



InnoRenew CoE

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Novel Approaches to Active and Healthy Ageing in Outdoor Environments

InnoRenew Conference: Timber – A Healthy Future for Sustainable Buildings

Assoc. Prof. Dr. Nejc Šarabon

Koper, 7.3.2019

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Introduction

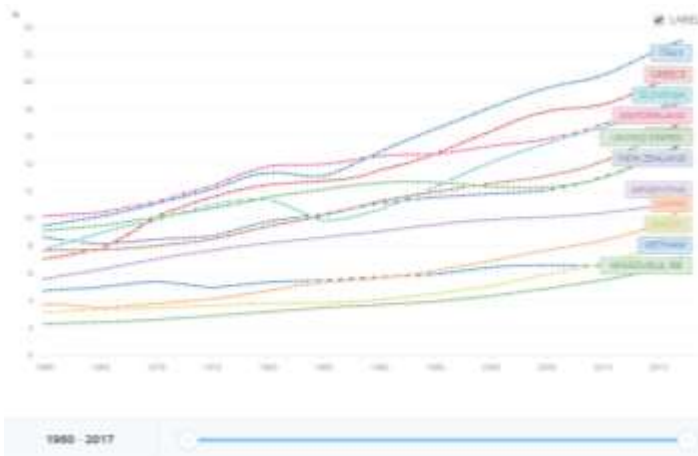
- Population Ageing
- Healthy ageing
- Health problems among the older adults
 - Sarcopenia
 - Osteoporosis
 - Cardio and Respiratory Decline
 - Cognitive Impairment
 - Falls
- An Innovative Idea



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Populations around the world are rapidly ageing

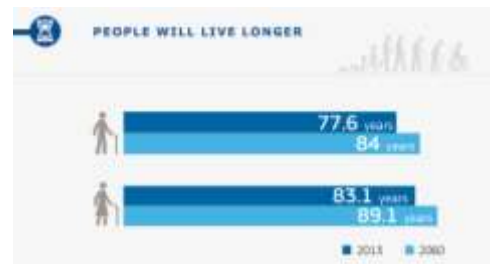
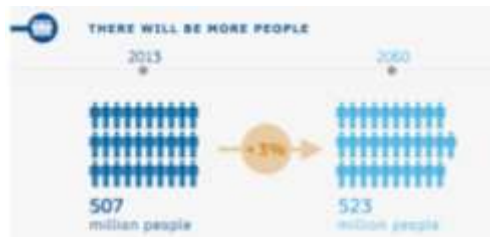
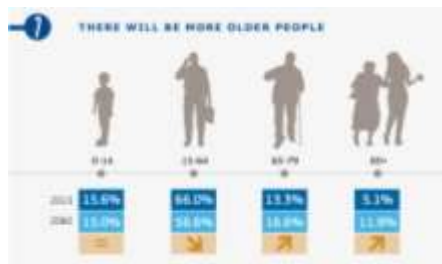


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Ageing Report

Projected demographic changes in the EU



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The Global Strategy and Action Plan on Ageing and Health (WHO)

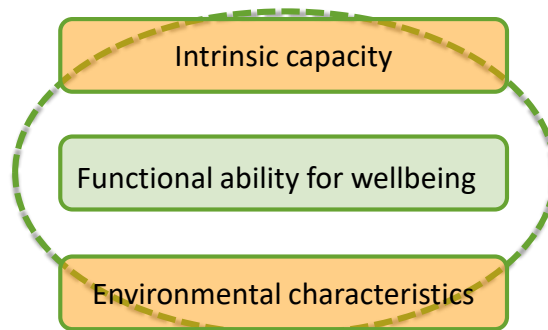
- Five objectives
 - Commit to action
 - Align health systems to the needs of older
 - **Develop age-friendly environments**
 - ... enabling older people's engagement
 - Strengthen long-term care
 - **Improve measurement, monitoring and research**
 - ... strengthening research capacities and initiatives for innovation

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Healthy Ageing

- Optimising opportunities for good health, so that older people can take an active part in society and enjoy an independent and high quality of life (healthyageing.eu)



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Health and Age

Age-related changes

Sarcopenia
Osteoporosis
Cardio-respiratory Fitness
Mental Health Problems

...

→ FALLS



<https://www.who.int/ageing/healthy-ageing/en/>

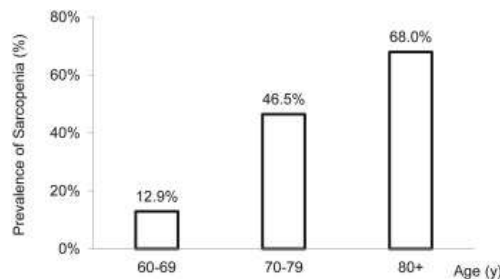
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1. Sarcopenia

- Sarcopenia is a geriatric syndrome characterised by progressive and generalized loss of skeletal muscle mass and strength (Santilli, Bernetti, Mangone, & Paoloni, 2014; Picca et al., 2018)

- Risk factors:
- Age
- Gender
- Levels of physical activity



(Khongsri, Tongsuntud, Limapai, & Kuptniratsaikul, 2016)

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1. Sarcopenia

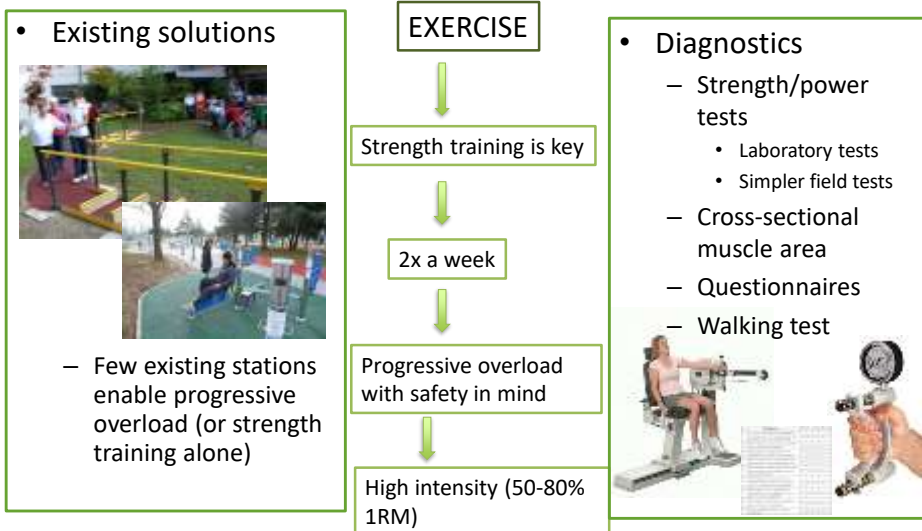
- Frequently associated with poor endurance, physical inactivity, slow gait speed and decreased mobility
- Important correlation between inactivity and losses of muscle mass and strength (Santilli, Bernetti, Mangone, & Paoloni, 2014)
- Importance of correct and sufficient nutrition



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Sarcopenia - detection and prevention

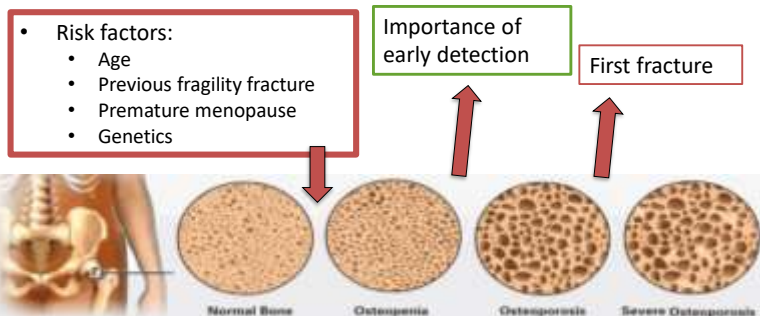


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2. Osteoporosis

- Systemic skeletal disease characterized by low bone density and microarchitectural deterioration of bone tissue
- Three times more common in women than in men (hormones and lower peak bone mass)



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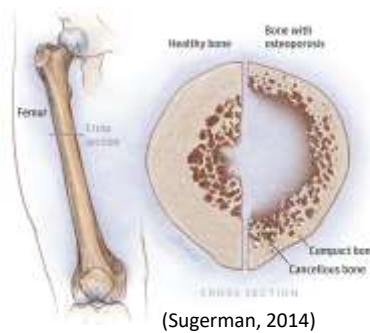


2. Osteoporosis

Physical activity as a way to prevent osteoporosis:

- regulates bone maintenance and stimulates bone formation including the accumulation of mineral
- strengthening muscles, improving balance, and thus reducing the overall risk of falls and fractures (Borer, 2005)

After menopause, effectiveness of exercise to increase bone mineral depends heavily on adequate availability of dietary calcium.



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Osteoporosis – detection and prevention





Exercise in childhood and throughout adulthood is crucial for increasing bone mass and bone mineral density


- Exercise involving high levels of force

At older age, similar rules apply

- Safety
- Careful with intensity


- **Diagnostics**
 - Problem of early diagnostics
 - Questionnaires



Vibrilar training

- Also applicable during bed rest



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3. Cardio and Respiratory Fitness (CRF)

Decline

- Physical activity (volume and intensity) is a principal determinant of CRF (Dumuid et al., 2018)
- Several biological mechanisms suggest that CRF improves insulin sensitivity, blood lipid profile, body composition, inflammation, and blood pressure (Lee, Artero, Sui, & Blair, 2010)

Sedentary behaviour (<1,5 MET)



www.blogs.koreanclass101.com

Low-intensity activity
(1,5 do <3,0 MET)



www.genius.com

Moderate intensity activity
(3,0 do <6,0 MET)



www.picturespider.com

High intensity activity
(>6 MET)



www.al.com

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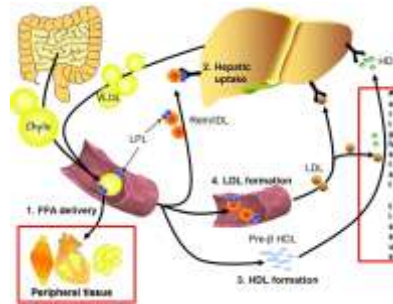
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3. Cardio and Respiratory Fitness (CRF) Decline

- VO₂max drops for 15% per decade (Hakola., 2014)
- Aerobic fitness is associated with accelerated cognitive impairment (Wendell et al., 2014)
- Impairments of metabolic system



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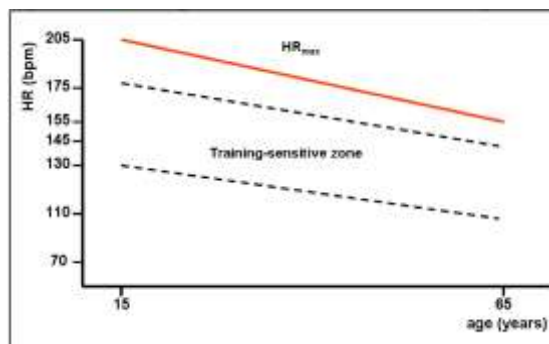
Exercise for CRP prevention

EXERCISE

Aerobic activities

Intensity based on individual's maximal heart rate

- Diagnostics
 - Heart rate monitoring
 - Questionnaires
 - Equations for HRmax estimation



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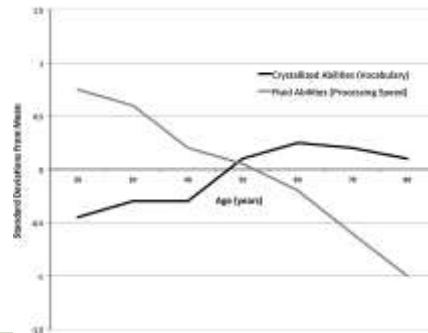


4. Cognitive Impairment

- Cognition is critical for functional independence as people age
- Aging brings changes in the structure and function of synapses and changes in neuronal networks

The number of neuronal synapses can now be measured using immunohistochemistry techniques that label presynaptic proteins, such as synaptophysin.

(Murman, 2015)



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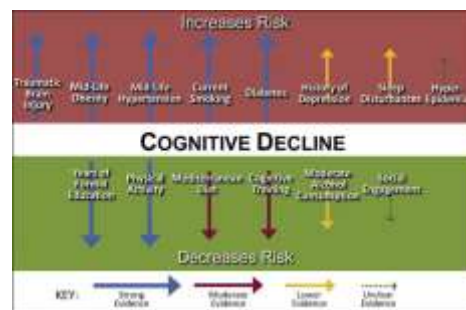
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4. Cognitive Impairment

- In cross-sectional studies, older adults who engaged in aerobic activities performed better on measures of working memory, processing speed, executive functioning, and memory compared to those engaged in sedentary activities
- Promoting good cognitive ageing:
 - **Depression-reduction**
 - **Social-stimulation**
 - **Cognitive exercises**



(Gangolli, 2016)

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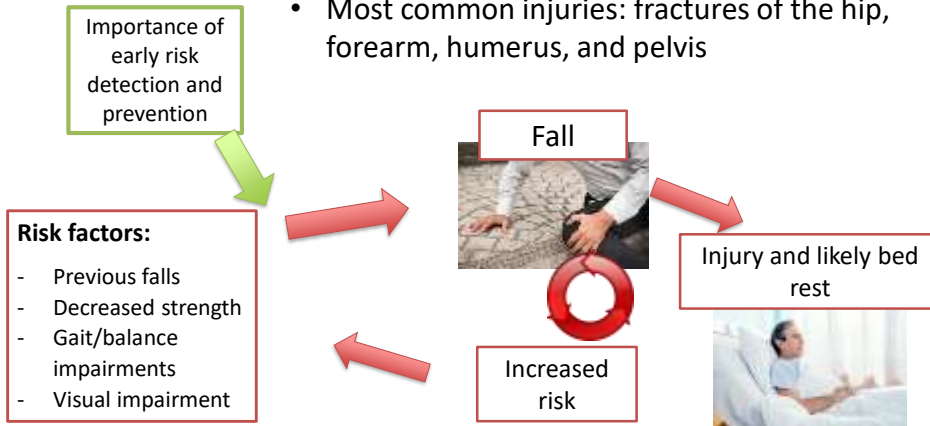
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Falls

- One of the major causes of morbidity and mortality worldwide among older adults (Alshammari et al., 2018)
- Most common injuries: fractures of the hip, forearm, humerus, and pelvis



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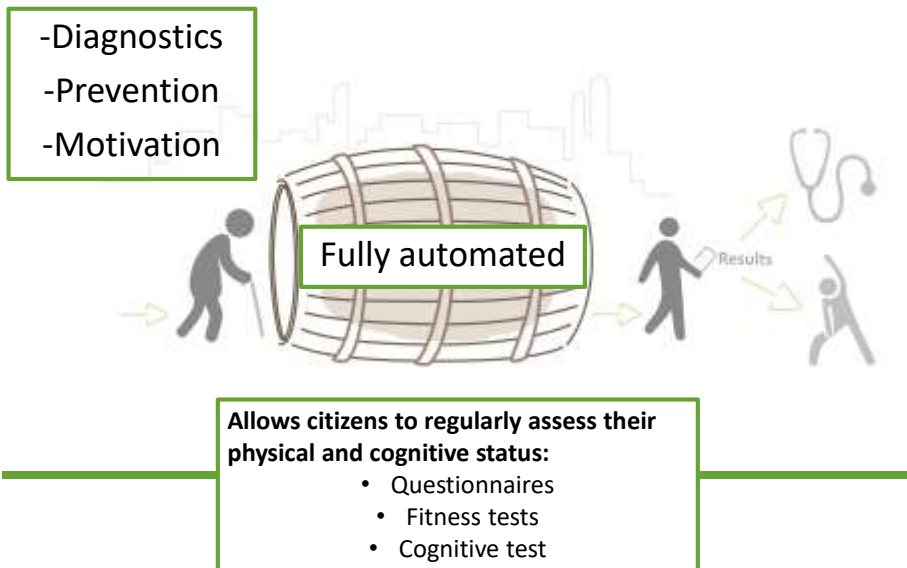


Proposed Solution

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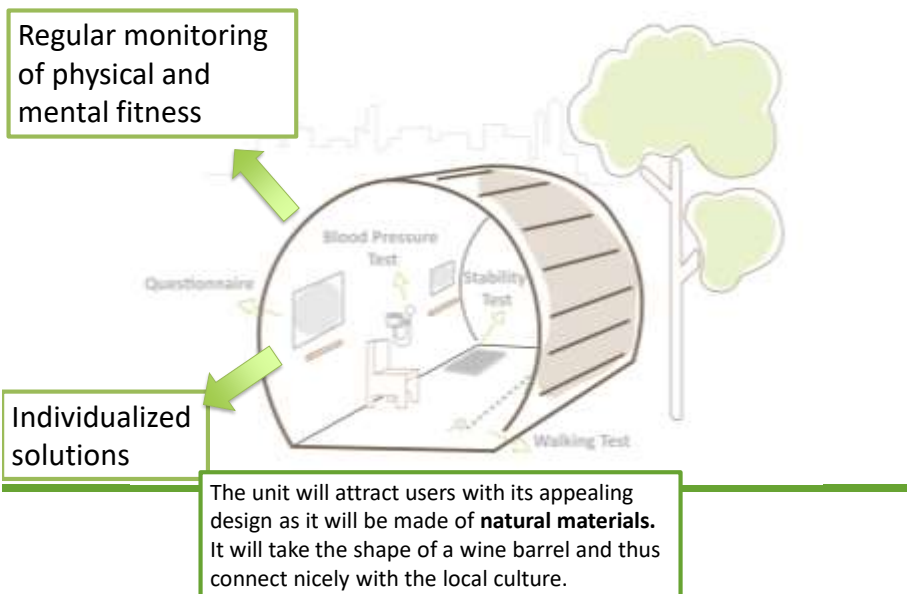


S O D - Smart Outdoor Diagnostic Unit

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S O D - Smart Outdoor Diagnostic Unit

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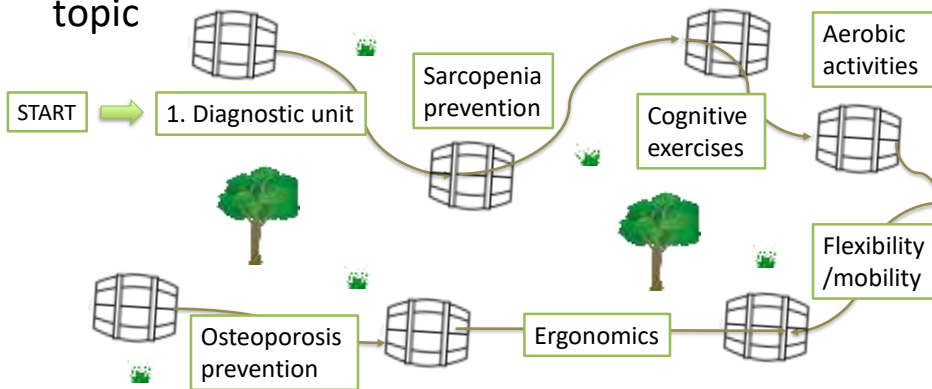
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SOD – Vision

- To design a path that contains several (7-10) units, each thoroughly focusing on a specific topic



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SOD – Future (WHO compliant)

- The units will be available to all, regardless of their age, gender, technological skills, and other characteristics
- With this, we aim to create world's first automated and systematic approach to support city dwellers in improving their health



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Thank you for your time.

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