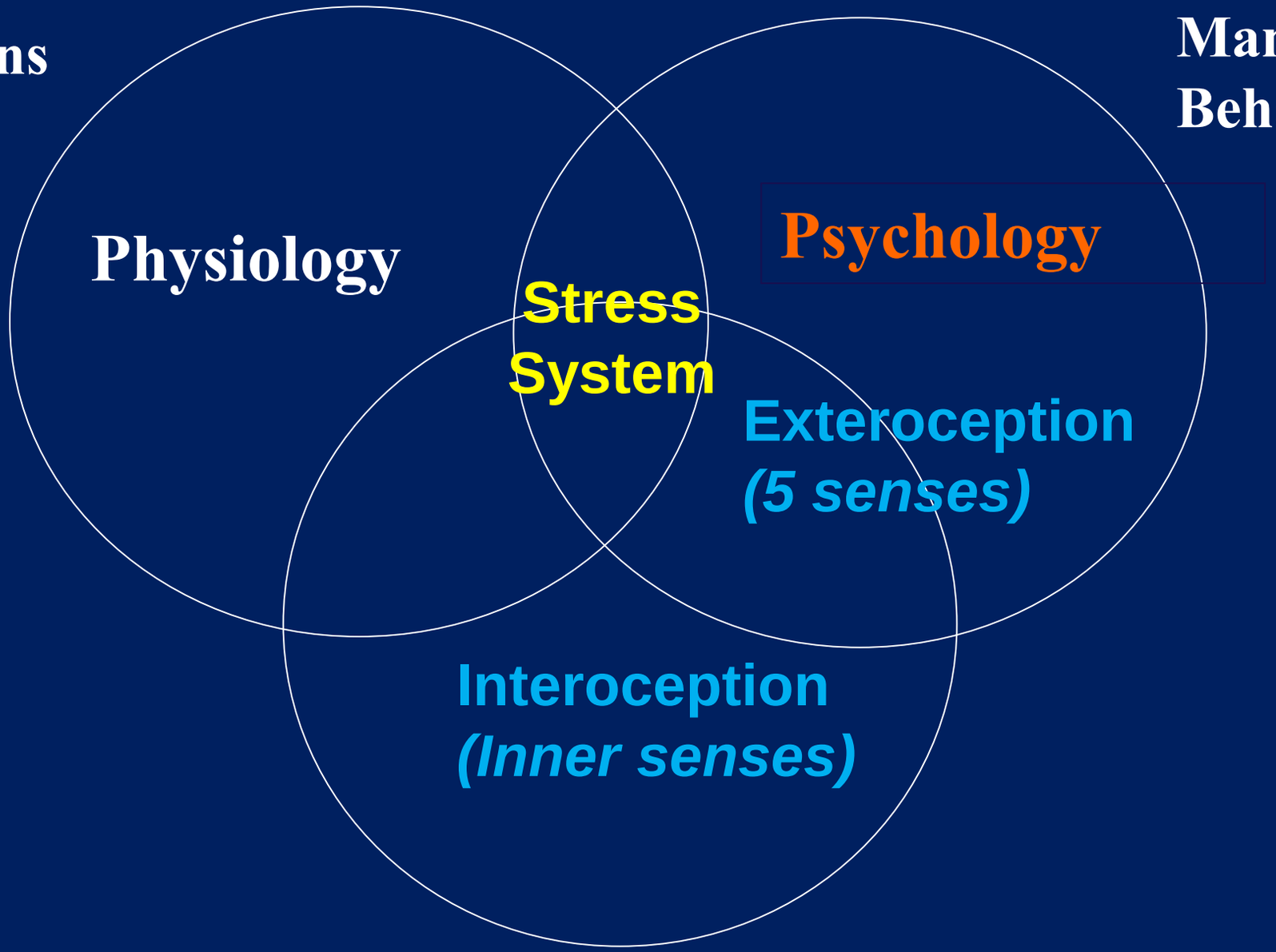
↓

Plasticity

The Human Brain

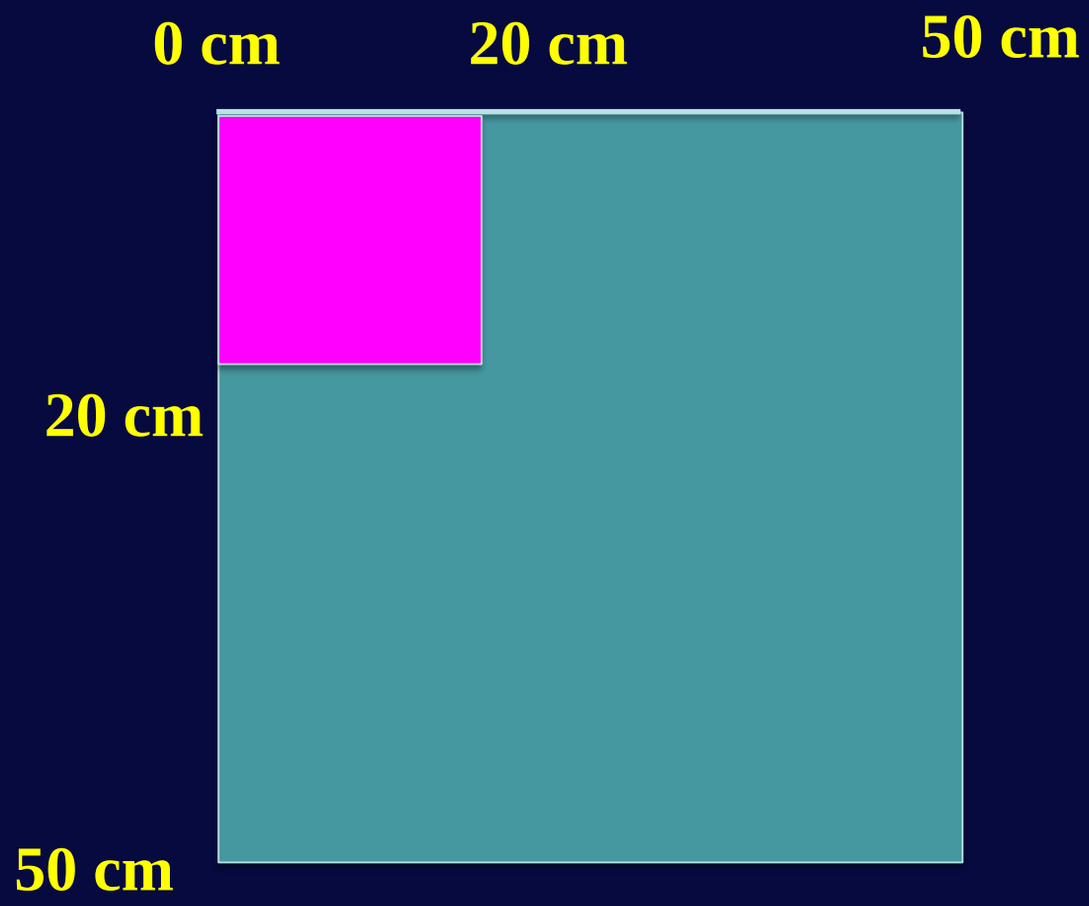
Physiologic Manifestations

Psychologic Manifestations Behavior

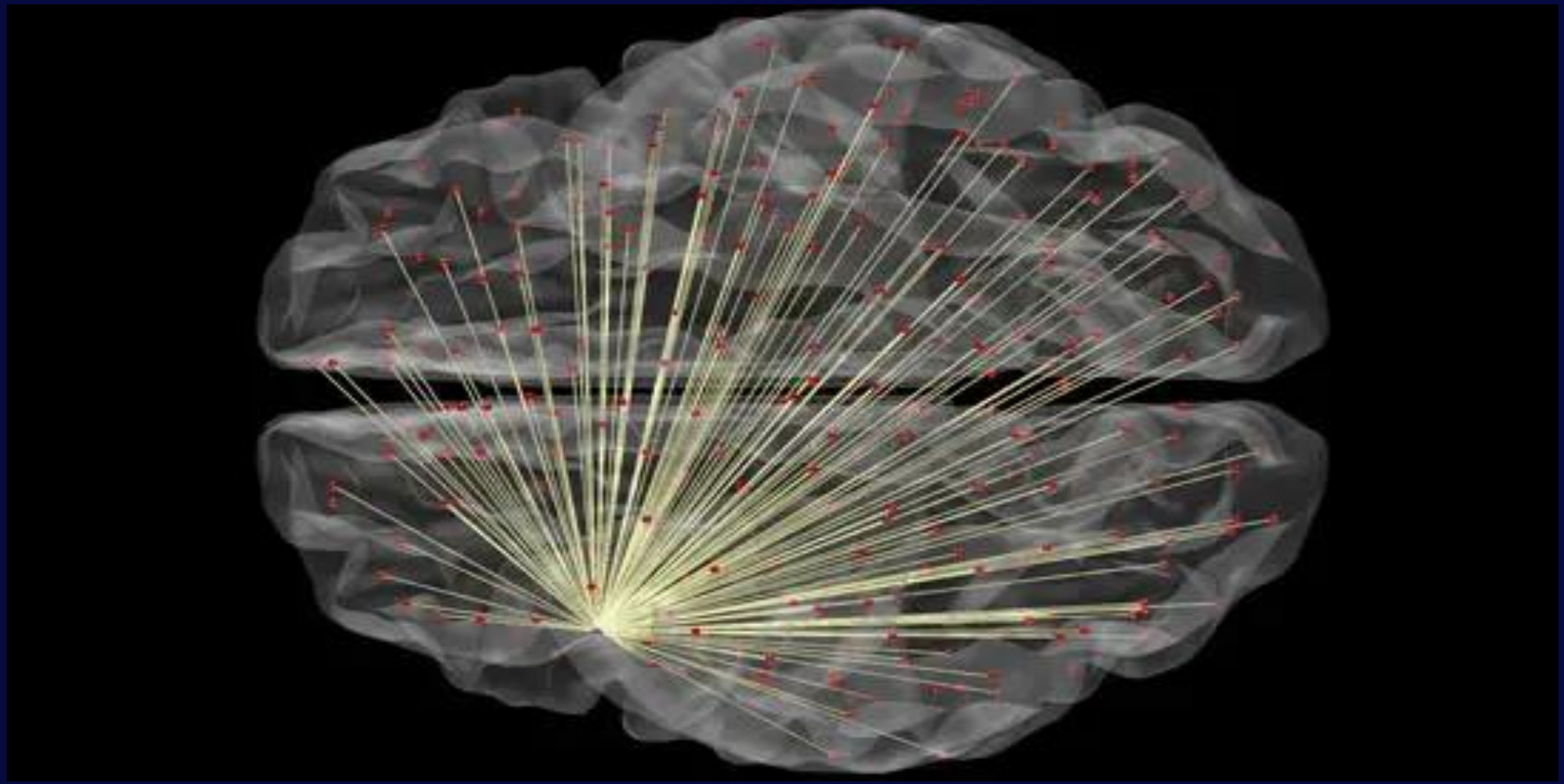


Somatizations

The Neocortical Napkin (~10% cognitive IQ)

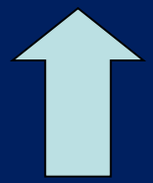


(~10% cognitive IQ)



"CRITICAL" PERIODS OF LIFE

Prenatal, Early Childhood, Puberty
(Human brain ontogeny complete at 25-27 y)



"Regulatory *vs.* Organizational"
Effects of Hormones:
Epigenetics,
"Predictive programming"

(CRH, glucocorticoids, sex steroids, cytokines)

Human Brain Properties

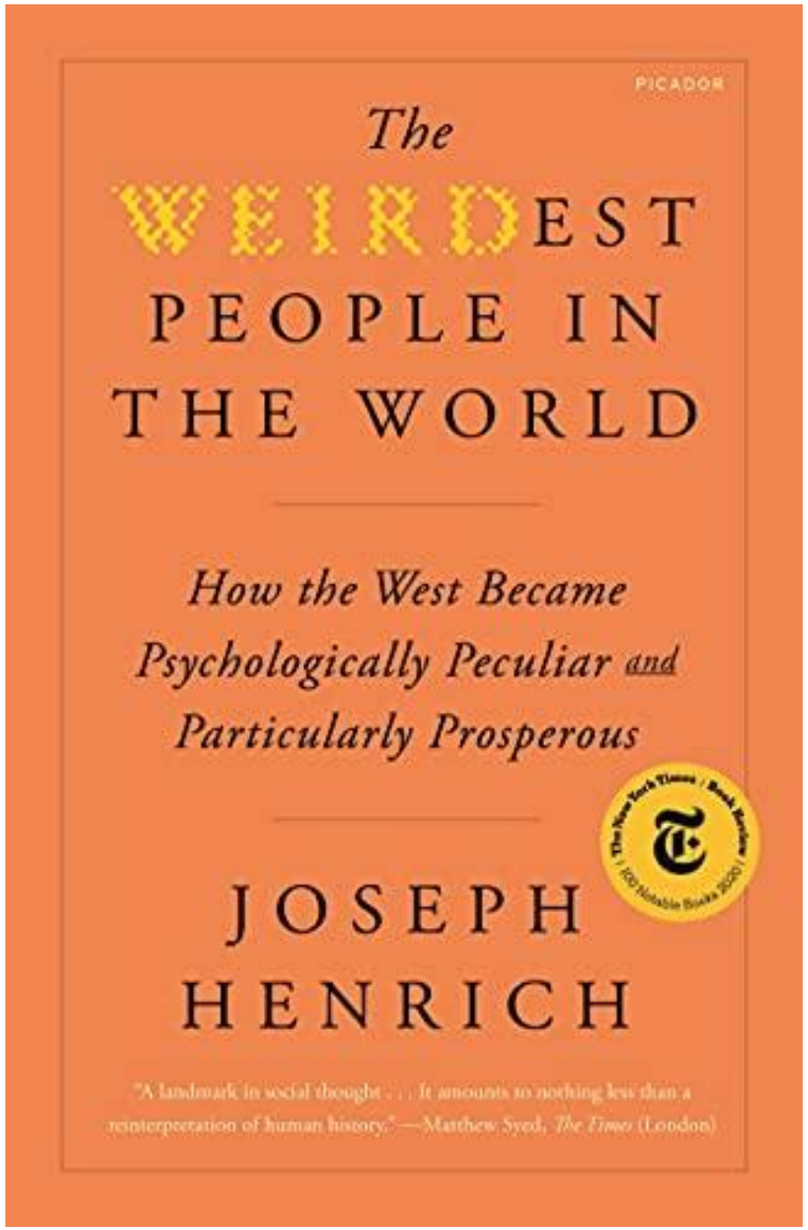
- *Speech/Logical thinking*
- *Volition ("Free will")*
- *Imagination (Space- and time-travel, Metarepresentations)*
- *Effectance, Hormesis (Eustress)*
- *Shared intentionality*
- *Delayed gratification*
- *Empathy/Caring/Morality*

Prefrontal/Frontal Lobe
"Higher Functions"

- Interpretation of the environment, social cues
- Problem solving
- Planning for the future
- Proper control of impulses (emotional auto-regulation)
- Morality

Digital Health Technologies

- Registries/Big Data/Health Systems
- Telemedicine
- Wearables
- Mobile Health
- Virtual Assistants/Chatbots
- Robotic Surgery
- Genomics/Personalized Medicine
- Medical AI



What is the WEIRD acronym?

Henrich et al. found that people from Western, educated, industrialized, rich and democratic (WEIRD) societies — who represent as much as 80 percent of study participants, but only 12 percent of the world's population — are not only unrepresentative of humans as a species, but on many measures they're outliers.

Digital “Negatives”

- “Metamodern” stress (Info overload)
- “Cyborg” stress
- Behavioral dependence
  (“No-mo[bile]-phobia”)= Nomophobia!
- “Computer vision syndrome”
- Myopia
- “Digital burnout”

“Digital Life” Syndrome

- Cognitive overload
- Behavioral dependence
- Attention deficit
- Sleep disturbances
- Sedentary life
- Decreased face-to-face socialization
- Increased myopia prevalence

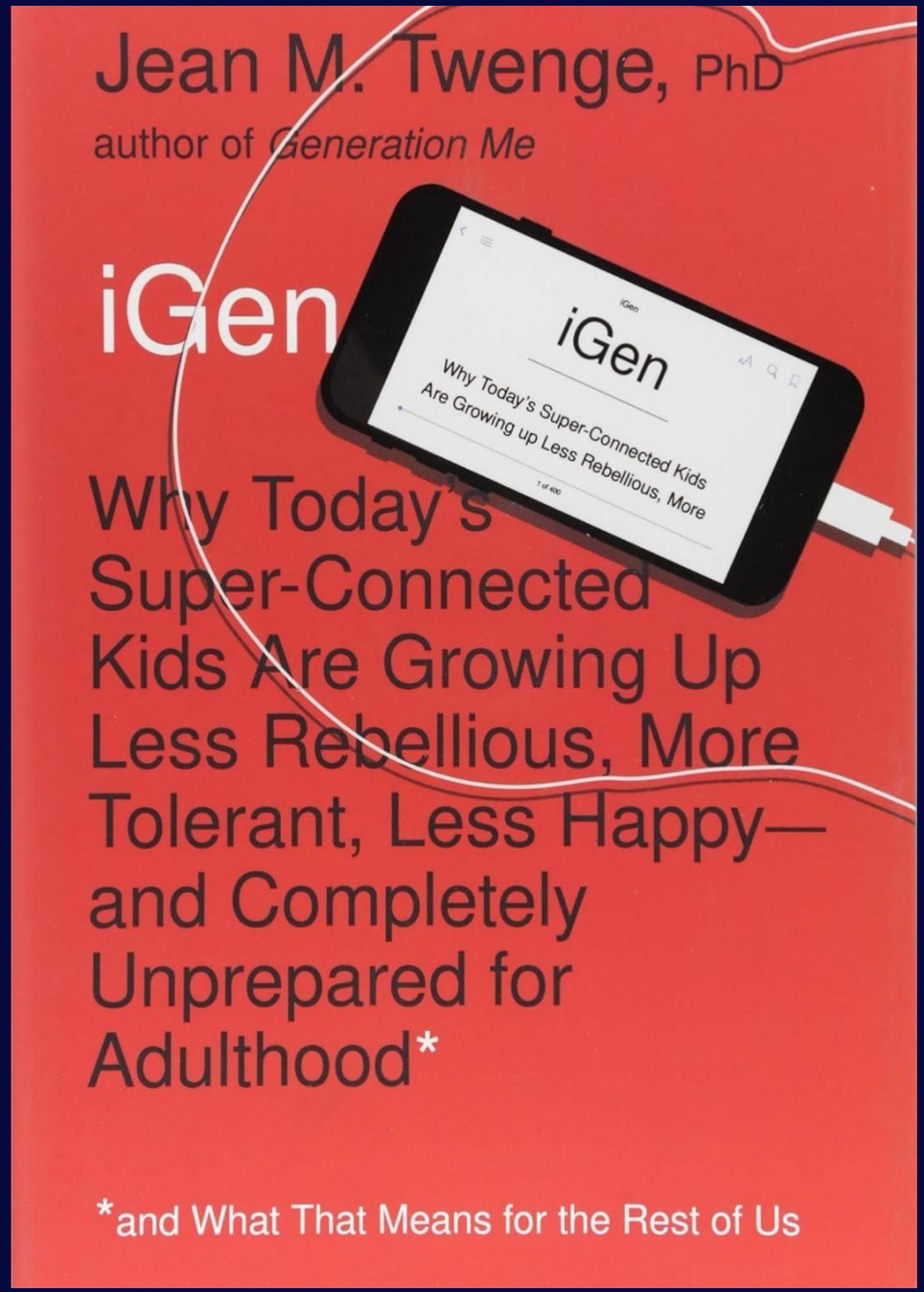
Children and Internet

Early Exposure

Maximos, 2mo

Vanessa 4.5 yo

iGen=
1995-present



Z= 1995-2012
Alpha=
2013-present


VINTAGE

Brain Development in iGen

Both Gen Z and Gen Alpha

- **Decreased face-to-face interaction**
- **Bombardment by digital stimuli**
- **Social immaturity**

- **Stereotypical behavioral features (Gen Alpha):**

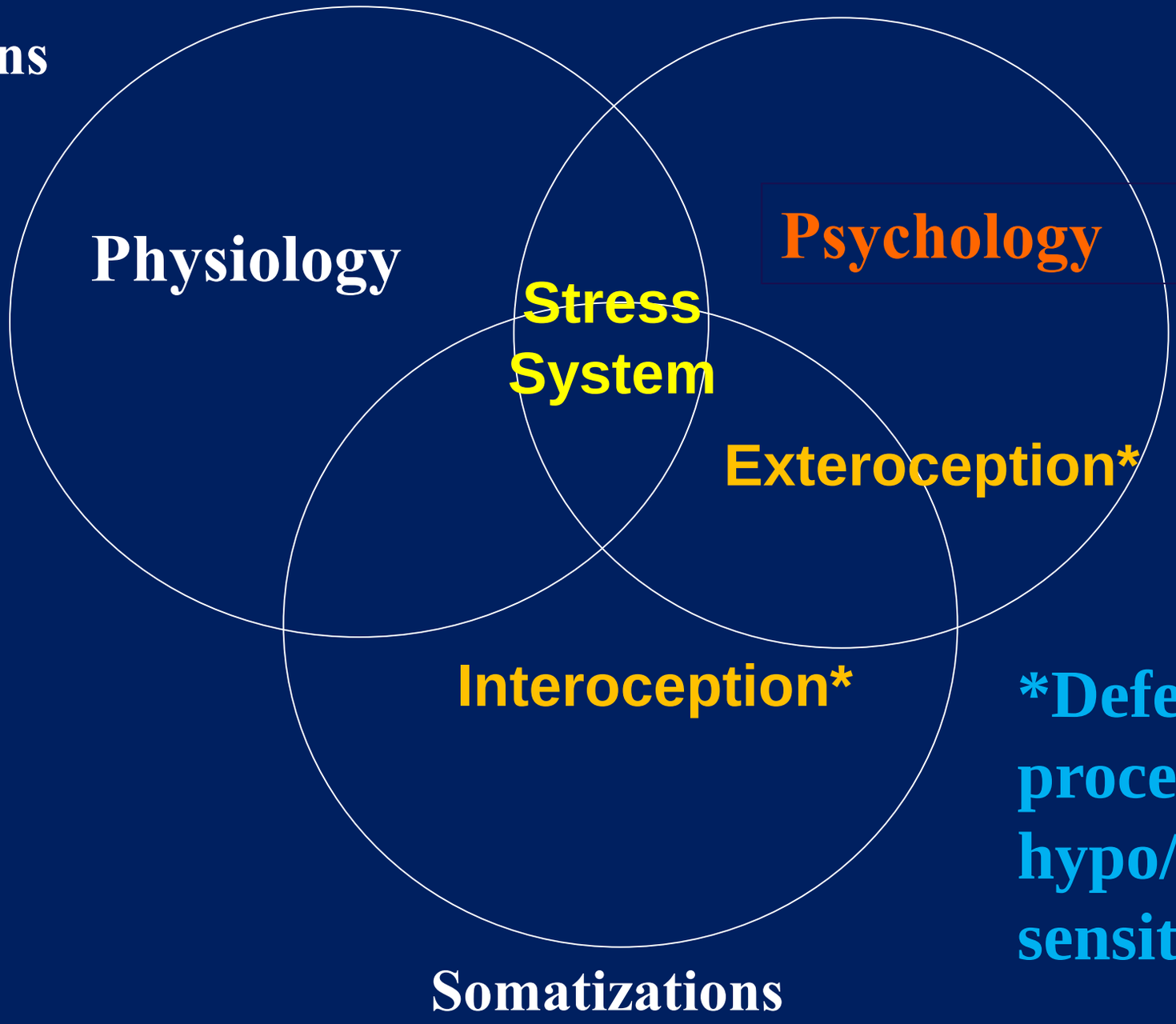
  Atypical sensory processing

  Attention deficits (deep learning, creativity)

  "Brain rewiring"

"Play-based" childhood ⇢ "Screen-based" childhood

Physiologic Manifestations



Psychologic Manifestations Behavior

Attention deficit
Anxiety
Social deficit

***Defective processing: hypo/hyper sensitivity**

Brain Development in Gen Z

- **Digital super-connectedness**
- **Decreased religiosity/spirituality**
- **Decreased rebelliousness, Conservatism**
- **Increased tolerance**
- **Decreased happiness (anxiety, depression)**
- **Completely unprepared for adulthood (social immaturity) (at least 2 y behind)“Physical and social incompetence”)**
- **NEET syndrome (No employment, education, training)**
- **Hikikomori syndrome**

Brain Cognitive Development

20th Century: "Flynn effect"

21st Century: "Reverse Flynn effect"

*Cognitive Development**

- **Verbal IQ (vocabulary, logical thinking) ↓**
- **Matrix reasoning (visual processing, abstract spatial conception) ↓**
- **Problem solving (math, calculations) ↓**

- **Spatial reasoning (movement of objects in 3D ↑**

Multiple Intelligences

- Bodily-kinesthetic
- Musical
- Interpersonal
- Intrapersonal
- Spatial
- Linguistic
- Logical-mathematical
- Naturalistic
- Existential
- Creative ?
- Intuitive?
- A ¡²?

} "Intellectual Ability"
"Cognitive Ability"
"Academic Ability"

Gardner 1983,1985

Neurodiversity ~23% of Children

Neurodiversity ~23% of Children

- Learning Difficulties
- Attention Deficit Hyperactivity Disorder
- Sensory Processing Disorders
- Autism Spectrum Disorder

4 Ways Parents Can Boost Preschool Children's IQ

- **Omega-3 supplementation 3.5 pts**
- **Reading to children interactively 6 pts**
- **Early educational interventions (Rx)**
- **Sending children to a quality preschool 7 pts**

Protzko et al., *Perspectives on Psychological Science* 2013

Maria Montessori 1870-1952

"The most important period in human life is not that of the school years, but from birth to the 6th year of life"

Importance of Play and Learning

- Play, especially imaginative and unstructured play, fosters brain development.
- Enhances creativity, problem-solving, and social skills.
- Early education and interaction with caregivers play a crucial role in cognitive growth.

Socialization is important

Risk-taking is important

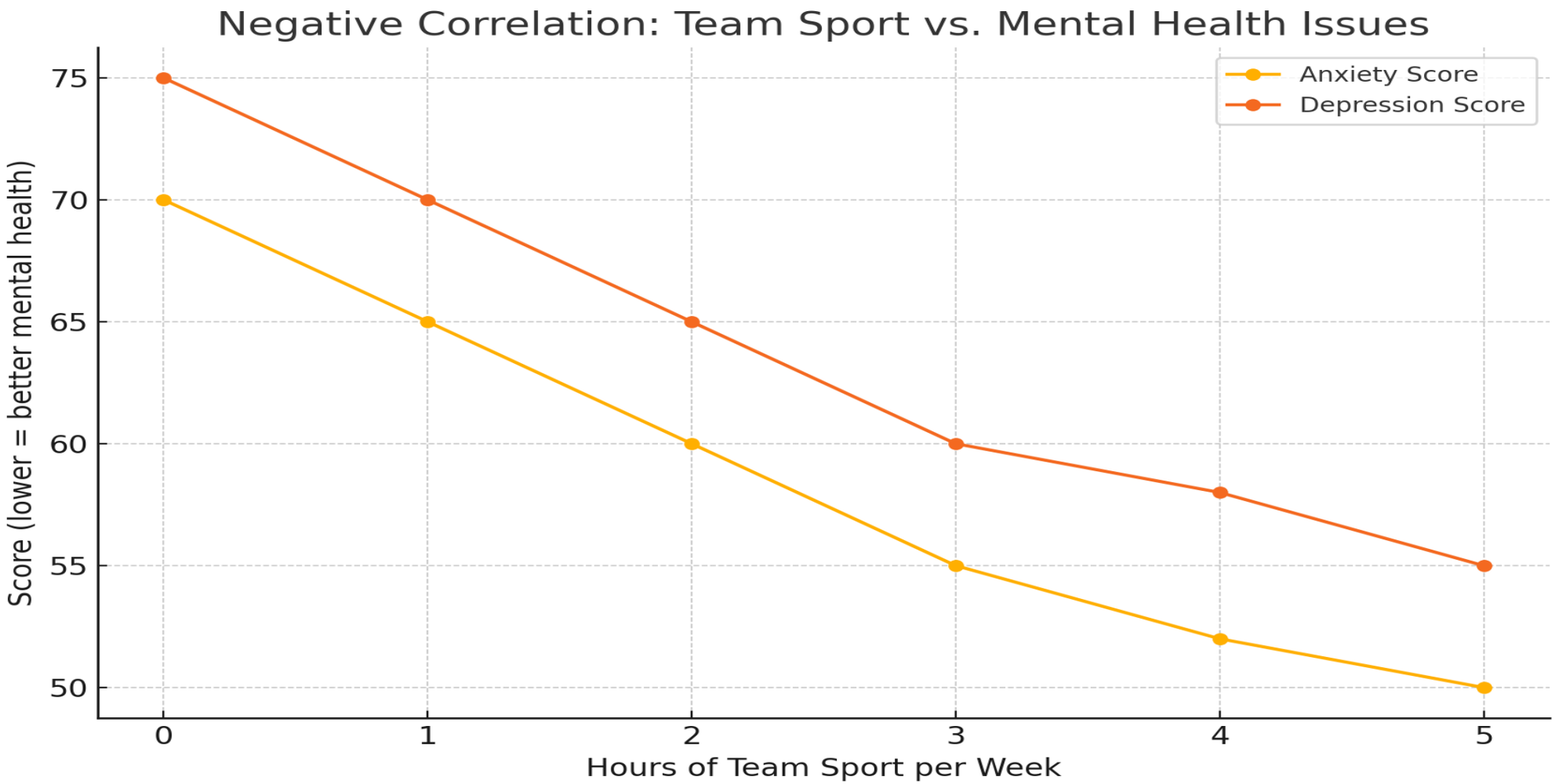
What can we do?W

- No smart phones in schools
- Increase opportunities for social interactions, including play time (preschooling)
- Athletics/sports
- Increased exposure to reading and books
- Social media only after the age of 16

Kids playing

Team Sports

Team Sports and Mental Health in Children and Adolescents



Key Takeaways

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- **Team sports are linked to lower levels of anxiety and depression in children.**
- **Physical activity serves as a protective factor against mental health issues.**
- **Organized sports contribute to better psychosocial health during adolescence**.