Models of Development: Nature and Nurture in Adulthood

What is Nature and What is Nurture?

Broad Perspectives

Nature (Organismic) Perspectives

Nurture (Mechanistic) Perspectives

Interactionist Perspectives

Psychological Models of Development

What is Nature and What is Nurture?

Nature

- Genetics
- Biology
- Evolution

Nurture

- Learning (classical, operant, social)
- Environment (e.g., culture, SES)
- Epigenetics

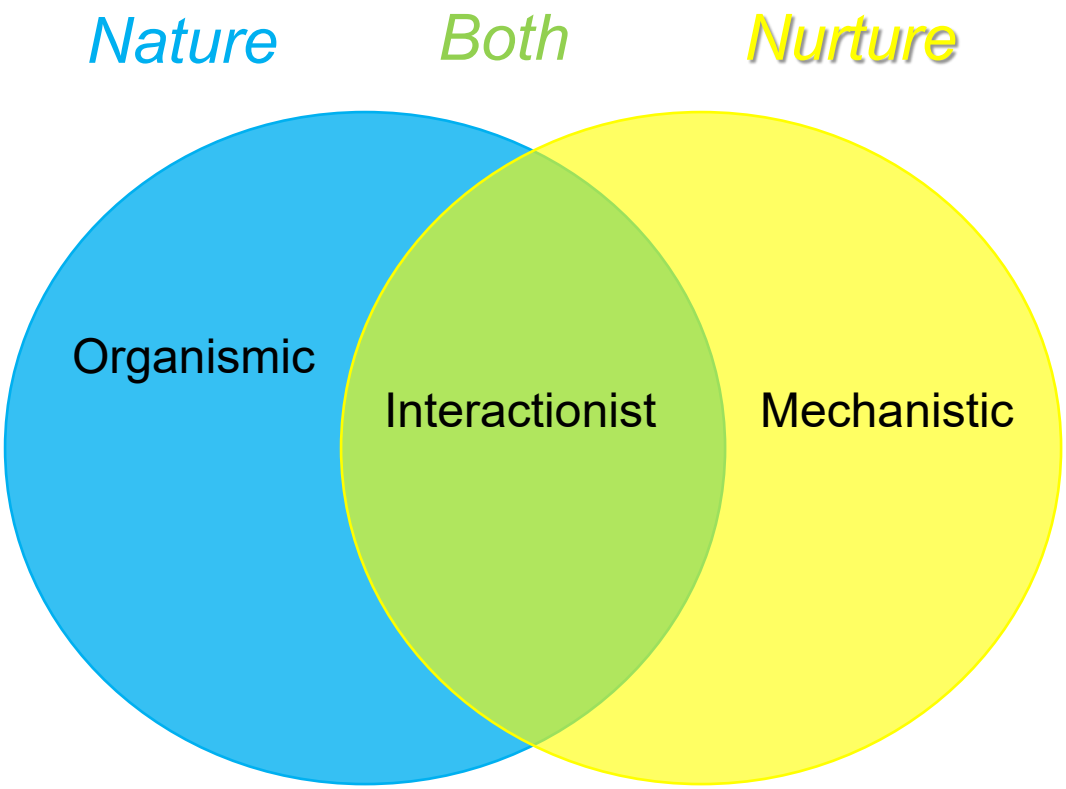
Broad Perspectives

Life span perspective→
Emphasizes continuity of development from childhood to old age

Contextual influences→
Life span change is a function of nature and nurture

Developmental science→
Need to look at multiple factors in development

Broad Perspectives



Broad Perspectives

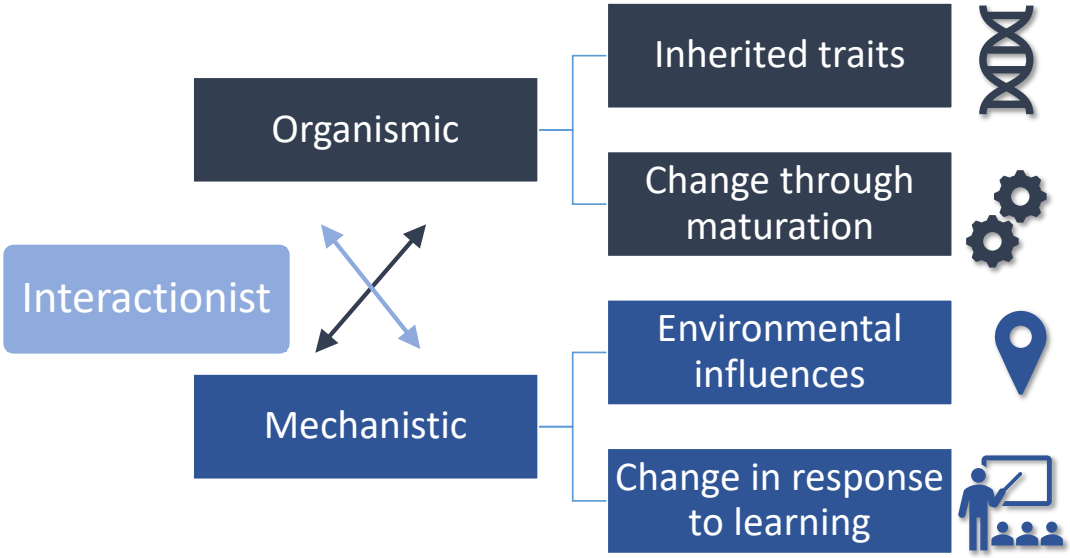
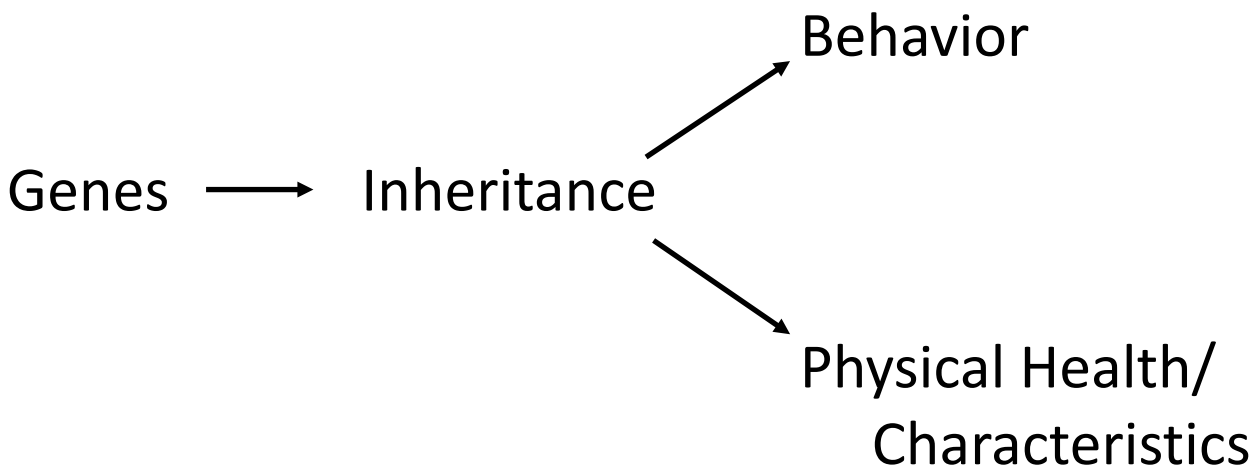


Figure 2.1

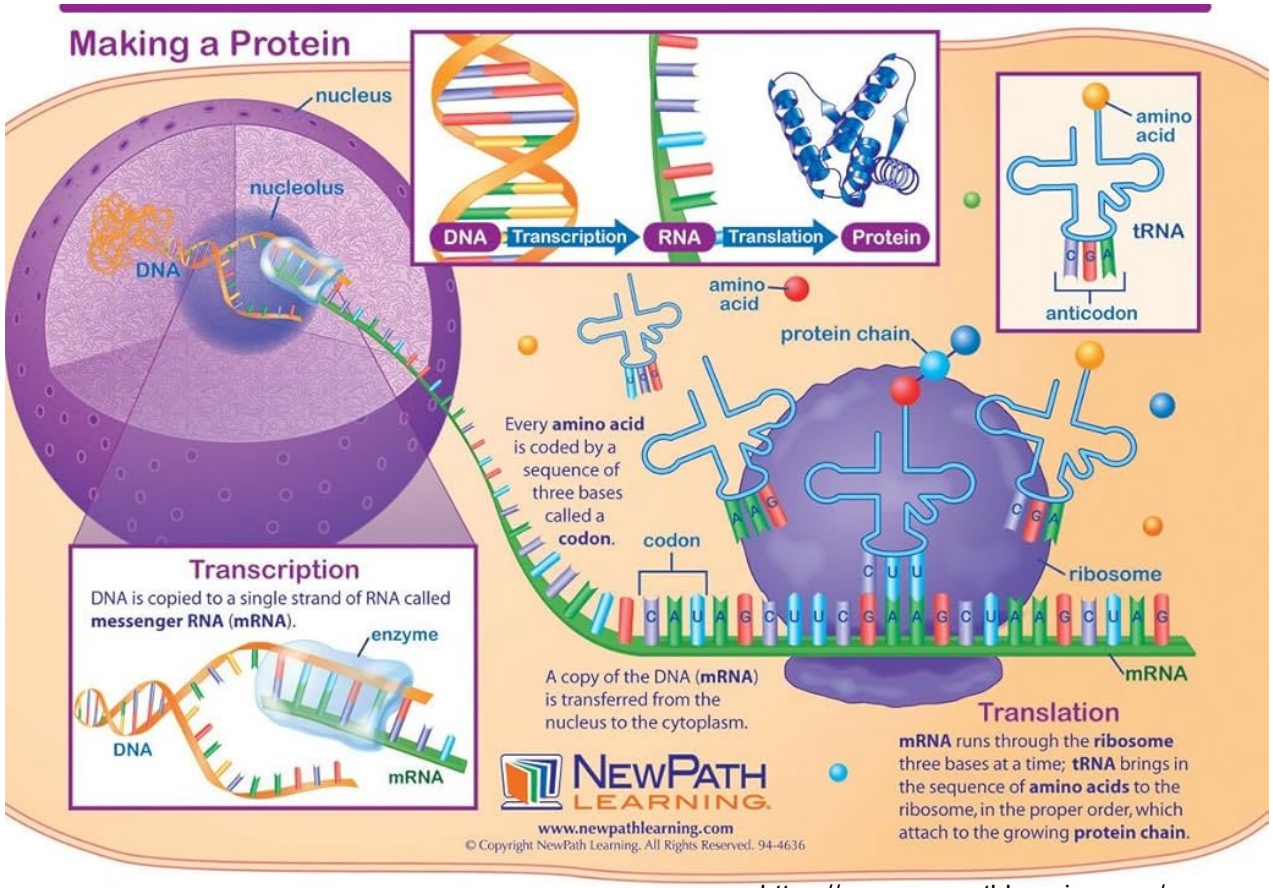
Nature (Organismic) Perspectives

Organismic Perspective: Genetics



Organismic Perspective: Genetics

From genes to protein



https://www.newpathlearning.com/
https://www.amazon.in/How-Genes-Work-Poster-Full-Color/dp/B0723DP9C6

Organismic Perspective: Genetics

Two types of behavioral genetic studies

Genome-Wide Association Study (GWAS)

Researchers scan the entire genome of a large number of people to find variations associated with disease

Genome-Wide Linkage Study

Researchers study genomes of families with specific traits or disorders

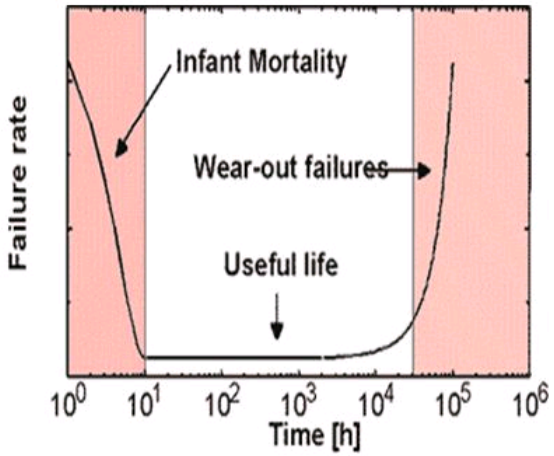
Organismic Perspective: Genetics

Programmed Aging Theories	Genetic code for life-span, aging genes, survival function (e.g., Gompertz)
Wear and Tear Theory	Life span and health depend on natural age capacity which can be limited by amount of use, like a car
Random Error Theories	Genetic mutation, random errors impact genes or genetic expression
	• Cross-linking Theory: connective tissues, collagen, natural age capacity • Free Radical Theory: Oxidation of cells, antioxidants, caloric restriction • Autoimmune: Inflammation mechanisms

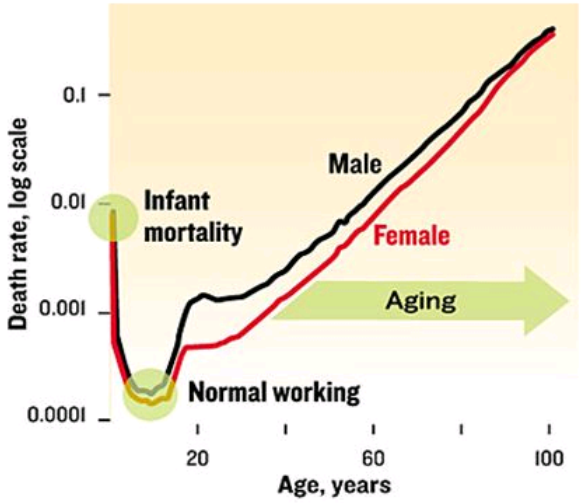
Programmed Aging & Wear and Tear Theories

Lifespan & Disease Survival Models

Stages of Life in Machines and Humans



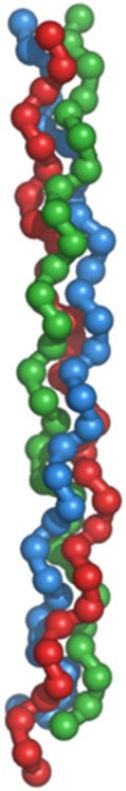
The so-called bathtub curve for technical systems



Bathtub curve for human mortality as seen in the U.S. population in 1999 has the same shape as the curve for failure rates of many machines.

Gavrilov & Gavrilova (1991). *Biology of a lifespan: A quantitative approach. Chur*, Switzerland: Harwood. http://slideplayer.com/slide/8437417/

Cross-Linking Theory



In *cross-linking*, the strands of the collagen molecule (left) start to become intertwined, causing the molecules to become increasingly more rigid and smaller. Effects rigidity of muscles, tendons, and joints.

Results from exposure to certain kinds of sugars which leads to *glycation* (bonding of sugar to proteins or lipids), causing formation of advanced glycation end-products (AGE's). May play a role in heart disease, cancer, Alzheimer's, hearing loss.

Free Radical Theory

- Unstable oxygen molecules produced when cells create energy ()
- Free oxygen electrons seek out and bind to other molecules
- The attacked molecule then cell loses its proper functioning
- Antioxidants (foods rich in vitamins A and E, such as fruits and nuts) can fend them off

Immune System

Immunosenescence

- Decreased ability to respond to infection (inflammation, T- & B-cell responses)
- Heightened susceptibility to autoimmune diseases, such as arthritis

Wear and tear-accumulative effects of stress and exposure

Programmed aging-natural lifespan of immune system

https://www.nia.nih.gov/health/publication/biology-aging/immune-system-can-your-immune-system-still-defend-you-you-age

Biology

But genes likely play less than 50% role in determining lifespan, which the amount increases with longevity age

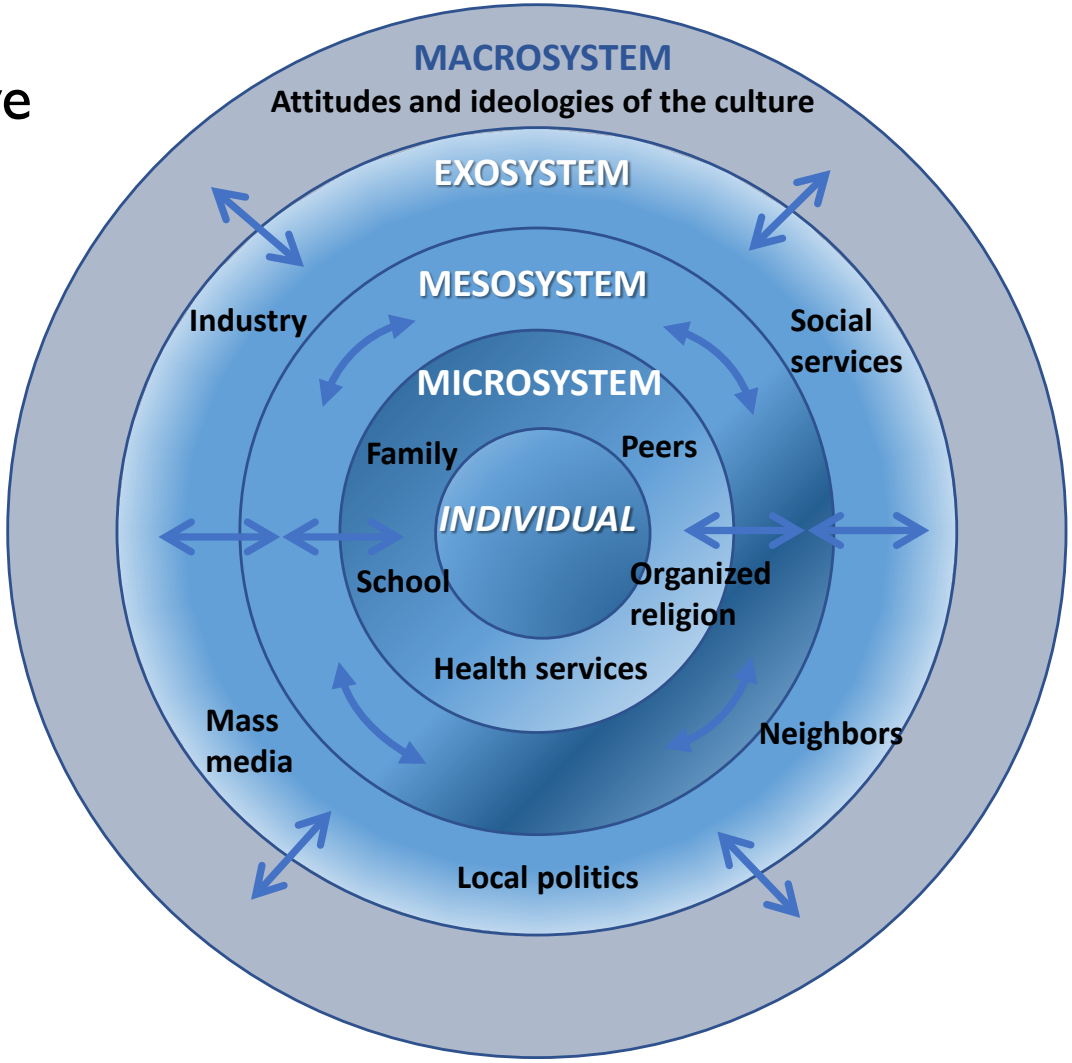
~25% for living past 60

~33% - 48% living past 100

Nurture (Mechanistic) Perspectives

Bronfenbrenner's ecological perspective

Development is affected by processes at multiple levels



Ecological Perspective Example: Social Class and Health

Whitehall II study investigated influence of social class on health

Men and women in lower employment grade occupations had lower physical functioning scores. Geographic regions associated with income associated with longevity

Source: Marmot, M., & Brunner, E. (2005). Cohort profile: the Whitehall II study. *International Journal of Epidemiology, 34,* 251–260 by permission of Oxford University Press.

Ecological Perspective Example: Social Support

Higher survival times when support is higher

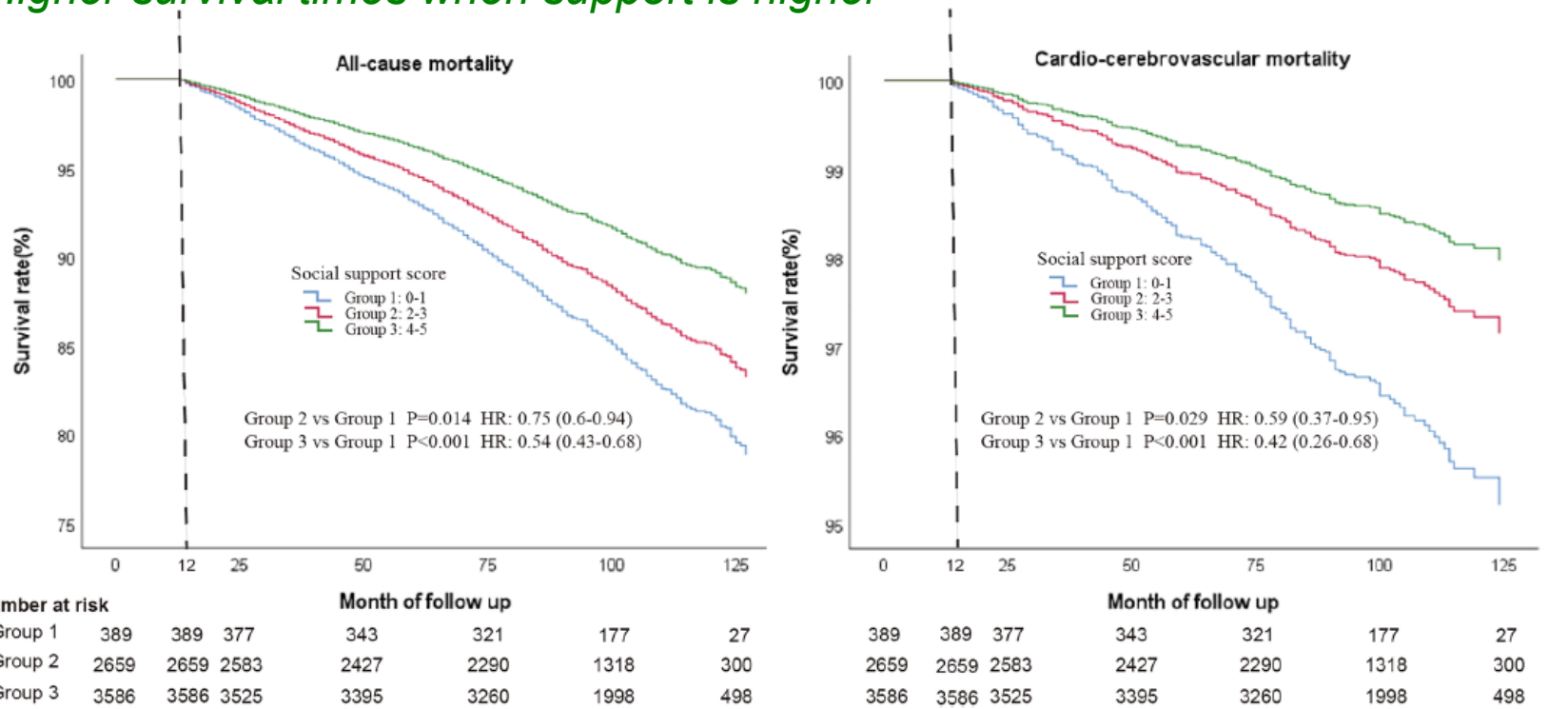


Figure 3. Cox regression curves for all-cause and cardio-cerebrovascular mortality according social support groups after full variable adjustment and excluding pa
year of the interview.

https://doi.org/10.1038/s41598-024-55012-w nature portfolio

Wang, Y., Wang, J. J., Zhou, H. F., Li, W. Y., Liao, Y. X., Xu, M. Y., ... & Lv, B. (2024). The protective effect of social support on all-cause and cardio-cerebrovascular mortality among middle-aged and older adults in the US. *Scientific Reports*, *14*(1), 4758.

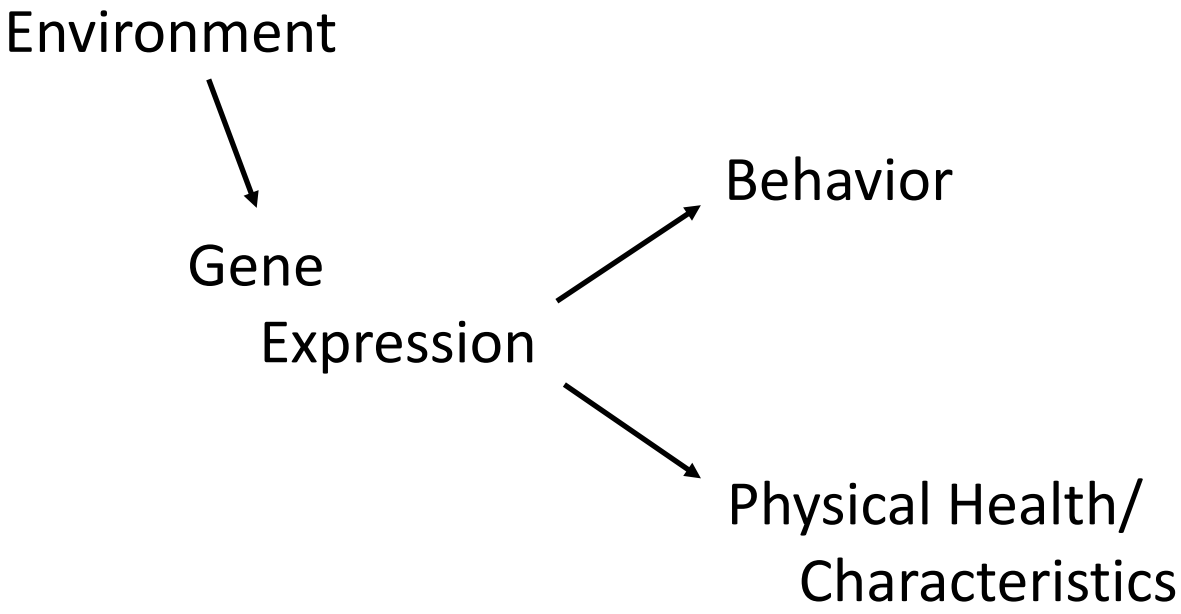
Interactionist Perspectives

Ways in Which Nature and Environment May Interact

- Epigenetics
- Telomere length
- Plasticity in development

Interactionist Perspectives: Epigenetics

Epigenetics: the study of changes in organisms caused by modification of gene expression rather than alteration of the genetic code itself.



Interactionist Perspectives: Epigenetics Example
Metabolism and Disease

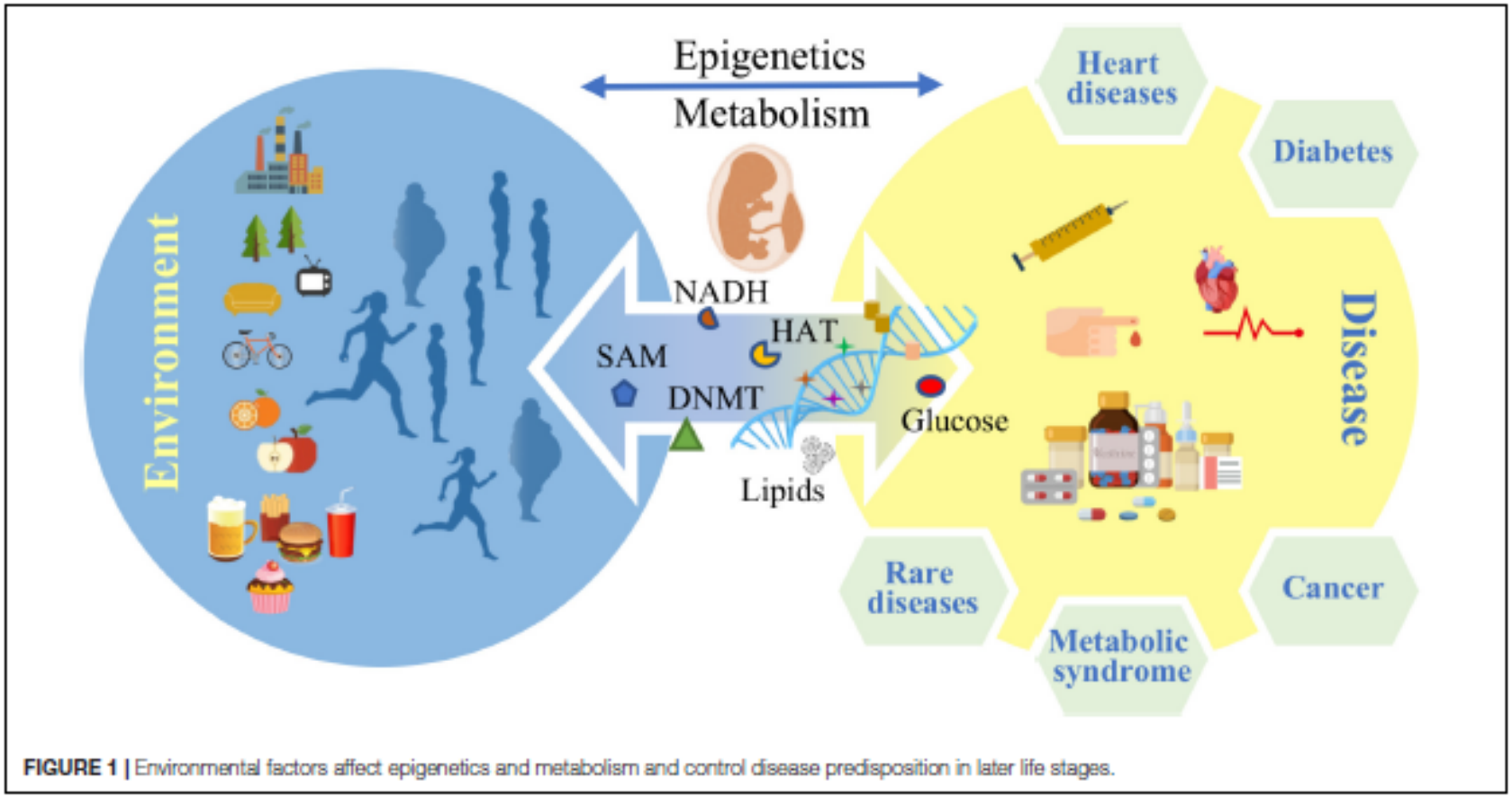
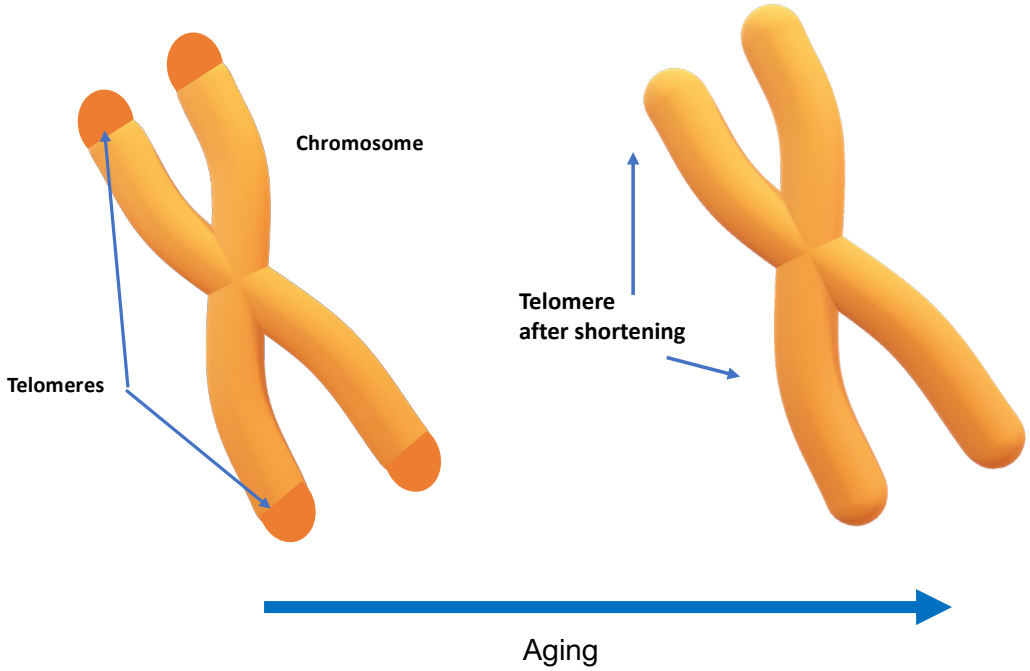


FIGURE 1 | Environmental factors affect epigenetics and metabolism and control disease predisposition in later life stages.

Tzika, E., Dreker, T., & Imhof, A. (2018). Epigenetics and metabolism in health and disease. *Frontiers in genetics*, *9*, 361.

Interactionist Perspectives: Epigenetics Example
Telomere Length

- Region with sequence of nucleotides at the end of chromosomes which are
- Truncated during cell division
- People with longer telomeres live longer, association with a number of diseases



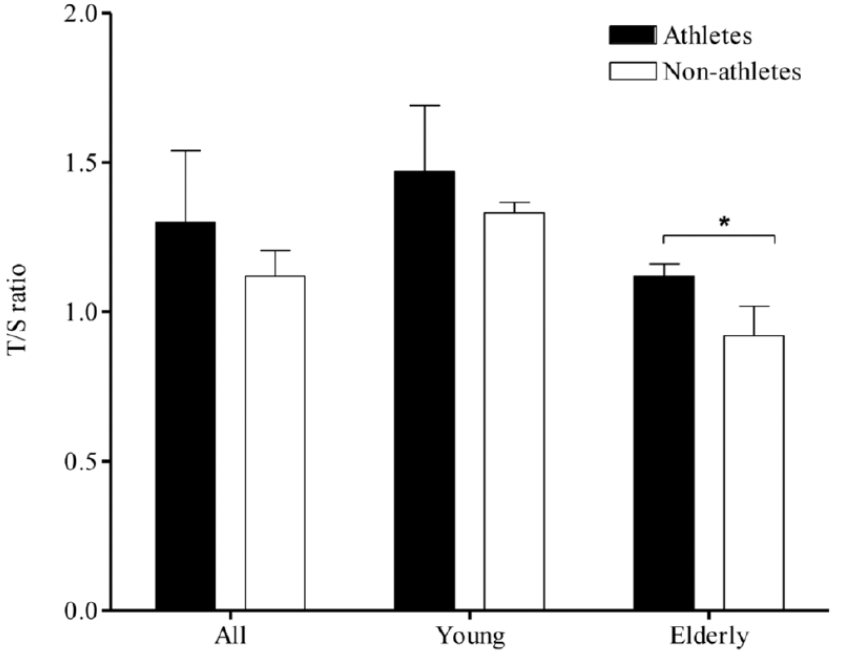
View: https://youtu.be/R5YiO6rKr-w

Interactionist Perspectives: Epigenetics Example Telomere Length

Physical Activity and Telomere Length study by Østhus and colleagues (2012)

- N = 20: ages 22-27 yrs vs. ages 66-77
- Half of each group were endurance athletes (endurance tested)
- Measured relative telomere length (polymerase chain reaction measurement of DNA sample)

Interactionist Perspectives: Epigenetics Example
Telomere Length



	All	Young	Elderly
Difference	0.17	0.14	0.21
90% CI	−0.02 to 0.37	−0.05 to 0.33	0.02 to 0.40
P-value	0.07	0.12	0.04

Figure 1. Telomere length expressed as T/S ratio among athletes and non-athletes, stratified by age. *$P<0.05$.
doi:10.1371/journal.pone.0052769.g001

Interactionist Perspectives: Epigenetics Example

$FOXO_3$ and longevity

Transcription factor forkhead box O-3

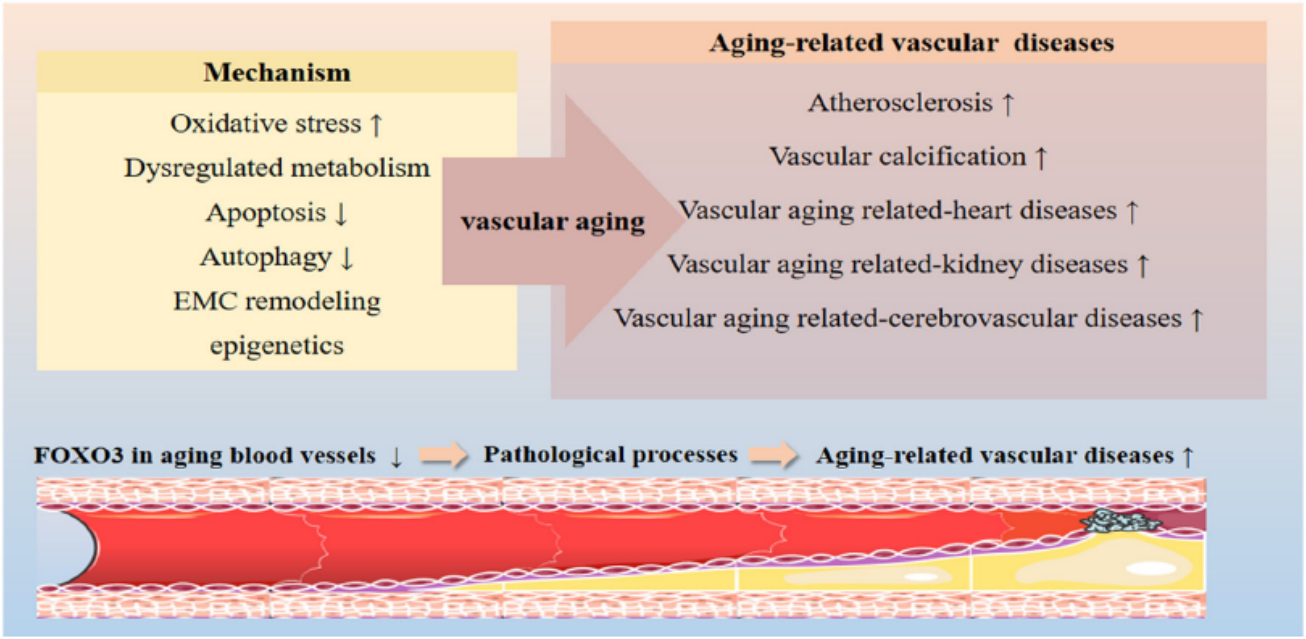


FIGURE 2 | Effects of FOXO3 on vascular aging-related diseases. FOXO3 participates in various cellular processes implicated in the progression of vascular aging, including oxidative resistance, apoptosis, autophagy, energy metabolism, and ECM remodeling processes by targeting the expression of effector genes. FOXO3 is a key protective factor in maintaining vascular homeostasis. Dysregulation of FOXO3 has been shown to contribute to a variety of vascular aging-related diseases, including atherosclerosis, vascular calcification, hypertension, and vascular aging-related heart diseases, kidney diseases, and cerebrovascular diseases.

Zhao, Y., & Liu, Y. S. (2021). Longevity factor FOXO3: a key regulator in aging-related vascular diseases. *Frontiers in cardiovascular medicine*, *8*, 778674. p.5

Interactionist Perspectives: Plasticity in development

Alter behavior to reduce risk, examples:

- Exercise, healthy diet, avoid smoking especially when predisposed to heart disease
- Mental exercise, e.g., brain games

Psychological Models of Development

Erikson's Psychosocial Theory
(1963)

Ages (approx.)	Reliance on others	Indepen-dence	Self-expression	Work ethic	Sense of self	Close relation-ships	Care for younger generation	Mortality and acceptance
65 and older								Ego integrity vs. Despair
30 to 65							Genera-tivity vs. Stagnation	
21 to 30						Intimacy vs. Isolation		
12 to 21					Identity vs. Identity diffusion			
6 to 12				Industry vs. Inferiority				
3 to 6			Initiative vs. Guilt					
1-1/2 to 3		Autonomy vs. Shame and doubt						
0 to 1-1/2	Trust vs. Mistrust							

Erikson's Psychosocial Theory
(1963)

Intimacy vs. isolation

Move in with your close romantic partner.

Generativity vs. stagnation

Mentor a younger employee or student.
Lose your job due to lack of productivity

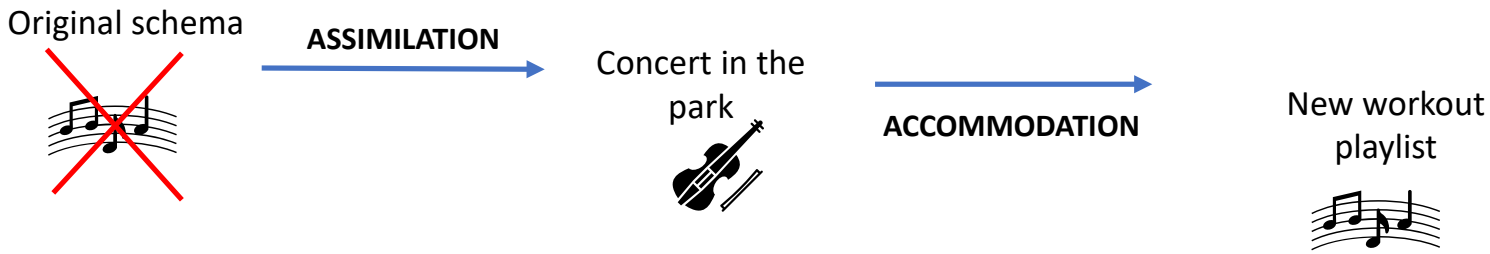
Ego integrity vs. despair

Wish that you could have done more with your life.

Piaget's Cognitive-Developmental Theory
(1923;1926)

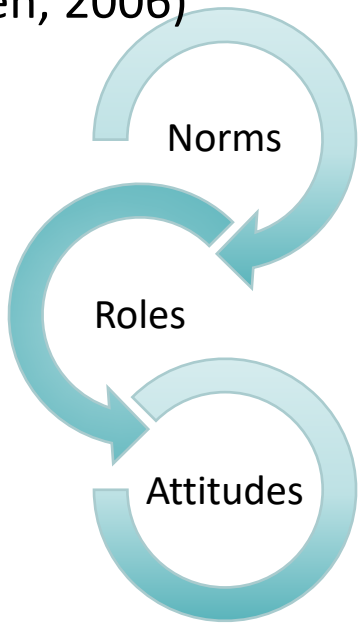
Schemas:

- Assimilation
- Accommodation

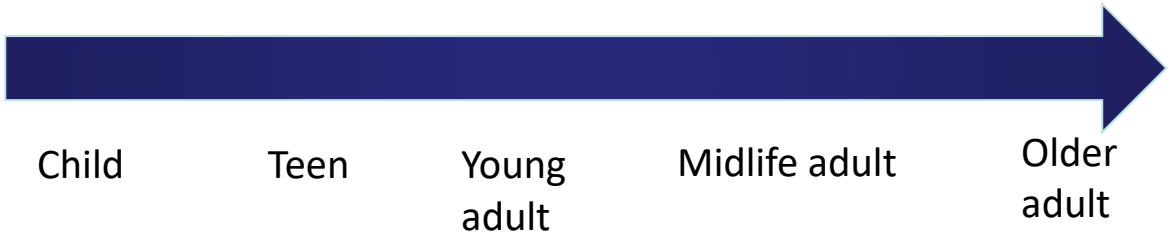


Life Course Perspective

(Settersten, 2006)

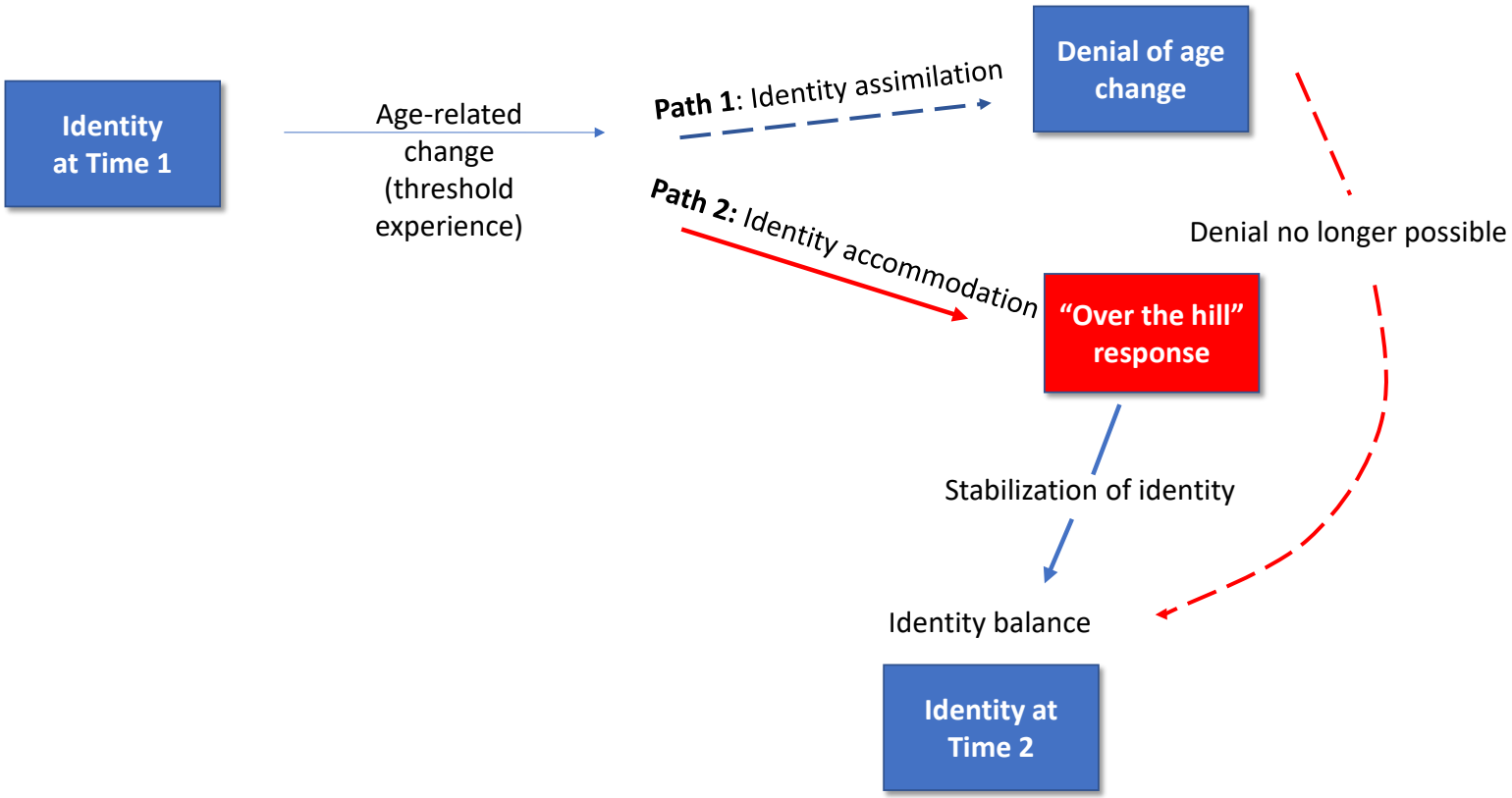


The **social clock** sets age norms and expectations



Identity Process Theory

(Whitbourne, Sneed, & Skultety, 2002)

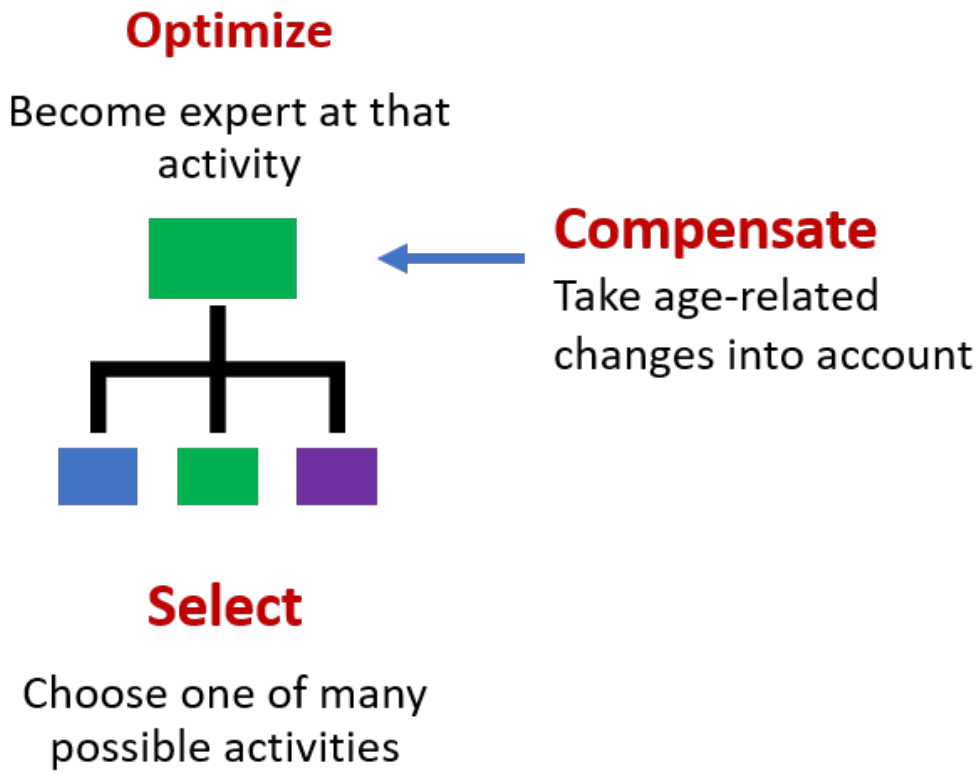


Identity Process Theory

Multiple Threshold Model (Whitbourne & Collins 1998)

- Awareness of stepwise changes
- Individual differences
- Some areas more significant than others (e.g., physical performance, appearance)

Selective Optimization with Compensation Model (SOC; Baltes & Baltes, 1990)



Examples:

Optimize
Making the best of retirement, learn painting

Compensation
Take the bus instead of drive

Selection of goals
Family activities rather than work