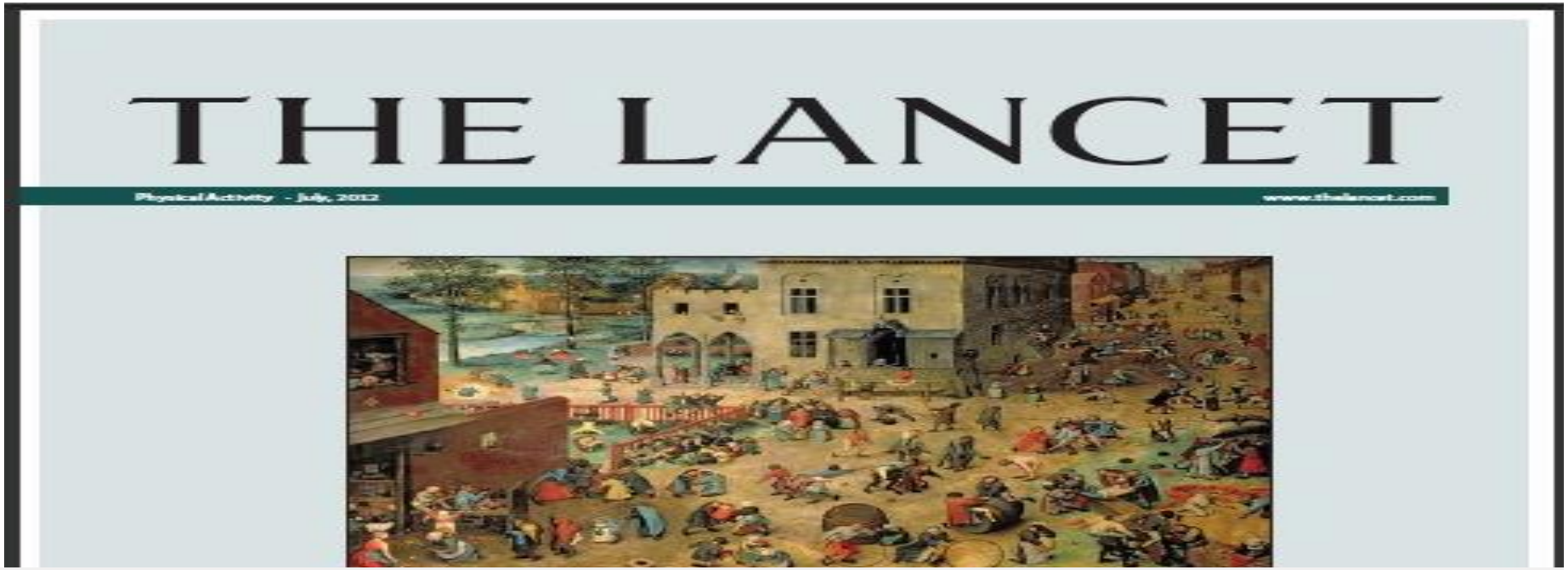
The Role of Sport and Exercise on Health

Co-funded by the European Union

Agenda

- **Facts on Physical Inactivity**
- **Consequences of Physical Inactivity to Health**
- **Types of Physical Activity (PA)/Exercise**
- **Benefits of PA/Exercise on Health**
- **PA/Exercise and Mental Health**
- **Physical PA/Exercise, Medication or Combination?**
- **How Much PA/Exercise is Best for Mental Health?**
- **PA/Exercise Recommendations for Mental Health**

Pandemic of Physical Inactivity



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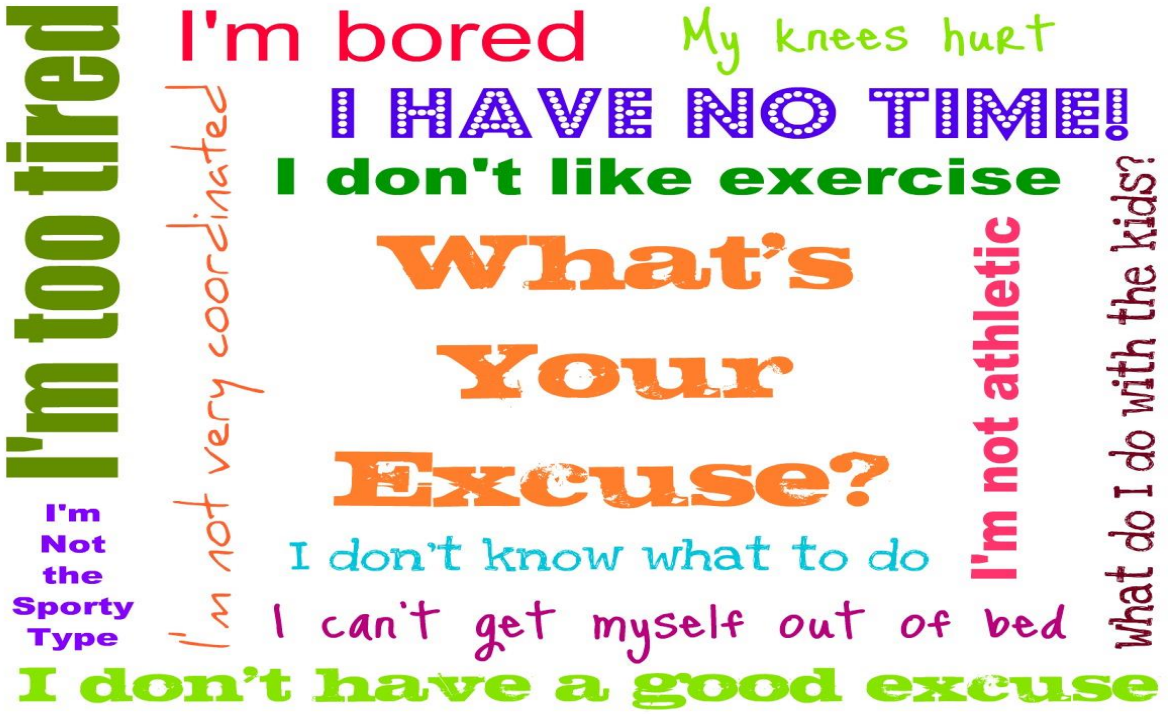
"Ineffect of physical inactivity, the issue should be appropriately described as **pandemic**, with far-reaching health, economic, environmental and social consequences."
view of the prevalence, global reach and health

Common Reasons for not Exercising

- I don’t have the time
- I don’t like to sweat
- I’ll look silly
- It hurts
- I don’t know what to do
- It’s not important



Pandemic of Physical Inactivity

40 – 60 % of the EU adult population follows a sedentary lifestyle

Approximately 25 % of the population is completely sedentary

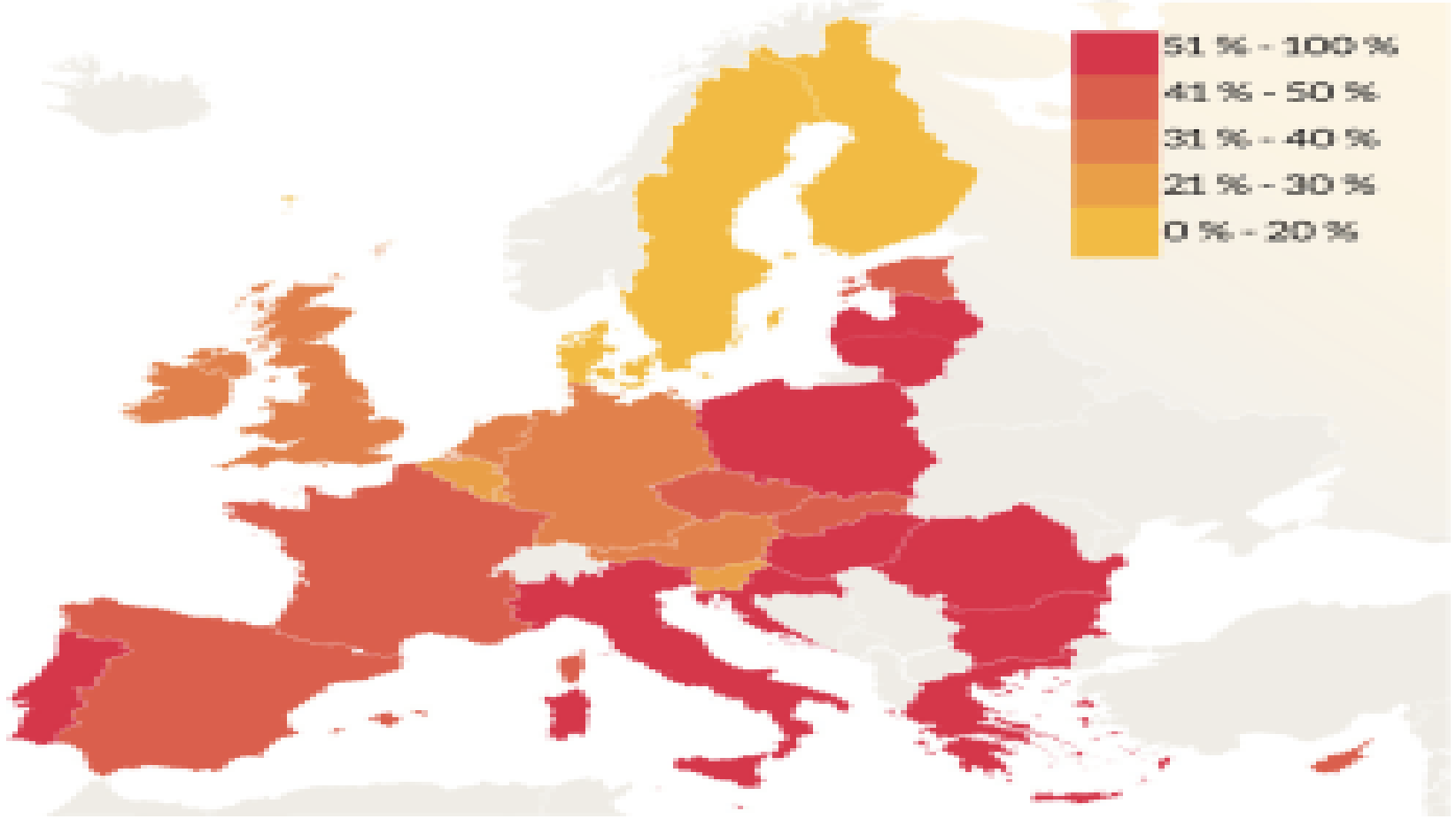
Table 13. Time spend walking on a usual day by age

	15-25 years %	26-44 years %	45-64 years %	65 + years%
No walking for at least 10 minutes	16.7	21.4	21.6	23.5
30 minutes or less	42.1	38.1	34.6	36.5
31 to 60 minutes	21.2	20.7	22.7	22.9
61 to 90 minutes	4.6	5.3	6.9	6.1
91 to 120 minutes	7.0	6.2	6.4	5.0
More than 120 minutes	1.4	1.7	1.7	1.6
DK	7.1	6.5	6.1	4.4

https://ec.europa.eu/commfrontoffice/publicopinion/archives/ebs/ebs_183_6_en.pdf

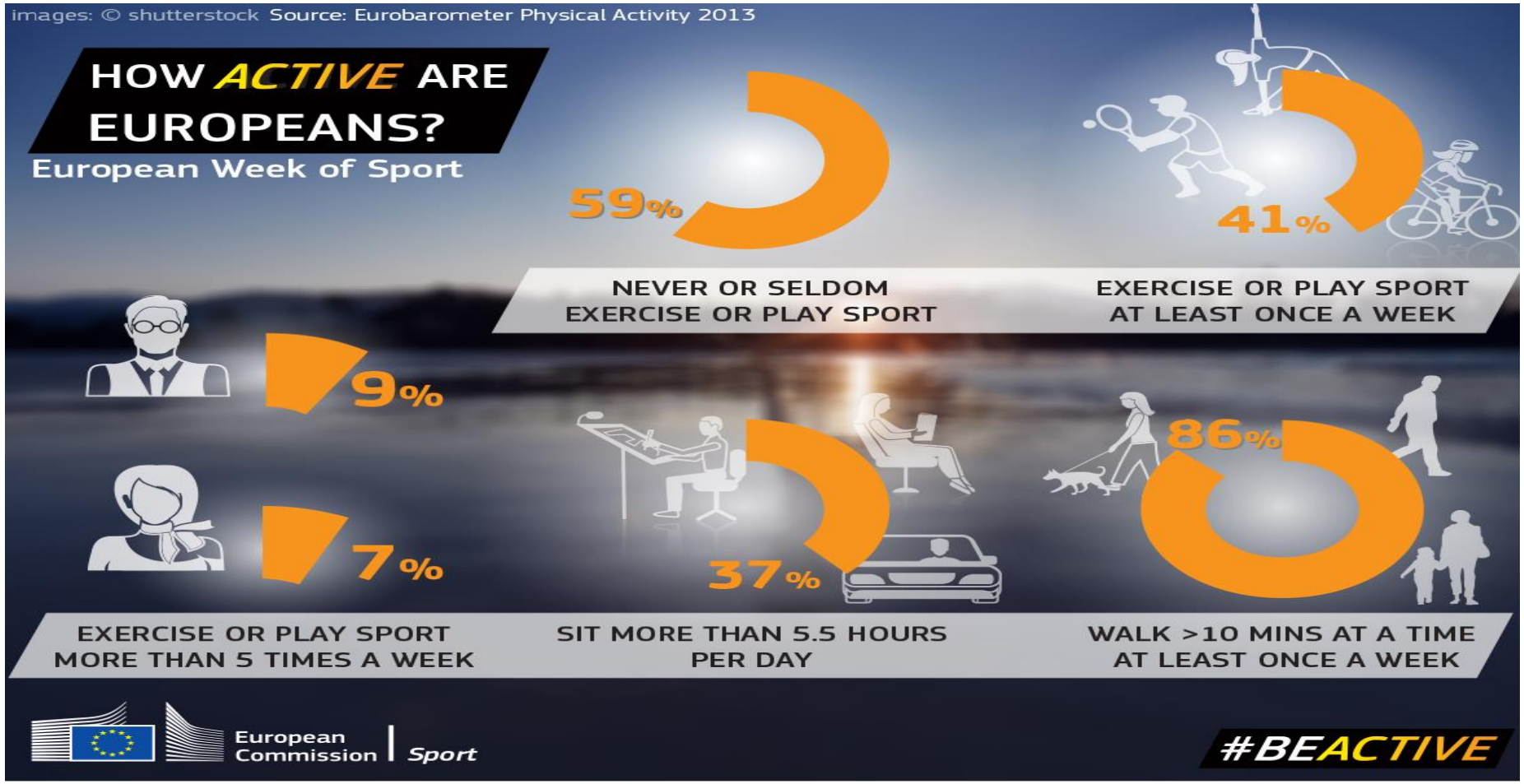
Pandemic of Physical Inactivity

Figure 1 – Map of physical inactivity in the EU



Data source: Sport and physical activity, Special Eurobarometer 472, TNS opinion & social, 2018.

Pandemic of Physical Inactivity



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MORE PEOPLE | MORE ACTIVE | MORE OFTEN

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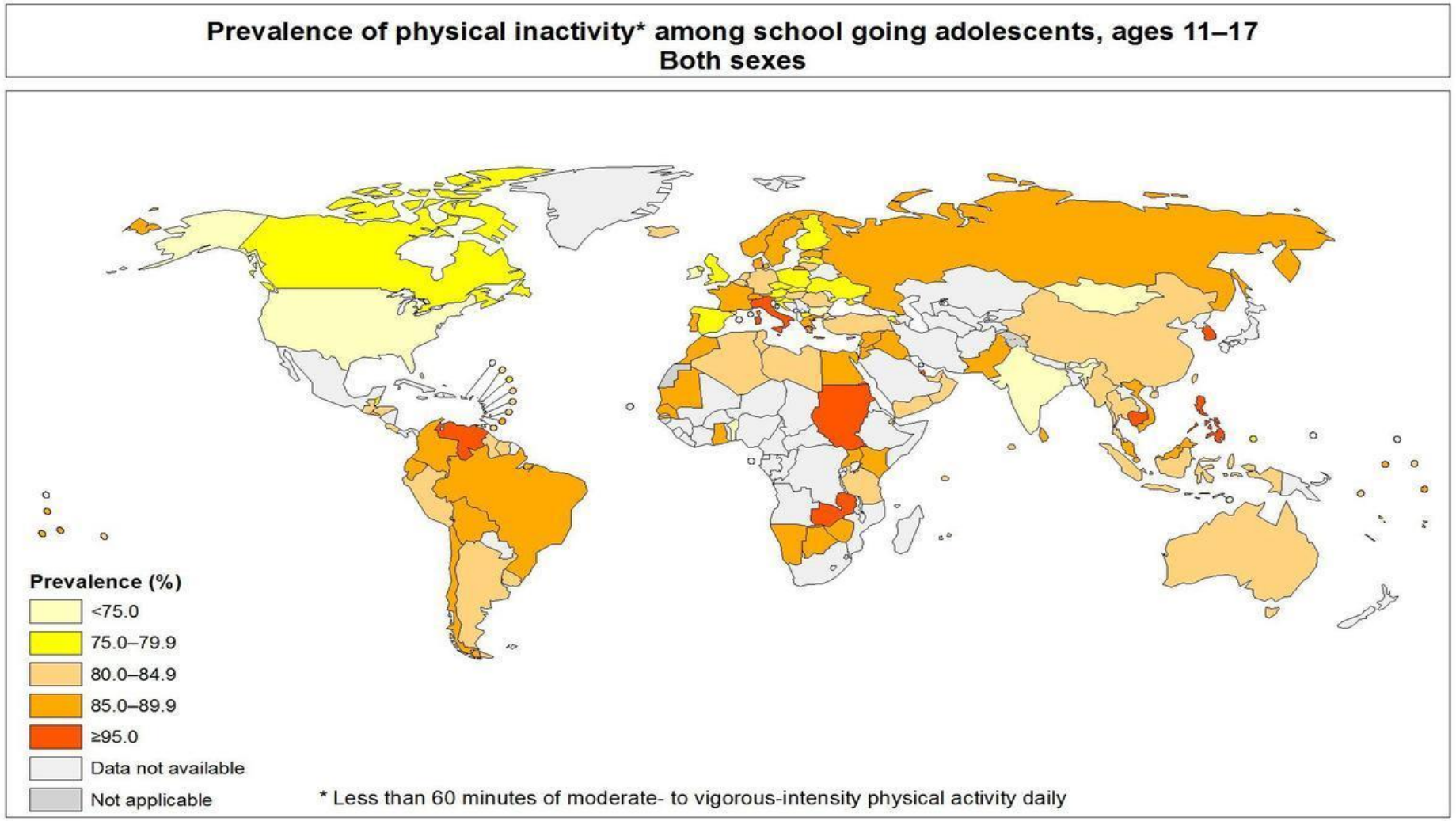
Pandemic of Physical Inactivity



The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted and dashed lines on maps represent approximate border lines for which there may not yet be full agreement.

Data Source: World Health Organization
Map Production: Health Statistics and Information Systems (HSI)
World Health Organization

World Health Organization

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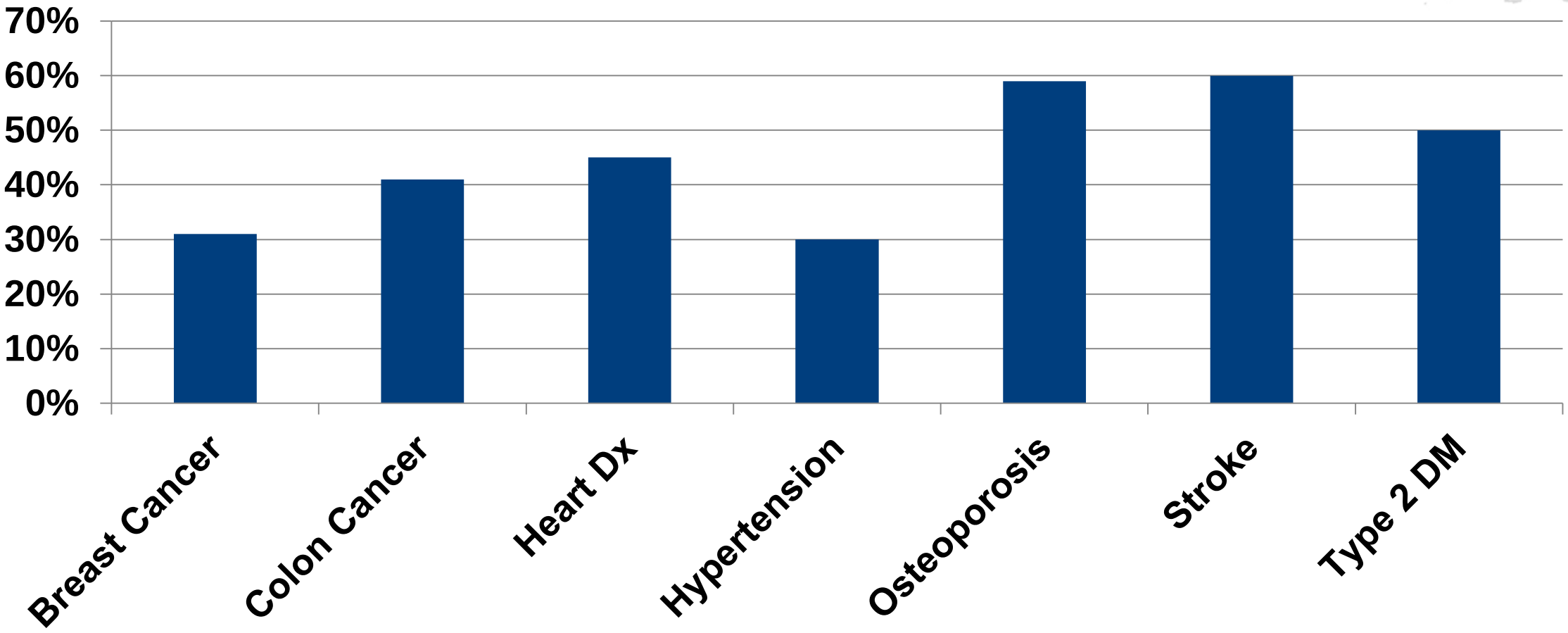
Physical Inactivity-Risky Business



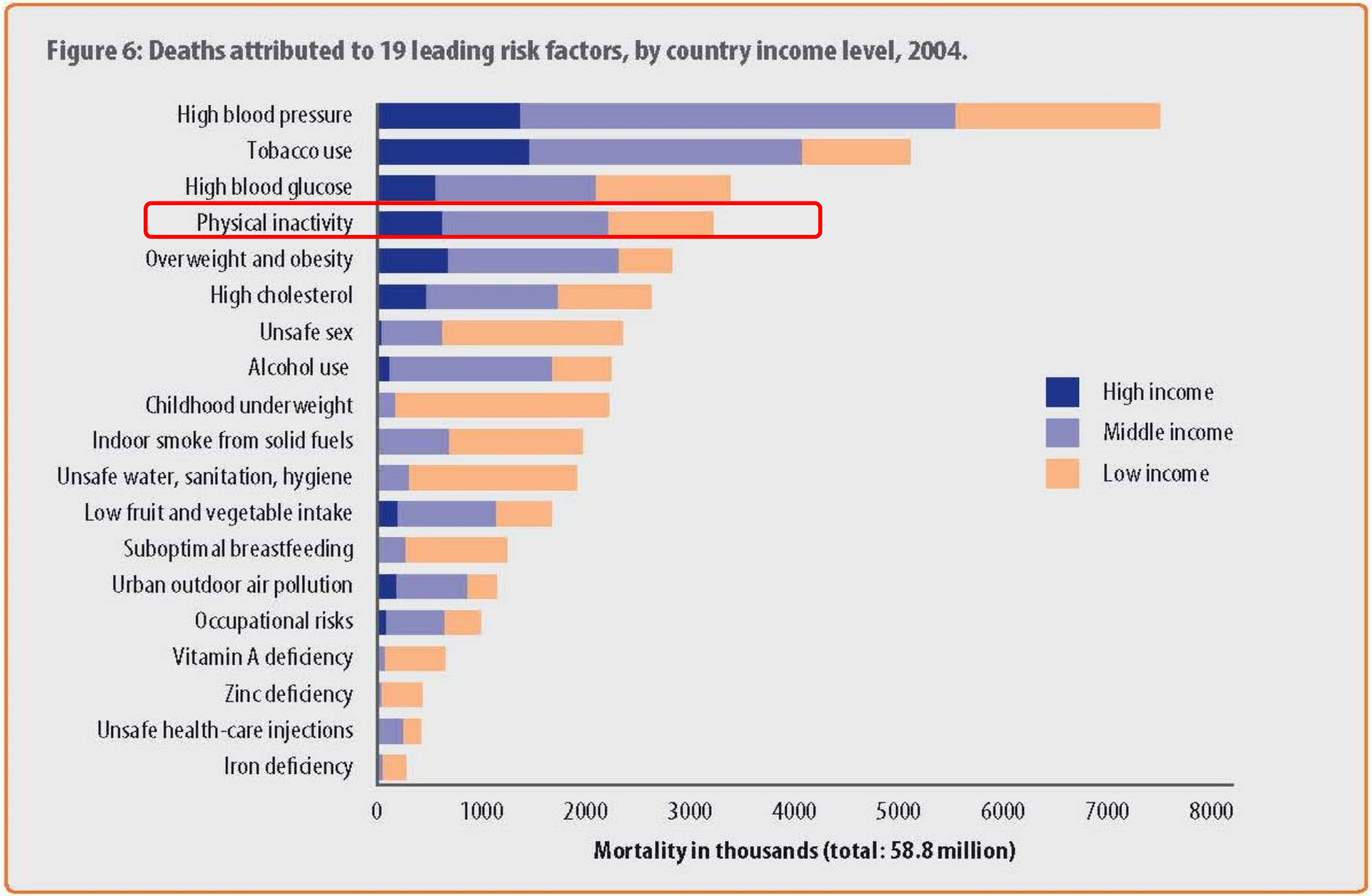
Katzmarzyk & Janssen. Can J Appl Physiol 2004; 29, 90-115

Pandemic of Physical Inactivity

Rank	Cause of Death	Percent of Deaths
1	High Blood Pressure	12.8%
2	Tobacco Use	8.7%
3	High Blood Glucose	5.8%
4	**Physical Inactivity**	**5.5%**
5	Overweight & Obesity	4.8%
6	High Cholesterol	4.5%
7	Unsafe Sex	4.0%
8	Alcohol Use	3.8%
9	Childhood Underweight	3.8%
10	Indoor Smoke Solid Fuels	3.3%

Source: WHO World Health Organization

Pandemic of Physical Inactivity



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Lack of Physical Activity/Exercise

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Physical Inactivity

Physical inactivity accounts for
3.2 – 5 million
deaths per year

By reducing physical inactivity 10-25%
0.5 – 1.3 million
premature deaths could be averted

Lim et al. Lancet 2012; 380: 2224–60
Lee et al. Lancet 2012; 380: 219–29

Physical Activity, Exercise, Physical Fitness

Physical activity (PA)

Bodily movement produced by skeletal muscles that results in an expenditure of energy.

Exercise

A subcategory of PA that is planned, structured, repetitive, and purposeful in the sense that the improvement or maintenance of one or more components of physical fitness is the objective.

Physical fitness

A measure of a person's ability to perform physical activities that require endurance, strength, or flexibility.

Type of Physical Activity (PA)

Moderate-intensity Physical Activity (Approximately 3-6 METs) Requires a moderate amount of effort and noticeably accelerates the heart rate.	Vigorous-intensity Physical Activity (Approximately >6 METs) Requires a large amount of effort and causes rapid breathing and a substantial increase in heart rate.
Examples of moderate-intensity exercise include:	Examples of vigorous-intensity exercise include:
• Brisk walking	• Running
• Dancing	• Walking / climbing briskly up a hill
• Gardening	• Fast cycling
• Housework and domestic chores	• Aerobics
• Traditional hunting and gathering	• Fast swimming
• Active involvement in games and sports with children / walking domestic animals	• Competitive sports and games (e.g. Traditional Games, Football, Volleyball, Hockey, Basketball)
• General building tasks (e.g. roofing, thatching, painting)	• Heavy shovelling or digging ditches
• Carrying / moving moderate loads (<20kg)	• Carrying / moving heavy loads (>20kg)

Prescribing Exercise: The FITT Principle

5 components:

Frequency – # of times per week
Intensity – how challenging
Time – how long
Type– modes of exercises
Progression – change over time

"A program of regular exercise for most adults should include a variety of exercise beyond activities performed as a part of daily living. An exercise prescription should include a plan to decrease periods of physical inactivity as well as increasing physical activity."

(ACSM Guidelines for Exercise Testing and Prescription 9th ed)

Prescribing Exercise: The FITT Principle

Frequency: 5 days

Intensity: Moderate intensity

Time: 30 minutes

Type: Aerobic activity (i.e. brisk walking)

AND

Muscle strengthening activities on 2 or more days a week that work all major muscle groups.

OR

- Frequency: 3 days
- Intensity: Vigorous intensity
- Time: 20-25 minutes
- Type: Aerobic activity (i.e. jogging or running)

AND

- Muscle strengthening activities on 2 or more days a week that work all major muscle groups.

Example 1: Moderate Intensity Activity and Muscle Strengthening Activity						
Sunday	**Monday**	**Tuesday**	**Wednesday**	**Thursday**	**Friday**	**Saturday**
30 minute brisk walk 	30 minute brisk walk 	30 minute brisk walk 	Weight training 	30 minute brisk walk 	30 minute brisk walk 	Weight training 
Total: 150 minutes moderate-intensity aerobic activity + 2 days muscle-strengthening activity						

Example 2: Vigorous Intensity Activity and Muscle Strengthening Activity						
Sunday	**Monday**	**Tuesday**	**Wednesday**	**Thursday**	**Friday**	**Saturday**
	25 minute jog 		25 minute jog and weight training 		Weight training 	25 minute jog 
Total: 75 minutes vigorous-intensity aerobic activity + 2 days muscle-strengthening activity						

Example 3: Mix of Moderate & Vigorous Intensity Activity and Muscle Strengthening Activity						
Sunday	**Monday**	**Tuesday**	**Wednesday**	**Thursday**	**Friday**	**Saturday**
30 minute brisk walk 	15 minute jog 	Weight training 	30 minute brisk walk 	Weight training 	15 minute jog 	30 minute brisk walk 
Total: The equivalent of 150 minutes of moderate-intensity aerobic activity + 2 days muscle-strengthening activity						

What is Physical Fitness

- **Physical fitness is a blend of a number of different physical qualities.**
- **Physical fitness is only one area of TOTAL fitness.**
- **Fitness is constantly changing and is influenced by many factors.**
- **Weakness in one fitness area may keep you from improving in other areas.**
- **Physical fitness is made up of 11 different parts or components:**

5 are Health-related and 6 are Skill-related.

Components of Physical Fitness

Health-Related Fitness	Skill-Related Fitness
Cardiovascular /Aerobic Fitness	Agility
Strength	Balance
Muscular endurance	Power
Flexibility	Speed
Body composition	Reaction
	Co-ordination

Cardiovascular Endurance /Aerobic Fitness

- **Cardiovascular endurance refers to the ability of your heart and lungs to work together to fuel your body with oxygen.**
- **The Cooper Run is most often used to test cardiovascular endurance.**
- **Aerobic conditioning, like jogging, swimming and cycling, can help improve cardiovascular endurance.**

Strength

THE ABILITY OF A MUSCLE OR MUSCLE GROUP TO APPLY FORCE AND OVERCOME RESISTANCE

- **Static or Isometric: When FORCE is applied to a NON-MOVING OBJECT.**
- **Dynamic or Isotonic: Which involves the MOVEMENT of the muscles / joints etc. against a MOVING object.**
- **Explosive: Which involves all the athlete's strength going into a QUICK MOVEMENT.**

Muscular endurance

Muscular endurance refers to the ability of a muscle to perform a continuous effort without fatiguing. Cycling, step machines and sit up tests are often used to measure muscular endurance.

Flexibility

REFERS TO THE RANGE OF MOVEMENT AT THE JOINT.

Can be improved by STRETCHING the muscles and tendons and by extending the ligaments and supporting tissues BEYOND THEIR NORMAL RANGE OF MOVEMENT.

There are 3 different types of stretching:

- **Static Stretching: EXTENDING a limb beyond its normal range. The position is held for at least 10 seconds.**
- **Active/Dynamic Stretching: Extending a joint beyond its normal limit, and repeats this RHYTHMICALLY over a period of 20 seconds.**
- **Passive Stretching: Joint flexibility is improved by EXTERNAL FORCE caused by partners or coaches who move the limb to its end position and keep it there for a few seconds.**

Flexibility

“REFERS TO THE PROPORTIONS OF LEAN BODY MASS AND BODY FAT”

Skill-Related Components of Fitness

Speed

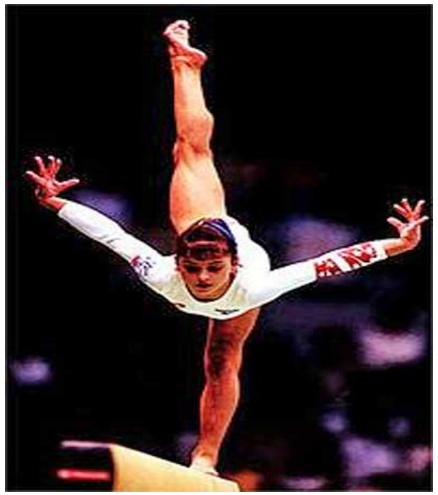
Power

Agility

Balance

Coordination

Reaction time



WHO: Guidelines

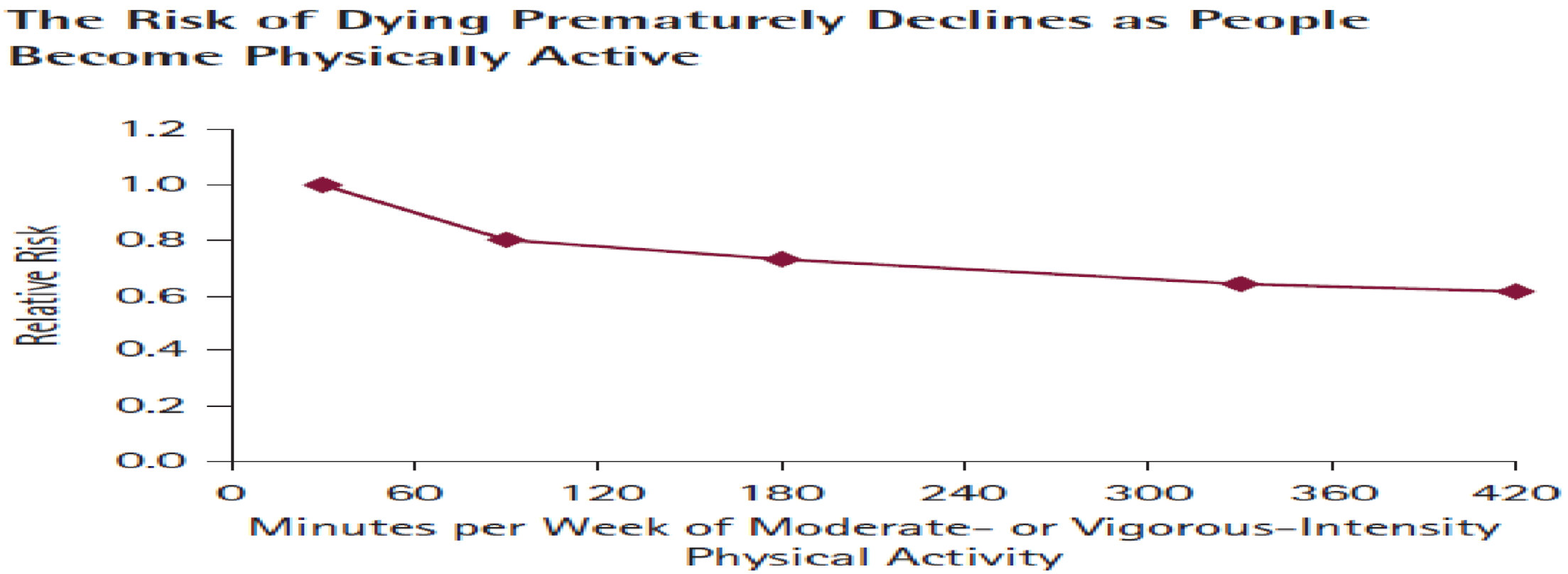
Objectives:

- To achieve a minimum of 30 min. of Moderate-Intensity PA 5 days per week OR at least 20 min. of Vigorous-Intensity PA 3 days per week.
- 30 min. a day → prevention of chronic diseases
- 60 min. a day → weight management

Benefits of PA/Exercise

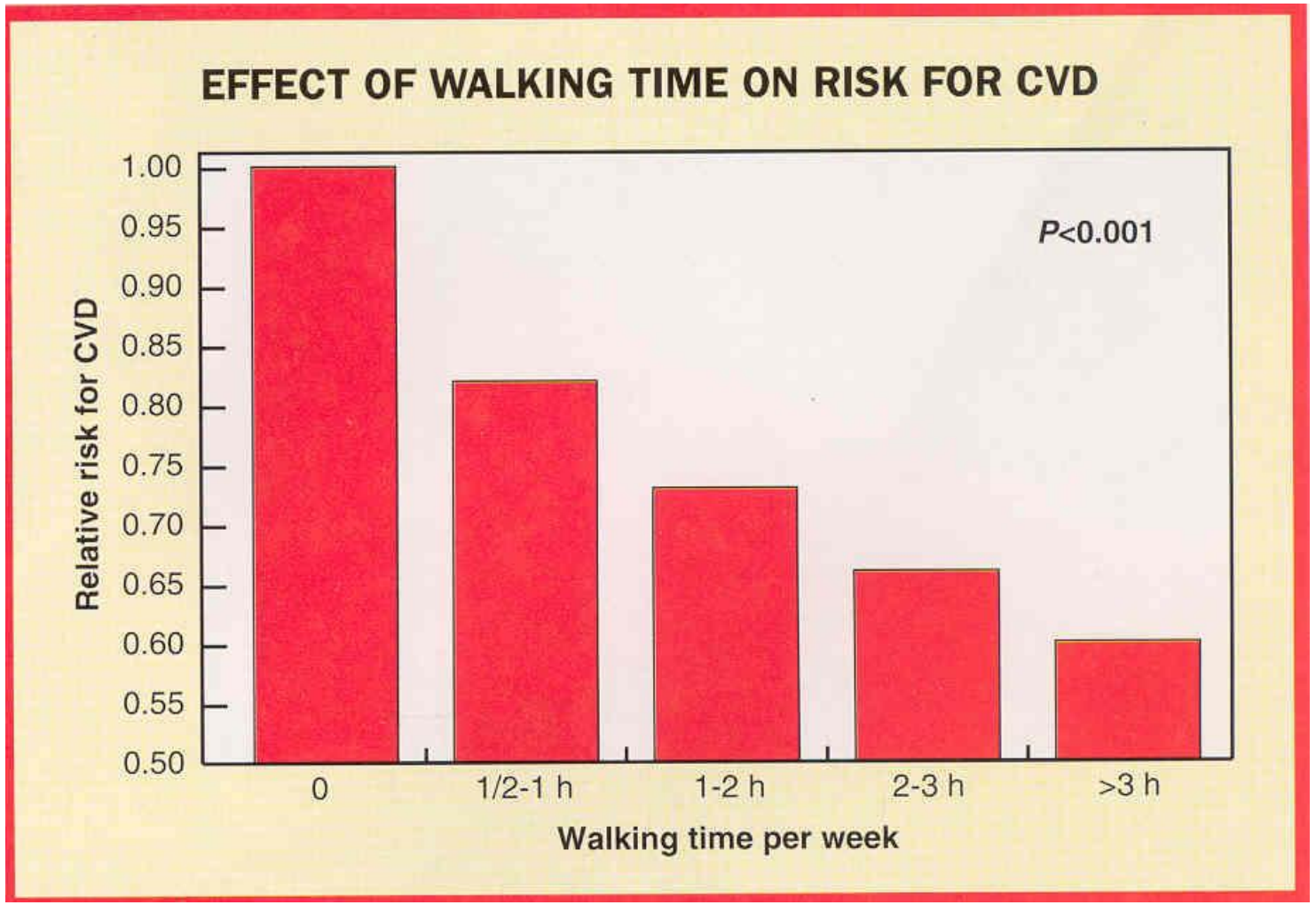
- **Reduce the risk of the three leading causes of death:**
  Heart disease, stroke, and cancer
- **Control or prevent development of various other diseases**
- **Enhance cognition**
- **Manage depression**
- **Manage anxiety and stress**
- **Improve self-concept**
- **Improve sleeping habits**
- **Increase energy Levels**
- **Control body weight and help appearance**

Benefits of PA/Exercise



(US Department of Health and Human Services, 2008, https://stacks.cdc.gov/view/cdc/23099)

Walking & Cardiovascular Diseases (CVDs)



https://www.ph.ucla.edu.cehd

- Walking 30 mins daily provides best health benefit (heart disease prevention).

- Walking 60 mins daily can cause reversal of heart disease.

Cardiovascular Risk

Physical Activity and Cardiorespiratory Fitness as Major Markers of Cardiovascular Risk: Their Independent and Interwoven Importance to Health Status

All roads go through physical activity and cardiorespiratory fitness status in determining cardiovascular disease risk. Legend: PA, physical activity; CRF, cardiorespiratory fitness.

Myers , P., McAuley , C.J. Lavie , J., Despres , R.A, & Kokkinos, P. (2015). Progress in Cardiovascular Diseases, 57, (4), 306 – 314.

PA/Exercise & Cardiovascular Diseases (CVDs)

- Physical inactivity is a serious risk factor for CVD.
- High blood pressure (above 140/90) is one the main causes of heart attack and stroke.
- PA/Exercise prevents atherosclerosis (clogged arteries).
- Exercise reduces cholesterol levels (clog the arteries - lead to heart attack and stroke).

(WHO, 2002)

PA/Exercise & Cardiovascular Diseases (CVDs)

- Each year cardiovascular disease (CVD) causes 3.9 million deaths in Europe and over 1.8 million deaths in the European Union (EU).
- CVD accounts for 45% of all deaths in Europe and 37% of all deaths in the EU.
- CVD is the main cause of death in men in all but 12 countries of Europe and is the main cause of death in women in all but two countries.
- Death rates from both ischaemic heart disease (IHD) and stroke are generally higher in Central and Eastern Europe than in Northern, Southern and Western Europe.
- CVD mortality is now falling in most European countries, including Central and Eastern European countries which saw considerable increases until the beginning of the 21st century.
- In 2015, there were just under 11.3 million new cases of CVD in Europe and 6.1 million new cases of CVD in the EU.

(European Cardiovascular Disease Statistics, 2017)

PA/Exercise & Cancer

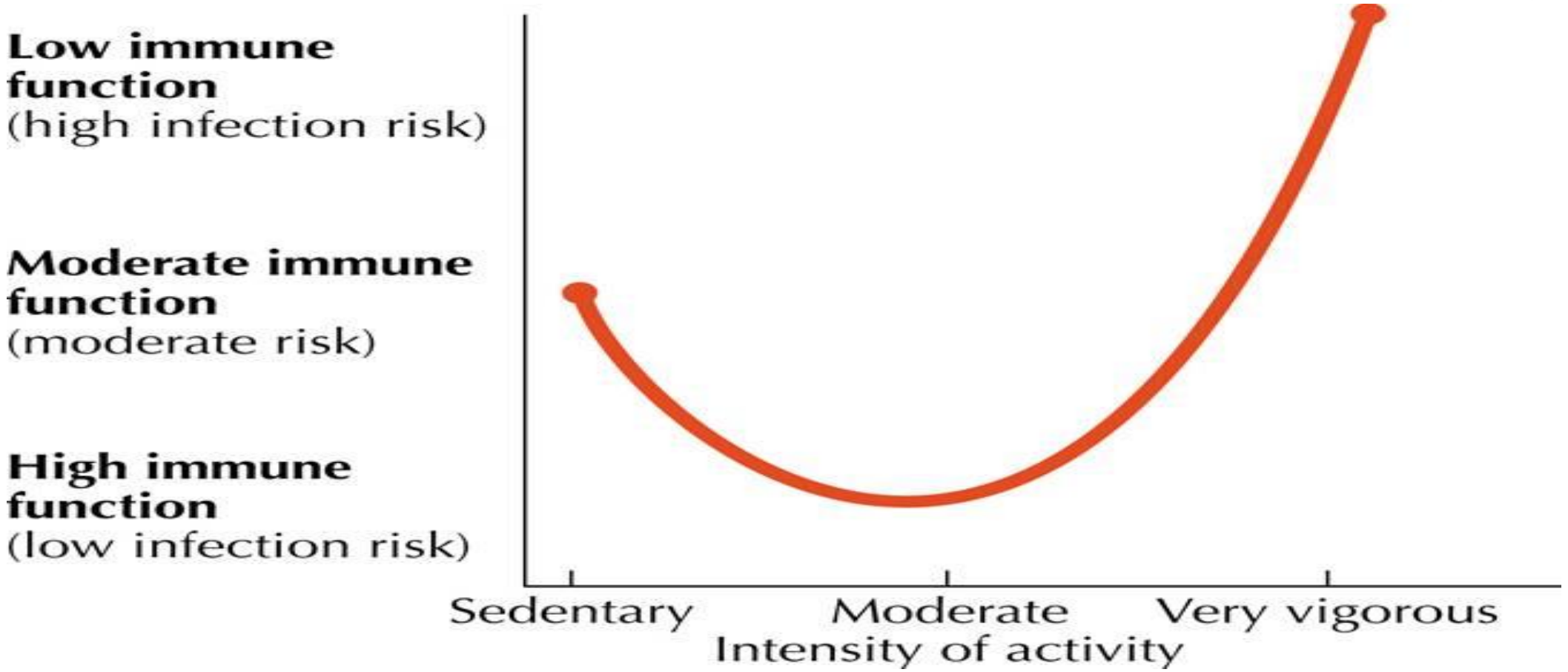
- PA/Exercise helps to prevent obesity, a major risk factor for several types of cancer.
- PA/Exercise activates antioxidant enzymes that protect cells from free radical damage.
- PA/Exercise enhances immune function.

PA/Exercise & Diabetes

- Increase insulin sensitivity
- Control blood glucose
- Control Weight/Lower body fat
- Reduce risk of cardiovascular disease

(WHO, 2002)

PA/Exercise & Immune function



PA/Exercise & Osteoporosis

Osteoporosis:

- P rogressive loss of bone mineral density
- Occurs commonly in old age
- Occurs at an earlier age and more frequently in women than men

PA/Exercise:

- **Increases peak bone mass**
- **Slows decline in bone mass**

PA/Exercise & Quality of Life

- Increase self-esteem & self-concept
- Increase feelings of enjoyment
- Increase of mood states
- Decrease feelings of depression
- Decrease feelings of anxiety

PA/Exercise & Social Benefits

- Enhance social integration
- Format new friendships
- Improve social networks
- Improve positive images
- Reduced health and social care costs

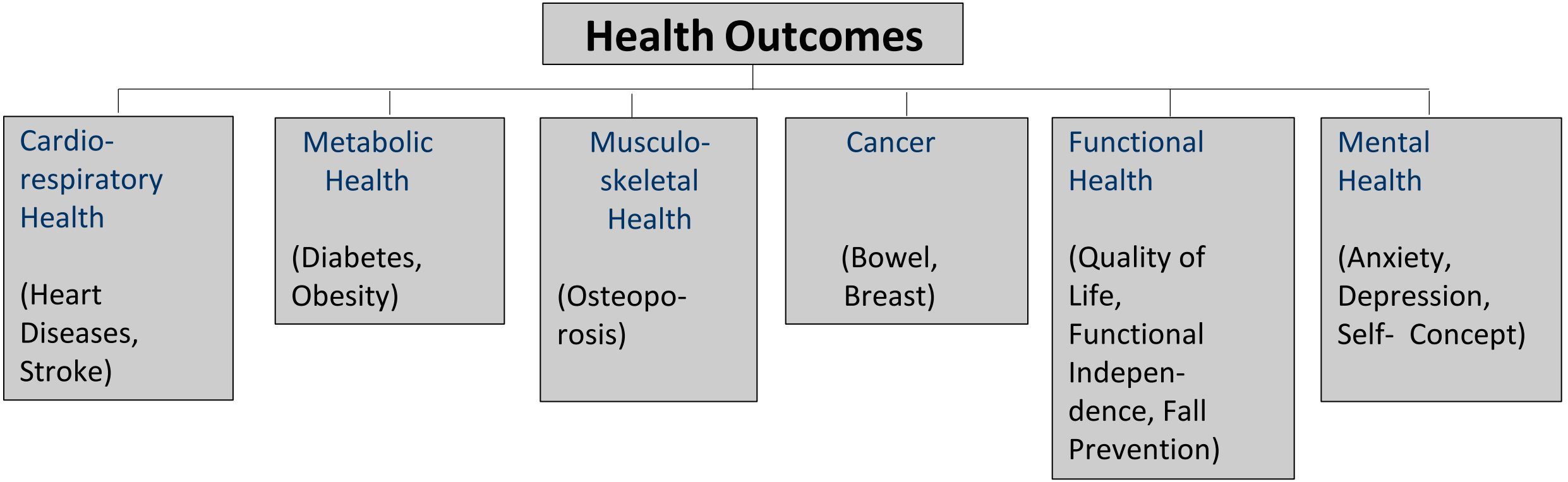
PA/Exercise & Mental Health (MH)

- Does PA contribute and how?

- Can we talk about treatment or prevention without a healthy and functional body?

- What is the relationship between PA and MH?

PA and Health



Inactivity → Increased mortality risk (20-30%) → 3.2 million deaths each year

Physical Activity Guidelines Advisory Committee, 2008

Some of the complex systems involved in linking PA with well-being and MH

- It can be difficult to determine the precise "active ingredient" that confers benefits
- PA is often associated with other potentially beneficial elements (social interaction, fresh air, exposure to green spaces etc)

PA sets in motion a sustainable cycle of enhanced psychological resources (Glow, A., & Edmunds, S., 2014)

Domain-Specific PA and Mental Health

- A meta-analysis of 98 studies has shown that the relationship between PA and MH varies among different PA domains.
- Although lifestyle PA **outside leisure time** may improve people's physical health, such behaviors may not benefit MH.
- A number of psychosocial mechanisms explain the effect of PA on MH

PA during leisure time

Enhances self-efficacy and exposes individuals to challenges that offer opportunities to develop confidence and a sense of mastery

Social interaction

Autonomous motivation

Distraction from stressful life events

Lee White et al., 2017)

PA/Exercise & Depression/Anxiety

- PA/Exercise can help prevent depression/Anxiety
  - PA/Exercise is as effective as antidepressant medication for treatment of depression.
- PA/Exercise improves sleep habits
- PA/Exercise controls weight
- PA/Exercise enhances self-concept

(WHO, 2002)

Anxiety Disorders - Depression and PA

The most common mental disorders

- **Mood disorders are a common problem and their symptoms are a serious public health issue**

- **The first attempts to understand the connection between PA and MH:**

- **An epidemiologuy study (Farmer et al., 1988) involving 1,900 participants aged 25-77 years showed:**

- **A survey of 1536 people over 15 years old (Meyer, 1992) revealed that :**

Physical inactivity may be a risk factor for depressive symptoms.

A meta-analyses of experimental studies

✓Positive effects of exercise, in healthy people and in clinical populations regardless of gender and age

✓The benefits are significant, especially in subjects with an elevated level of anxiety and depression

•**More affective results**

↓ ↓ ↓ ↓

Rhythmic, aerobic exercises, using large muscle groups (jogging, swimming, cycling, walking) of moderate and low intensity.

Duration: 15-30 min.

Frequency: a minimum of 3 times/week in programs of 10 weeks

(Guszkowska, 2004)

PA/Exercise and Cognition

Short-term benefits:

- Boost alertness (possibly by triggering the release of epinephrine and nor epinephrine)
- Improves memory
- Improves intellectual function
- Improves creativity

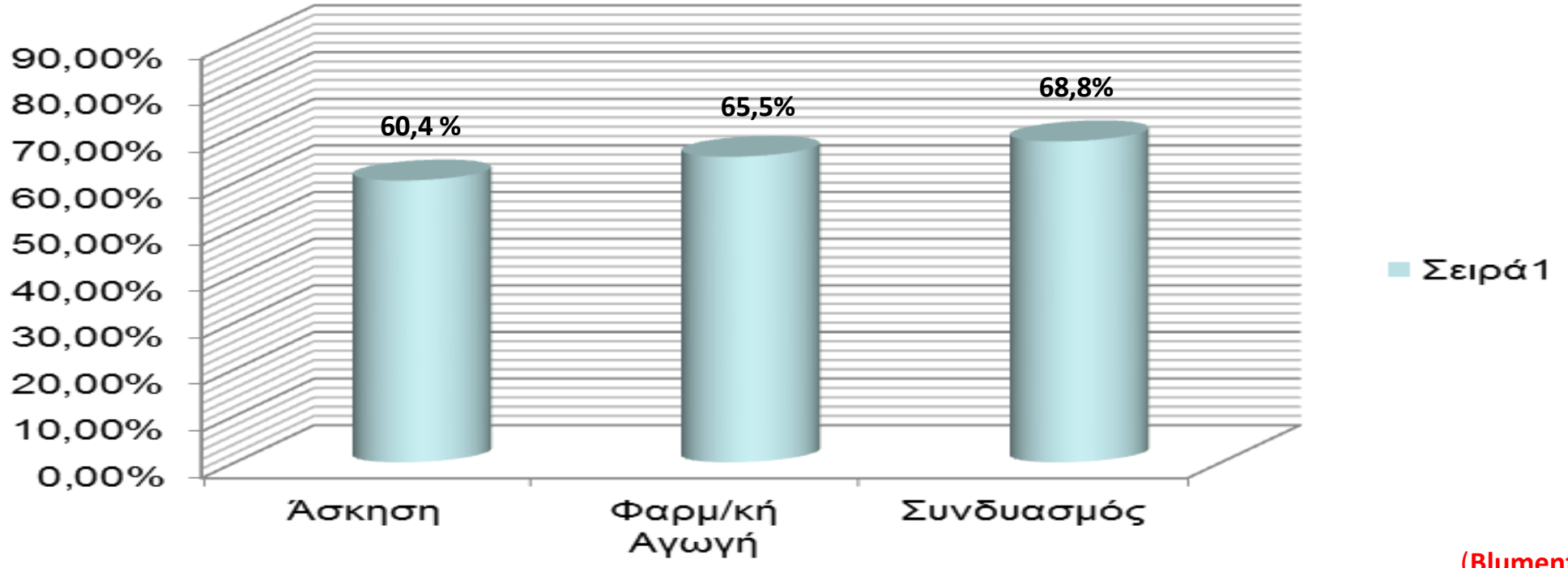
Long-term benefits:

- Exercise slows and even reverses age-related decline in mental function and loss of short-term memory

(A report of Surgeon general, Physical Activity and Health, 1996)

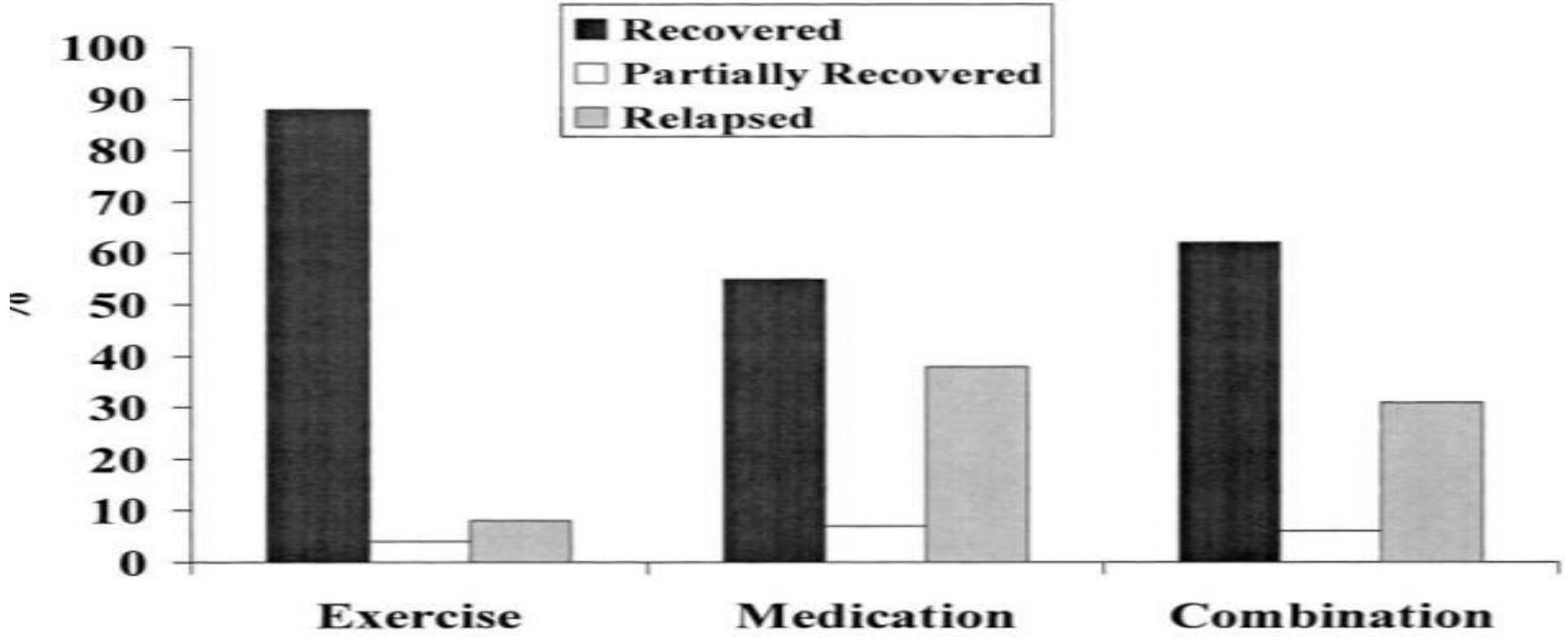
Physical exercise, medication or combination?

A study of 3 experimental groups with major depression disorder (exercise, medication and combined exercise and medication) after 4 months showed similar rates of recession



(Blumenthal, et al., 1999)

Physical exercise, Medication or Combination?

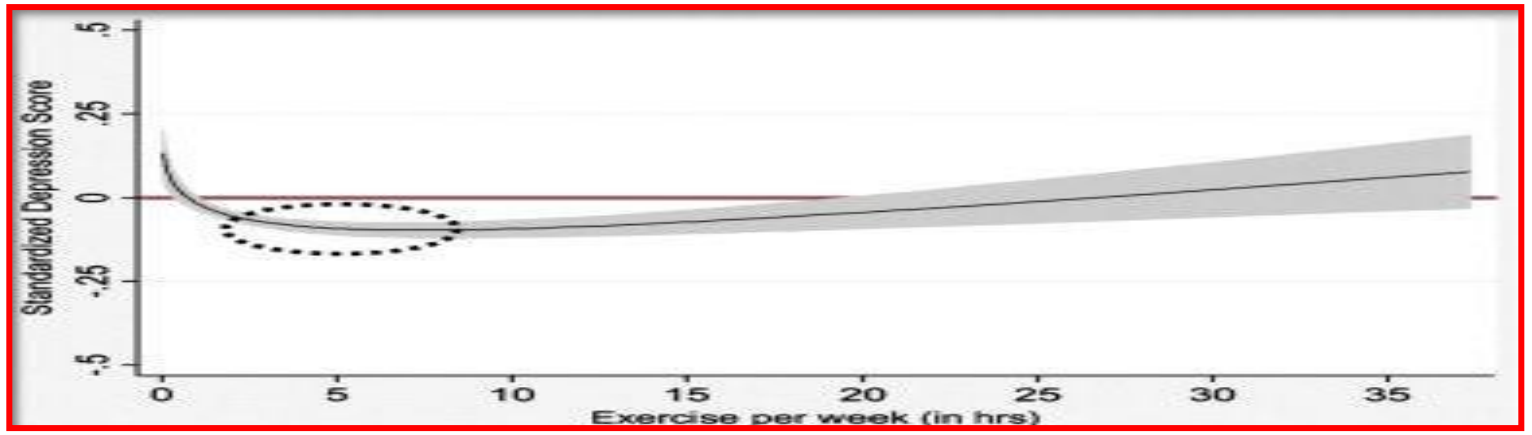


6 months after completion of the study, the participants in the exercise group were more likely to recover partially or totally and less likely to relapse

(Babyak et al., 2000)

How Much Exercise is Best for Mental Health?

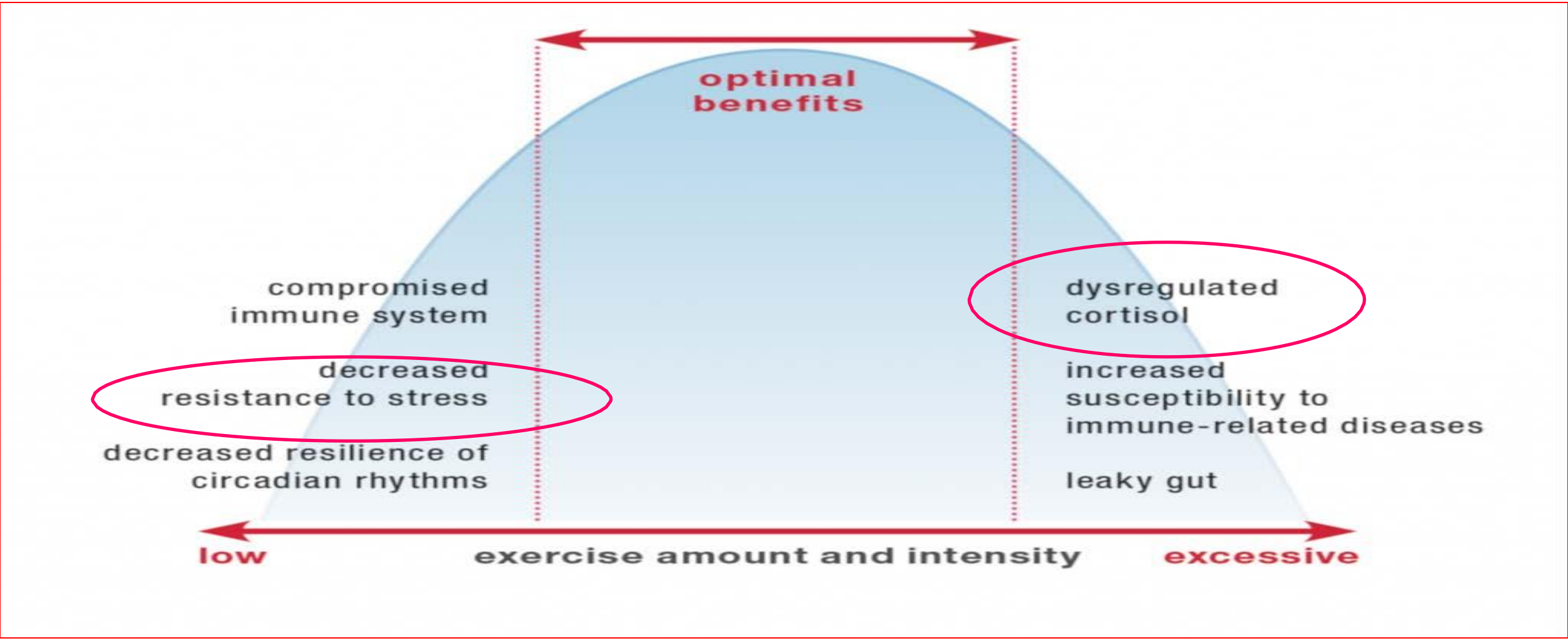
- There is a minimum level of exercise for physical health-related benefits
- Increasing levels of exercise lead to additional benefits
- However, there is a a curvilinear association between physical activity and mental health:
  Excessive exercise can be harmful to both physical and mental health



Optimal range: 2.5 to 7.5 hours/week

(U.S. Department of Health and Human Services, 2008; Kim et al., 2012

Happy Medium



Ballantyne S., 2013

Mens Sana in Corpore Sano

In conclusion:

- The number of patients suffering from mental illness constantly increases
- There is an urgent need for applying alternative, non-pharmaceutical interventions
- PA can be utilized as a means of preventing and enhancing the treatment of mental illness
- PA enhances MH and reduces the risk of mental disorders
- It is a treatment without “side effects” and financial costs
- It does not stigmatize

Mens Sana in Corpore Sano…

- The relationship between PA and MH varies according to the different combinations of the exercise characteristics
- Excessive exercise can lead to opposite results.
-
- Although the number of studies (for the effectiveness of PA) is limited compared to the number of studies for the drug efficacy in mental illness, it has been shown that:

- **The understanding of the specific factors that affect the above relationship facilitates:**

The development of specially designed (customized) PA programs and guides

The improvement of the PA effectiveness as an alternative, non-costly prevention and treatment approach

PA/Exercise Recommendations for Mental Health

- Aerobic, rhythmic exercise of moderate intensity
- Resistance exercise
- Team and individual sports
- Expressive activity such as dance
- Daily movement – walking or cycling to work
- Green gyms
- Adventurous activity
- Health walks, nature walking

Currently no generic guidelines for exercise for mental health