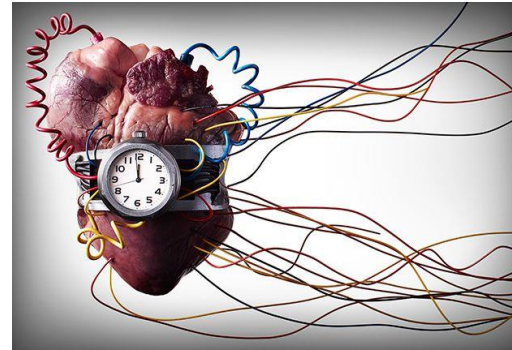


The impact of poor physical activity throughout the life cycle

Inactivity kills, and we're sitting on a ticking time bomb



There is a high cost to doing nothing



Prof Mariette Swanepoel

North West University

School of Human Movement Sciences

Biokinetics program



Session layout

1. Introduction and background information
2. Adverse effect of physical inactivity in childhood and adolescence
3. Adverse effect of physical inactivity in adulthood
4. Adverse effect of physical inactivity older adults
5. Overall Quality of Life
6. Long term Health Risks



Introduction & background information



It's important to note that the impacts of poor physical activity can be cumulative over the life cycle.



Encouraging and maintaining regular physical activity throughout life is crucial for promoting better health, preventing chronic diseases, and enhancing overall well-being.



It's never too late to start incorporating physical activity into one's daily routine, and even small changes can have significant health benefits.



*Consult with a healthcare professional before beginning a new exercise program, especially if you have existing health conditions or concerns.

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The cost of inaction on physical inactivity to public health-care systems: a population-attributable fraction analysis

Andrea Costa Santos, PhD • Juana Willumsen, PhD • Filip Meheus, PhD • Andre Ilbawi, MD • Fiona C Bull, PhD

Open Access • Published: December 05, 2022 • DOI: [https://doi.org/10.1016/S2214-109X\(22\)00464-8](https://doi.org/10.1016/S2214-109X(22)00464-8)

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PlumX Metrics

Summary

Background Physical inactivity is an important modifiable risk factor for non-communicable diseases (NCDs) and mental health conditions. We aimed to estimate the public health-care costs associated with these diseases because of physical inactivity, which will help policy makers to prioritise investment in policy actions to promote and enable more people to be more active.

Interpretation This health and economic burden of physical inactivity is avoidable. Further investments in and implementation of known and effective policy interventions will support countries to reach the Sustainable Development Goal of reduction of NCD mortality by 2030.

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PlumX Metrics

Findings 499·2 million new cases of preventable major NCDs would occur globally by 2030 if the prevalence of physical inactivity does not change, with direct health-care costs of INT\$520 billion. The global cost of inaction on physical inactivity would reach approximately \$47·6 billion per year. Although 74% of new cases of NCDs would occur in low-income and middle-countries, high-income countries would bear a larger proportion (63%) of the economic costs. The cost of treatment and management of NCDs varied—although dementia accounted for only 3% of new preventable NCDs, the disease corresponded to 22% of all costs; type 2 diabetes accounted for 2% of new preventable cases but 9% of all costs; and cancers accounted for 1% of new preventable cases but 15% of all costs.

WHO publishes global status report on physical activity 2022

17.10.2022

Regular physical activity promotes both mental and physical health in people of all ages. Yet, today, more than 80% of adolescents and 27% of adults do not meet WHO's recommended levels of physical activity. This affects not only individuals over their life course, but also places a financial burden on health services and society as a whole.

WHO's Global Action Plan on Physical Activity 2018-2030

(GAPPA) provided recommendations to help countries increase levels of physical activity within their populations, by developing and implementing dedicated comprehensive national policies to ensure safer roads for cycling and walking; accessible opportunities for active recreation where people live, work and play; and on physical activity.

Global status report on physical activity 2022

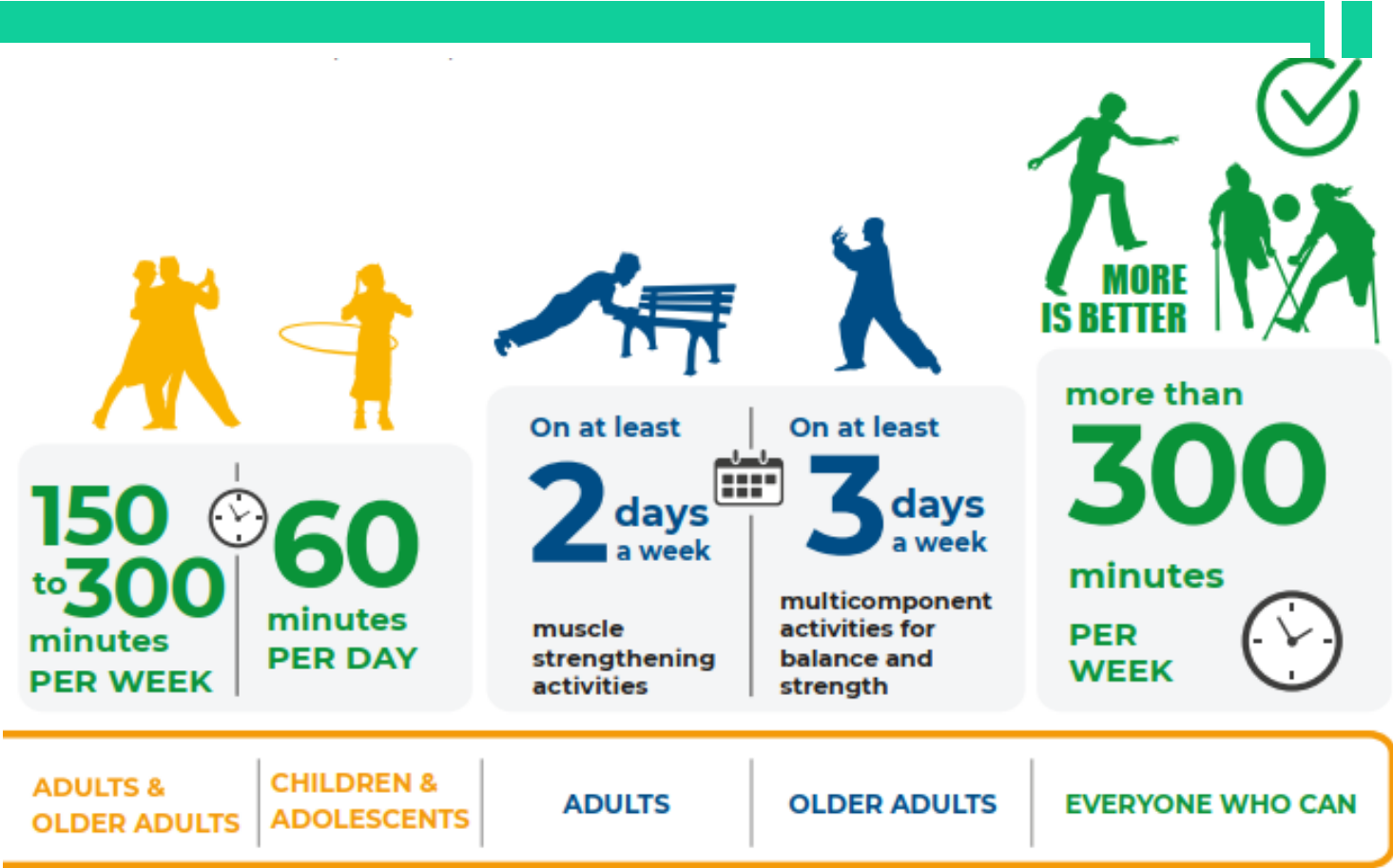


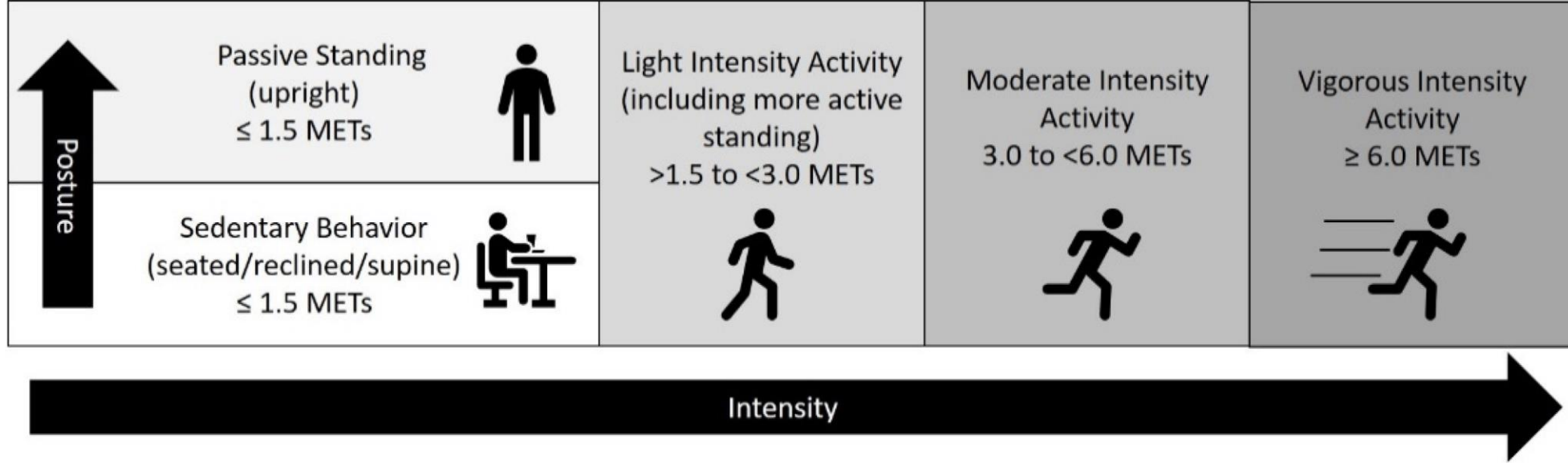
Definition of Physical Inactivity

Physical inactivity is a term used to identify people who do not get the recommended level of regular physical activity.

ADULTS: Prevalence of insufficiently physically active persons aged 18+ years (defined as less than 150 minutes of moderate-intensity activity per week, or equivalent).

CHILDREN & ADOLESCENTS: Prevalence of insufficiently physically active adolescents (defined as less than 60 minutes of moderate to vigorous intensity activity daily).



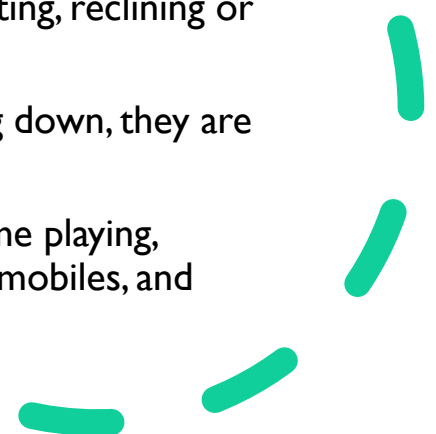



Definition of Sedentary Behaviour

Sedentary behavior is any waking behavior characterized by an energy expenditure ≤ 1.5 metabolic equivalents (METs), while in a sitting, reclining or lying posture.

In general this means that any time a person is sitting or lying down, they are engaging in sedentary behaviour.

Common sedentary behaviours include TV viewing, video game playing, computer use (collective termed “screen time”), driving automobiles, and reading.





Physical inactivity


An insufficient level of moderate-to-vigorous intensity physical activity level to meet present physical activity recommendations.¹

Sedentary behavior (SB)

Any waking behavior characterized by an energy expenditure < 1.5 METs, while in a seated, reclined, or supine posture.¹

An individual who is physically inactive is often wrongly labelled as “sedentary”.

The typical definition does not include quiet standing or standing-related behaviors with low energy expenditure, nor does it include squatting or kneeling behaviors such as those commonly seen in hunter-gatherer communities.



Physical inactivity vs Sedentary behaviour

Classification	Sedentary	Non-sedentary
NOT physically active	1. NOT reaching the PA recommendations AND sitting for long periods	2. NOT reaching the PA recommendations BUT NOT sitting for long periods
Physically active	3. Reaching the PA recommendations BUT sitting for long periods	4. Reaching the PA recommendations AND NOT sitting for long periods

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 Article
Text

 Article
info


Citation

Guidelines

World Health Organization 2020 guidelines on physical activity and sedentary behaviour

 Fiona C Bull^{1, 2},  Salih S Al-Ansari³,  Stuart Biddle⁴,  Katja Borodulin^{5, 6},   Matthew P Buman⁷,  Greet Cardon⁸,
 Catherine Carty^{9, 10},  Jean-Philippe Chaput¹¹,  Sebastien Chastin¹²,  Roger Chou¹³,  Paddy C Dempsey^{14, 15},  Loretta
 DiPietro¹⁶,  Ulf Ekelund^{17, 18},  Joseph Firth^{19, 20},  Christine M Friedenreich²¹,  Leandro Garcia²²,  Muthoni Gichu²³, 



PDF



XML

Given that the most recent global estimates show that **one in four (27.5%) adults** and **more than three-quarters (81%) of adolescents** do not meet the recommendations for aerobic exercise, as outlined in the 2010 Global Recommendations on Physical Activity for Health, there is an urgent need to increase priority and investment directed towards services to promote physical activity both within health and other key sectors.

Table 3

Summary of health outcomes (in alphabetical order) by population groups addressed in the 2020 global guidelines evidence reviews

	5–17 years PA and SB	Adults 18–64 years PA	Adults over 18 years SB	Adults over 65 years PA	Pregnancy and post partum	Chronic conditions*	Children and adults with disability*
Outcomes	Importance†						
Adiposity—weight gain, weight change, weight control, weight stability, weight status and weight maintenance	Critical	Critical	Critical	Critical	Critical		
Adverse events	Critical	Critical		Critical	Critical		
All-cause and cause-specific mortality		Critical	Critical	Critical		Critical—cancer and cancer-specific	
Bone health	Critical						
Cardiometabolic health	Critical						

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	5–17 years PA and SB	Adults 18–64 years PA	Adults over 18 years SB	Adults over 65 years PA	Pregnancy and post partum	Chronic conditions*	Children and adults with disability*
Outcomes	Importance†						
Cognitive outcomes	Critical	Critical		Critical			Critical—MS, PD, Stk, Sch, ADHD
Delivery complications					Important		
Disease progression						Critical—HT, T2D, HIV Critical—cancer recurrence	
Falls and fall-related injuries				Critical			
Fetal outcomes					Critical		
Functional ability				Critical			
Gestational diabetes mellitus					Critical		
Gestational hypertension/pre-eclampsia					Critical		

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	5–17 years PA and SB	Adults 18–64 years PA	Adults over 18 years SB	Adults over 65 years PA	Pregnancy and post partum	Chronic conditions*	Children and adults with disability*
Outcomes	Importance†						
Health-related quality of life		Important		Important		Critical—HT, T2D, HIV	Critical—MS, SCI, ID, MCD, Sch
Incidence of cancer		Critical	Critical	Critical			
Incidence of CVD		Critical	Critical	Critical			
Incidence of hypertension		Important		Important			
Incidence of type 2 diabetes		Critical	Critical	Critical			
Mental health (symptoms of anxiety and depression)	Critical	Critical		Critical	Critical		
Osteoporosis				Critical			
Physical fitness	Critical						
Physical function						Critical—HT, T2D, HIV	Critical—MS, SCI, ID, PD, Stk

Table 3

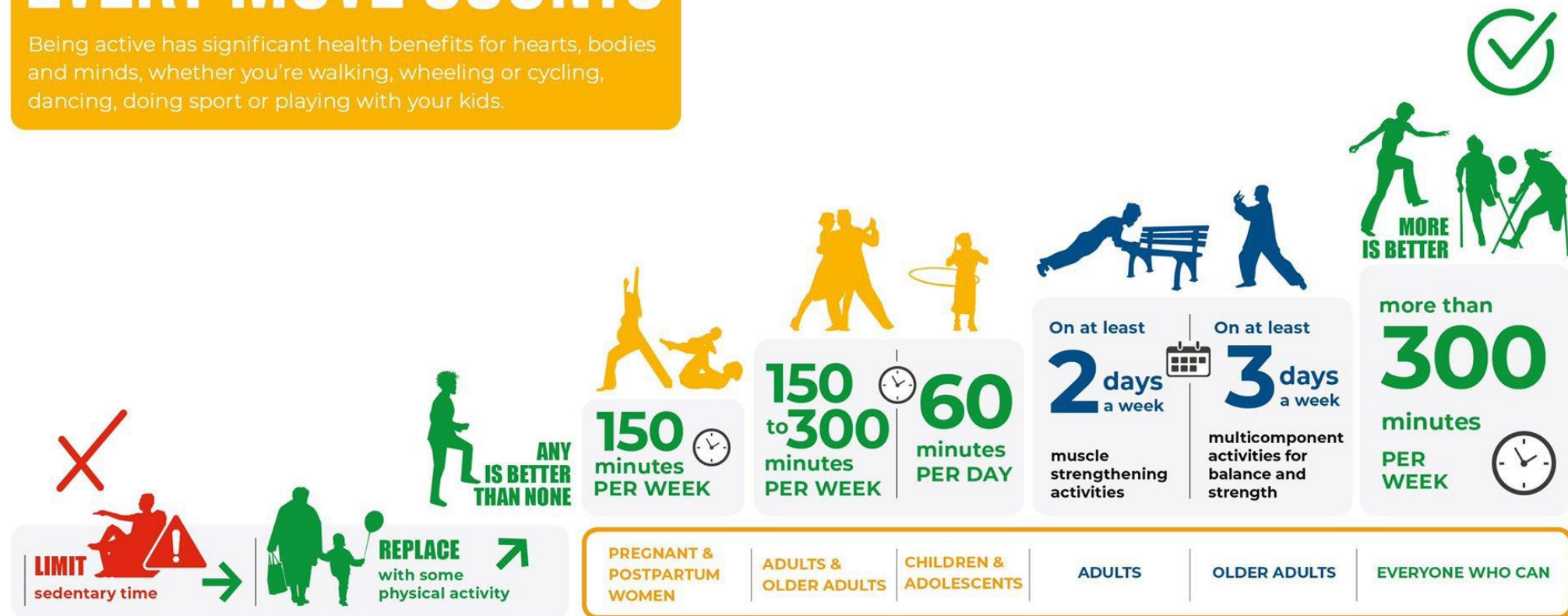
Summary of health outcomes (in alphabetical order) by population groups addressed in the 2020 global guidelines evidence reviews

	5–17 years PA and SB	Adults 18–64 years PA	Adults over 18 years SB	Adults over 65 years PA	Pregnancy and post partum	Chronic conditions*	Children and adults with disability*
Outcomes	Importance†						
Prosocial behaviour	Important						
Psychosocial outcomes	Important						
Risk of comorbid conditions	Critical—HT, T2D, HIV Critical—MS, SCI, ID						
Sleep	Important	Important	Important	Important			

- *Outcomes are for subpopulation condition as listed: HT, T2D, MS, SCI, ID, PD, Stk, Sch, ADHD, MCD.
- †Critical outcome: an outcome that is critical to decision-making. Important outcome: an outcome that is important, but not critical to decision-making.
- ADHD, attention deficit hyperactivity disorder; CVD, cardiovascular disease; HT, hypertension; ID, intellectual disability; MCD, major clinical depression; MS, muscular sclerosis; PA, physical activity; PD, Parkinson’s disease; SB, sedentary behaviour; Sch, schizophrenia; SCI, spinal cord injury; Stk, in stroke survivors; T2D, type 2 diabetes.

EVERY MOVE COUNTS

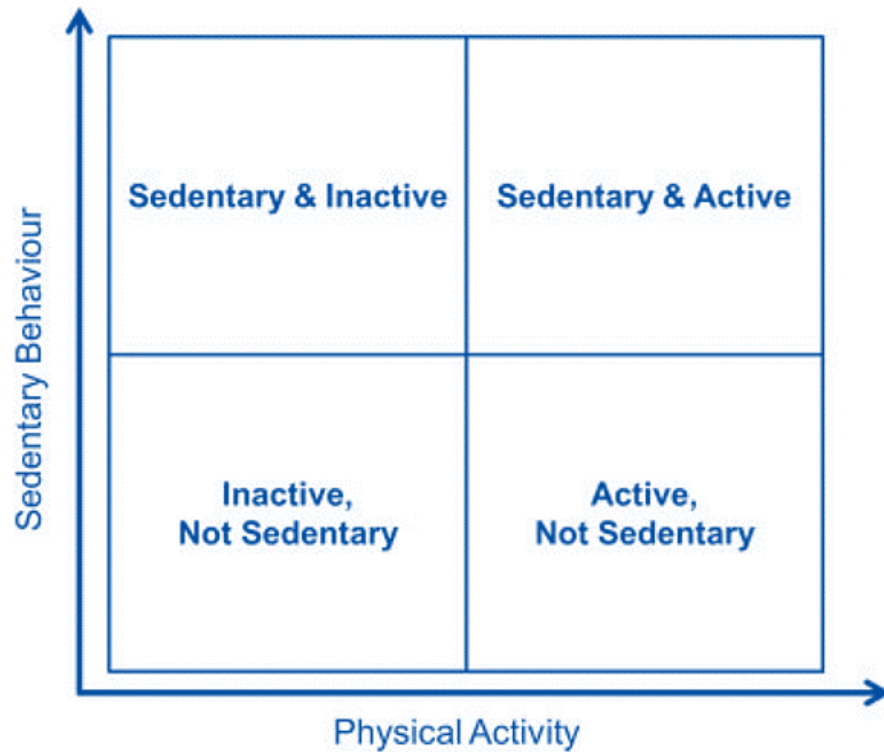
Being active has significant health benefits for hearts, bodies and minds, whether you're walking, wheeling or cycling, dancing, doing sport or playing with your kids.



WHO guidelines on physical activity and sedentary behaviour (2020).

For more information, visit: www.who.int/health-topics/physical-activity





“a person can meet the physical activity guidelines and still be considered sedentary. Sedentary behavior might produce harmful effects on health independently of physical activity level, but when both are combined, the results seem to change (combined joint association). High levels of sedentary behavior combined with low levels of physical activity increase the risk of death by 46%” (Biswas et al., 2015).

Figure 1. Sedentary behavior and physical activity as distinct constructs. Reprinted from Canadian Journal of Diabetes, 38(1), Saunders, T. J., Chaput, J. P., & Tremblay, M. S., Sedentary behavior as an emerging risk factor for cardiometabolic diseases in children and youth, 53-61, 2014, with permission from Elsevier.

Risk of death

Low	Equivalent risk to reference
Low to medium	1–15% increased risk
Medium	≥15 to <30% increased risk
Medium to high	≥30 to <45% increased risk
High	≥45% increased risk

During a usual 24-hour day, approximately how many hours do you spend sitting?



Hours of sitting per day

During a usual 24-hour day, approximately how much time (minutes) do you spend doing physical activity?



Minutes of physical activity per day

	<4	4–6	6–8	>8
>60	Low	Low	Low	Low
30–60	Low	Low–medium	Low–medium	Low–medium
5–29	Low–medium	Medium	Medium	Medium
<5	Medium	Medium–high	Medium–high	High

The SIT-ACT risk matrix.

Representation of the SIT-ACT risk matrix⁹⁵ showing the interacting influences of sedentary behavior and physical activity (physical activity includes walking and moderate–vigorous intensity activities) on all-cause mortality.

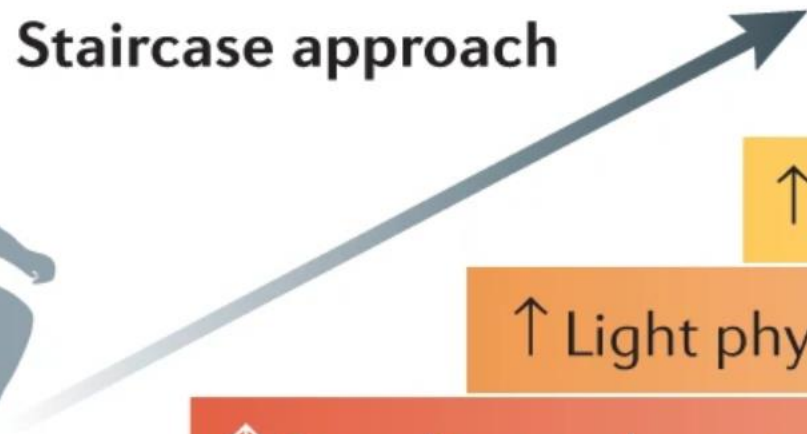
The highest risk of death is evident in individuals who sit the longest and do the least amount of physical activity.

Opportunities for risk reduction include both increases in physical activity (to >5 minutes per day), reductions in time spent sitting (to <8 hours per day) or the combination of both increases in physical activity and reductions in sitting time...

For example, transition to low–medium risk by increasing physical activity to >5 minutes per day and decreasing sitting time to <4 hours per day).



Staircase approach



↓ Sitting

↑ Standing and moving

↑ Light physical activity

↑ Moderate–vigorous physical activity

↑ Cardiorespiratory fitness

Sit less

Move more

Keep fit

ROLE OF INACTIVITY IN CHRONIC DISEASES: EVOLUTIONARY INSIGHT AND PATHOPHYSIOLOGICAL MECHANISMS

● Frank W. Booth, Christian K. Roberts, John P. Thyfault, Gregory N. Rueggsegger,
and Ryan G. Toedebusch

Department of Biomedical Sciences, University of Missouri, Columbia, Missouri; Department of Medical Pharmacology and Physiology, University of Missouri, Columbia, Missouri; Department of Nutrition and Exercise Physiology, University of Missouri, Columbia, Missouri; Dalton Cardiovascular Research Center, University of Missouri, Columbia, Missouri; Geriatrics, Research, Education and Clinical Center (GRECC), VA Greater Los Angeles Healthcare System, Los Angeles, California; Department of Molecular and Integrative Physiology, University of Kansas Medical Center, Kansas City, Kansas; and Cardiovascular Division, Department of Medicine, University of Missouri, Columbia, Missouri

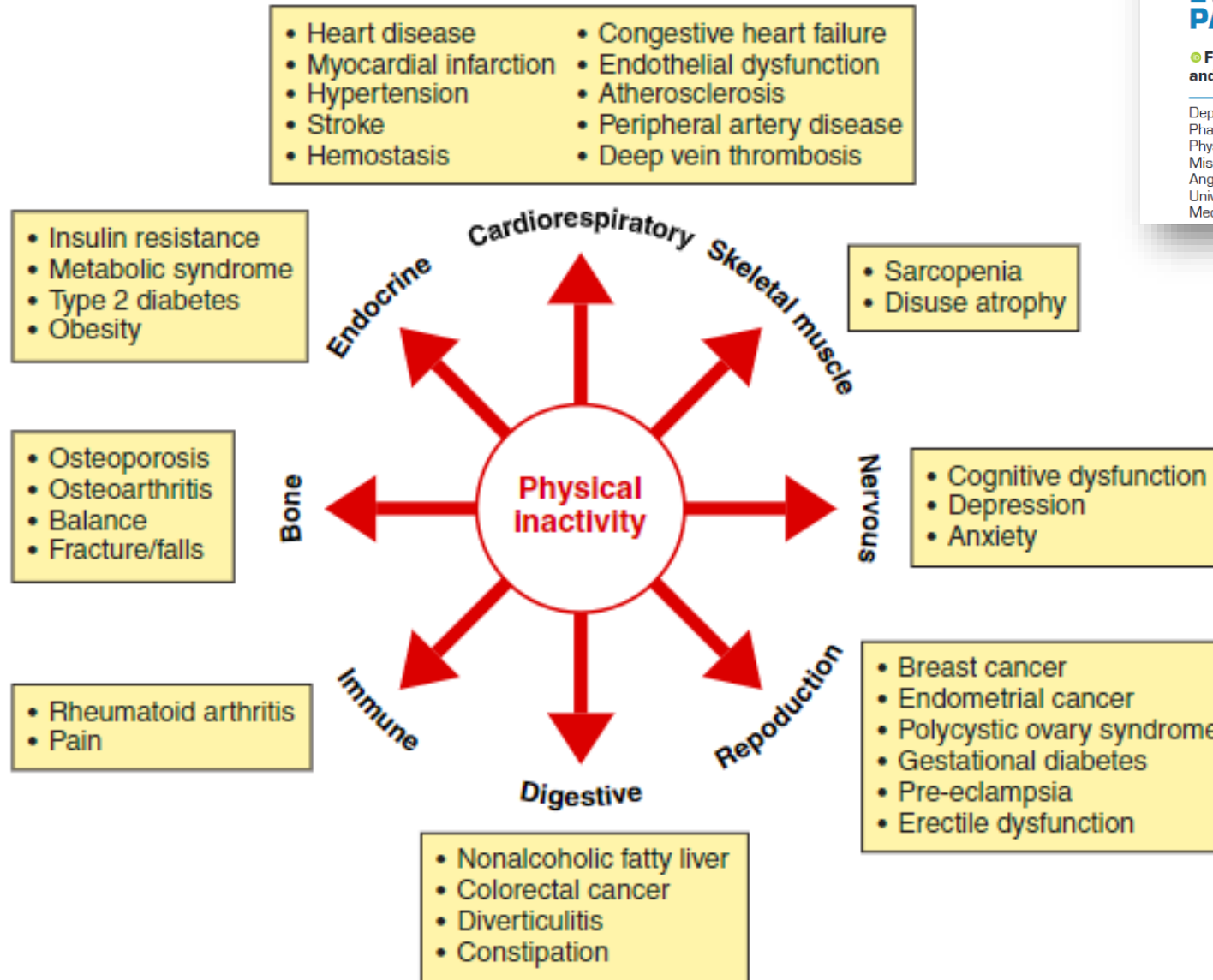
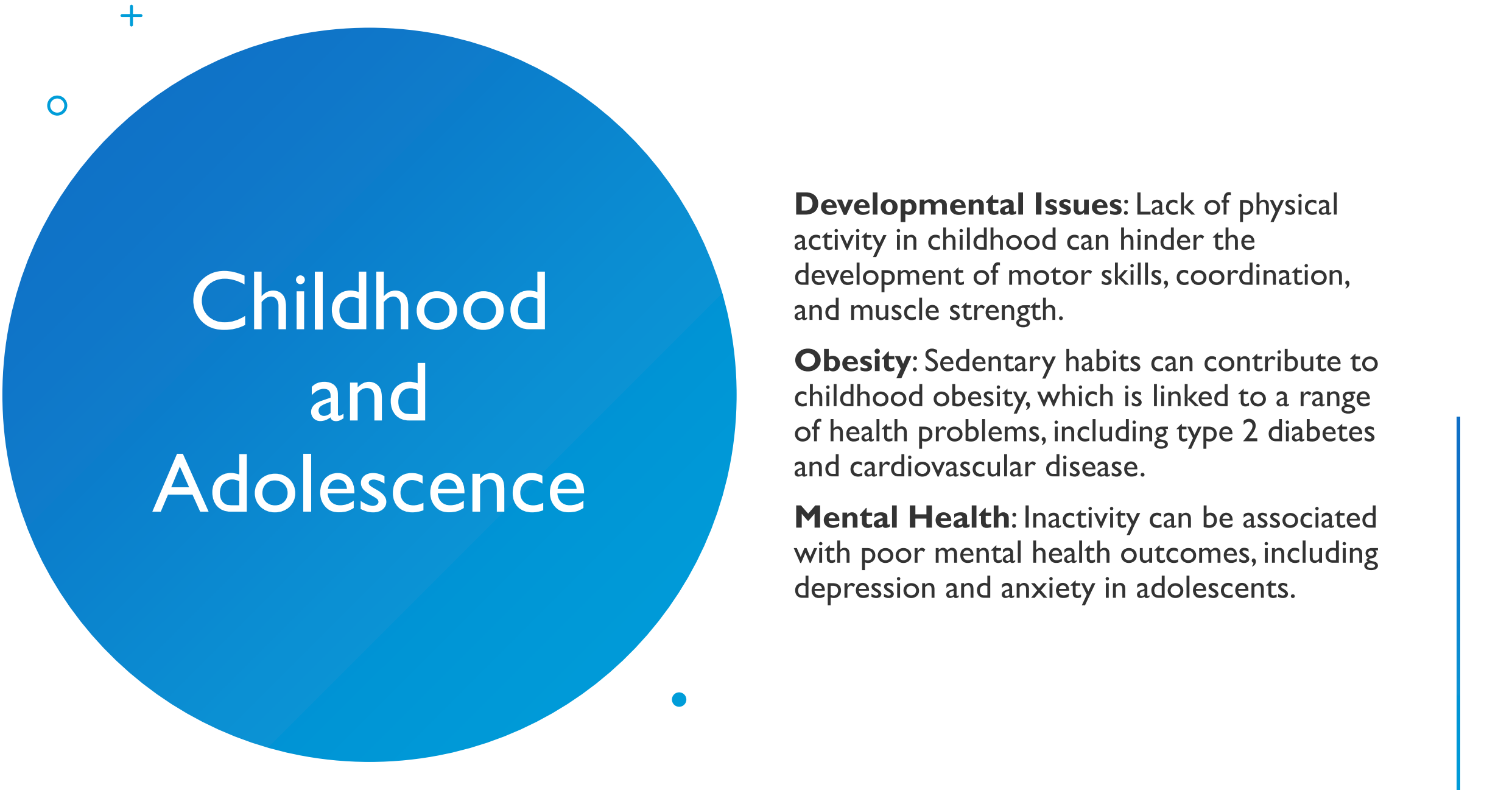


FIGURE 3. Physical inactivity increases 35 chronic diseases. See Booth et al. (55) for more details on how physical inactivity is a major cause of chronic diseases.



Childhood and Adolescence

Developmental Issues: Lack of physical activity in childhood can hinder the development of motor skills, coordination, and muscle strength.

Obesity: Sedentary habits can contribute to childhood obesity, which is linked to a range of health problems, including type 2 diabetes and cardiovascular disease.

Mental Health: Inactivity can be associated with poor mental health outcomes, including depression and anxiety in adolescents.

Adulthood



- **Weight Gain:** Insufficient physical activity in adulthood can lead to weight gain and an increased risk of obesity.
- **Cardiovascular Health:** A sedentary lifestyle is a major risk factor for heart disease, high blood pressure, and other cardiovascular conditions.
- **Type 2 Diabetes:** Lack of activity is associated with an increased risk of developing type 2 diabetes.
- **Muscle and Bone Health:** Reduced physical activity can lead to muscle weakness and decreased bone density, increasing the risk of fractures and osteoporosis.
- **Mental Health:** Physical inactivity is linked to higher rates of depression and stress in adults.

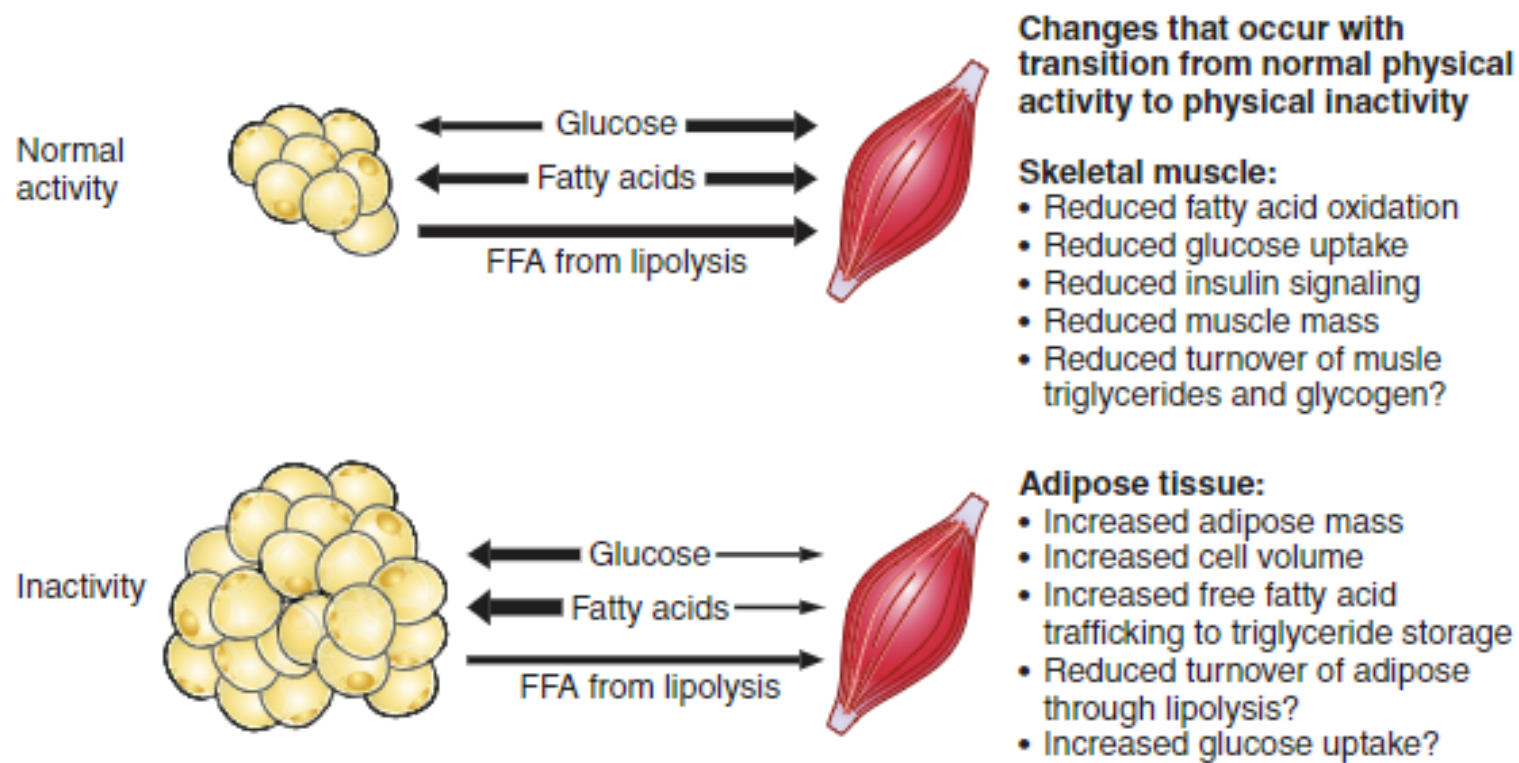


FIGURE 10. Schematic of metabolic dysfunctions produced by physical inactivity in white adipose tissue and skeletal muscle.



Older Adults

Functional Decline: Lack of physical activity in older adults can lead to a decline in functional abilities, making daily tasks more challenging.

Falls and Fractures: Weak muscles and poor balance due to inactivity can increase the risk of falls and fractures.

Chronic Conditions: Physical inactivity can exacerbate chronic conditions common in older age, such as arthritis and osteoarthritis.

Cognitive Decline: Some research suggests that physical activity may have a protective effect against cognitive decline and dementia in older adults.

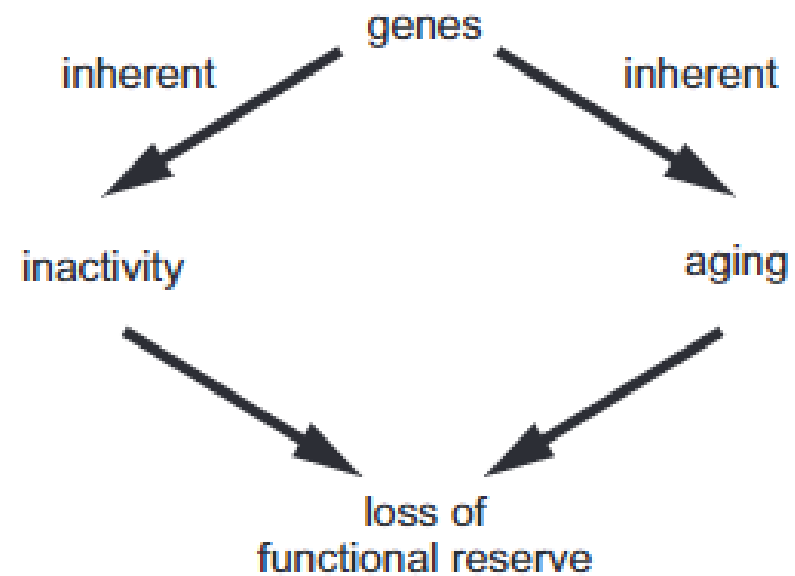



FIGURE 11. Schematic of two factors, physical inactivity and aging, that produce sarcopenia and its associated eventual loss of an important functional reserve.

Session layout


1. Introduction and background information
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6. Long term Health Risks





Overall Quality of Life

Reduced Quality of Life:
Poor physical activity levels
can lead to a decreased
overall quality of life,
affecting physical, mental,
and emotional well-being.



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Long term Health Risks

Cancer: A sedentary lifestyle is associated with an increased risk of certain types of cancer, including colon and breast cancer.

Premature Mortality: Insufficient physical activity is a known risk factor for premature mortality, meaning a shorter lifespan.



Where to
intervene?

Schools

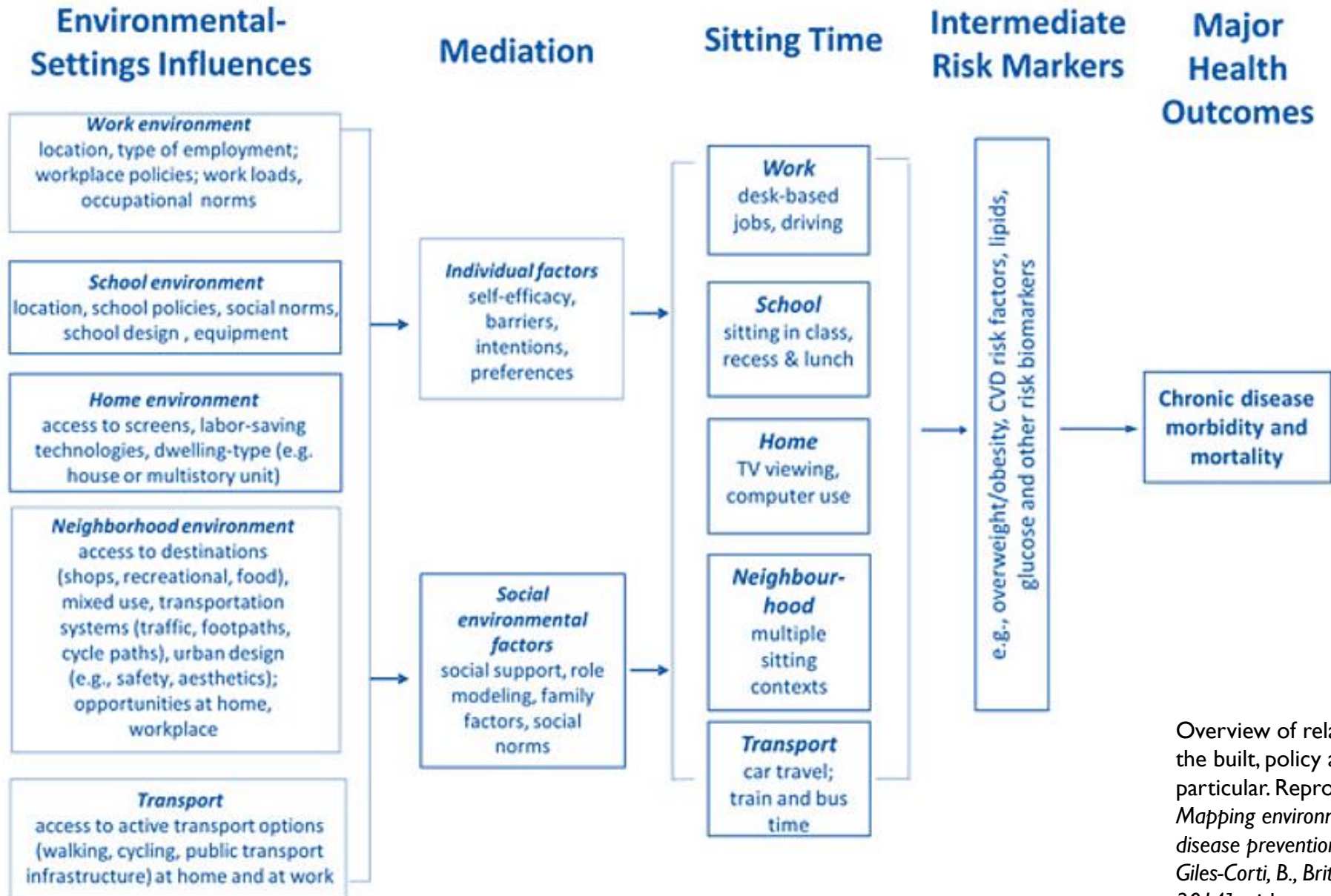
The Workplace

Provincial clinics

Community centres

Homes

Care centres



Overview of relationships that need to be identified-between the built, policy and social environments, prolonged sitting in particular. Reproduced from [Sedentary behavior and health: Mapping environmental and social contexts to underpin chronic disease prevention, Owen, N., Salmon, J., Koohsari, M. J., Turrell, G., & Giles-Corti, B., *British Journal of Sports Medicine*, 48(3), 174-177, 2014] with permission from BMJ Publishing Group Ltd.

Perspective

A Pandemic We Continue to Ignore: South Africa's Disease Burden of Physical Inactivity

Jon Patricios^{1,*} , Robin Saggars^{1,2}  and Georgia Torres³ 

¹Wits Sport and Health (WiSH), School of Clinical Medicine, Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, South Africa

²Department of Paediatrics and Child Health, School of Clinical Medicine, Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, South Africa

³Centre for Exercise Science and Sports Medicine, Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, South Africa

*Correspondence to: jonathan.patricios@wits.ac.za



Guidelines



World Health Organization 2020 guidelines on physical activity and sedentary behaviour

Fiona C Bull ^{1,2}, Salih S Al-Ansari,³ Stuart Biddle,⁴ Katja Borodulin,^{5,6} Matthew P Buman ⁷, Greet Cardon,⁸ Catherine Carty,^{9,10} Jean-Philippe Chaput ¹¹, Sebastien Chastin ¹², Roger Chou,¹³ Paddy C Dempsey,^{14,15} Loretta DiPietro,¹⁶ Ulf Ekelund ^{17,18}, Joseph Firth,^{19,20} Christine M Friedenreich,²¹ Leandro Garcia,²² Muthoni Gichu,²³ Russell Jago ²⁴, Peter T Katzmarzyk,²⁵ Estelle Lambert ²⁶, Michael Leitzmann,²⁷ Karen Milton ²⁸, Francisco B Ortega,²⁹ Chathuranga Ranasinghe,³⁰ Emmanuel Stamatakis ³¹, Anne Tiedemann,³² Richard P Troiano ³³, Hidde P van der Ploeg,^{34,35} Vicky Wari,³⁶ Juana F Willumsen¹

Links to the electronic resources used for this presentation

<https://www.cdc.gov/chronicdisease/resources/publications/factsheets/physical-activity.htm>

<https://journals.physiology.org/doi/epdf/10.1152/physrev.00019.2016>

file:///C:/Users/12262404/Downloads/How_to_Reduce_Sedentary_Behavior_at_All_Life_Domai.pdf

<https://www.nature.com/articles/s41569-021-00547-y>

<https://www.who.int/data/gho/indicator-metadata-registry/imr-details/3416>

<https://www.sedentarybehaviour.org/what-is-sedentary-behaviour/>

<https://www.semanticscholar.org/paper/Sedentary-behavior-and-cardiovascular-disease-risk%3A-Higgins-Pomeroy/e8ab177b724b00d9fbd9fe15e1677f028063e214>

<https://www.semanticscholar.org/paper/Sedentary-behavior-and-cardiovascular-disease-risk%3A-Higgins-Pomeroy/e8ab177b724b00d9fbd9fe15e1677f028063e214>

<https://www.unicef.org/southafrica/media/6126/file/ZAF-baseline-report-diet-physical-activity-South%20Africa-2022.pdf>

<https://bjsm.bmj.com/content/bjsports/54/24/1451.full.pdf>

<https://www.thelancet.com/journals/langlo/article/PIIS2214-109X%2822%2900464-8/fulltext>

<https://iris.who.int/bitstream/handle/10665/363607/9789240059153-eng.pdf?sequence=1>

Other resources used.

- Biswas A, Oh PI, Faulkner GE, Bajaj RR, Silver MA, Mitchell MS, et al. Sedentary time and its association with risk for disease incidence, mortality, and hospitalization in adults a systematic review and meta-analysis. *Ann Intern Med.* 2015;162(2):123-32.
- Tremblay MS, Aubert S, Barnes JD, Saunders TJ, Carson V, Latimer-Cheung AE, Chastin SFM, Altenburg TM, Chinapaw MJM, SBRN Terminology Consensus Project Participants. Sedentary Behavior Research Network (SBRN) – Terminology Consensus Project process and outcome. *Int J Behav Nutr Phys Act.* 2017 June 10;14(1):75.