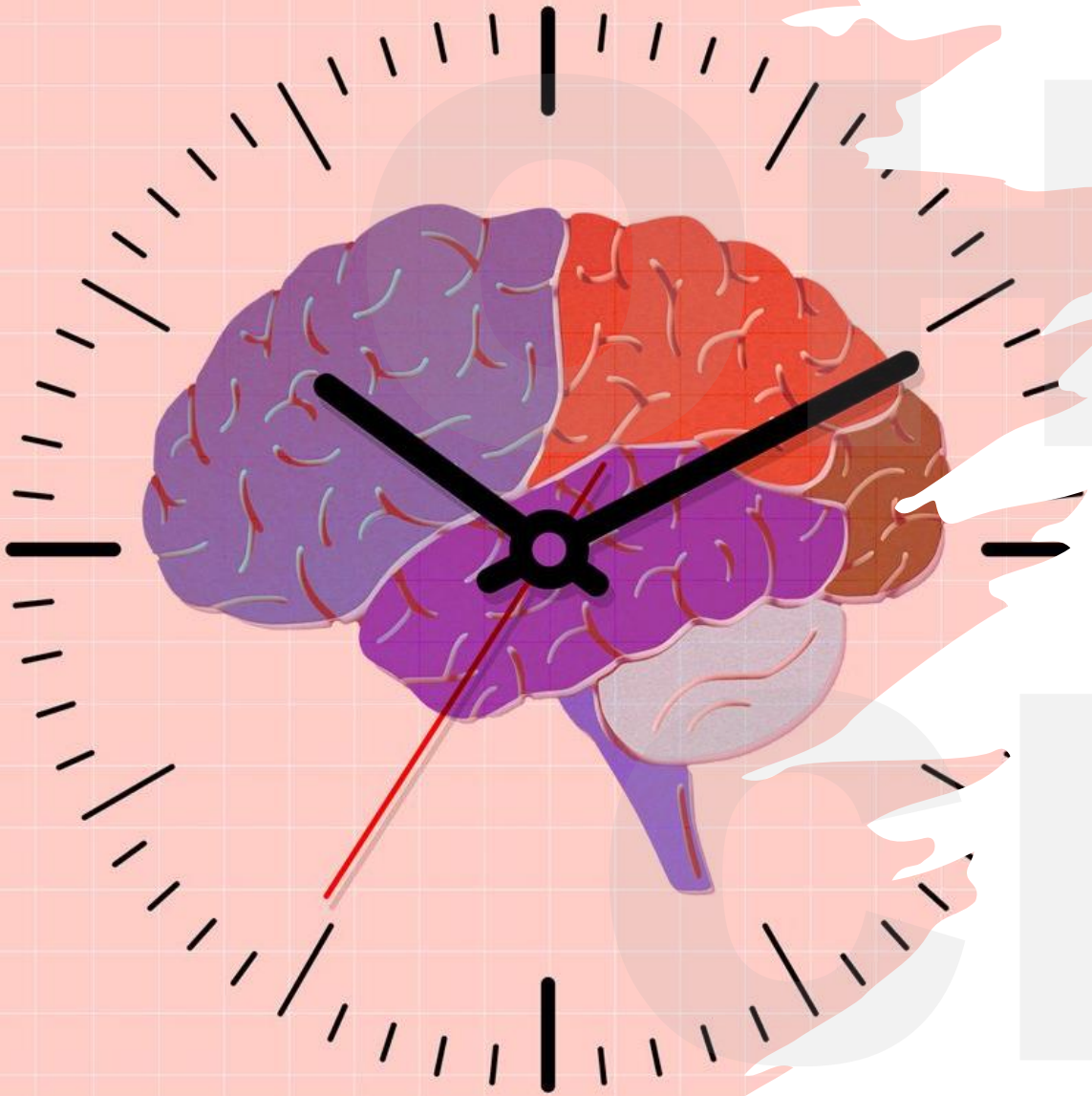
Cognitive Aging & Brain Health

Shanna Cooper, PhD, ABPP-CN

14 March 2025

No Disclosures



Agenda

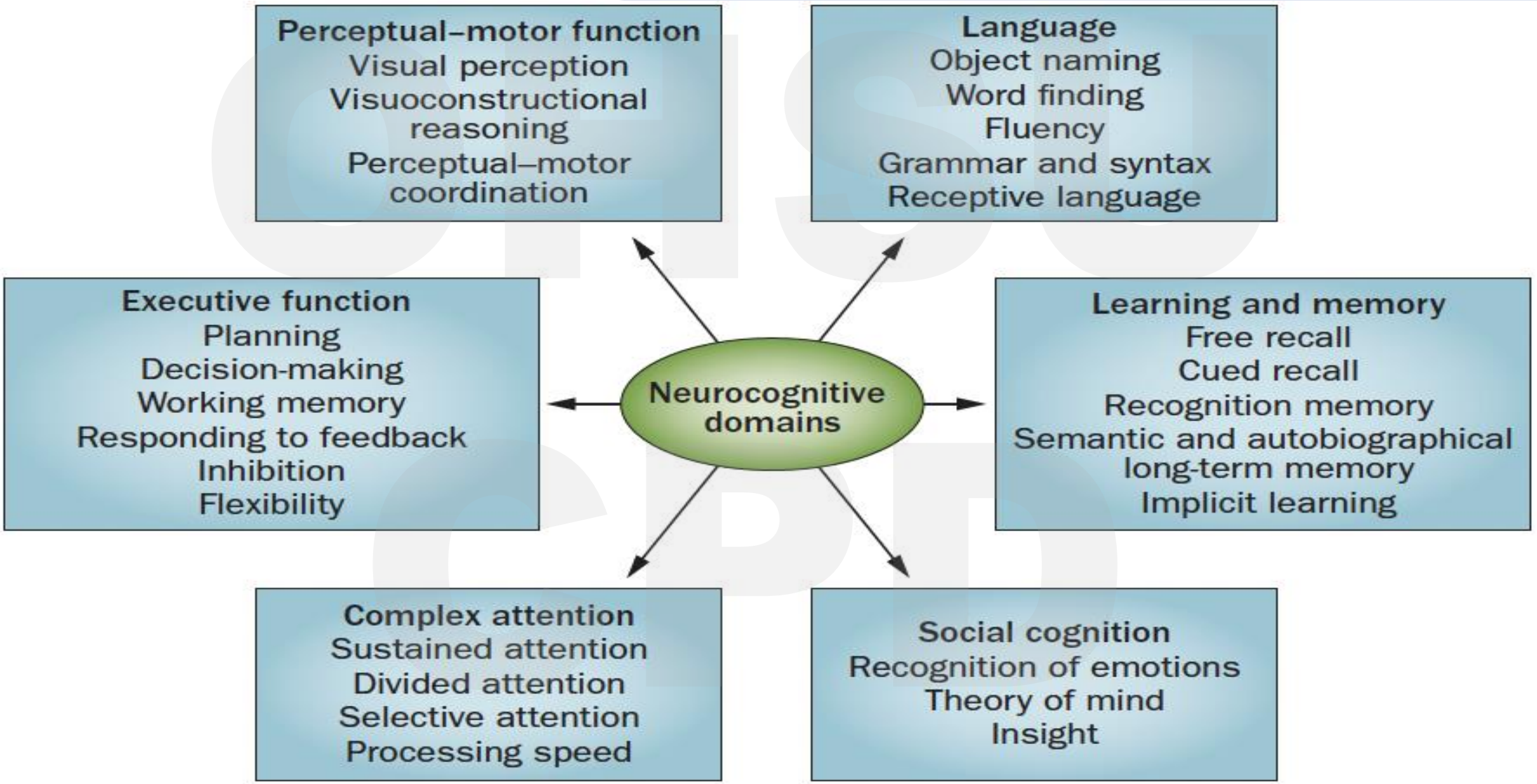
- Cognition & Cognitive Aging
  - Who are neuropsychologists
  - What is cognition
  - Why it is relevant to Primary Care
- Cognitive Screeners
  - Advantages & disadvantages
  - Comprehensive neuropsych evals
- Cognitive/Brain Health

What does a neuropsychologist do?

- PhD psychologist
- Specialty training on brain-behavior relationships
- OHSU
  - Evaluate changes in thinking/comportment
  - Provide data, etiological opinion, recommendations
  - Referring provider to determine next steps
  - No treatment
- Focus is to determine whether/degree of cognitive changes in patient

Shanna Cooper, PhD, ABPP-CN
Assistant Professor – Psychiatry & Neurology
Director – Adult Neuropsychology Clinic
Program Director - Clinical Psychology PhD Program

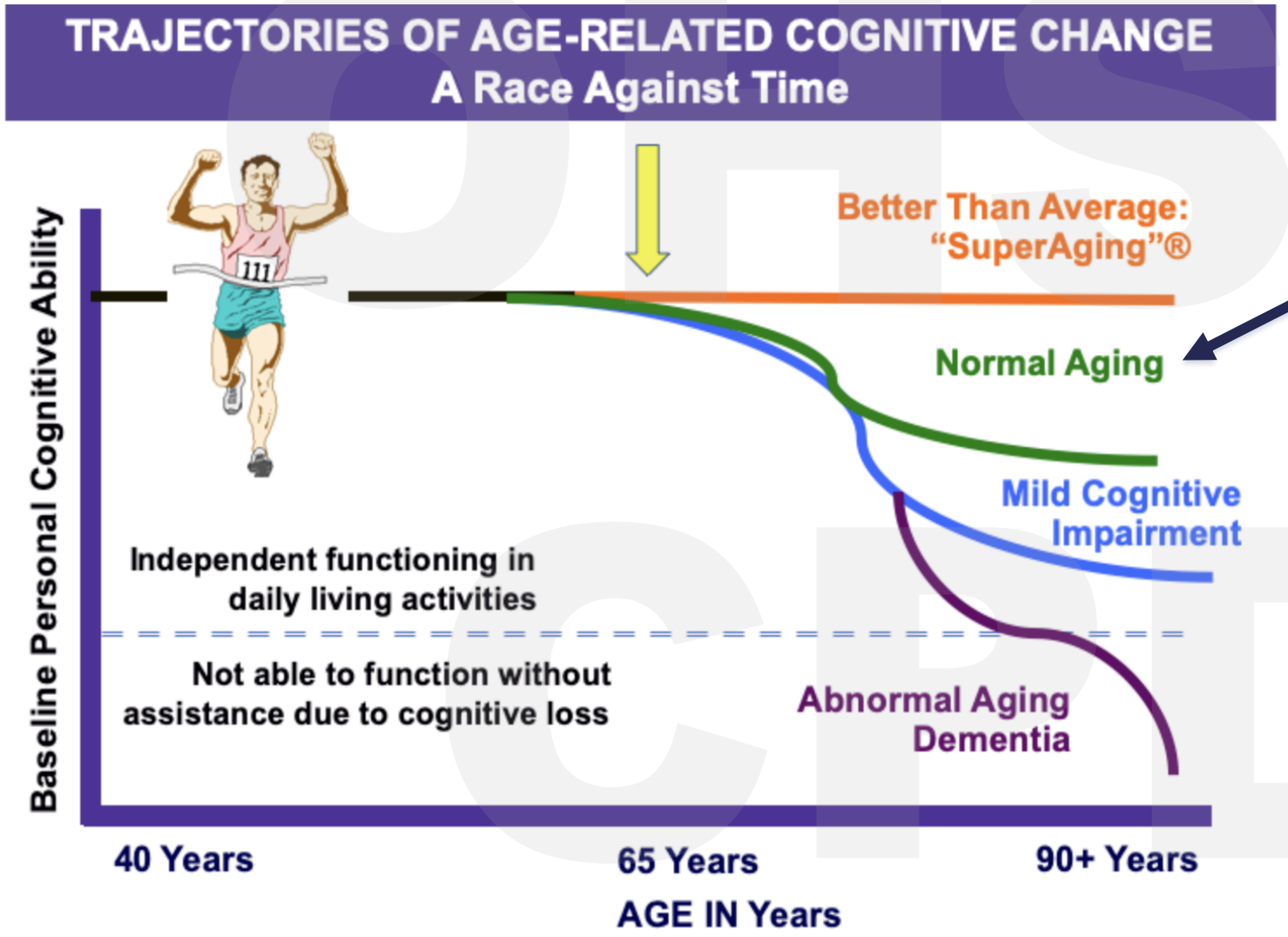
Cognition


Perceptual–motor function
Visual perception
Visuoconstructional reasoning
Perceptual–motor coordination
Language
Object naming
Word finding
Fluency
Grammar and syntax
Receptive language
Executive function
Planning
Decision-making
Working memory
Responding to feedback
Inhibition
Flexibility
Neurocognitive domains
Learning and memory
Free recall
Cued recall
Recognition memory
Semantic and autobiographical long-term memory
Implicit learning
Complex attention
Sustained attention
Divided attention
Selective attention
Processing speed
Social cognition
Recognition of emotions
Theory of mind
Insight

Cognitive complaints are in your office!

- Quickly growing aging population (alz.org)
  - Increase in age-related dementias
  - ~7 million with AD current rising to ~13 million by 2050
- Increase in TBIs (cdc.gov)
  - ~230,000 people in US hospitalized each year
  - Cumulative result = ~5.3 million with ongoing sequelae
- Other diagnosis of cognitive disorders also increasing
- Media
  - Increased provider awareness/referrals
  - Famous people
    - Gene Hackman, Robin Williams, Wendy Williams, Bruce Willis, Muhammad Ali
  - Social media
    - Known connections, influencers
    - But… a **lot** of misinformation (e.g., Yeung et al., 2022)

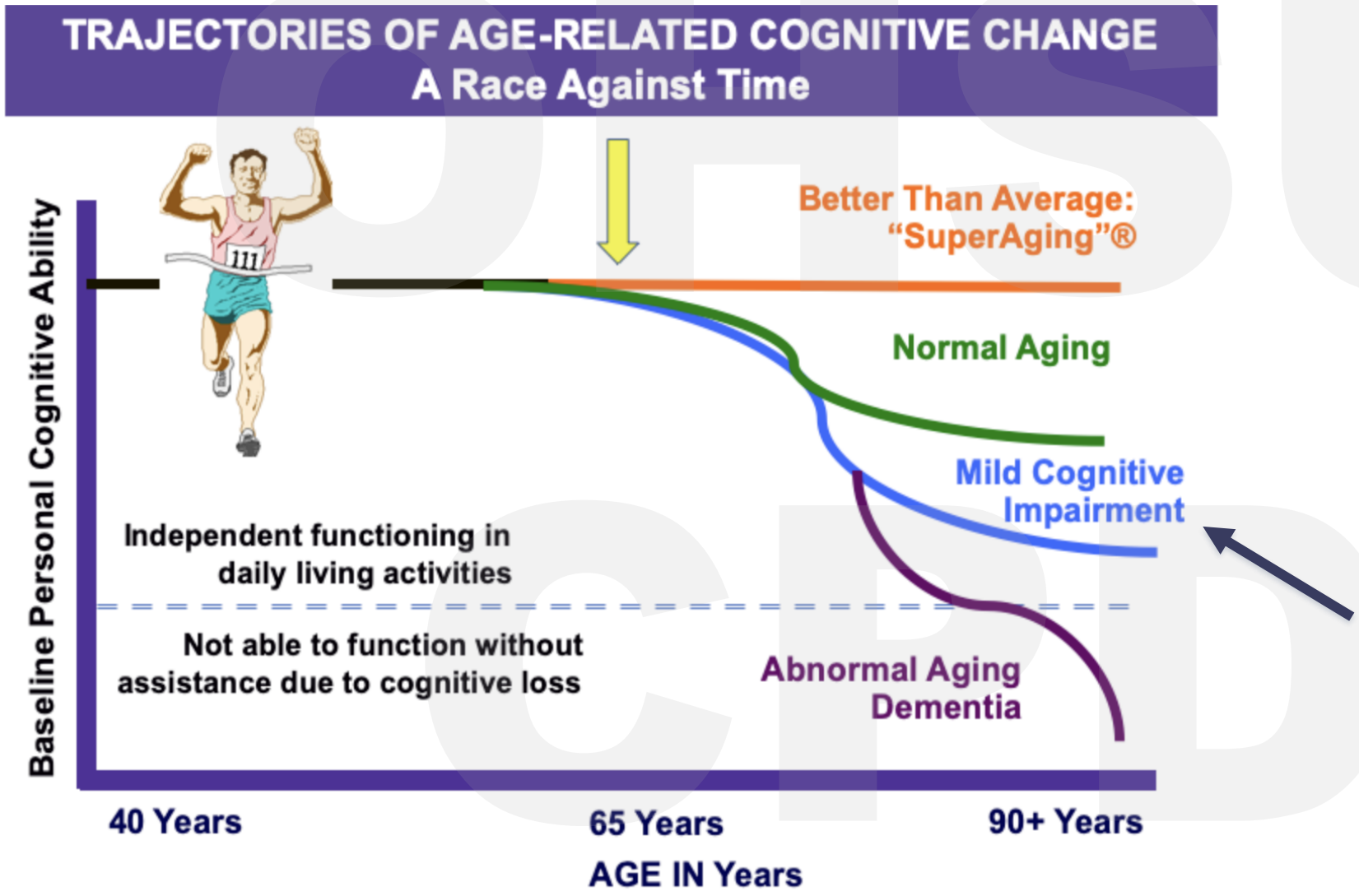
Cognitive Aging



MOST of us will experience SOME cognitive change with age

Some cognitive change is <u>expected</u>

Cognitive Aging



But, sometimes these cognitive changes start to become GREATER than expected

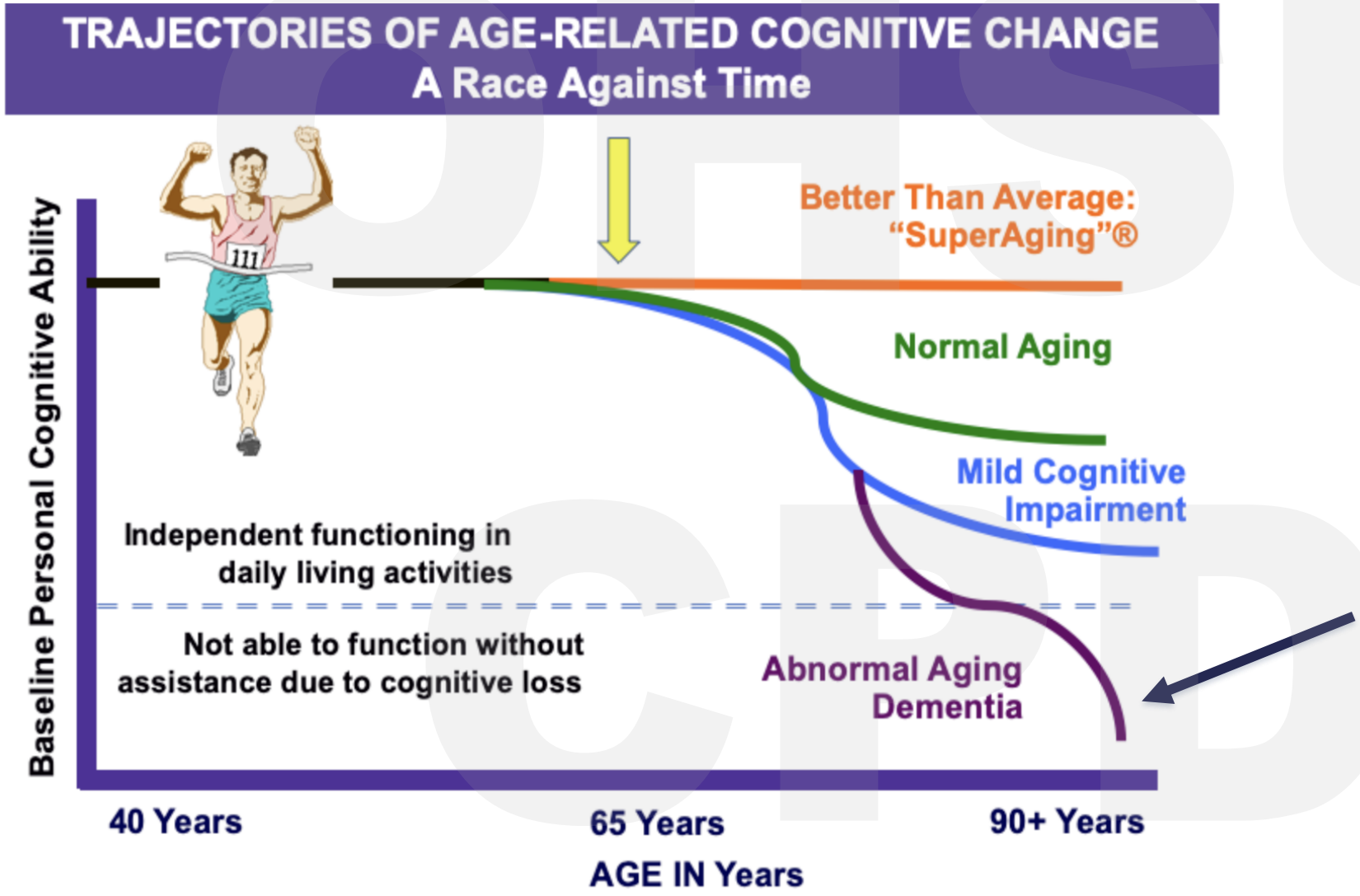
We call this **mild cognitive impairment /mild neurocognitive disorder**

What is the difference?

Repeated cognitive issues & mistakes

Normal Aging	*Possible* Mild Neurocognitive Disorder
• Making a bad decision occasionally; taking longer to complete tasks	• Poor judgement & decision-making
• Occasionally missing a bill payment or daily meds	• Difficulty & errors managing finances; financial scams
• Forgetting what day it is & remembering later	• Losing track of the day & month of the year often
• Misplacing things from time to time	• Losing items & missing details of conversations

Cognitive Aging



When cognitive deficits are severe and impact **everyday functioning**, we call this **dementia /major neurocognitive disorder**

Cognitive Screeners

Longstanding

- Consideration of screeners for diseases longstanding
- Wilson & Junger, 1968

Common

- VERY common to use screeners in PC & community
- e.g., Morely et al., 2015

Useful

- Utility for physical disease decision-making, research, & outcome improvements
- e.g., Quinlivan et al., 2015; Faruque et al., 2015

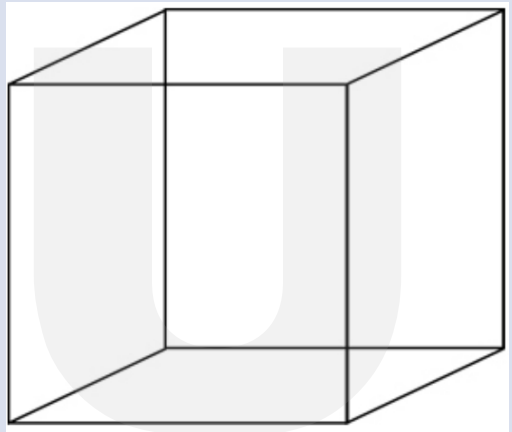
Informative

- Quantifies global cognitive ability (w/caveats!) for easy tracking
- Cierus et al., 2015; Perry et al., 2015; Morley et al., 2015; Raiker et al., 2015; Zygouris et al., 2015

(some)

Cognitive Screeners

- MoCA (Nasreddine et al., 2005)
- SLUMS (Feliciano et al., 2013)
- Oxford Cognitive Screen (Demeyere et al., 2015)
- MMSE (Folstein et al., 1975)
- TICS (Brandt & Folstein, 1988)
- Cambridge Cog (Hupper et al., 1995)
- CNS Vital Signs (Gualtieri et al., 2006)
- 6-Item (Callahan et al., 2002)



Screeners are not created equally

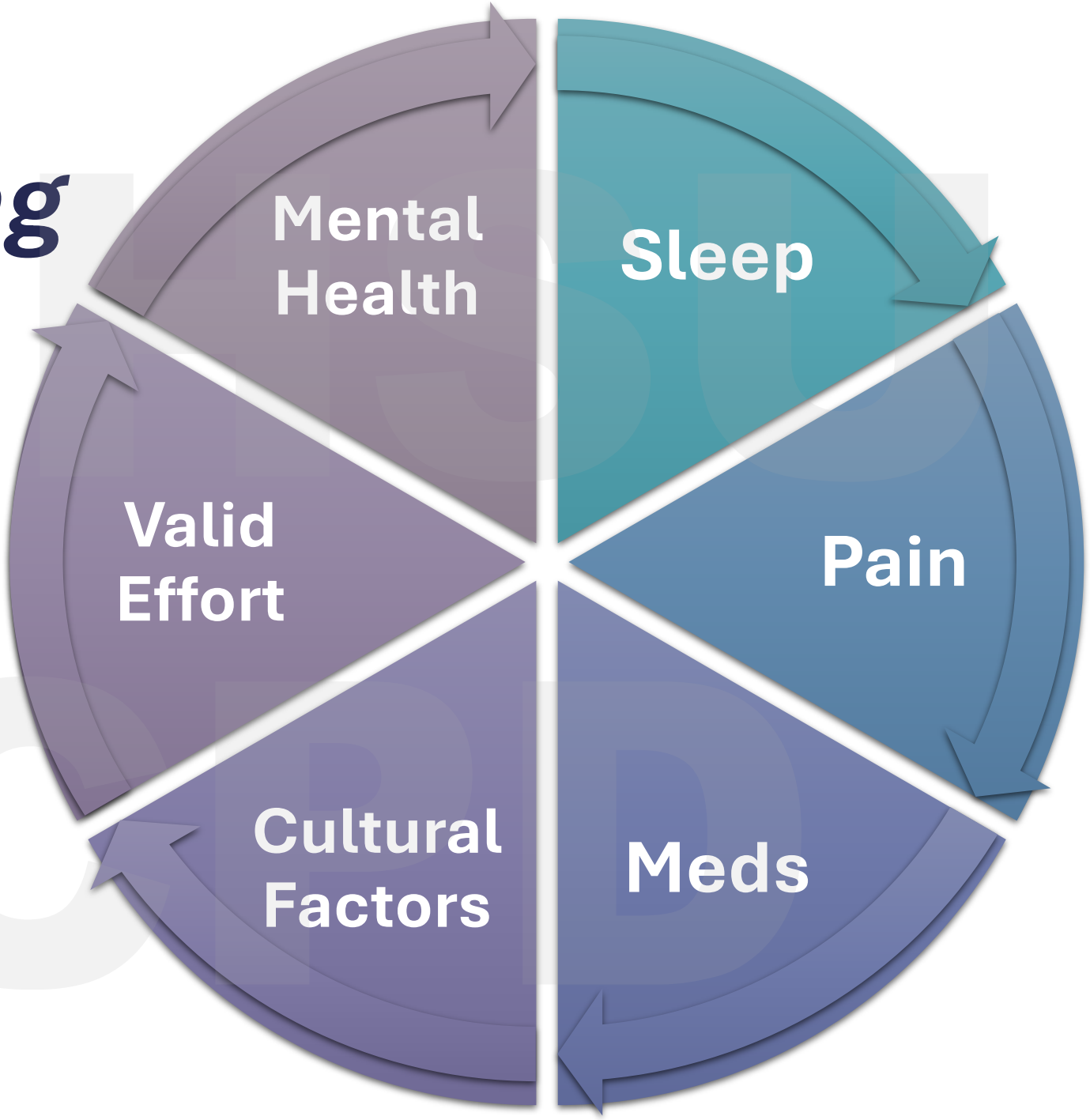
Cognitive complaints are variable

Screening Cognition

Not all subjective concerns are measurable

MANY factors contribute to cognitive concerns

(some) Contributing Factors



Are cognitive screeners accurate?

Advantages

Boustani e tal., 2003; Cordell et al., 2013
Bauer et al., 2012

Disadvantages

Chan et al., 2014; Olson et al., 2011
Moafmashhadi & Koski, 2012

Comprehensive Neuropsychological Evaluations

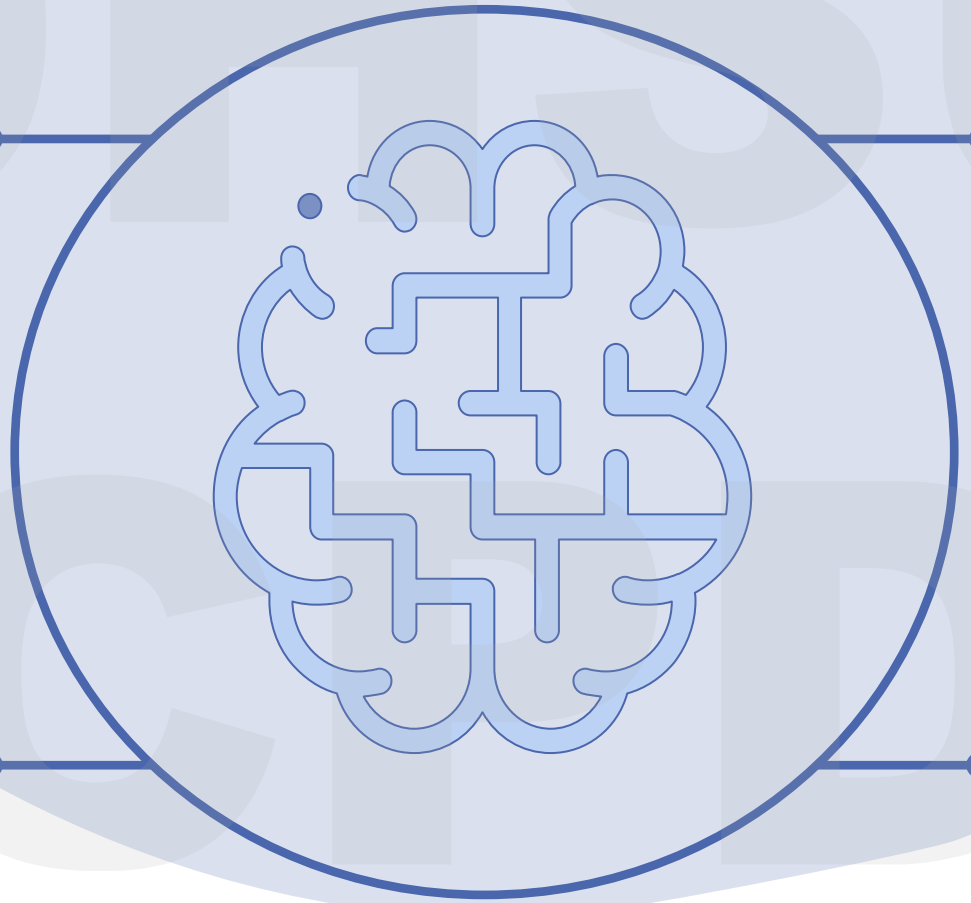
Comprehensive Neuropsych Evals

Trans-Diagnostic Sensitivity

Braun et al., 2011
Schmand et al., 2014

Predictor of Functional Status

Green et al., 2008
Hanks et al., 2008
Sherman et al., 2011



Valued & Useful

Hilsabeck et al., 2014
Temple et al., 2006
Tremont et al., 2002
Westervelt et al., 2007

Cost-Effective

Prigatano & Pliskin, 2003
VanKirk et al., 2013
Smith et al., 2017

(some) Benefits of Neuropsych Evals

Provides a more comprehensive clinical picture of person

Comprehensive focus on person's functioning across multiple domains

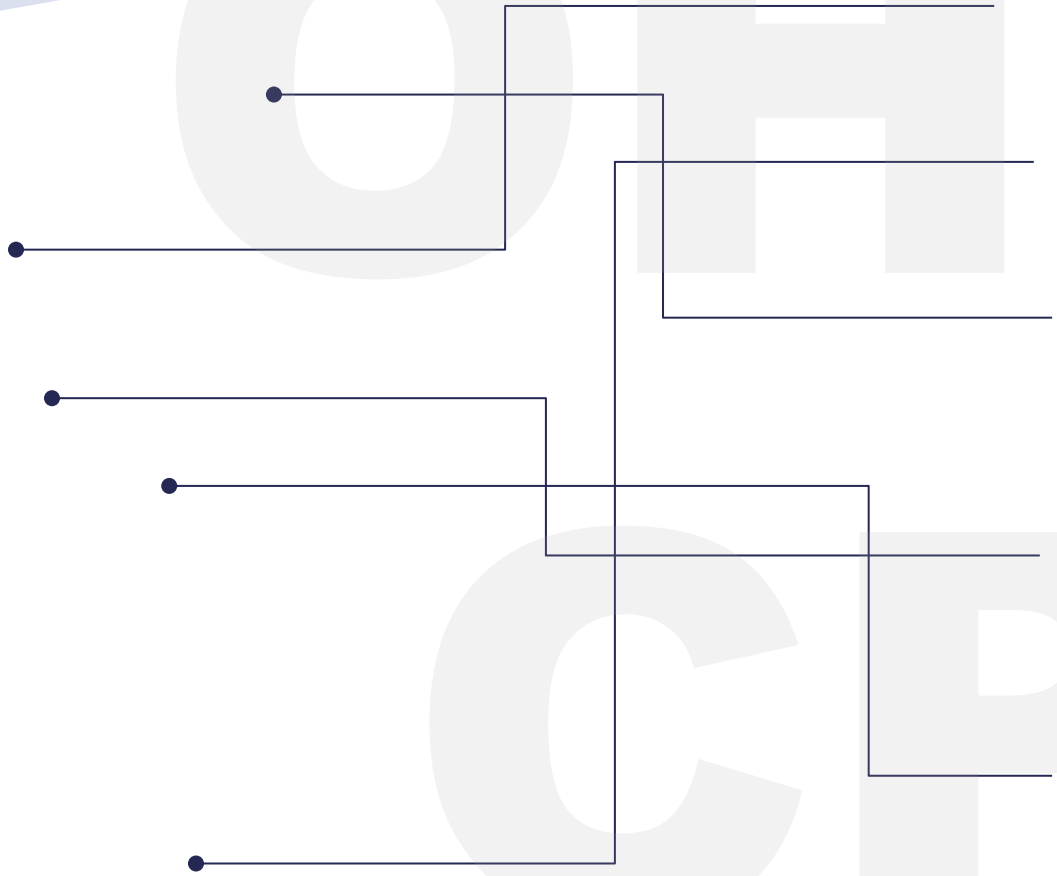
Covers multiple domains of functioning: language, memory, visual/verbal problem solving, executive functioning, adaptive functioning, psychological status, level of self-care, psychosocial history, etc.

Can identify presence/severity of psychological problems/considtions and related treatment recommendations

Aids in diagnosis and/or treatment planning in a culturally competent manner

Integrates results from multiple methods, including interview, tests, behaviors, records review, collateral informants, etc.

Some Disadvantages



Duration of Testing

Sessions usually take 2-8 hours

Wait Times

National average is about 6-12 months

Providers

Young specialty

Long duration of training

Cultural Limitations

Test materials

Norms

Cost

Insurance troubles

Cash pay ranges

National average >$3000 for PP

Screeners vs Neuropsych Evals

Table 1. Summary of distinctions between cognitive screening tests and comprehensive neuropsychological batteries

	Cognitive Screening Tests	Comprehensive Neuropsychological Batteries
Potential uses	• Early identification of individuals at potential risk for condition or disorder • May indicate need for further evaluation or intervention • May be used to monitor progression of symptoms or response to intervention • Does not provide definitive diagnoses	• Determination of presence and magnitude of impairment • Determination of diagnoses • Determination of functional status, abilities, and capacities • Assistance with medical treatment planning
Administration	• Generally brief (<30 min) • May be administered as part of routine clinical visit • Requires minimal training for administrator or can be self-administered	• Varies but typically several hours • Typically occurs as a separate encounter or appointment • Requires specialized training in administration and interpretation
Domains assessed	• Narrow in scope	• Multidimensional • Provides information about functioning across multiple domains

Brain Health


A
heimer's
cular
y body
ntotemporal
her, including Huntington's
* Mixed dementia: Dementia from more than one cause
with daily life.

Risk factors for cognitive decline

- Non-Modifi

How do non-modifiable risk factors impact the brain?

Age impacts brain structure & function, which then impacts cognition

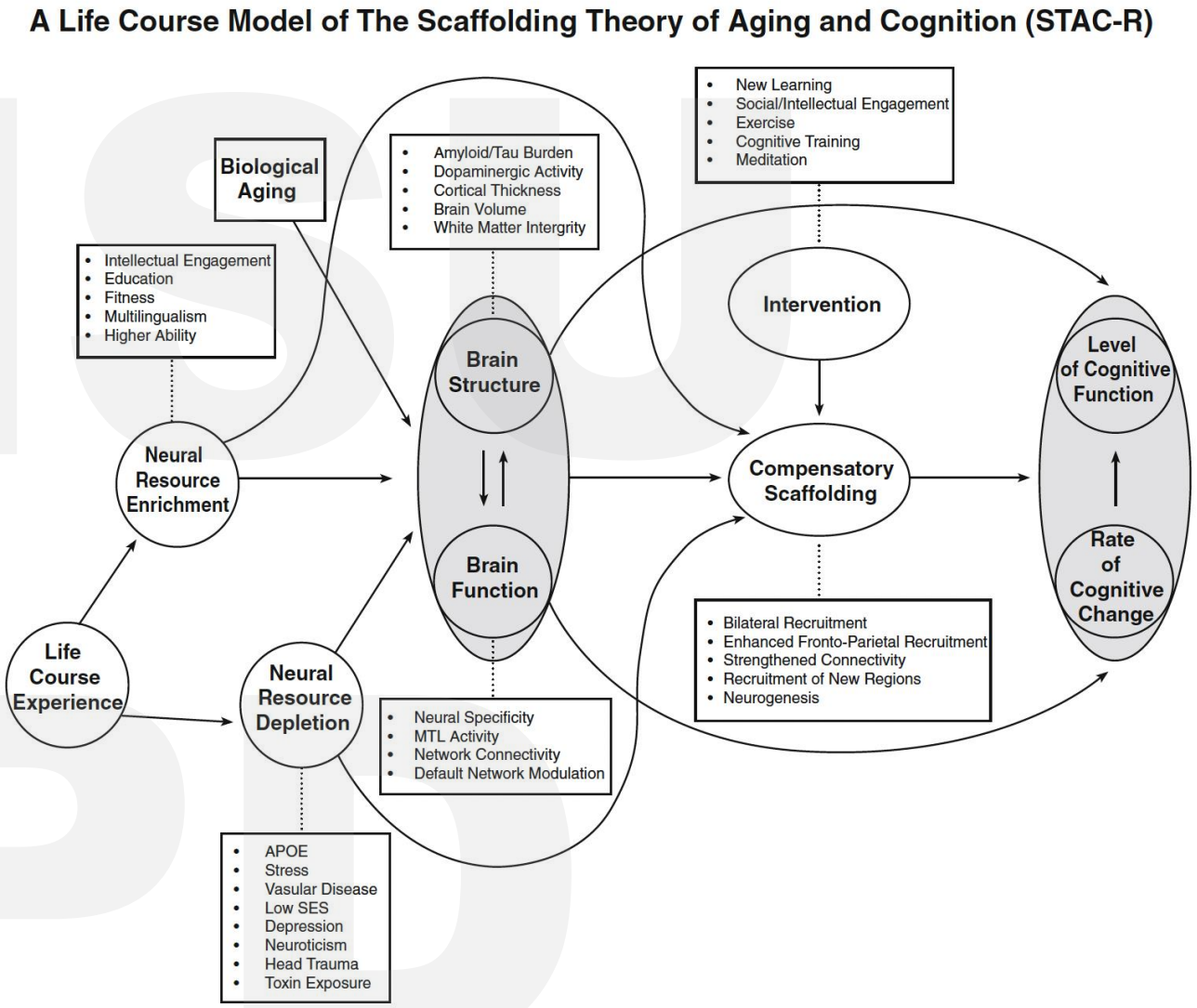


Fig. 2 A conceptual model of the scaffolding theory of aging and cognition-revised (STAC-r)

Reuter-Lorenz et al., 2014

Non-modifiable risk factors impact the brain

Structure: tissue loss, atrophy

Function: less efficient, does not work as well/fast

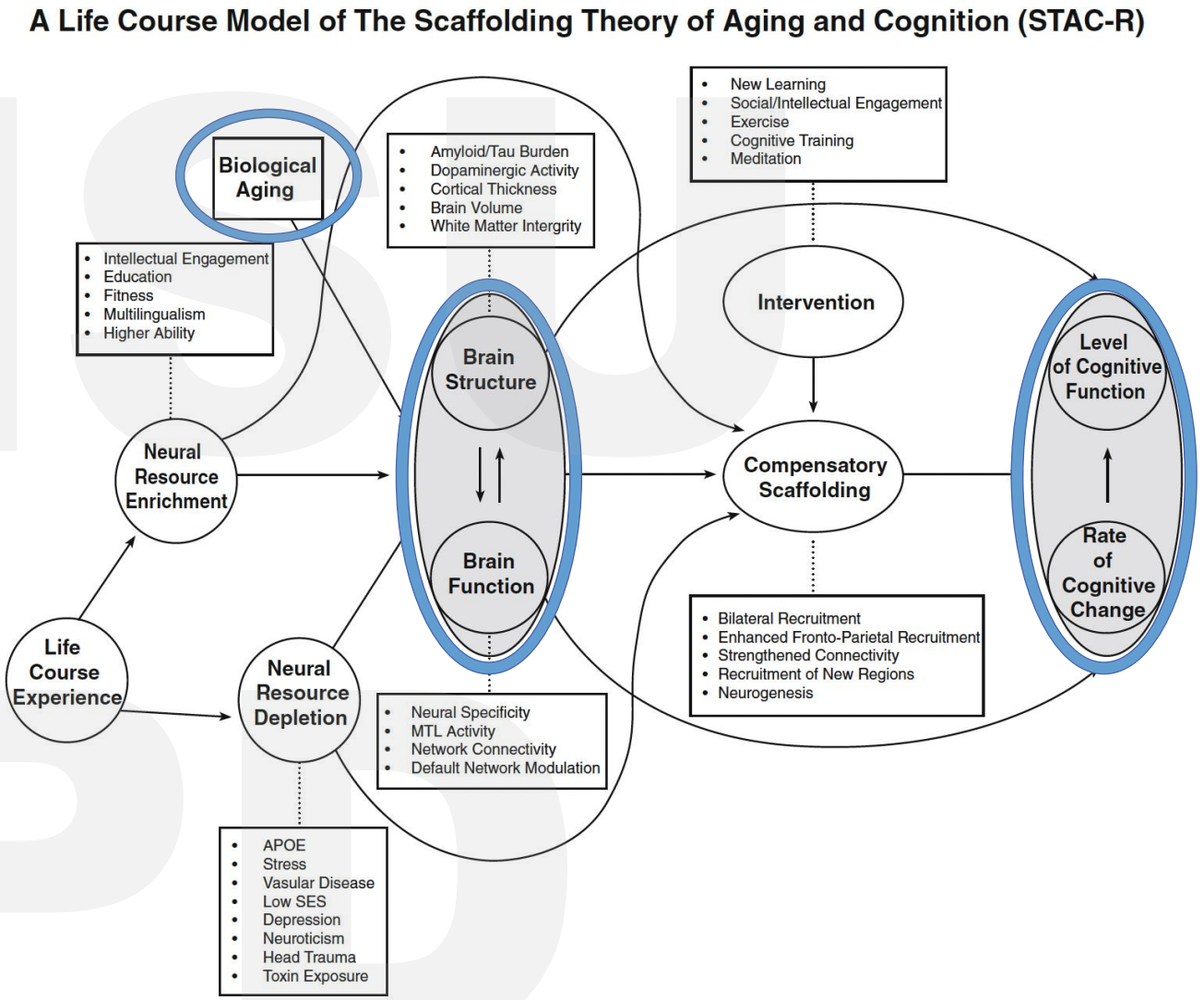


Fig. 2 A conceptual model of the scaffolding theory of aging and cognition-revised (STAC-r)

Reuter-Lorenz et al., 2014

Non-modifiable risk factors impact the brain

Accumulation of proteins also impacts brain structure & function

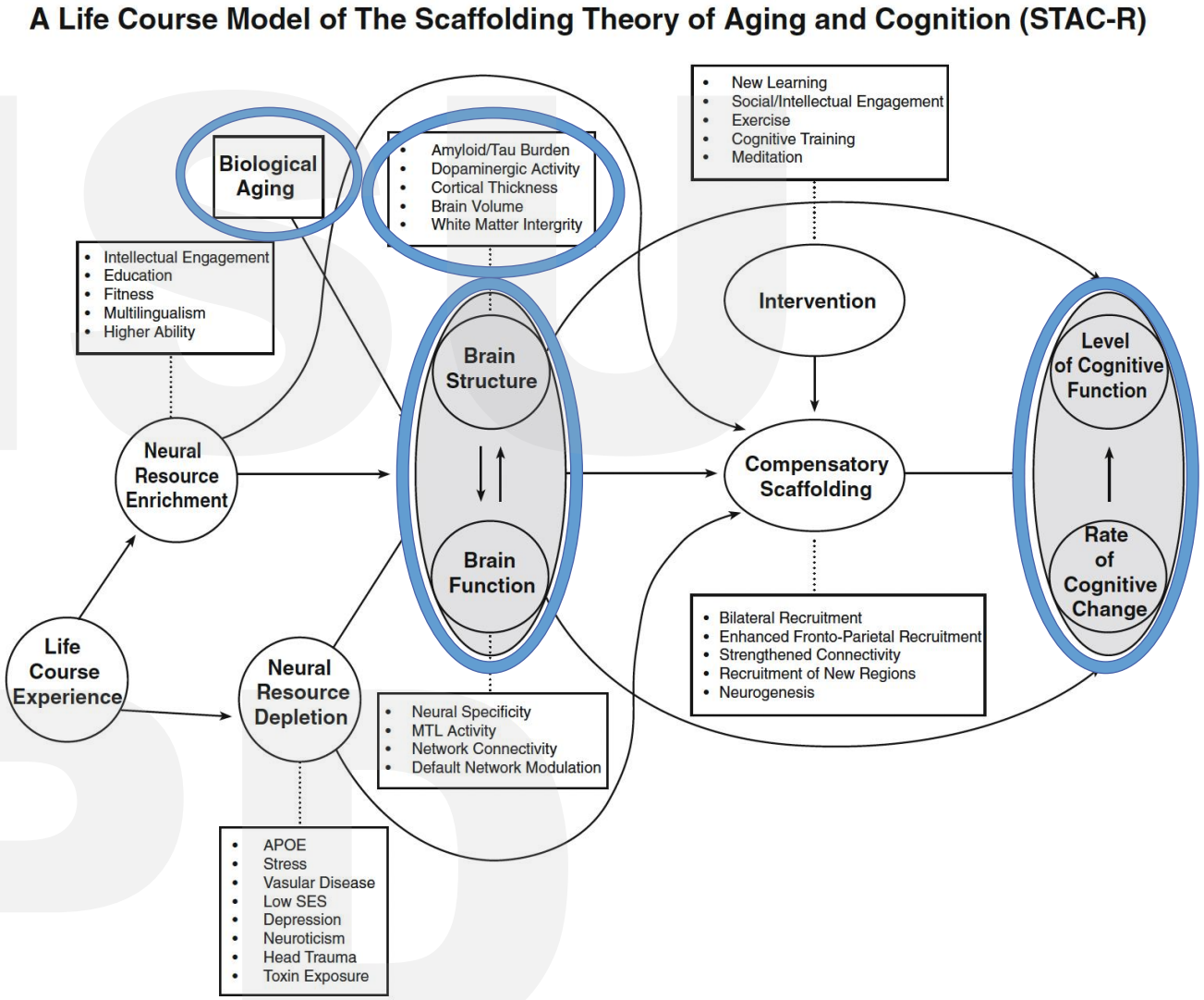


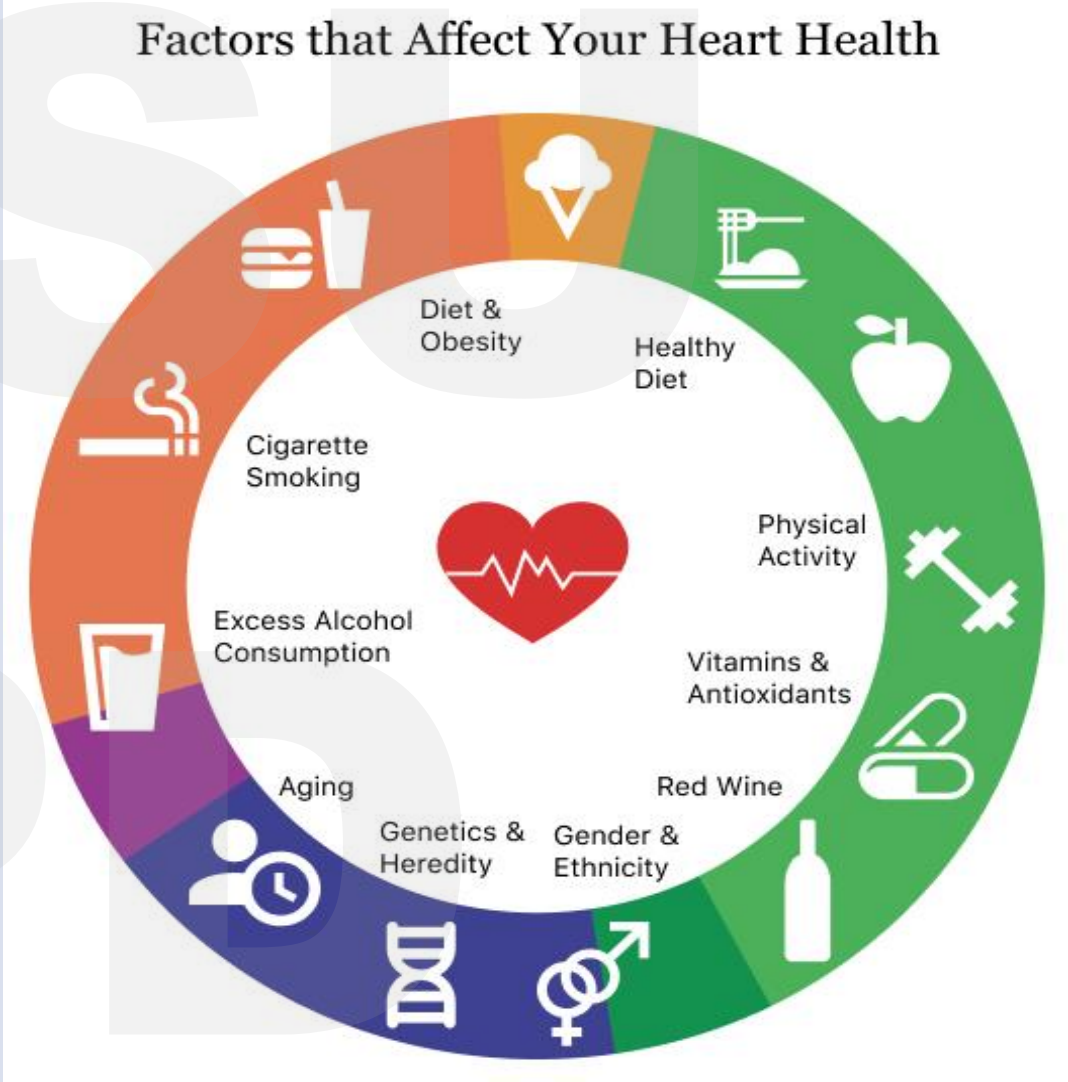
Fig. 2 A conceptual model of the scaffolding theory of aging and cognition-revised (STAC-r)

Reuter-Lorenz et al., 2014

Heart health = brain health!

But, some factors are non-modifiable:

- Age
- Sex
- Genetics



How do modifiable risk factors impact the brain?

Impact:

- Brain structure & function
- Brain's ability to compensate or leverage other areas
- Cognition

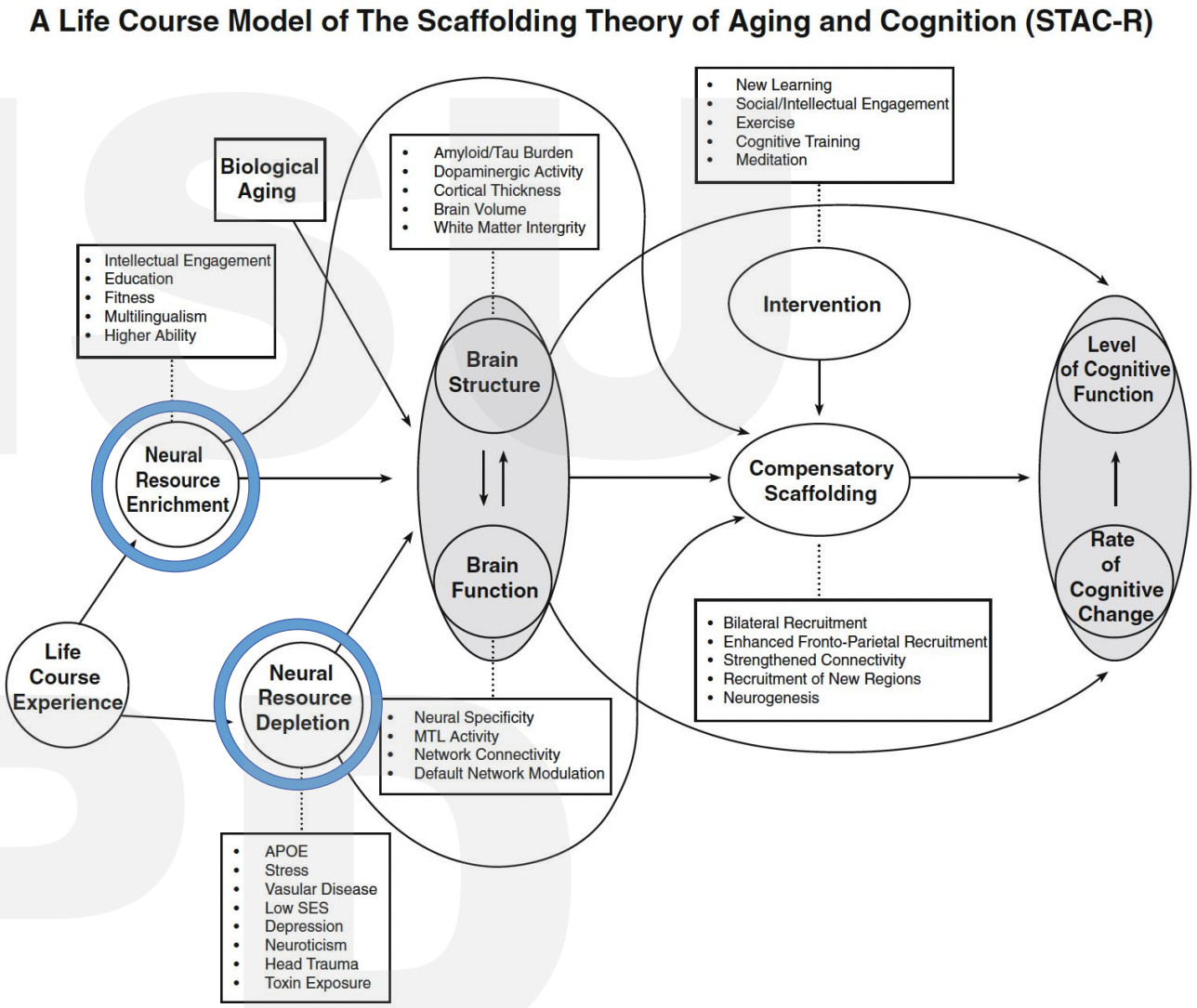
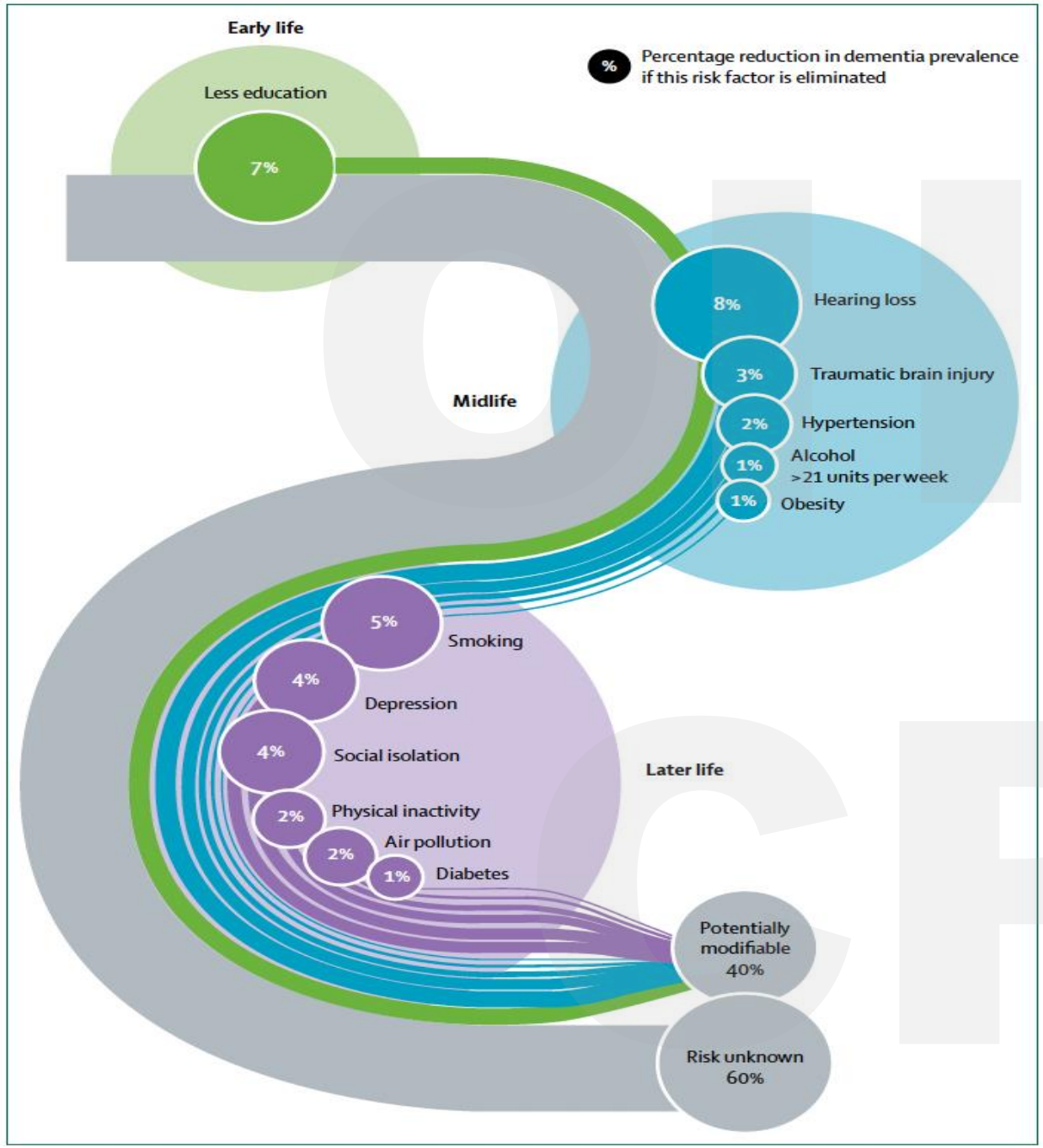


Fig. 2 A conceptual model of the scaffolding theory of aging and cognition-revised (STAC-r)

Reuter-Lorenz et al., 2014



Livingston et al., 2020

Percentage of potentially modifiable risk factors for dementia

- Growing evidence that a large percentage of cognitive decline is modifiable!
- Risk is shaped across the life course & begins early.
- There are many individual-level factors that can be targeted for important for prevention & intervention efforts.

Mid-life is key (ages 35 – 65)

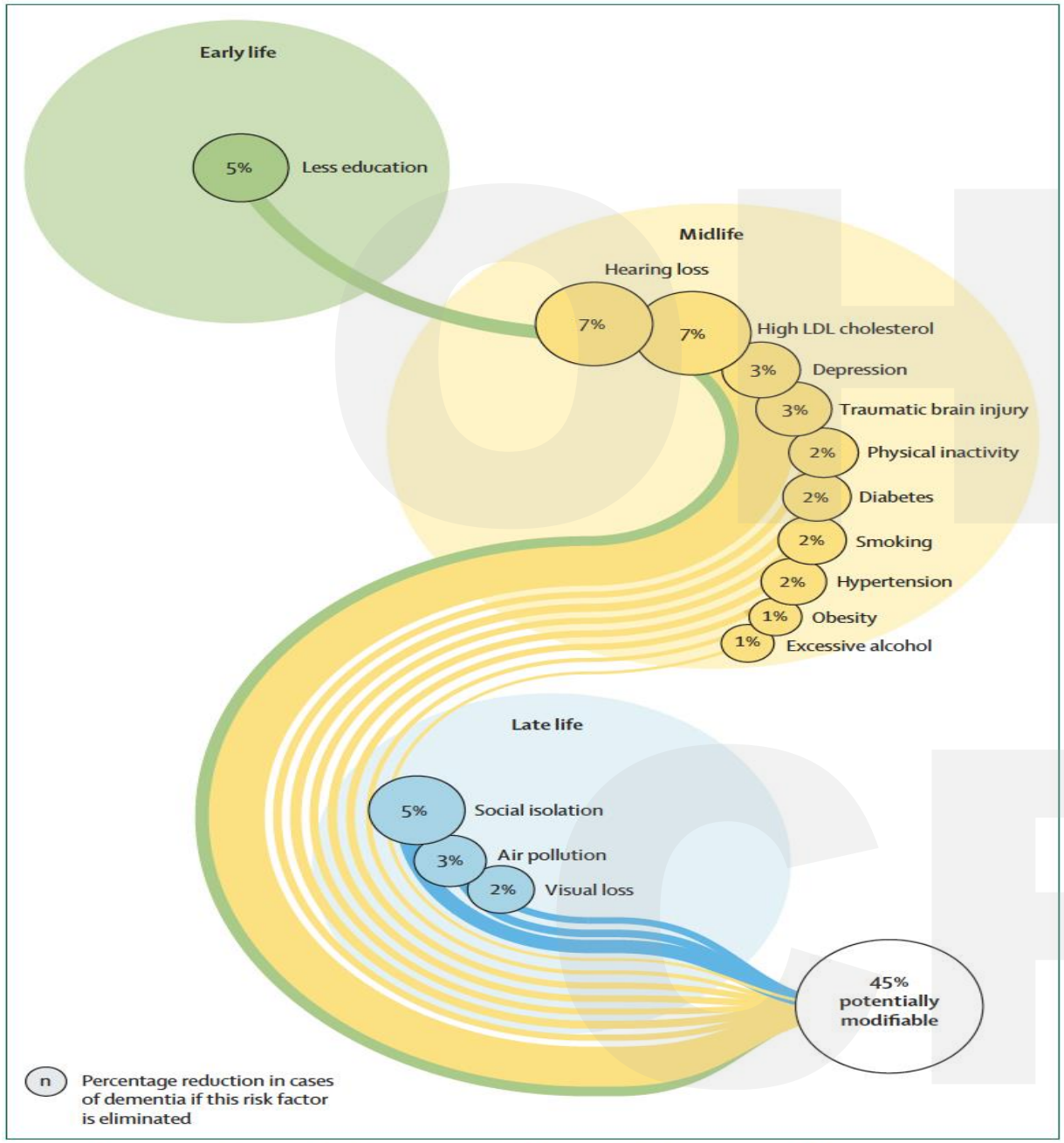


Figure 9: Population attributable fraction of potentially modifiable risk factors for dementia

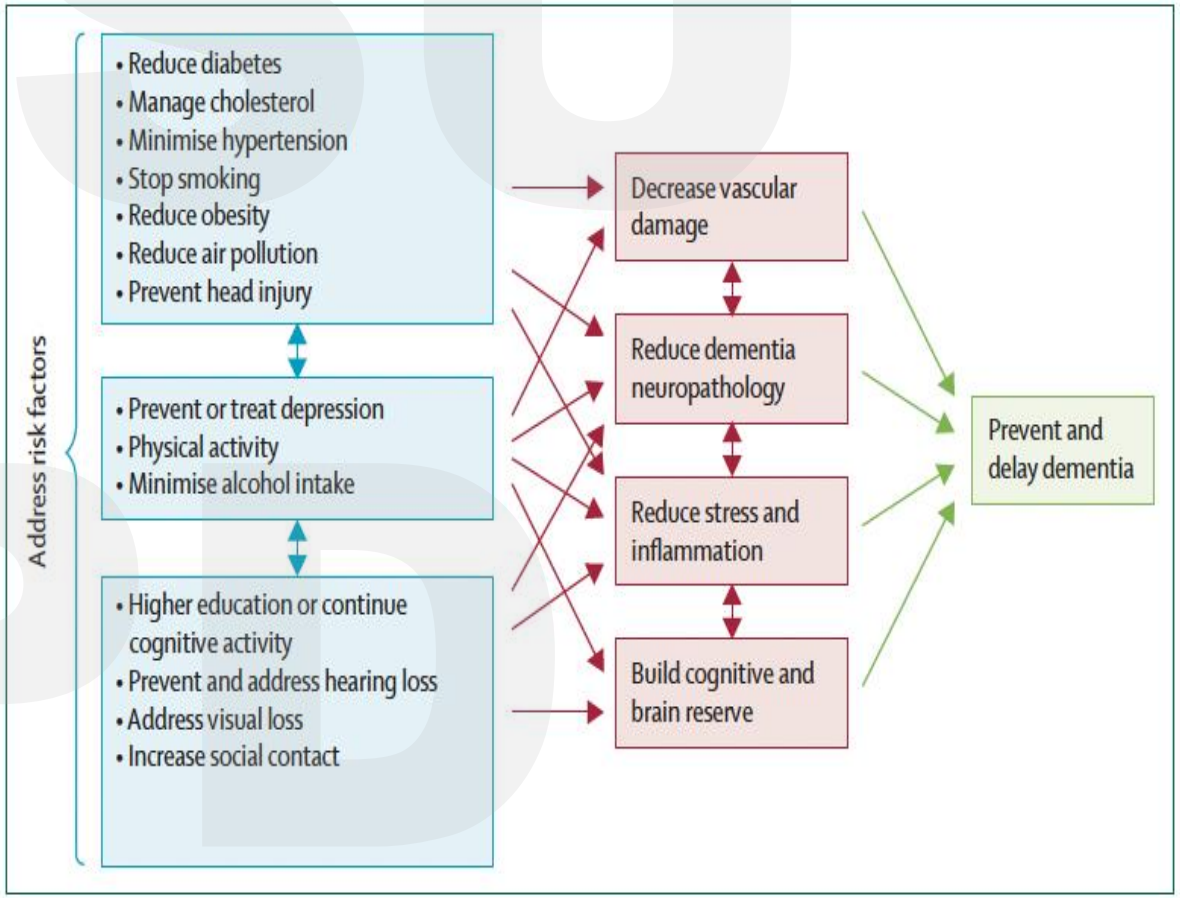
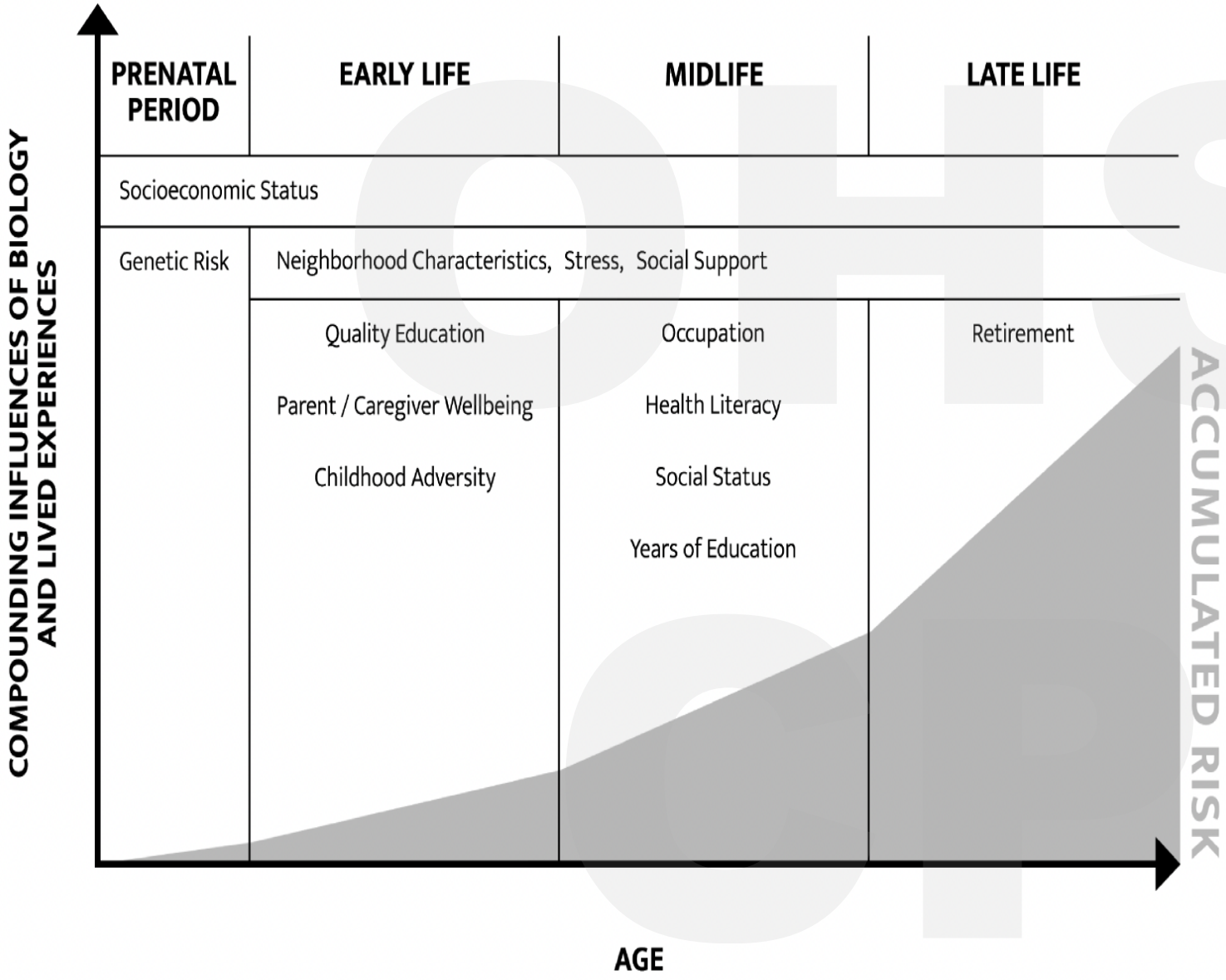


Figure 2: Possible brain mechanisms for enhancing or maintaining cognitive reserve and risk reduction of potentially modifiable risk factors in dementia

Livingston et al., 2020



Risk for AD with exposure to neural resource depletion factors

Risk for AD with exposure to neural resource enrichment factors

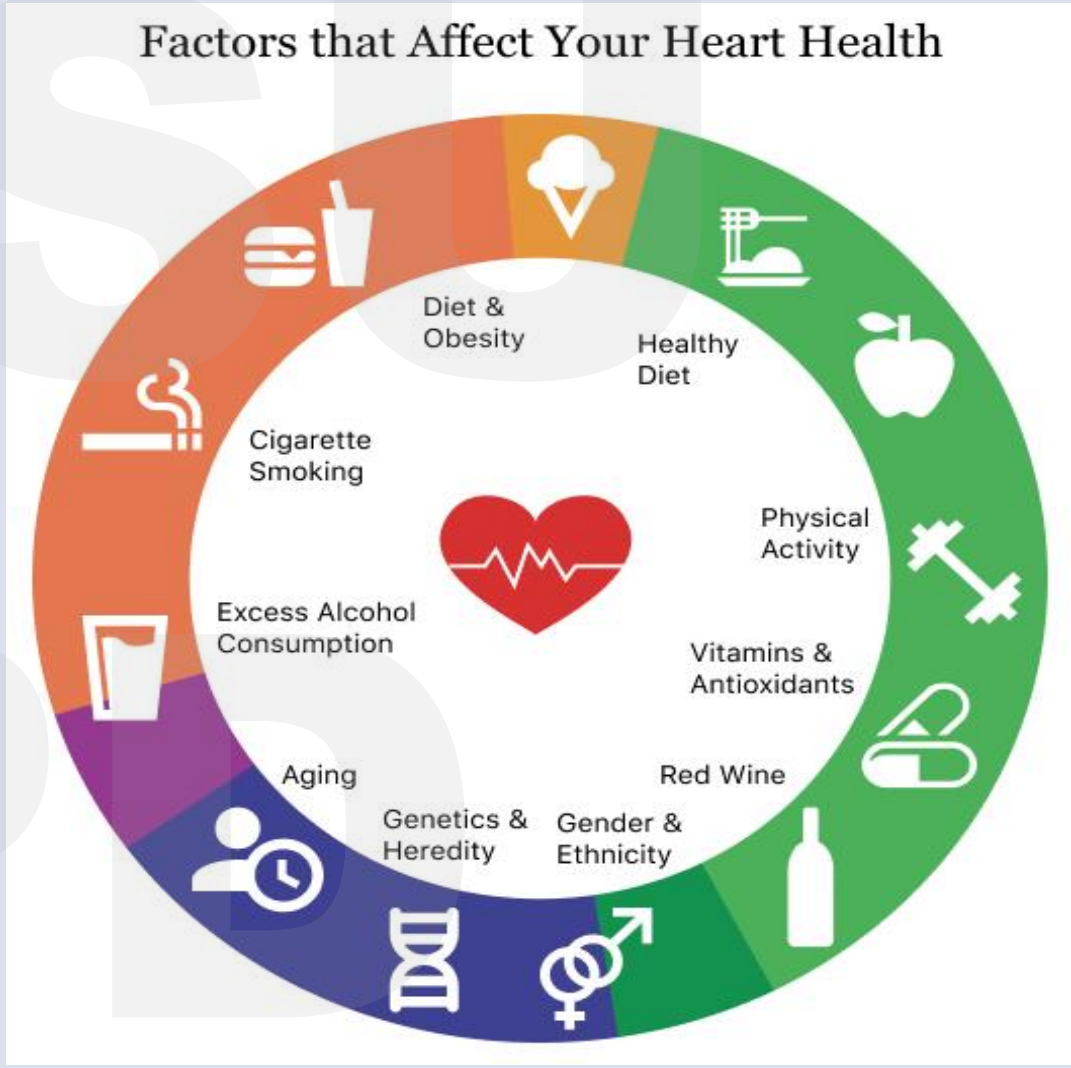
Figure 2. Individuals' lived experiences and biology have cumulative effects over the life course.

Stites et al., 2022

Heart health = brain health!

Some modifiable factors include behaviors, medical health condition, or diet-related:

- Diet
- Obesity
- Cigarette smoking
- High blood pressure
- Hyperlipidemia
- High blood glucose/A1c



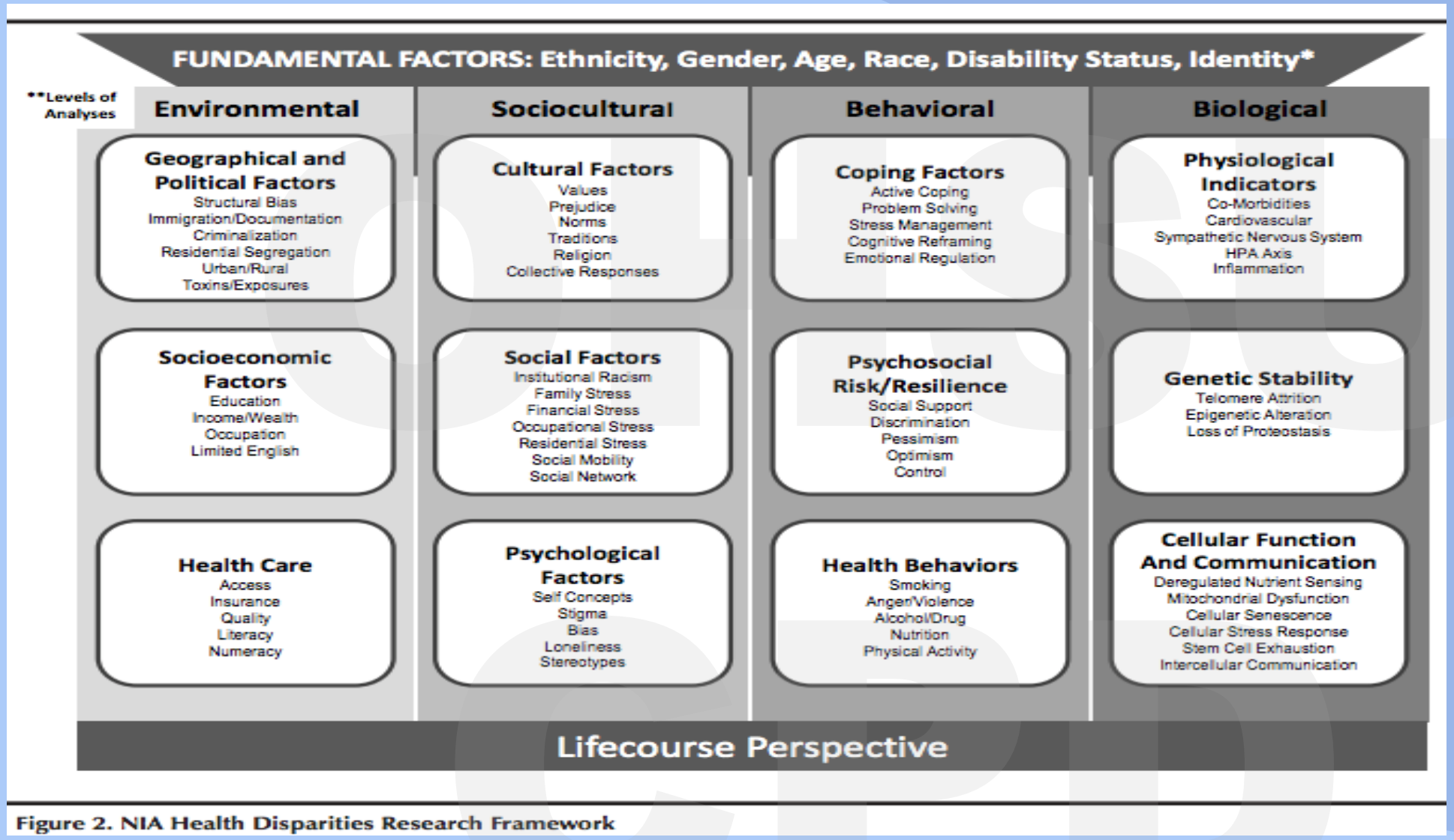
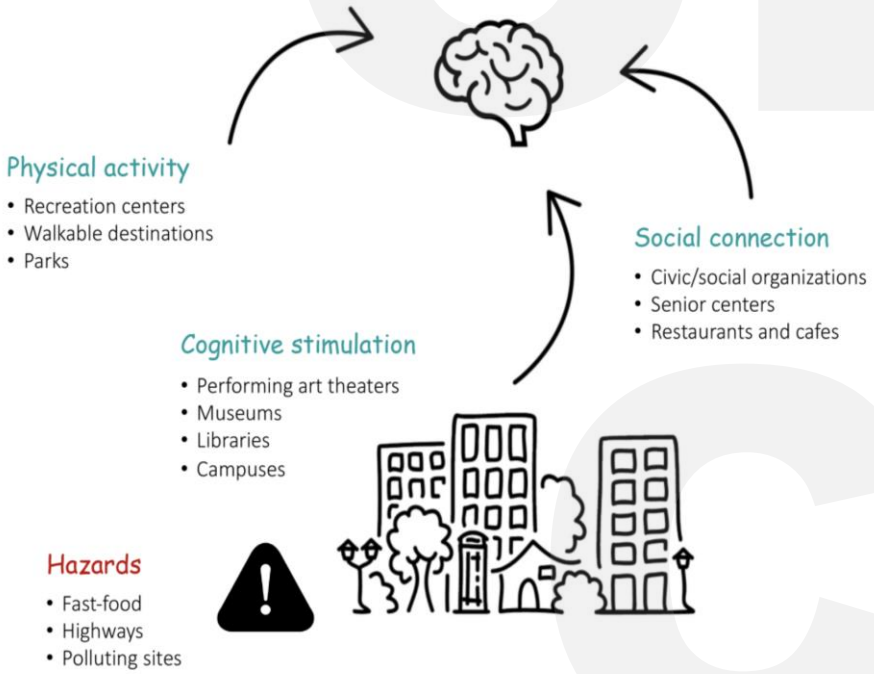


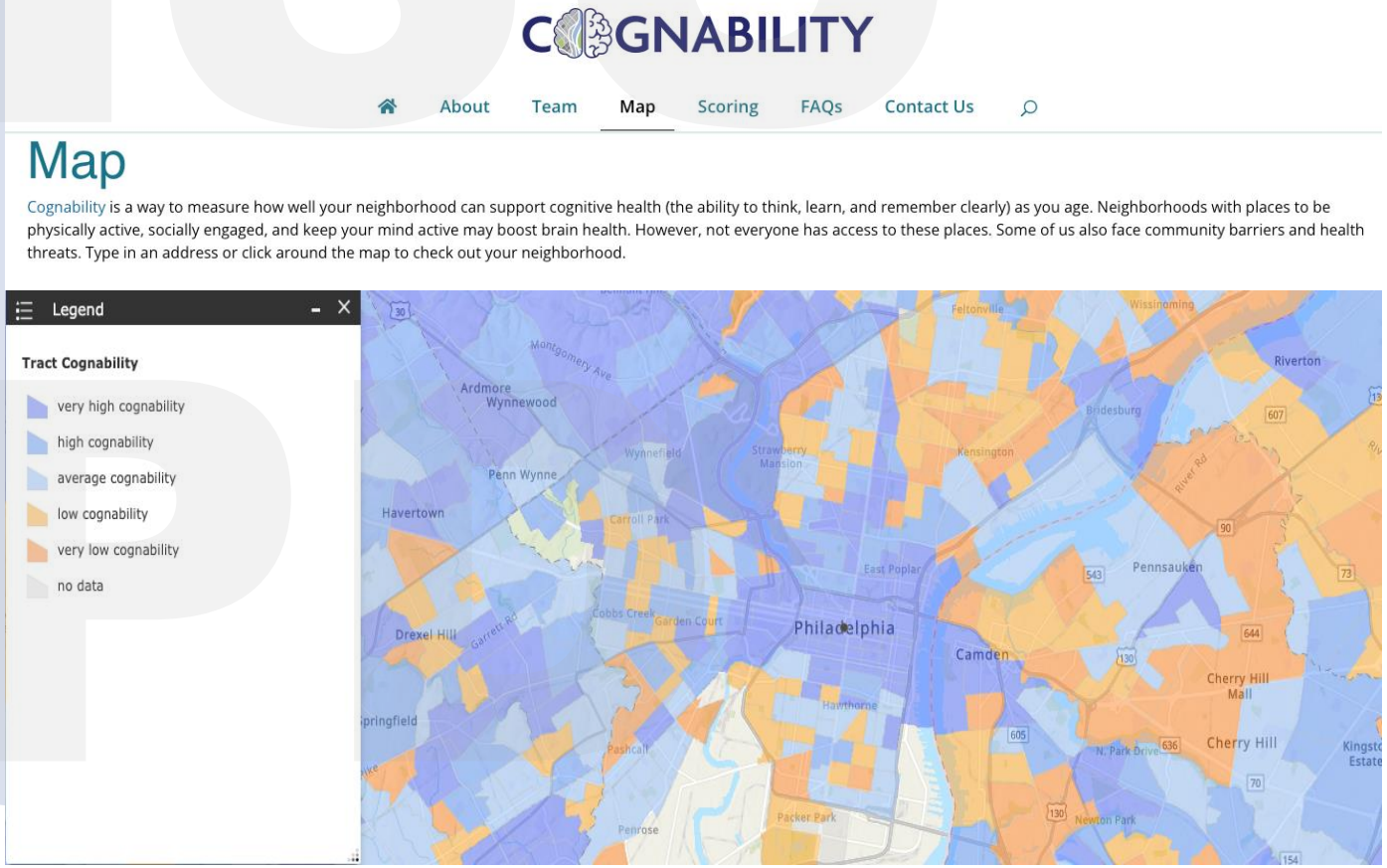
Figure 2. NIA Health Disparities Research Framework

However, exposure to neural resource enrichment or depletion factors in ANY of these domains may reduce risk for cognitive decline!

Hill et al., 2015.

Neighborhood resources are linked to cognitive health

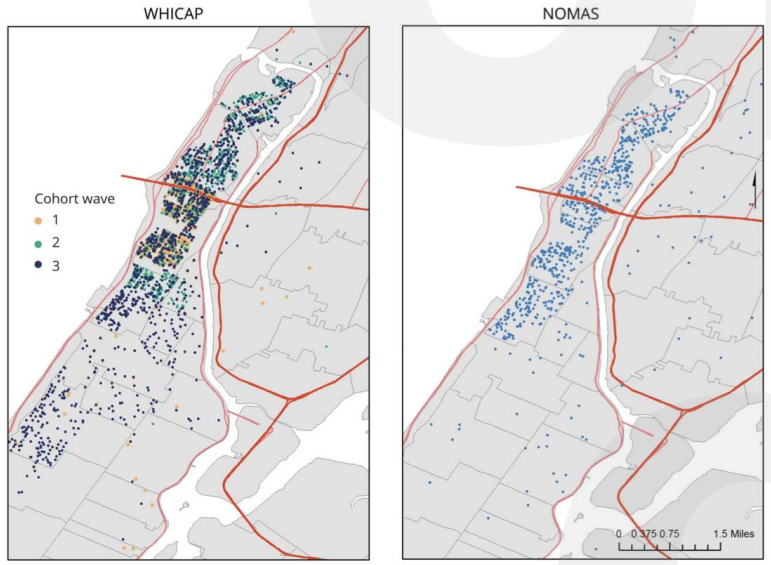




Finlay et al., 2022

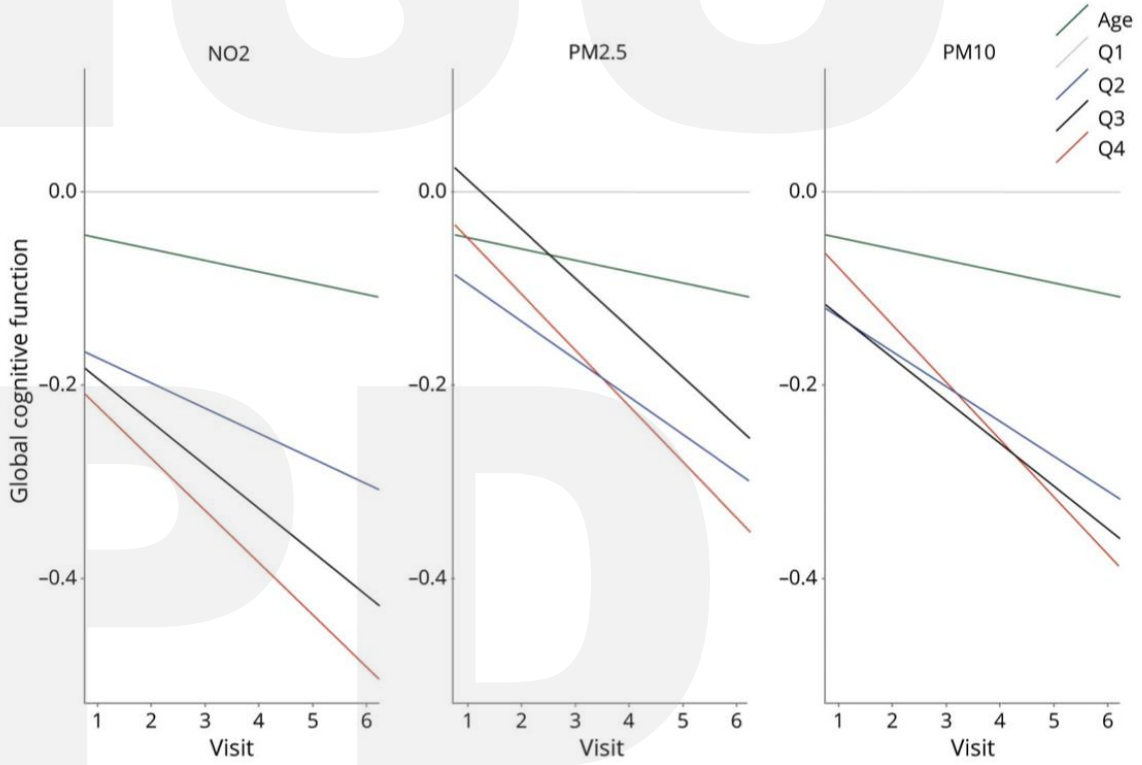
Higher levels of ambient air pollution are associated with accelerated cognitive decline

Figure 1 Residential location of cohort participants throughout northern Manhattan



NOMAS = Northern Manhattan Study; WHICAP = Washington Heights–Inwood Community Aging Project.

Figure 3 Associations between ambient air pollutants, baseline global cognition, and cognitive decline with effects of age as comparison



NO_2 = Nitrogen Dioxide; $PM_{2.5}$ = fine particulate matter less than 2.5 μm in diameter; PM_{10} = respirable particulate matter.

Kulick et al., 2020

Environmental context matters!

- But each person exists within a larger context
- Context shapes exposure to neural resource enrichment and depletion factors (e.g., toxin exposure, segregation)
- Context also influences the success of individual-level interventions (e.g., will a specific diet or exercise intervention for reducing cognitive risk work without environmental resources?)

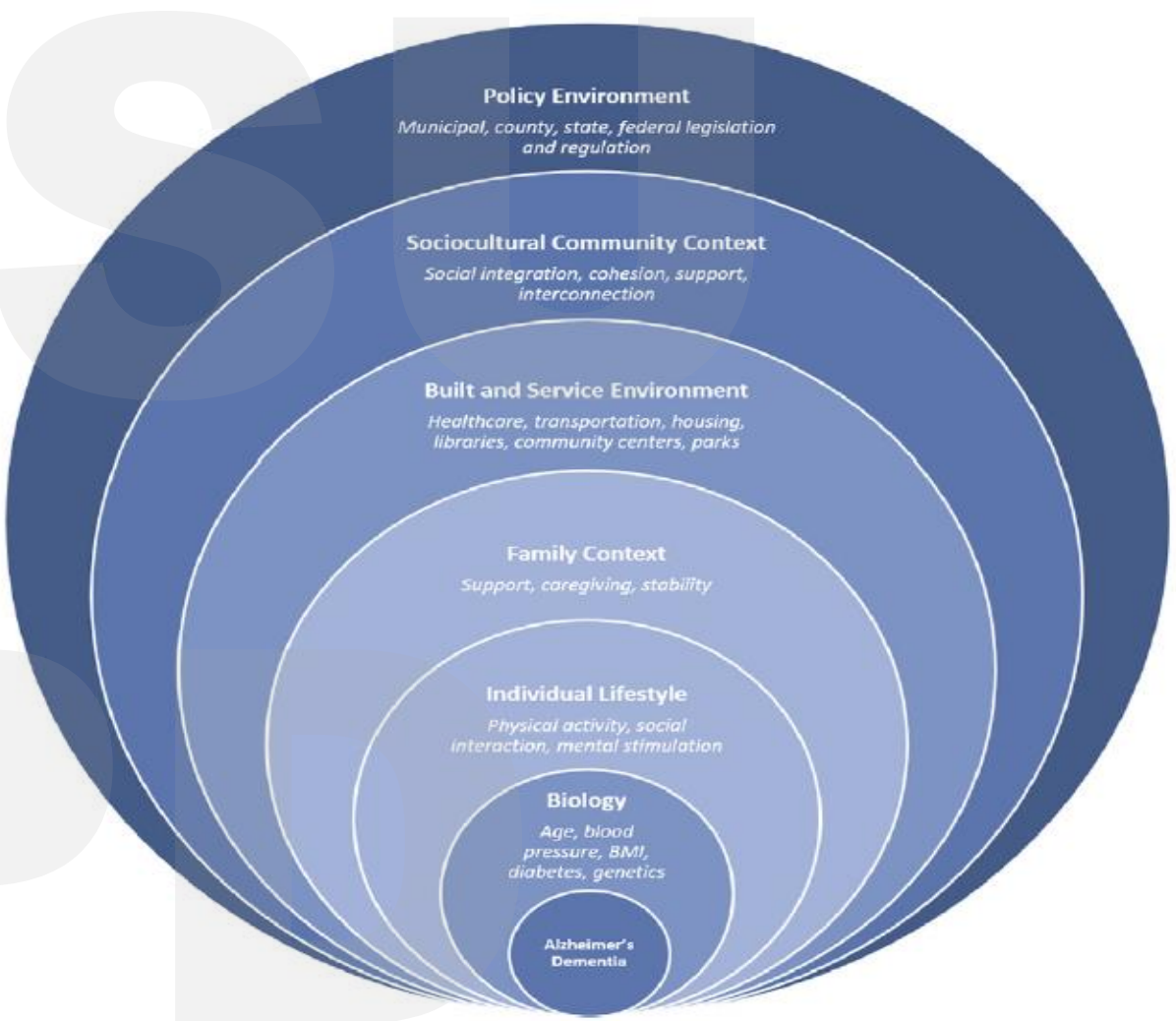
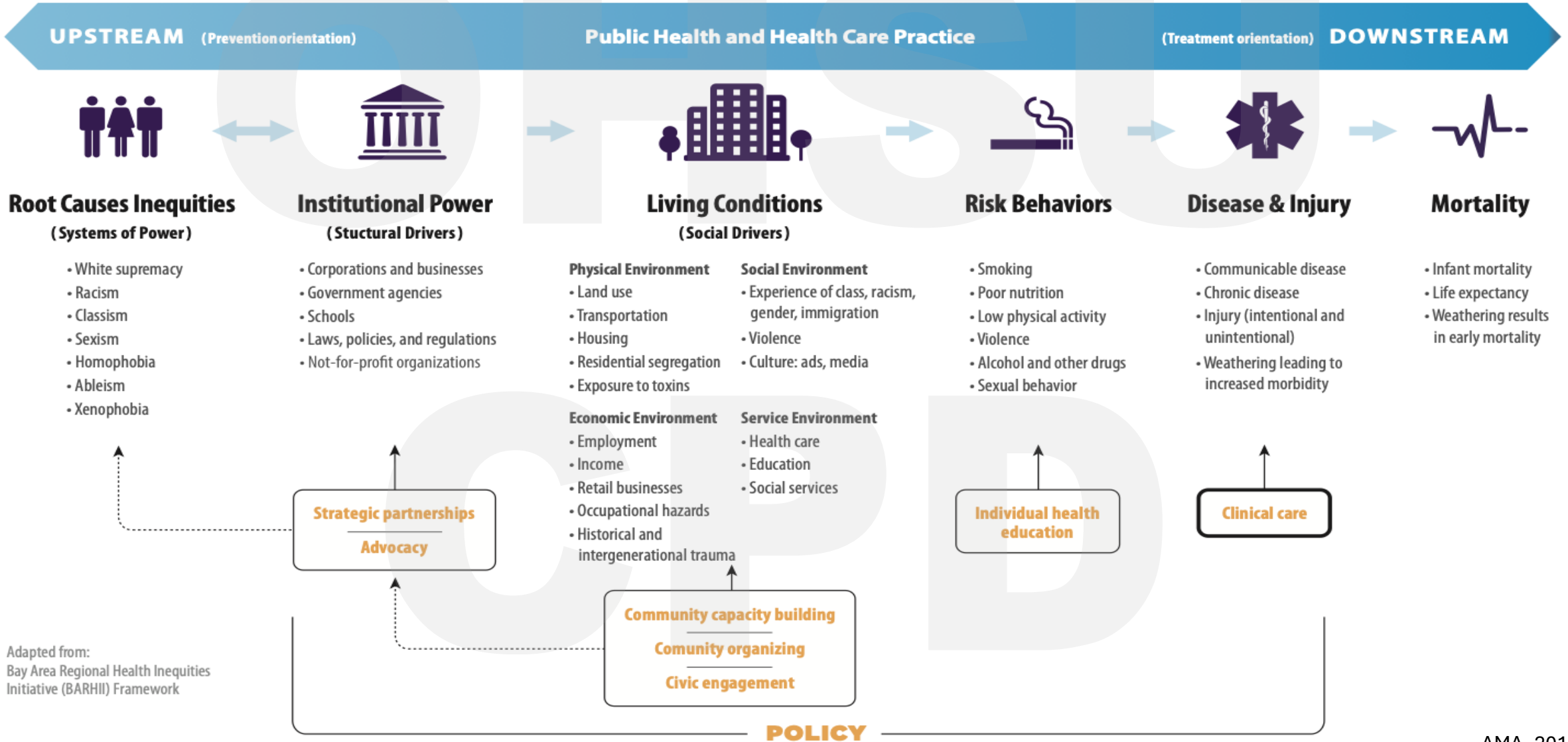


Fig. 2. Socioecological Model of Alzheimer's Dementia.

Gaugler et al., 2019

AMA Health Equity Plan: Intervene on aspects of the environment

Figure 3. What Creates Health Framework



AMA, 2019

Six pillars to reducing cognitive decline

Physical Activity

Social Activity

Sleep

Mental Stimulation

Nutrition

Mental Wellness

Questions?

Thank you!