

Geriatric Neuropsychiatry

Neuropsychiatry: A Comprehensive Update

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Disclosures

Neither I nor my spouse has a relevant financial relationship with a commercial interest to disclose

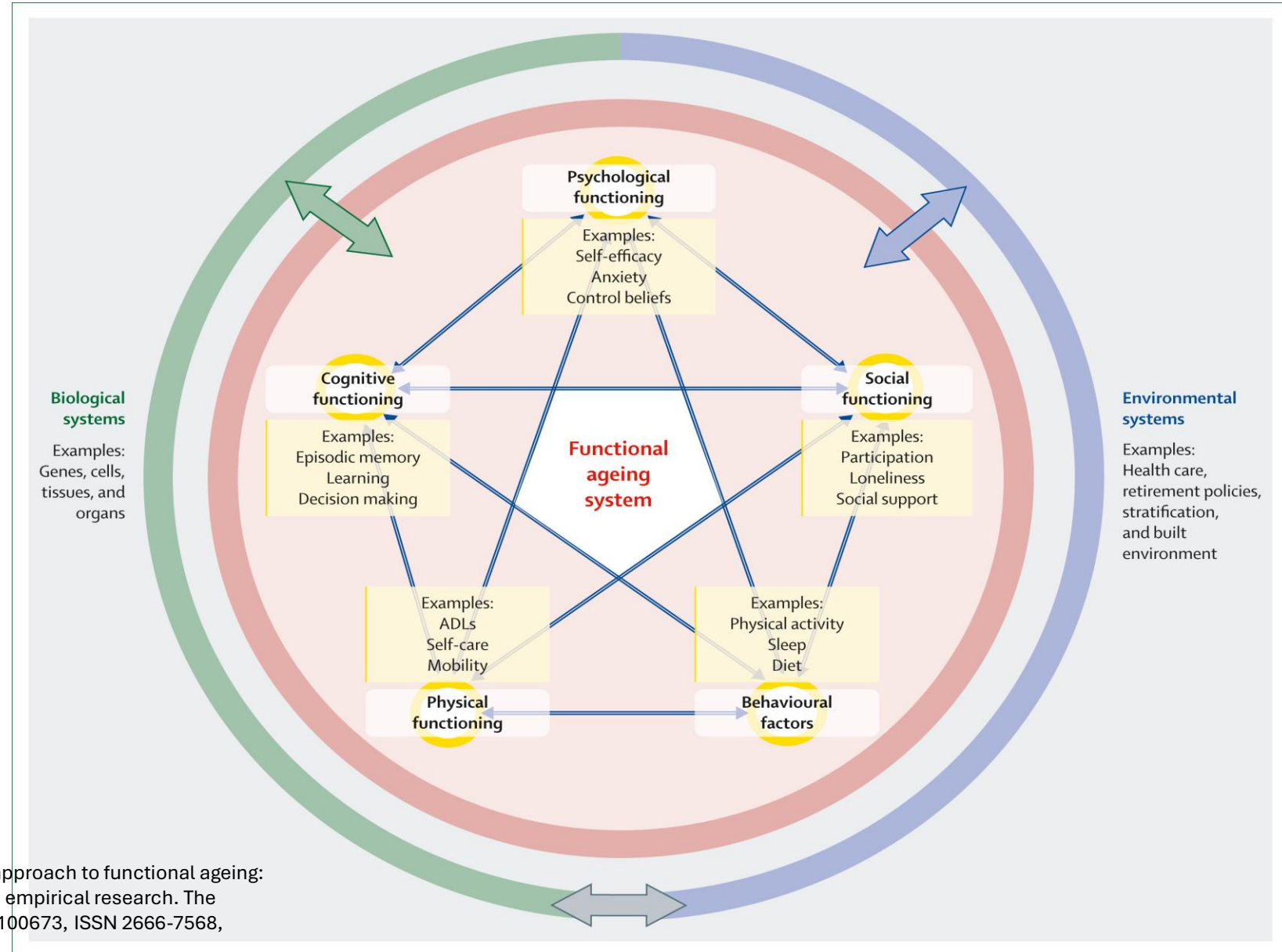


Overview

- Normal Aging
 - Functional Concept of Aging
 - Brain Structural and Functional Changes
 - Neurocognitive Changes
 - Psychological Development and Personality
 - Psychosocial Aspects and Social Determinants of Health
- Geriatric Neuropsychiatry
 - Scope
 - Assessment
 - Neurological / Medical Conditions Associated to Neuropsychiatric Symptoms
 - Early-Onset Psychiatric Disorders (Began Early in Life Persisting into Adulthood)
 - Late-Onset Neuropsychiatric Syndromes
- Geriatric Syndromes
- Principles of Treatment

Normal Aging

The Functional Concept of Aging



Almar A L Kok, et. al. Adopting a complex systems approach to functional ageing: bridging the gap between gerontological theory and empirical research. The Lancet Healthy Longevity. Volume 6, Issue 3, 2025, 100673, ISSN 2666-7568, <https://doi.org/10.1016/j.lanhl.2024.100673>

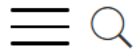
Normal Aging

Brain Structural and Functional Changes

Changes in the Aging Brain

Gross changes		Microscopic changes
Structural Aging • Volume loss • Neurodegeneration in the GM, Demyelination in the WM, Ventricular enlargement • Sulci widening • Cerebrovascular diseases		• Lipofuscin accumulation • Neurofibrillary tangles, amyloid plaque formation • Dendritic tree decrease, axon number decreases, demyelination
Acetylcholine	Monoamine	Neurosteroid
Biochemical and Metabolic Aging • Dysfunction in the cholinergic system: memory decline • Nicotinic binding ability lost • Nicotinic acetylcholine receptors decrease	• Disturbed dopaminergic pathway • Disturbed serotonergic pathway • Decreased receptors and binding ability	• Decreased testosterone disturbs BBB, and invoke inflammation activity • Decreased androgen and estrogen reduce receptor expression and synapse density.
Changes in the nucleus	Mitochondrial dysfunction	Accumulation of oxidatively damaged molecules
Cellular and Molecular aging • Alteration in gene expression • Decrease in synaptic function • Increase in stress responses • Telomere shortening	• mtDNA damage • Disturbed ATP production • Apoptosis induced	• ETC damage • Lipid, protein DNA/RNA damage • Disturb cellular metabolic pathway or homeostasis
Impaired lysosome and proteosome function	Electrophysiological Changes in the Brain by Aging	Dysregulation of neuronal calcium homeostasis
• Autophagy and UPS reduction • Increase cellular wastes	• AP threshold changes: changes in voltage-gated Na⁺ channel activation prperties and subtypes expression pattern. • AP amplitude decrease. • AP axonal conduction rate decrease	• Plasma membrane proteins: - Decreased NMDAR function - Post-translational alterations in receptors - Increased VDCC number • Changes in Ca²⁺ influx and disturb cellular Ca²⁺homeostasis - Cellular organelles - Mitochondria : Depolarization disturbs electrochemical gradients - ER : Ca²⁺regulating receptors changes. : Changes in calcium-binding protein : Decreased expression and disturbs Ca²⁺buffering

GM, gray matter; WM, white matter; BBB, brain blood barrier; mtDNA, mitochondrial DNA; ETC, electron transport complex; UPS, ubiquitin proteasome system; AP, action potential; NMDAR, N-methyl-D-aspartate receptor; VDCC, voltage-dependent calcium channel; ER, endoplasmic reticulum; ATP, adenosine triphosphate.



Original Investigation | Imaging



 Cite  Permissions  Metrics  Comments

Characterization of Brain Volume Changes in Aging Individuals With Normal Cognition Using Serial Magnetic Resonance Imaging

Shohei Fujita, MD, PhD^{1,2}; Susumu Mori, PhD^{3,4}; Kengo Onda³ ; [et al](#)

JAMA Netw Open

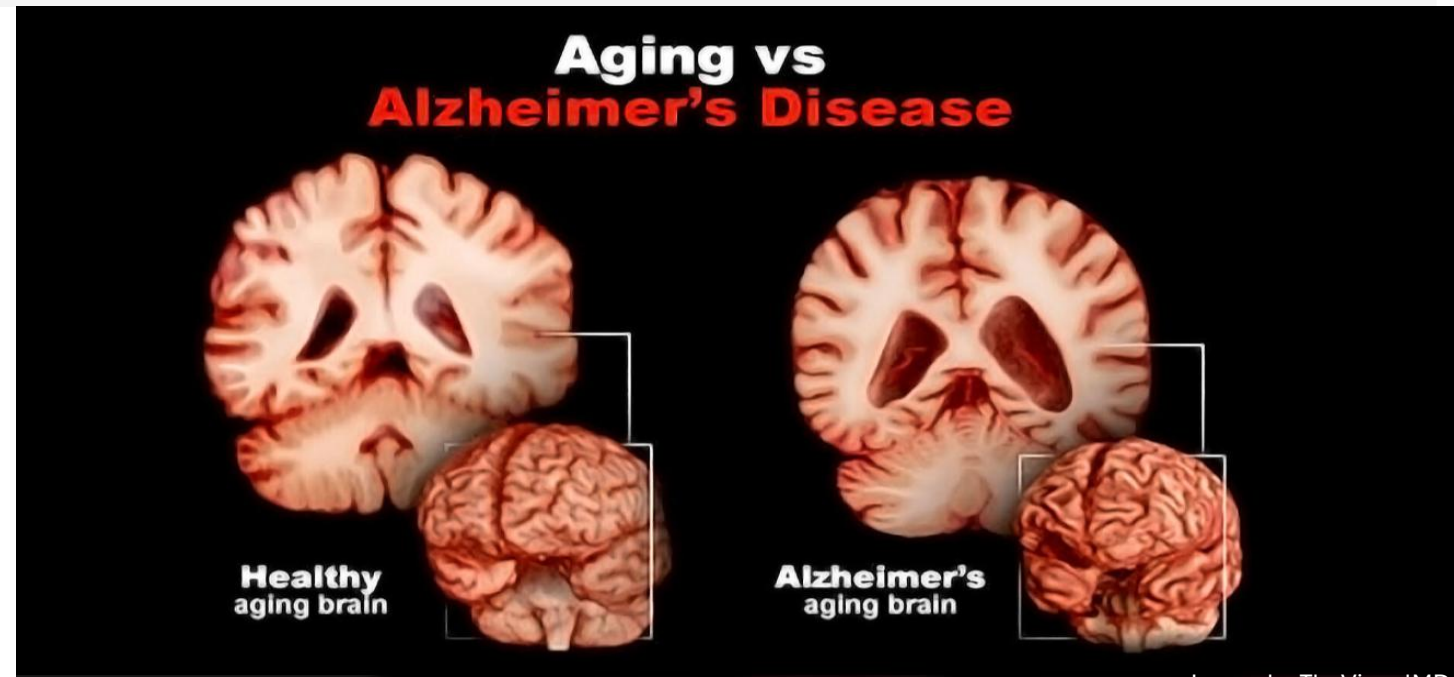
Published Online: June 28, 2023

2023;6;(6):e2318153.

doi:10.1001/jamanetworkopen.2023.18153

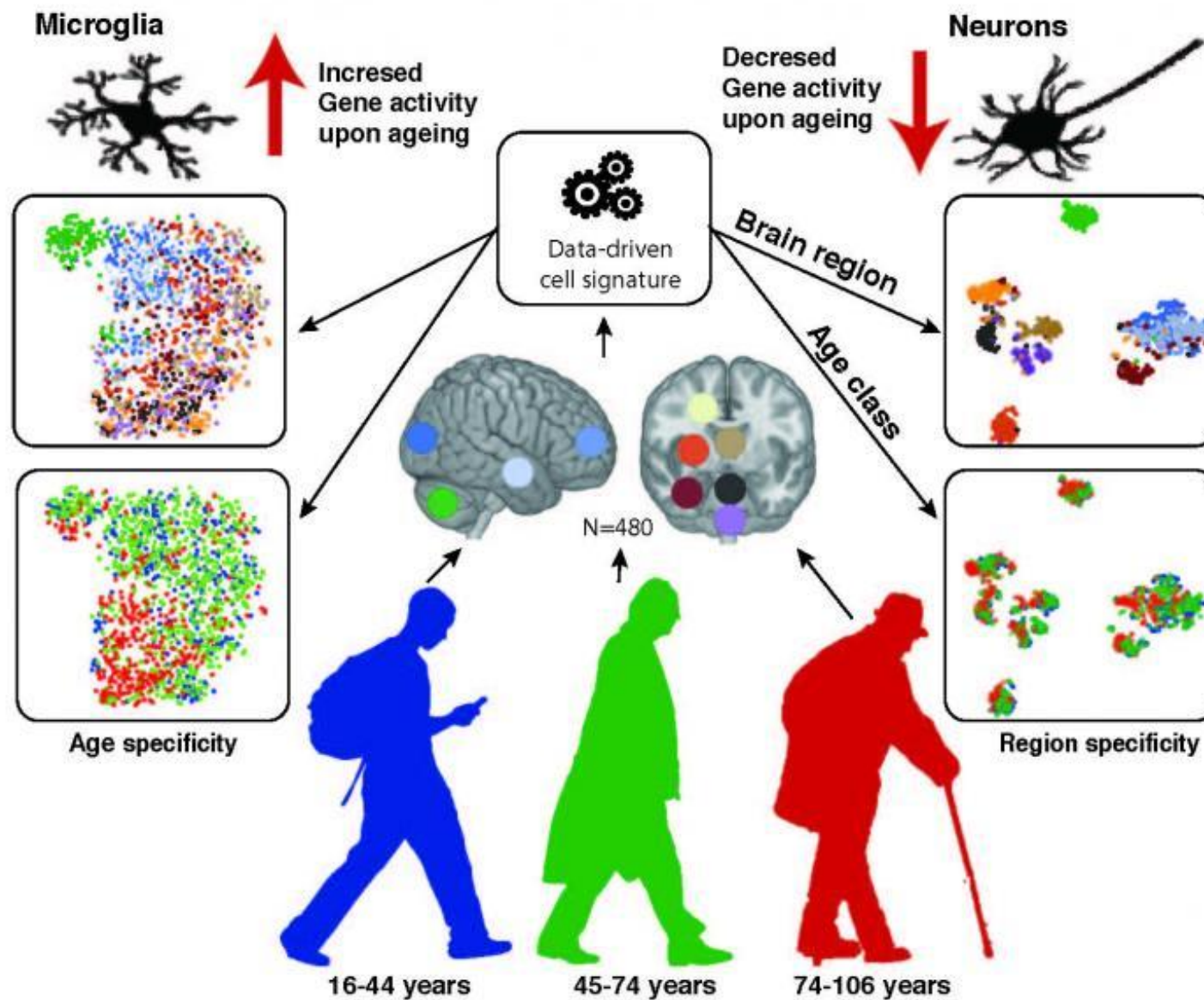
Structural changes

- Volume loss
- Sulci widening
- Ventricular enlargement
- Gray matter degeneration and demyelination of white matter
- Small vessel disease (white matter hyperintensities)





Glia and Neurons in the Aging Human Brain



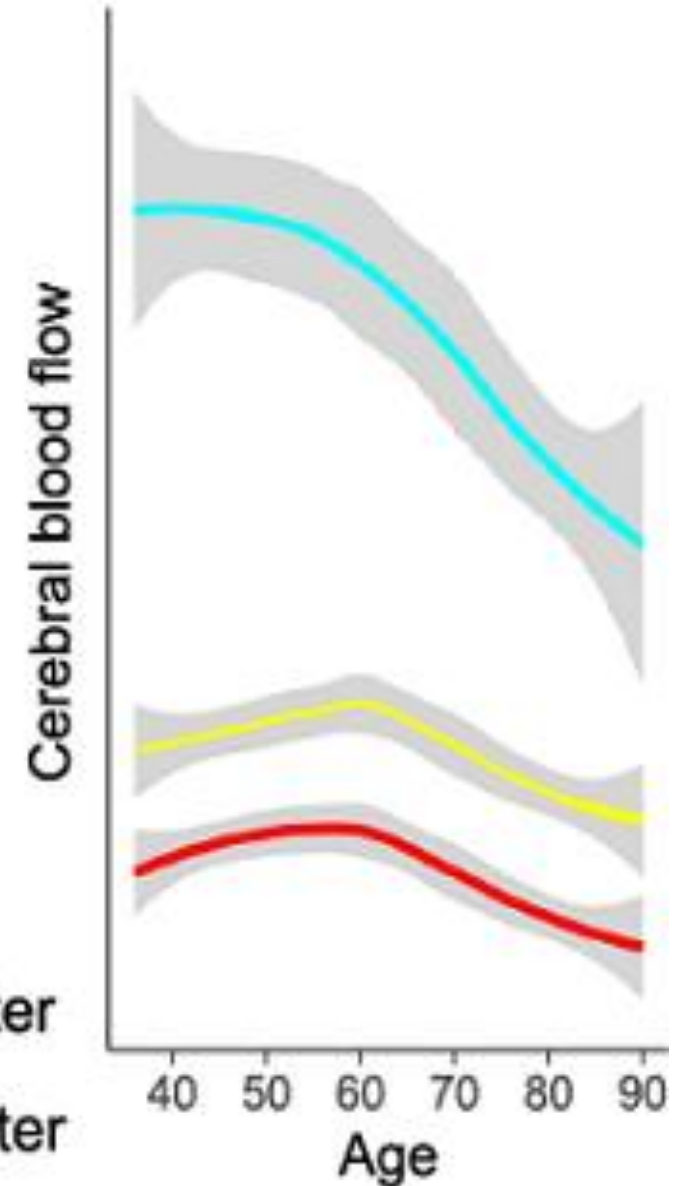
Cell Reports, Soreq et al.: "Major shifts in glial regional identity are a transcriptional hallmark of human brain aging" [http://www.cell.com/cell-reports/fulltext/S2211-1247\(16\)31684-9](http://www.cell.com/cell-reports/fulltext/S2211-1247(16)31684-9)

Credit: Lilach Soreq

Blood Flow



-  Gray matter
-  Less susceptible white matter
-  More susceptible white matter



[Characterizing cerebral hemodynamics across the adult lifespan with arterial spin labeling MRI data from the Human Connectome Project-Aging](#)

Juttukonda, M. R., Li, B., Almaktoom, R., Stephens, K. A., Yochim, K. M., Yacoub, E., Buckner, R. L., & Salat, D. H. (2021). *NeuroImage*, 230, 117807.

<https://doi.org/10.1016/j.neuroimage.2021.117807>



Neurocognitive Changes During Aging

- Processing Speed
 - Decline affecting other cognitive domains
 - Frontal network (cerebral small vessel disease) and cerebellar network
- Attention
 - Reduced efficiency, progressive slowing in processing of complex tasks and reduced capacity to inhibit irrelevant stimuli.
- Memory
 - Rate of acquisition and retrieval decline across the lifespan.
 - Slower processing, and reduced working memory



Neurocognitive Changes During Aging

- Language
 - Vocabulary remains stable and could improve.
 - Visual confrontation naming starts declining around 7th decade.
 - Verbal fluency, declines.
- Visuospatial abilities and construction
 - Intact object perception, recognition of familiar objects and ability to appreciate physical location of objects alone or in relation to others.
 - Visual construction skills decline, ability to put together individual parts to make a coherent whole.



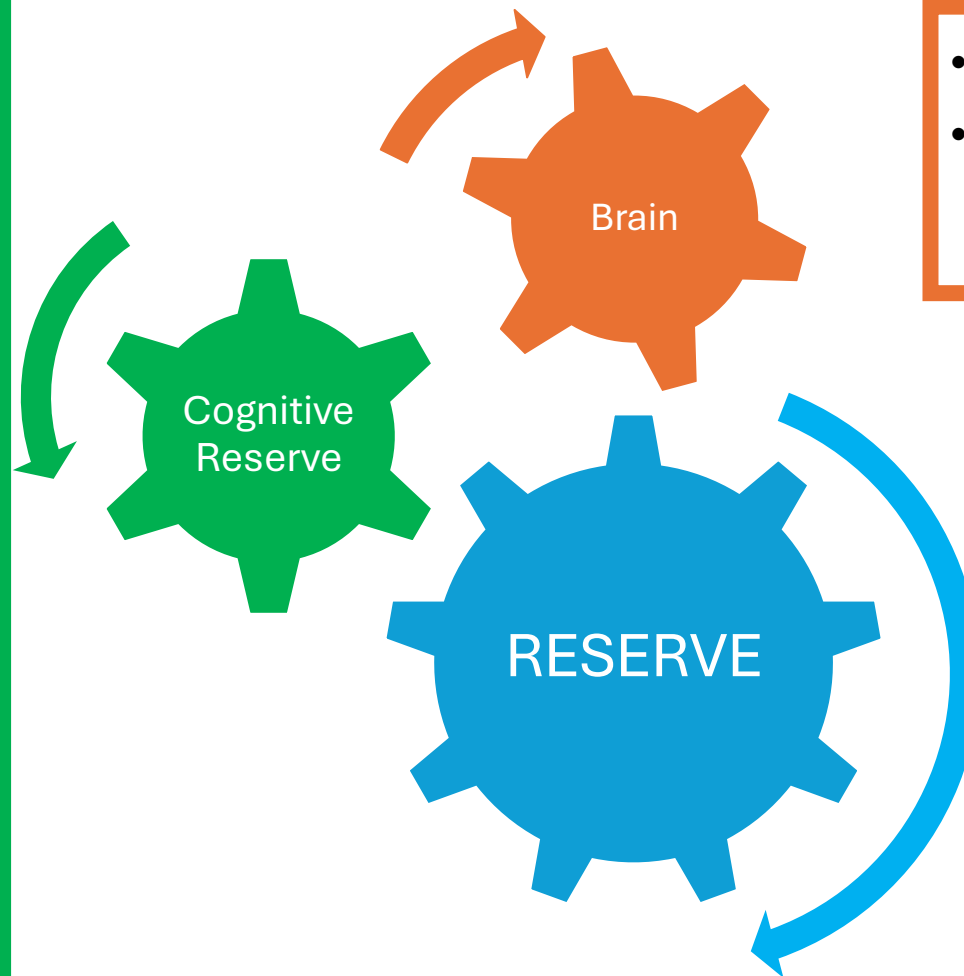
Neurocognitive Changes During Aging

- Executive Functioning
 - Concept formation, abstraction, and mental flexibility decline after 70.
 - Reduced response inhibition, inhibit automatic response in favor of a novel one.
 - Executive abilities dependent on processing speed
 - Reduced inductive reasoning and reasoning with unfamiliar information
 - Ability to appreciate similarities, describe meaning of proverbs and reasoning of familiar information remains stable



Cognitive and Brain Reserve

- Flexibility and adaptability of cognitive/brain networks to actively resist the effects of age- or disease-related changes.
- Difference between the degree of brain damage observed and the clinical manifestation of that damage.
- Cognitive skills and abilities that are acquired before the onset of neural deterioration serve as a hedge against—or even actively mitigate—loss of function inflicted by the progressive brain failure.



- Neuroanatomic resource
- Volume, size, shape, weight, number of neurons and synapses

Ability to maintain intact cognitive performance over time and contributing to more successful cognitive aging.

Stern Y, 2002



Activities of Daily Living

Basic	Instrumental	Advanced
Ability to care for oneself at home. Getting in and out of bed or a chair Bathing or showering Dressing Walking Using the toilet Self-feeding	Ability to live independent in the community. Administering medications Food preparation Housekeeping Doing laundry Managing finances Shopping for groceries Driving	Culture, gender specific and influenced by personal choices. Hobbies Working Interpersonal/social activities



Erikson's Stages of Psychological Development

- Childhood
 - Stage 1 – Infancy period: Trust (hope) vs. Mistrust (withdrawal)
 - Stage 2 – Early Childhood period: Autonomy (will) vs. Shame, doubt (compulsion)
 - Stage 3 – Play Age period: Initiative (purpose) vs. Guilt (inhibition)
 - Stage 4 – School Age period: Industry (competence) vs. Inferiority (inertia, passivity)
- Adolescence
 - Stage 5 – Adolescence period: Identity (fidelity) vs. Identity confusion (repudiation)
- Adulthood
 - Stage 6 – Young Adulthood period: Intimacy (love) vs. Isolation (distantiation)
 - Stage 7 – Adulthood period: Generativity (care) vs. Stagnation/Self-absorption (rejectivity)
 - Stage 8 – Old Age period: Integrity (wisdom) vs. Despair (disdain)

Personality and Aging

The Five-Factor Model (OCEAN)

McRae and Costa (1997)

- Organize personality traits not a comprehensive theory of personality.
- Does not sufficiently provide a causal reason for human behavior.
- More descriptive than explanatory
- Does not fully account for differences between individuals (John & Srivastava, 1999).

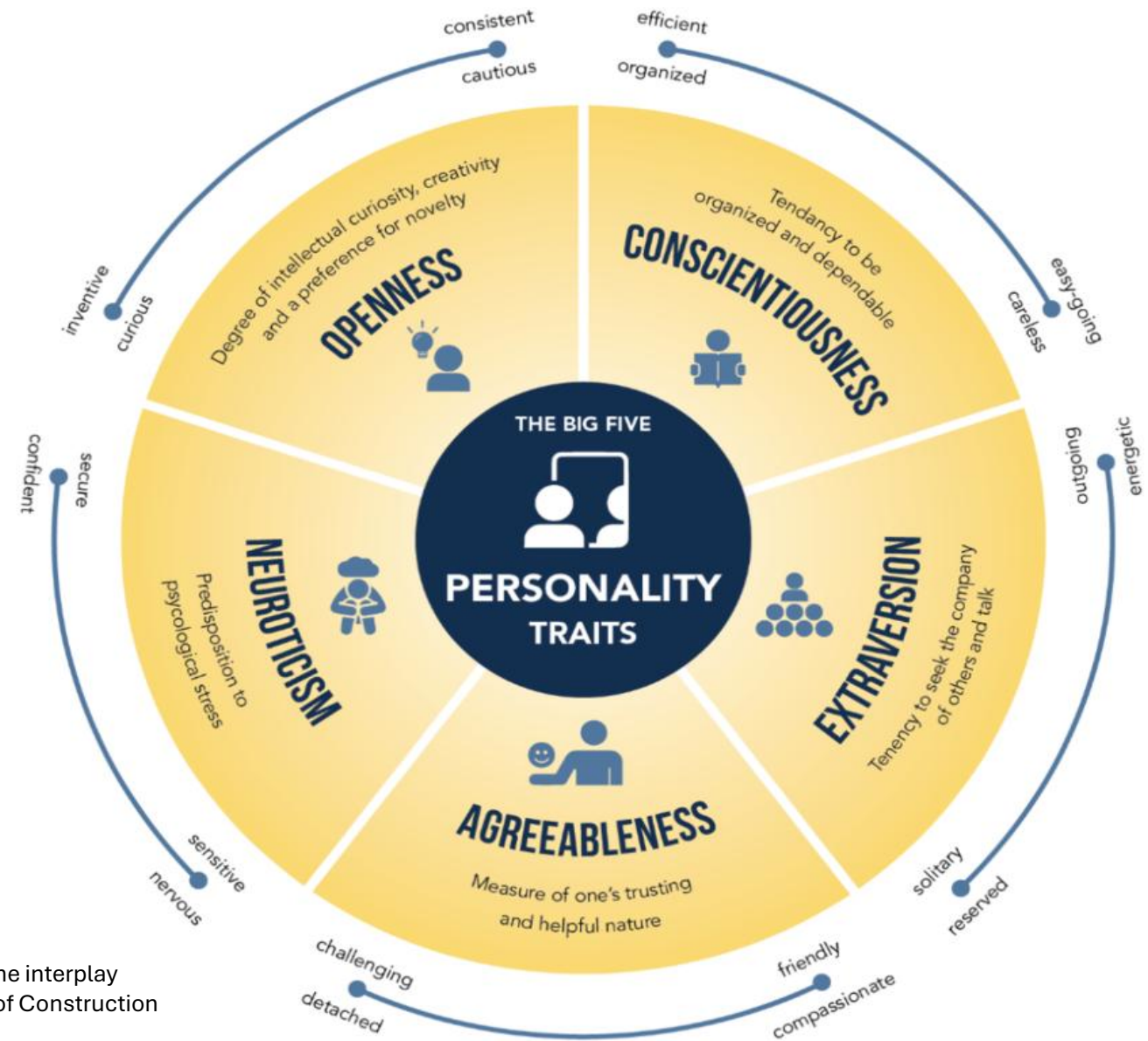
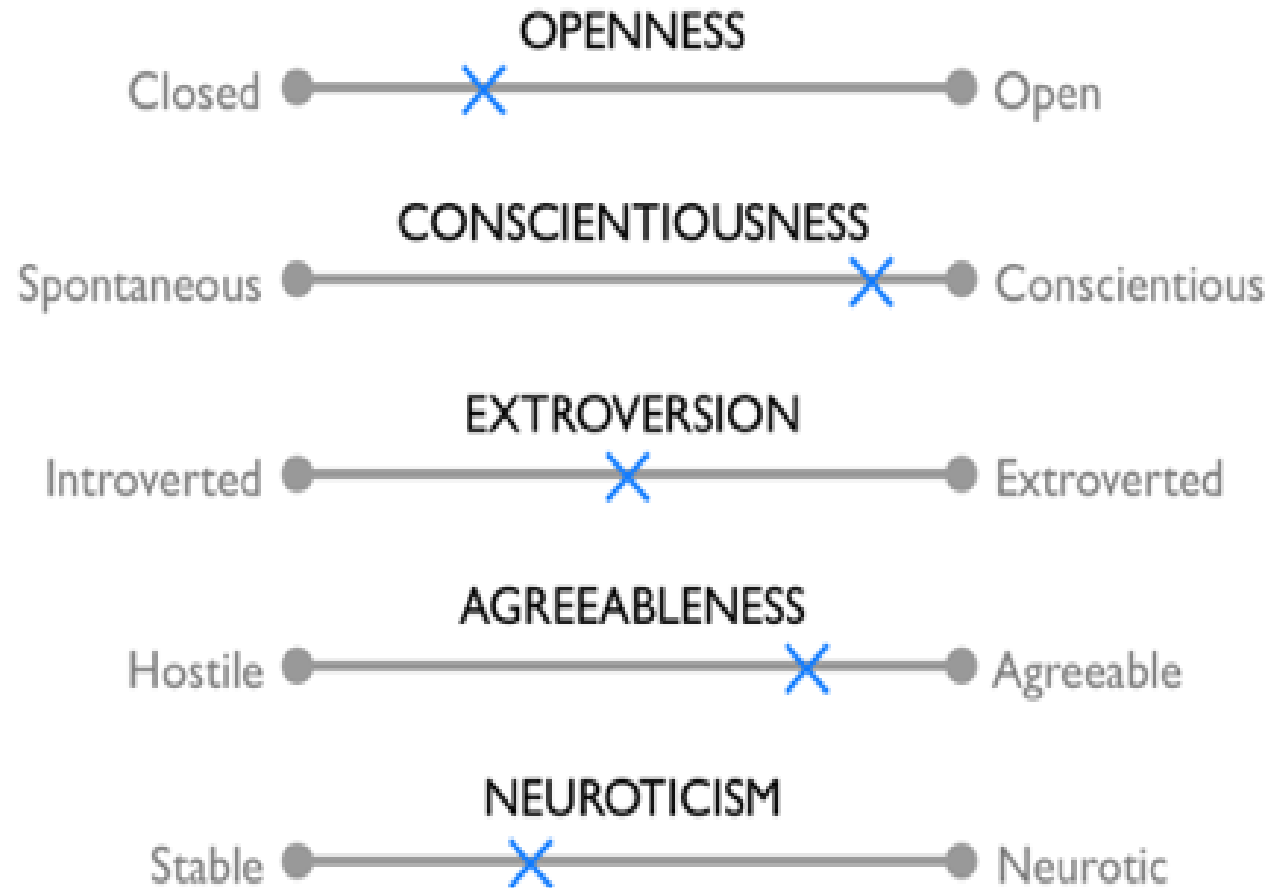


Figure from Verwey, Janita & Cumberlege, Roy & Crafford, Gerrit. (2023). Exploring the interplay between quantity surveyors' conflict-handling styles and personality traits. *Journal of Construction Business and Management*. 6. 38-49. 10.15641/jcbm.6.2.1256.



The Five-Factor Model and Aging

- Stable throughout most lifetime.
- Influenced by genes (nature, heritability 50%) and the environment (nurture)
- Predictor of outcomes such as personal milestones, education and health.
- Each trait in a continuum, a spectrum (non-binary)





Crystallized Intelligence

- “Overlearned skills, abilities and accumulated knowledge
- Based on life experiences
- Stable or improve ~ rate of 0.02 to 0.003 SD per year ~ 60



Fluid Intelligence

- “Abilities of problem-solving and reasoning about novel things.
- Innate
- Executive function, processing speed, memory, and psychomotor ability.
- Psychomotor ability and processing speed, peak third decade of life and declines ~ rate of -0.02 SD per year



Emotional Intelligence (EQ)

- “Emotional strength” Skills to recognize, understand, and manage one’s emotions, and recognize and influence other’s emotions.
- Skills: self-awareness, self-regulation, empathy, and social skills and they help build positive relationships and navigate social interactions.
- Often improves with age, peaking around 50-60

Theory of Mind (ToM)

- “Cognitive perspective-taking”
- Ability to understand that others have different thoughts, beliefs, desires, intentions, and perspectives than one's own, and that people's actions and behaviors are influenced by their own thoughts and emotions.
- Decline in older adults often linked to age-related changes in cognitive abilities like executive functions, processing speed, and working memory.



Psychosocial Aspects

- Decisional Capacity, Health Care Proxy, Guardian, Conservator
- Work, retirement and professional will
- Shifting social role and losses
- Finances and housing
- Lifestyle, healthy aging, substance use and health insurance
- Exercise and physical activity
- Culture, ageism, super-agers
- Sexuality, intimacy, social isolation and loneliness
- Driving and transportation

Social Determinants of Health





Geriatric Neuropsychiatry – Assessment

- Chief Concern versus chief complaint
- History of the Present Illness
- Psychiatric and Substance Use History
- Medical and Surgical History
- Medications and Allergies
- Family History
- Social and Developmental History
- Functional Assessment
- Mental Status Exam
- Focused Elemental Neurological Exam



Geriatric Neuropsychiatry

Neurological / Medical Conditions Associated to Neuropsychiatric Symptoms	Early-Onset Psychiatric Disorders (Began Early in Life Persisting into Adulthood)	Late-Onset Neuropsychiatric Syndromes
Alzheimer's Disease and other dementias	Early-Onset Depression (EOD)	Late-Life Depression (LLD)
Parkinson's Disease	Schizophrenia	Psychosis
Stroke	Bipolar Disorder	Anxiety
Other medical conditions presenting with psychiatric symptoms, e.g., delirium, autoimmune, endocrine, etc.	Anxiety	Mania
	Obsessive Compulsive Disorder	
	Alcohol and Substance Use Disorders	

Neurological / Medical Conditions Associated to Neuropsychiatric Symptoms



Post-Stroke Symptoms / Syndromes

Apathy	Depression	Anxiety
30-40%	Inpatient 40%, Outpatient 20%	25%
Diminished will and initiative, lack of interest in activities, and limited affective response to positive or negative events present for at least 4 weeks.	Acute-onset (within 3 months) • 60% remission after 1 year • More biologically-mediated Late-onset (after 3 months) • More psychologically-mediated	Generalized anxiety disorder (GAD) alone or comorbid with depression (75% cases). Right-sided lesions more frequent than left-sided ones
Risk factors • Cognitive impairment • Older age • Functional impairment • Frontal lobe vascular territories	• 70% anterior frontal cortical and subcortical infarctions/basal ganglia, L-sided • Disruption of cortico-limbic circuits, serotonergic system, reduced 5-HIAA in CSF • Inflammation, cytokines interfere with HPA-axis production neurotransmitters	



Post-Stroke Symptoms / Syndromes

Apathy	Depression	Anxiety
Risk factors • Cognitive impairment • Older age • Functional impairment • Frontal lobe vascular territories	• Serotonin transporter (SERT) gene polymorphisms in chromosome 17q • Normal reaction and bereavement and catastrophic/existential crisis • Disability (perceived and actual) • Insecurities related to SODH	
Dopamine agonists SSRIs may worsen Acetyl cholinesterase inhibitors Behavioral Activation (BA)	SSRIs, SNRIs, Stimulants, TMS, ECT Non-pharmacological treatment • Support/psychoeducation (choice) • Behavioral activation (choice) • CBT, variable not for monotherapy • Rehabilitation strategies (PT, OT, Speech/Language, Nutritionist, etc.)	Treatment SSRIs, SNRIs, Buspirone, BZD Psychotherapies CBT, ACT, Mindfulness



Other Neuropsychiatric Syndromes Associated to Strokes

- Catastrophic reaction
- Pathological laughter and crying (PLAC)—now known as Pseudobulbar affect (PBA)
- Psychosis
- Anosognosia
- Personality changes
 - Irritability/agitation/anger outbursts
 - Rapid mood changes
 - Disinhibition/impulsivity/tactlessness/vulgarity
 - Lack of empathy
- Cognitive deficits
- Central post-stroke pain syndrome
- Fatigue

Early-Onset Psychiatric Disorders (Began Early in Life Persisting into Adulthood)



Severe Mental Illness (SMI)

- Chronic conditions
- Significantly impact ability to function in daily life.
- Combination of mental, behavioral, or emotional disorders that affect a person's thinking, mood, and/or behavior.
- Depression
- Bipolar Disorder
- Schizophrenia



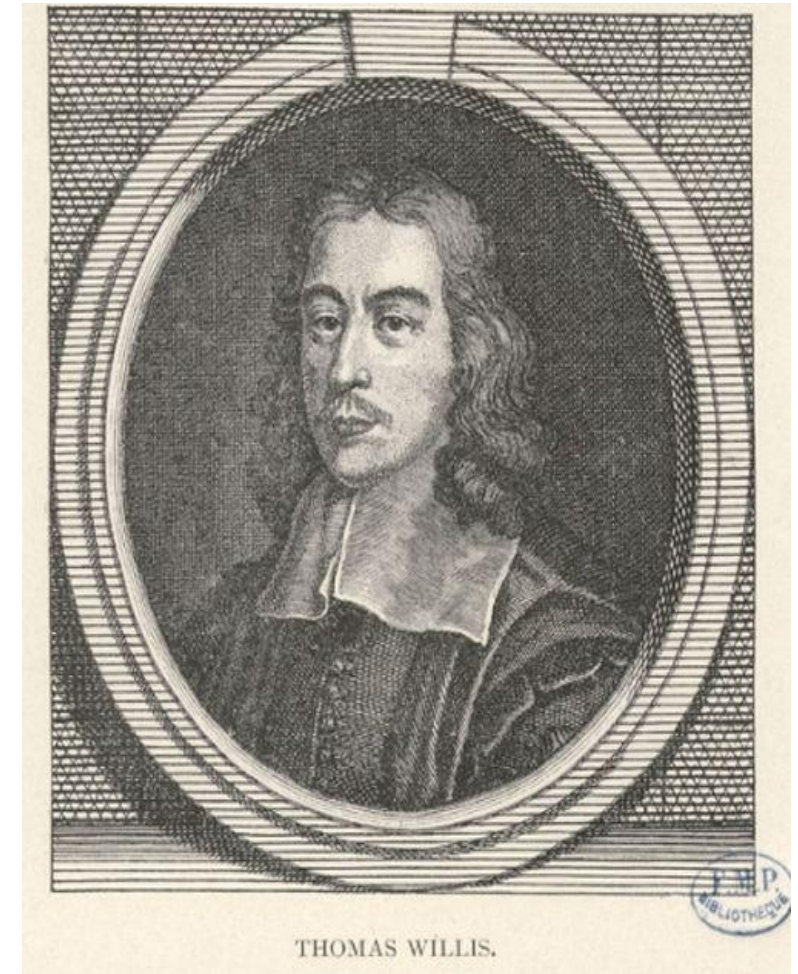
Severe Mental Illness (SMI)

- Neuroinflammatory theory depression or bipolar disorder increases the risk of dementia.
- Reduced neuroplasticity, which is the ability of our brain to change and adjust, so when we learn, it's because we're able to make new connections. Increasing risk of dementia.



Depression and Diabetes Mellitus (DM)

- Thomas Willis, 17th Century
 - *Long sorrow leads to diabetes*
- Depression 2-3 times more common in DM than general population
- Only 25-50% individuals with DM are diagnosed and treated for depression
- Combination of depression and DM increases risk of suicidal ideation and attempts

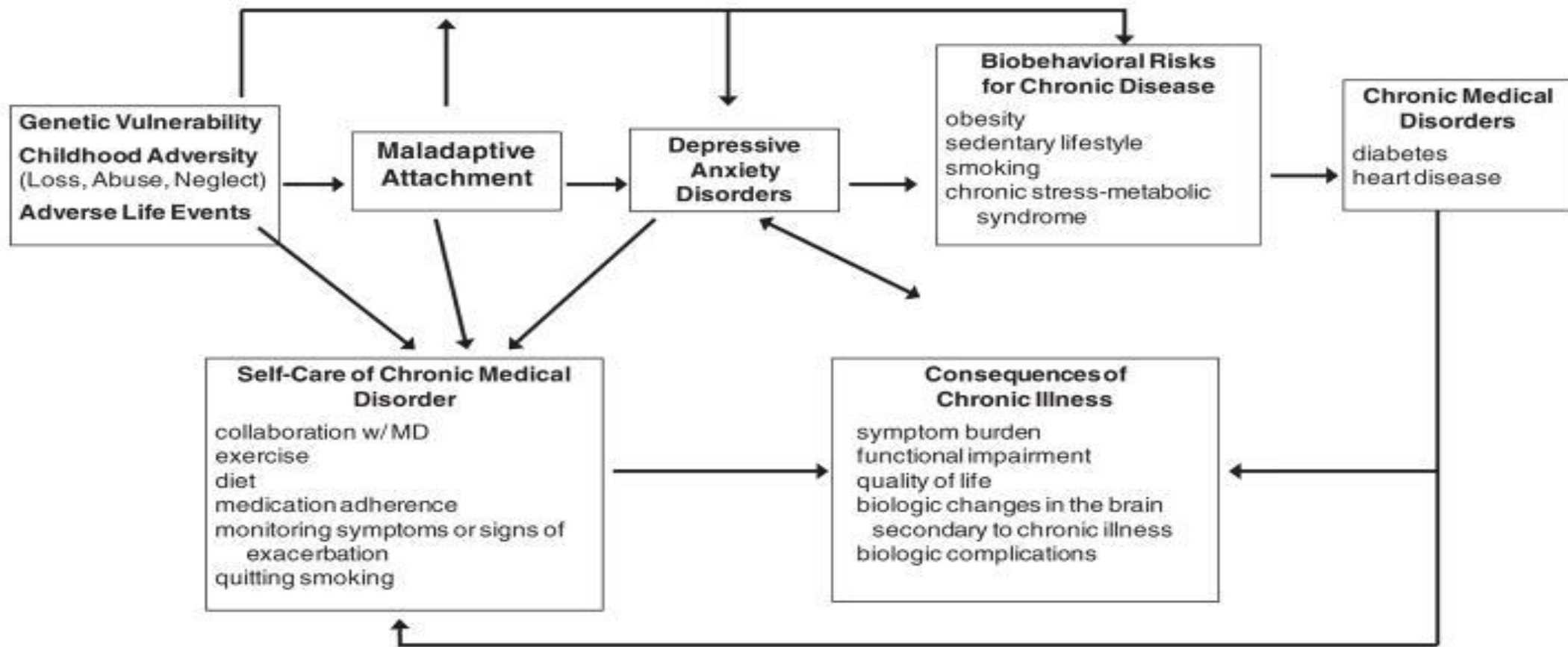




Effects of Insulin in the Normal Brain

- Facilitates long-term potentiation (LTP) of hippocampus in processes associated to learning and memory
- Increases the expression of receptors NMDA (N-methyl-D-aspartate)
- Regulates concentration of neurotransmitters such as Acetylcholine, Noradrenaline and Epinephrine
- Promotes accumulation of GABA A receptors in presynaptic membrane

Depression and Anxiety

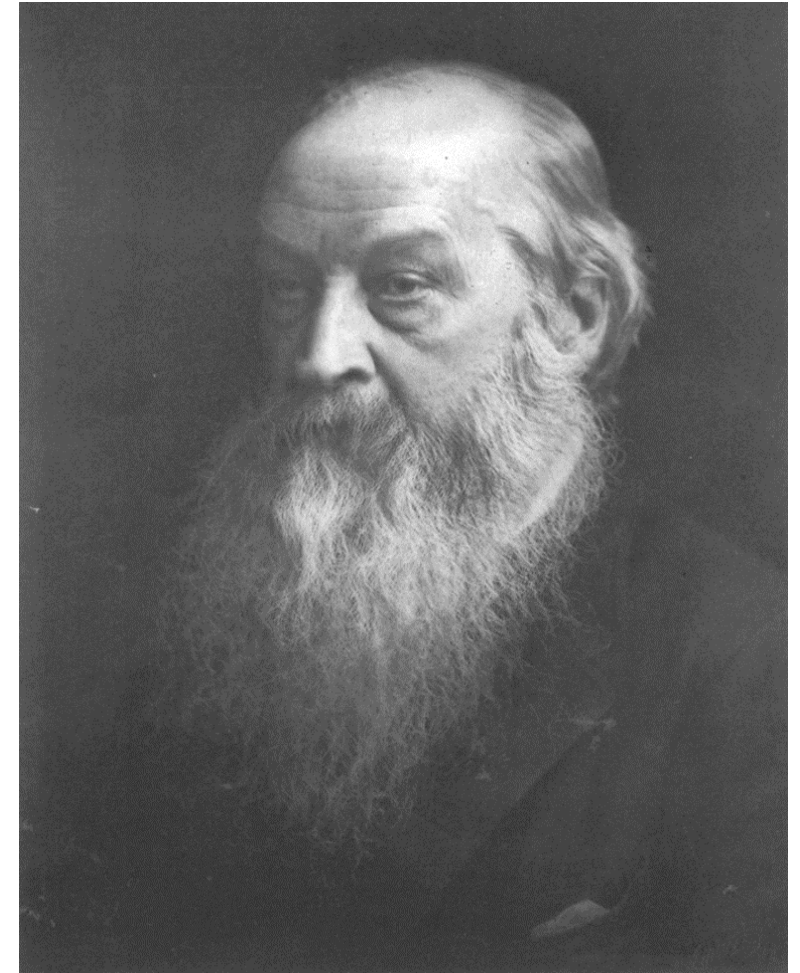


Adapted from Katon et al. *Biol Psychiatry* 2003



Severe Mental Illness and Diabetes Mellitus

- Henry Maudsley, 19th Century
 - *"Mental disorders are neither more nor less than nervous diseases in which mental symptoms predominate, and their entire separation from other nervous diseases has been a sad hindrance to progress...."*
- *The Pathology of Mind* that "Diabetes is a disease which often shows itself in families in which insanity prevails".
- Diabetes is more common in dementia praecox (Schizophrenia)





Metabolic Syndrome and SMI

- More common in schizophrenia, bipolar disorder and severe chronic depression than in general population.
- Individuals with schizophrenia
 - Overweight/obese (45–55%), smokers (50–80%), diabetes (10–15%), hypertension (19–58%), dyslipidemias (25–69%) and metabolic syndrome (37–63%) (Correll, 2007).
- Bidirectional relationship between metabolic syndrome and depression.
- Bidirectional relationship between depression and stroke.
- Increased the risk for cardio- and cerebrovascular conditions.
- Two to three times higher risk of developing dementias



SMI – Challenges and Consequences

- Inability to complete education
- Inability to maintain employment
- Poor social support
- Repeated hospitalizations
- Homelessness
- Incarceration
- Coexisting substance use disorders
- Premature death 15-20 years earlier than individuals without SMI by:
 - Diabetes
 - Cardiovascular Disease
 - Respiratory Disorders
 - Cancer



Schizophrenia and Cognition

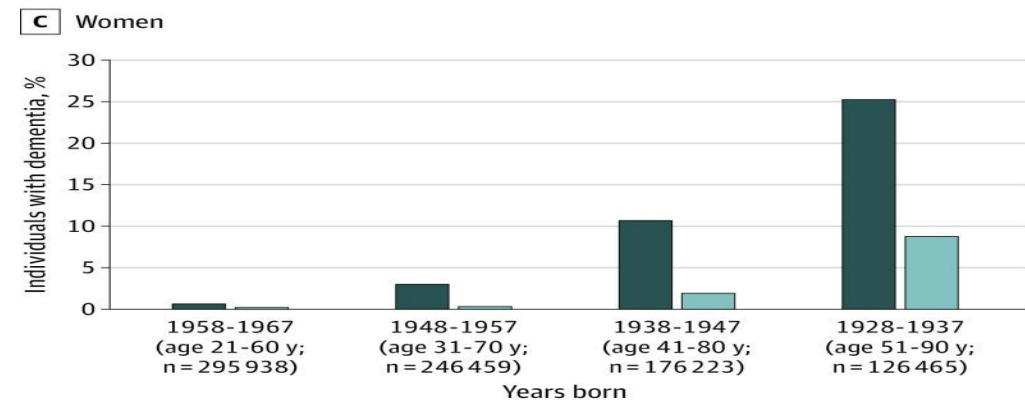
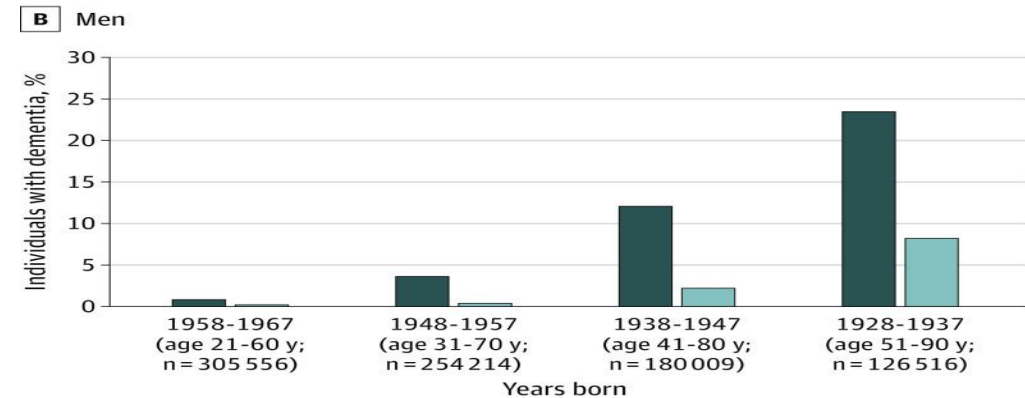
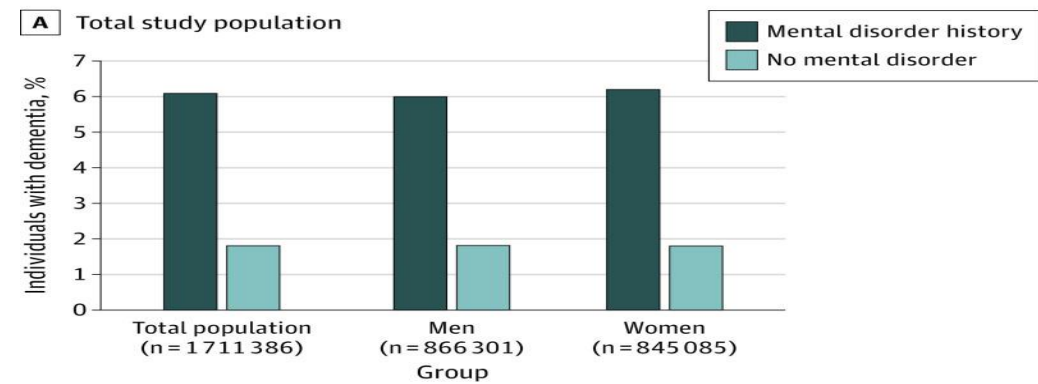
- Hallucinations, delusions and negative symptoms impact on executive function.
- Very early onset in life, in their teens or in their 20s, and then their cognition is not well developed, less cognitive reserve, affective and emotional reserves (resilience).
- Medical comorbidities that increase risk for developing dementia.
- Three times higher risk of developing dementia.



Severe Mental Illness (SMI)

- Depression
- Schizophrenia
- Bipolar Disorder

Richmond-Rakerd LS, D'Souza S, Milne BJ, Caspi A, Moffitt TE. Longitudinal Associations of Mental Disorders With Dementia: 30-Year Analysis of 1.7 Million New Zealand Citizens. JAMA Psychiatry. 2022 Apr 1;79(4):333-340. doi: 10.1001/jamapsychiatry.2021.4377. PMID: 35171209; PMCID: PMC8851362.



Late-Onset Neuropsychiatric Syndromes

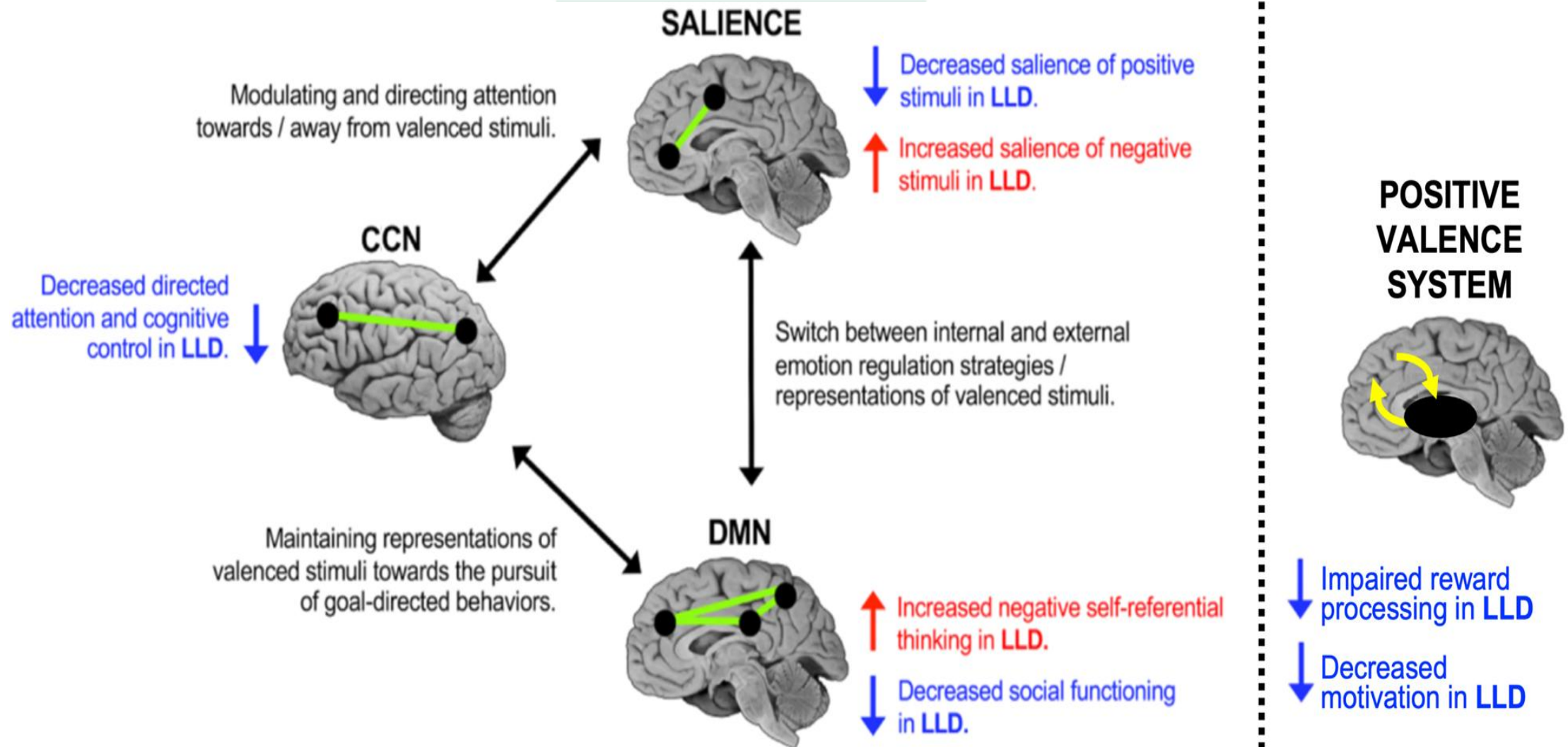


Late-Life Depression (LLD)

- **NOT part of normal aging**
- Community dwelling older adults have a prevalence of late life depression of 9% with a higher proportion in women
- Major Depressive Disorder 1-5%
- Depressive Syndromes 10-15%
- Different from neuropsychiatric symptoms of dementia (NPSPD)

Network Model of LLD

Szymkowicz, S.M., Gerlach, A.R., Homiack, D. *et al.* Biological factors influencing depression in later life: role of aging processes and treatment implications. *Transl Psychiatry* **13**, 160 (2023).





Early-Onset Depression

- Onset < 60
- Presence of psychiatric history
- Variable substance abuse
- Low medical comorbidities
- Presence of family history
- Severe symptoms
- Suicidality
- Social supports

Late-Onset Depression

- Onset > 60
- Absence of psychiatric history
- Variable substance abuse
- Higher medical comorbidities
- Absence of family history
- Moderate to severe symptoms
- Suicidality (completion)
- Social supports



Early-Onset Depression

- Cognition usually normal
- Better response to treatment
- Episodic course and long duration
- Less residual
- Usual risk for relapse
- Functional recovery full
- More psychological manifestations

Late-Onset Depression

- Cognition usually affected
- Poor response to treatment
- Unrelenting and chronic
- More residual
- Higher risk for relapse and faster
- Recovery at lower baseline
- More somatic manifestations

Vascular Depression

Hypertension → Single most modifiable factor to prevent cognitive decline

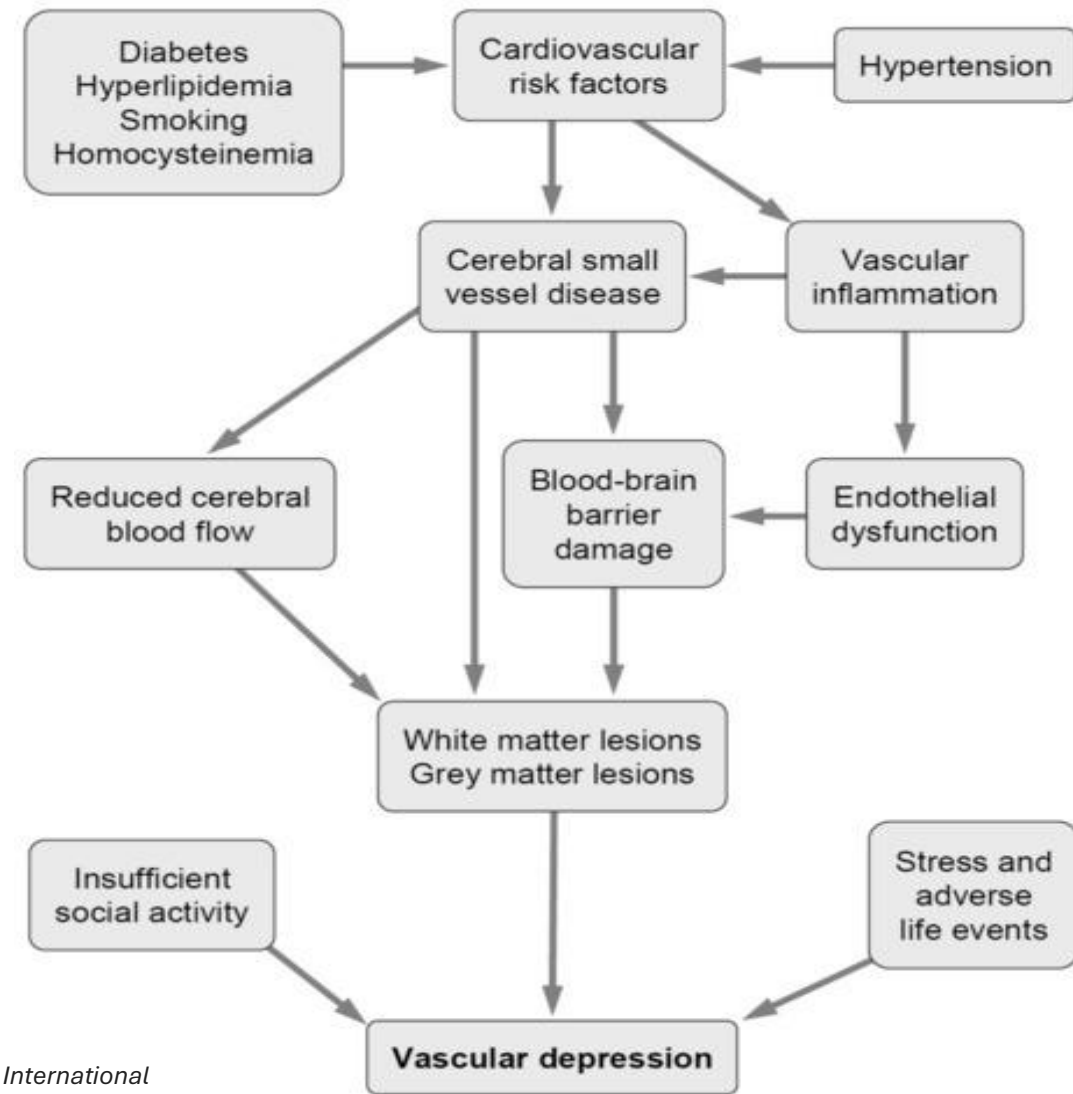
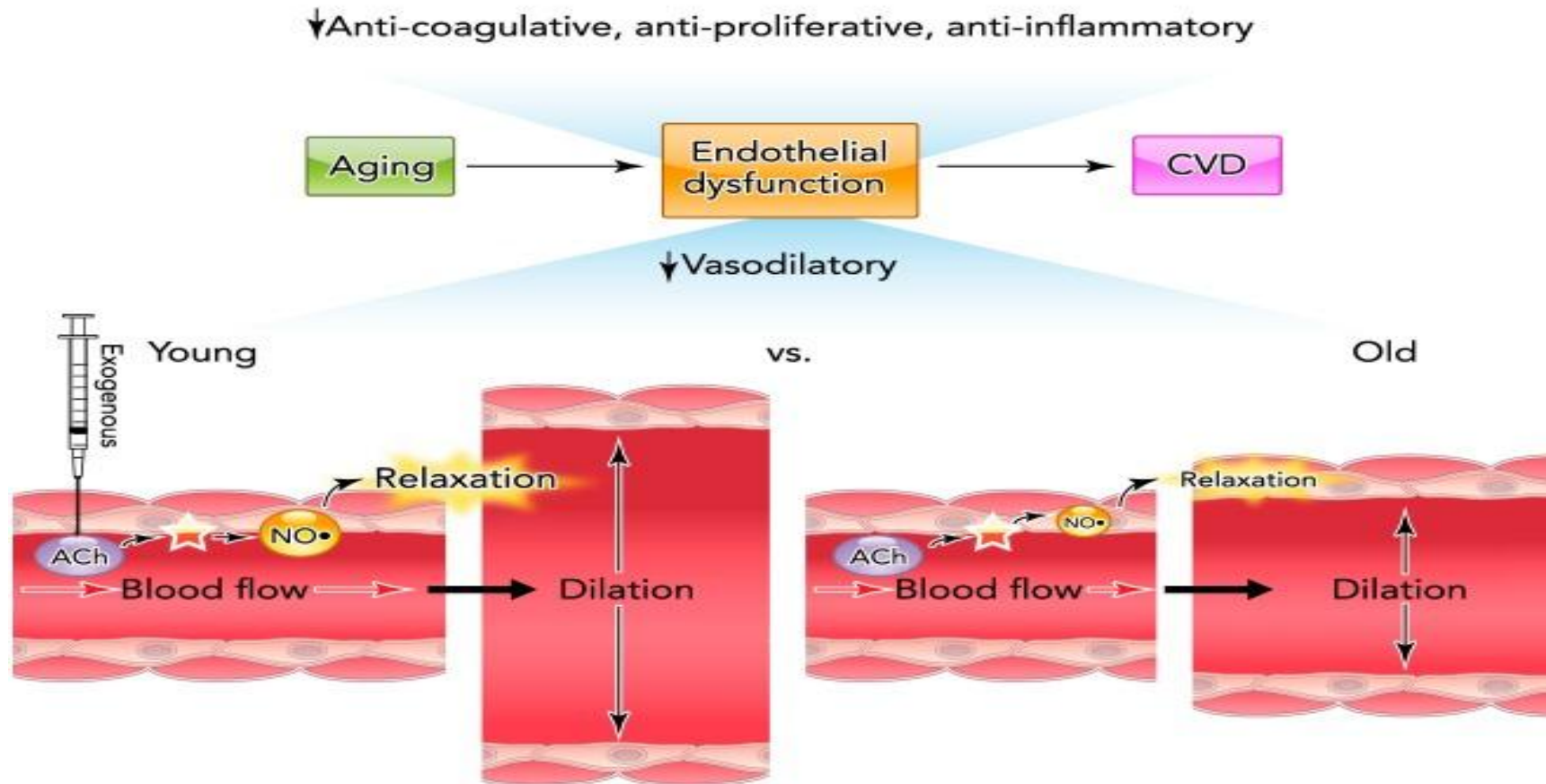


Figure: Jellinger, K. A. (2022). Pathomechanisms of Vascular Depression in Older Adults. *International Journal of Molecular Sciences*, 23(1), 308. <https://doi.org/10.3390/ijms23010308>

"You are only as old as your arteries"

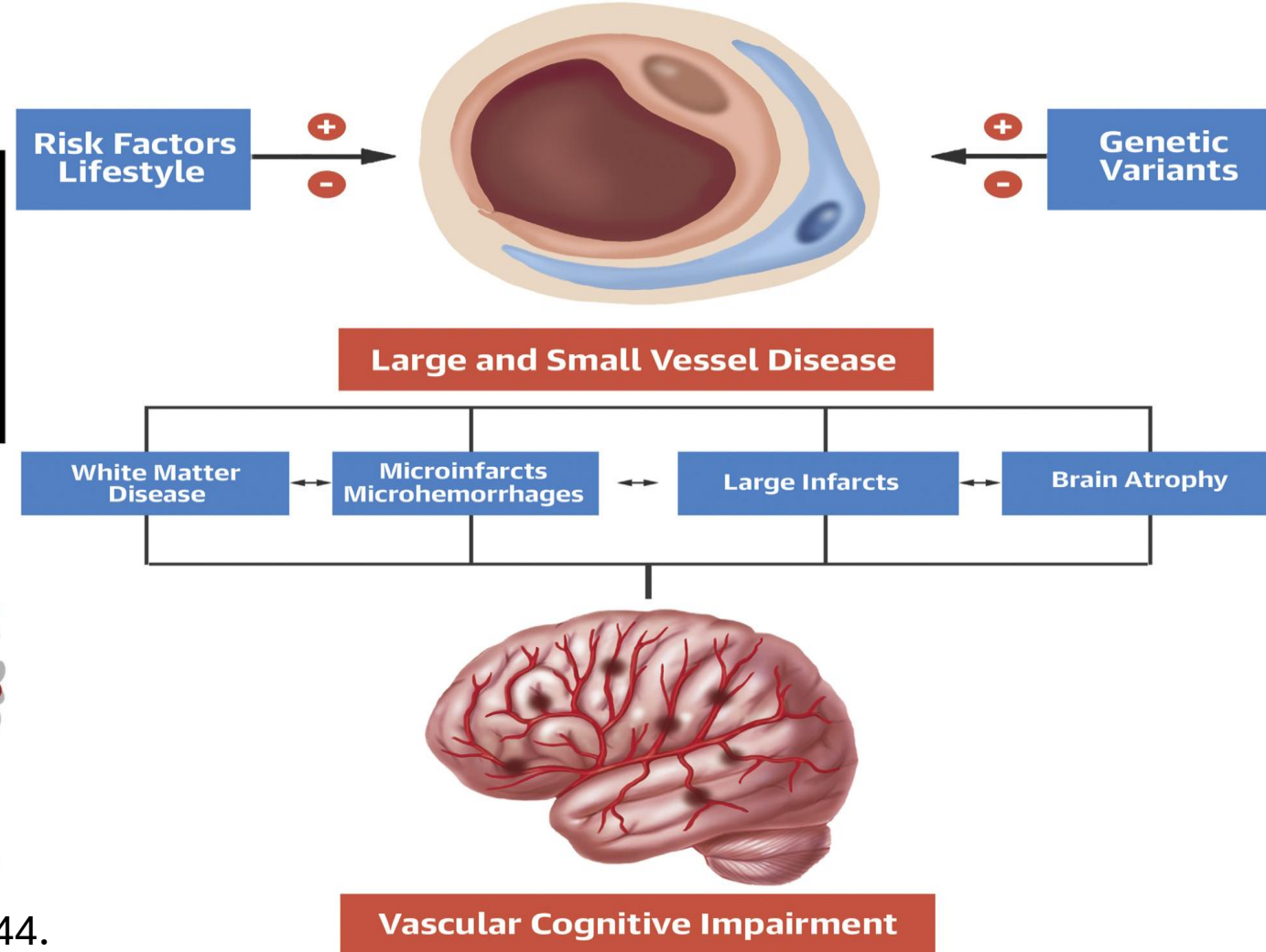
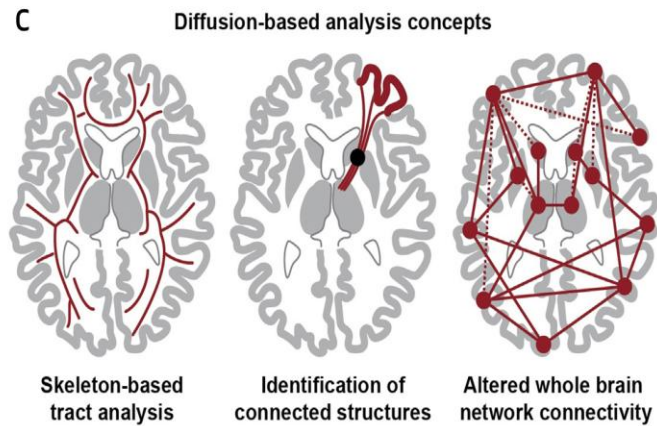
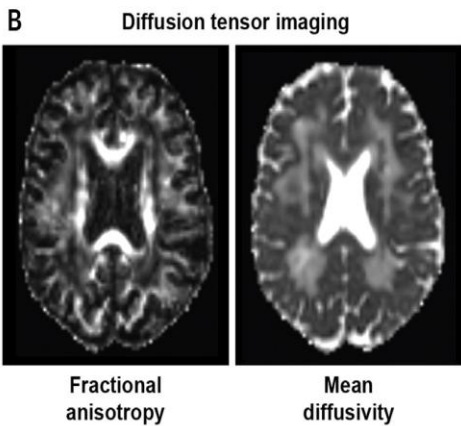
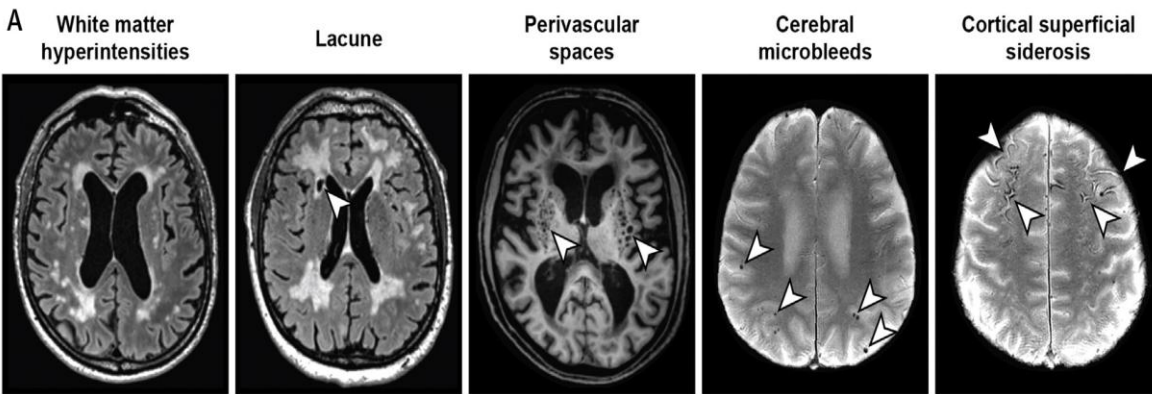


Thomas Sydenham

Seals DR, Kaplon RE, Gioscia-Ryan RA, LaRocca TJ. You're only as old as your arteries: translational strategies for preserving vascular endothelial function with aging. *Physiology (Bethesda)*. 2014 Jul;29(4):250-64. doi: 10.1152/physiol.00059.2013. PMID: 24985329; PMCID: PMC4103060.

Vascular Cognitive Impairment and Dementia

Neuroimaging of Vascular Cognitive Impairment



ladecola, C. et al. J Am Coll Cardiol. 2019;73(25):3326–44.



Late-Life Anxiety

Prevalence	Pharmacology	Non-pharmacologic
• 8-10% • Most cases began earlier in life • More common than late-life mood disorders • Generalized anxiety disorder (GAD), Panic disorder Late-life onset • Fear of falling • Fear of dying • Hoarding • Prodrome neurodegenerative condition (NPSD)	First-line • Sertraline (GI), escitalopram, citalopram (QTC), fluoxetine (CYP2D6) • Venlafaxine, desvenlafaxine, duloxetine (check kidneys, blood pressure) Second-line • Buspirone (GAD) • Gabapentin, Pregabalin (check kidneys, sedative effects) • Lorazepam, oxazepam • Propranolol • Quetiapine	Cognitive behavioral therapy (CBT) • Identify automatic thoughts • Challenge dysfunctional beliefs Relaxation techniques Relaxation response, deep breathing Positive imagery Progressive muscle relaxation



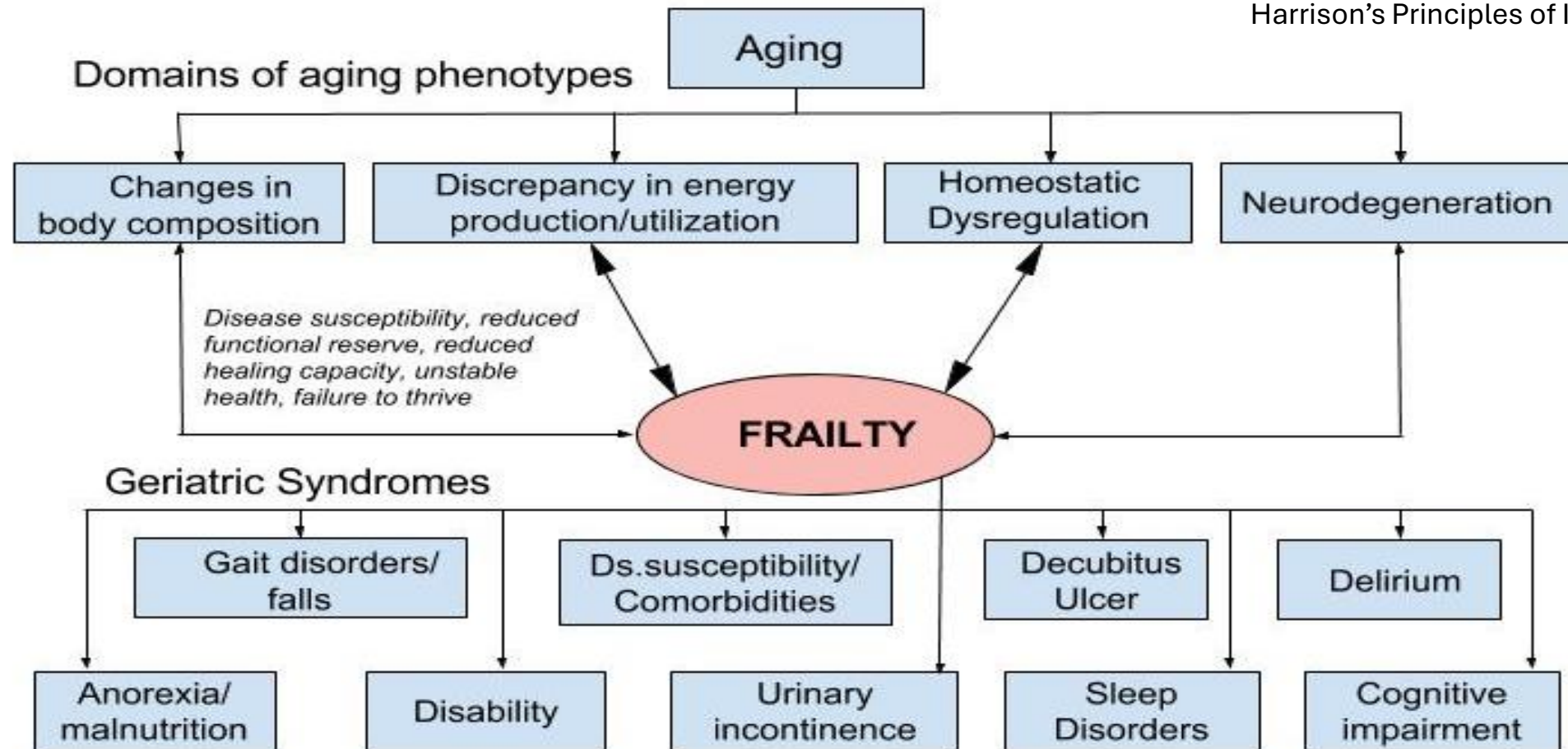
Suicide in Older Adults (National Council of Aging, 2025)

- Older adults 16.8% population, make up ~ 22% of suicides.
- More carefully planned and more likely lethal methods.
- Attempt suicide, 1 in 4 older adults will succeed, compared to 1 in 200 youths.
- Poor recovery from failed attempt due to frailty or comorbidities
- Men age 75 and older face the highest overall rate of suicide.
- 85% of elderly suicides men
- Ratios men/women ration, 65-74=4.7, 75-84=8, and $\geq 85=17$

Geriatric Syndromes

A unifying model of aging, frailty, and the geriatric syndromes.

Harrison's Principles of Internal Medicine.





Delirium

- Acute decline attention and global cognitive functioning, fluctuating, usually reversible
- Prevalence 14–56%, mortality 22-76%
- Hospital Elder Life Program (HELP)
<https://www.hospitalelderlifeprogram.org/>
- Confusion Assessment Method (Short CAM)
- Family Confusion Assessment Method (FAM-CAM)

Frailty

- State of increased vulnerability to poor resolution of homeostasis after a stressful event
- Adverse outcomes, including falls, functional decline, and delirium.
- Impairment in mobility, balance, muscle strength, cognition, nutrition, endurance, and physical activity

Sundowning

Neurobiological factors	Degeneration of the suprachiasmatic nucleus Decreased melatonin production Disruption of circadian rhythms Impaired cholinergic neurotransmission Dysregulation of the HPA axis
Pharmacological factors	Antipsychotics Anticholinergics Antidepressants Hypnotics
Physiological factors	Fatigue Hunger Unmet physical or psychological needs Temporal changes in body temperature Circadian modifications of blood glucose levels Circadian changes in blood pressure
Medical factors	Sleep disorders Sensory deprivation Pain Mood disorders and fluctuations Cognitive deficits (e.g., agnosia)
Environmental factors	Exposure to inadequate amount of light Lower staff–patients ratio in residential facilities Lessened availability of home caregivers Caregiver fatigue Environmental overstimulation (noise and chaos)



Falls in Older Adults

Prevalence

- Thirty percent ≥ 65 and 40% > 80
- ED visits/year: 3 million
- Injury required medical treatment or restricted activity for at least one day 10-30%
- WHO 684,000 people die every year due to falls

Risk Factors

Individual

- Cognitive: visuospatial deficits
- Sensory: vision, proprioception, pain
- Vitamin D deficiency
- Difficulties with walking, gait, strength, balance, weakness, medical/neurological conditions, medications

External

- Footwear
- Home hazards or dangers (broken or uneven steps, rugs or clutter, wires, etc.)

Consequences

Psychological impact:

Loss of autonomy and independence

Injuries can impair a person to get around, perform everyday activities, or live on their own.

- Fractures
- Head injuries (Number one cause of TBI in older adults)
- Fear of falling

Assessment and Prevention

- Stopping Elderly Accidents, Deaths and Injuries (STEADI)
<https://youtu.be/Snvw7b94yXU>



Falls in Older Adults

- Screen (STRIDE)
 - Feeling unsteady?
 - Worried about falls?
 - Fell in the past year?
- Assess
 - Modifiable risk factors
- Intervene
 - Referrals to eye exam, physical therapy, occupational therapy

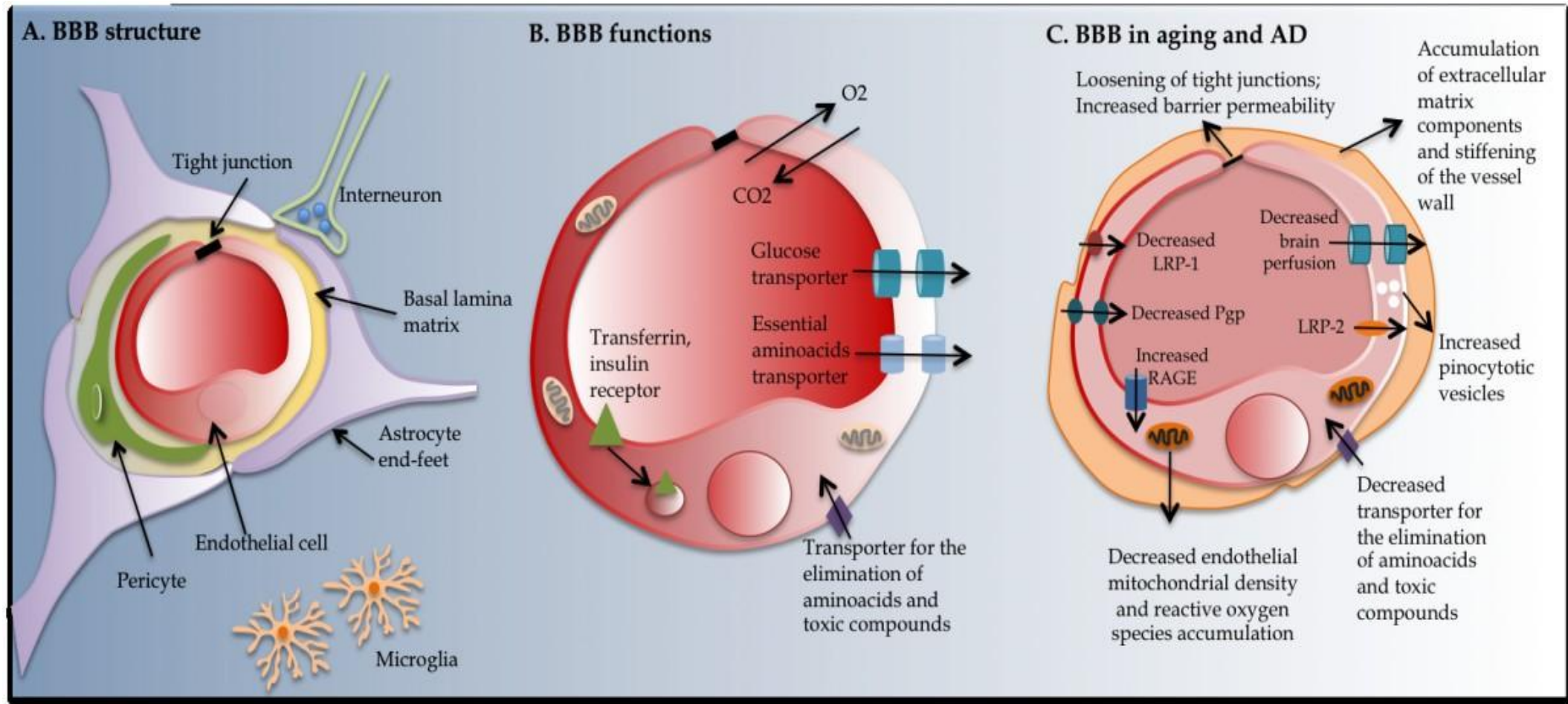
Principles of Treatment



Physiological changes in aging that can influence pharmacokinetics

System	Changes
General	Reduced total body mass, basal metabolic rate, and proportion of body water; increased proportion of body fat
Circulation	Decreased cardiac output; altered relative tissue perfusion; decreased plasma protein binding (?)
Gastrointestinal tract	Reduced gastric acid production, gastric emptying rate, gut motility, gut blood flow, absorption surface, intestinal uptake/transport (?), intestinal metabolism
Liver	Reduced liver mass, blood flow, and albumin synthesis
Kidney	Reduced glomerular filtration rate, tubular function
Lung	Reduced vital capacity

Blood-Brain Barrier in Aging and in AD



Pharmacology in Older Adults

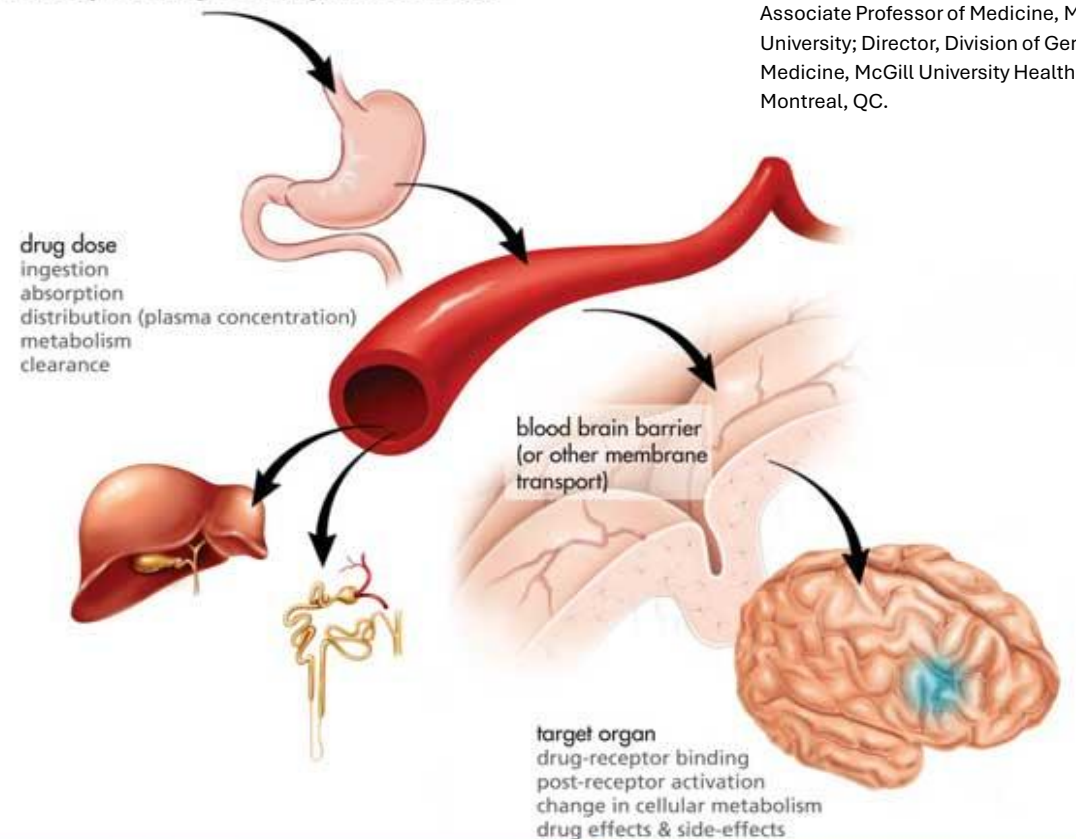
Pharmacodynamic changes

- “How the drug affects the body”
- Increased sensitivity to various drug classes

Pharmacokinetic changes

- “How the body handles the drug”
- Decreased renal and hepatic clearance
- Increased volume of distribution for lipid-soluble drugs, prolonging elimination half-life.

Figure 1:
Pathway of Drug Delivery and its Effect



Optimizing Prescribing among Older Adults.
Dr. Allen R. Huang, MDCM, FRCPC, FACP,
Associate Professor of Medicine, McGill
University; Director, Division of Geriatric
Medicine, McGill University Health Centre,
Montreal, QC.



Pharmacology

Pharmacodynamic factor	Impact on geriatrics
Altered receptor sensitivity	Decreased sensitivity may necessitate higher doses for therapeutic effect
Drug metabolism	Slowed metabolism leads to prolonged drug action and increased risk of drug accumulation
Physiological changes	Age-related changes in organ function affect drug distribution and elimination pathways
Increased susceptibility to ADEs	Greater vulnerability to ADEs, necessitating careful dose adjustment
Pharmacodynamic interactions	Potential interactions with co-existing conditions and polypharmacy require consideration

It highlights how ageing influences drug responses and efficacy, emphasising key factors such as changes in receptor sensitivity, altered drug metabolism, and increased susceptibility to ADEs. Understanding these pharmacodynamic nuances is crucial for optimising medication therapy and ensuring safe and effective treatment outcomes in geriatrics [[4](#), [10](#), [14](#)]

ADEs adverse drug effects

Ngcobo, N.N. Influence of Ageing on the Pharmacodynamics and Pharmacokinetics of Chronically Administered Medicines in Geriatric Patients: A Review. *Clin Pharmacokinet* **64**, 335–367 (2025).
<https://doi.org/10.1007/s40262-024-01466-0>



American Geriatric Society Beers Criteria

- Developed by Dr. Mark Beers et. al. at UCLA in 1991
- American Geriatrics Society (AGS) since 2010
- List of Potentially Inappropriate Medications (PIM) use in older adults
- Revised every 3 years (last update 2023)
- Ambulatory, acute, and institutionalized settings of care, except hospice and end-of-life care settings.
- Adapt to special circumstances if used outside of the US

American Geriatrics Society 2023 updated AGS Beers Criteria® for potentially inappropriate medication use in older adults. J Am Geriatr Soc. 2023 Jul;71(7):2052-2081. doi: 10.1111/jgs.18372. Epub 2023 May 4. PMID: 37139824.



Sleep Changes in Normal Aging

- Common changes are advanced sleep timing, decreased nocturnal sleep time and sleep efficiency, increased frequency of daytime naps, increased nocturnal awakenings, and decreased slow wave sleep.
- Most sleep parameters remain unchanged after 60 years of age in healthy older adults.
- Related to changes in circadian system and sleep homeostasis, the amount and pattern of sleep-related hormone secretion.
- Other factors such as medical and psychiatric conditions, and environmental, social and lifestyle changes, can contribute to sleep problems in older adults.

Geriatric Neuropsychiatry

- Recognize normal age-related changes in older adults
- Diagnosis and treatment behavioral, psychological and neurocognitive disorders from brain dysfunction.
- Aiming to preserve autonomy, dignity and quality of life.
- Interdisciplinary work.

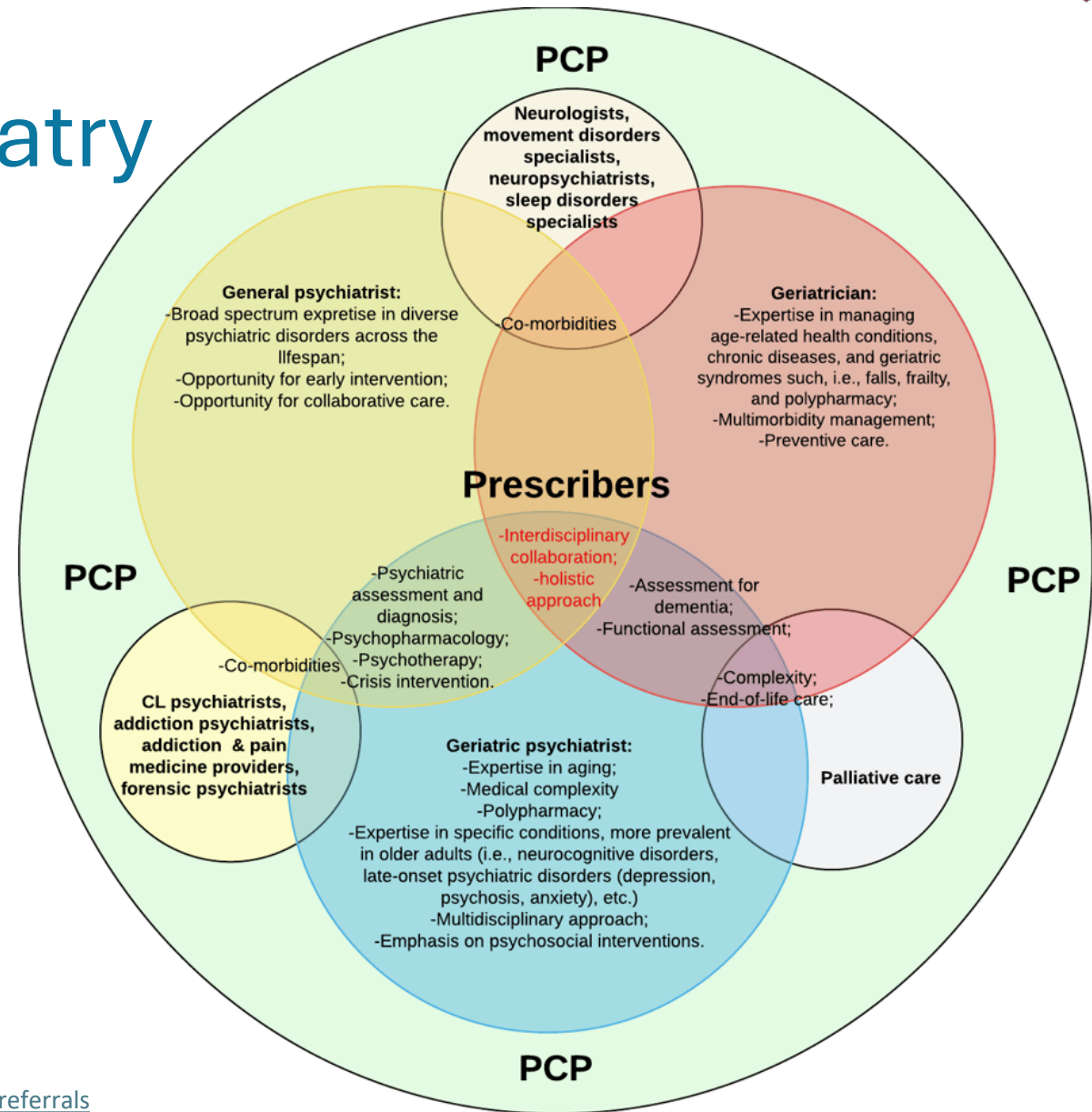
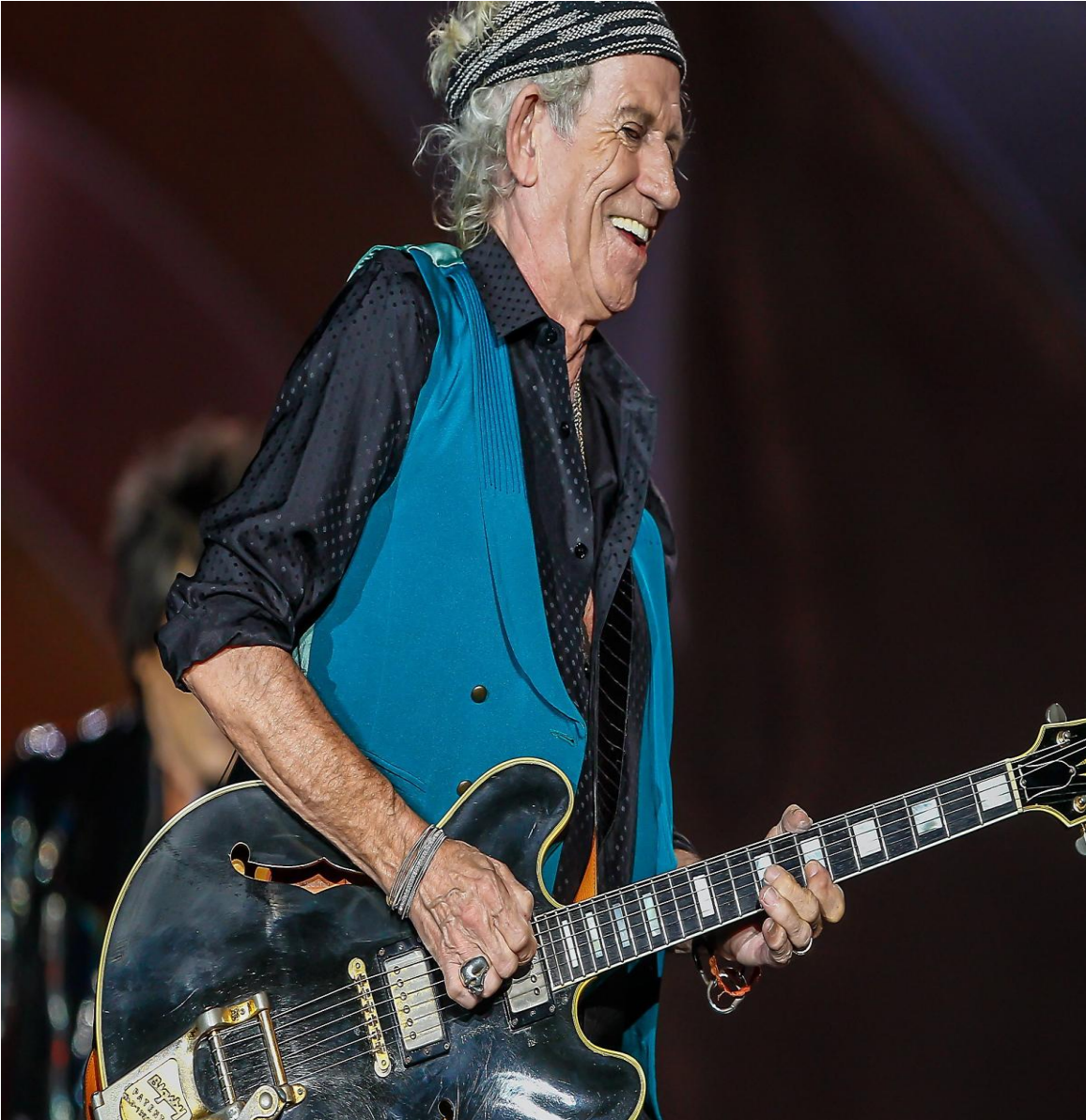


Figure from Olga Koblova, MD and Jürgen Unützer, MD, MPH, MA

<https://info.primarycare.hms.harvard.edu/perspectives/articles/geriatric-psychiatry-referrals>



“You know, life's a funny thing. Nobody wants to get old, but nobody wants to die young either.”

Keith Richards