

Balance and fall prevention- what role does *HEARING* play?

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- 2 A majority of clients in audiology are in old age
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Fall characteristics and impact
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Quality of life and well-being is determined by a variety of factors

What does **Healthy Aging** Look Like to You?



Changing **Age-Specific Goals** Needs and Values

Middle adulthood

- Capability
- Precautions for later on
- Self-fulfillment
- Enjoyment
- Social involvement

Old age

- Health & wellbeing
- Safety & Security
- Autonomy & Mobility
- Social participation



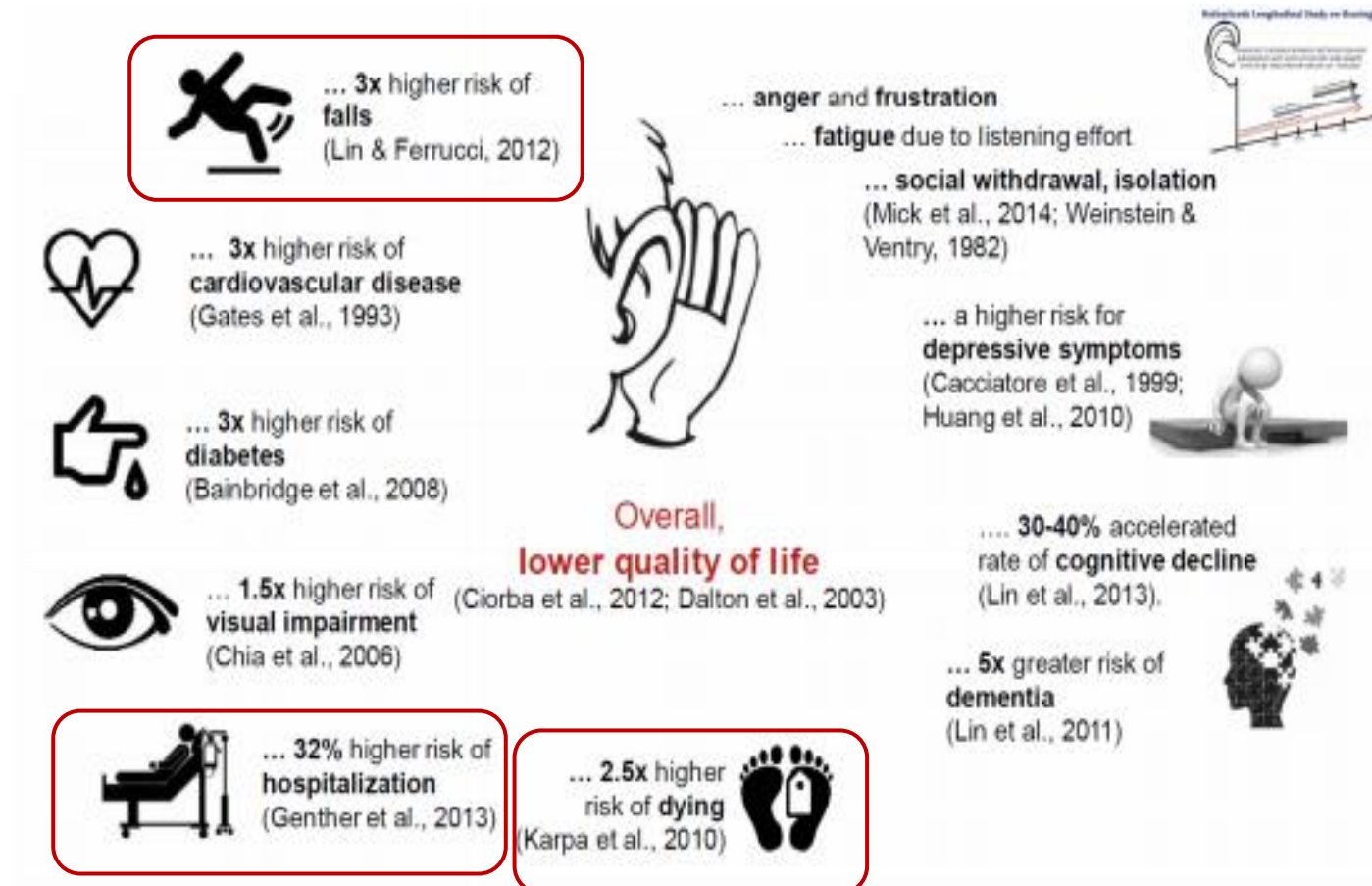
Quality of life and well-being determined by a variety of factors in **old age**



- Relying on **physical** and mental abilities
- Feeling **safe, secure** and supported
- Exchanging with others, **participating** in social relationships and life
- **Following one's interests**
- Engaging in **activities**
- Being **confident and mobile**
- Ability to make autonomous decisions, **independence in activities** of daily living



The importance of hearing becomes apparent when the ability to hear diminishes



(Besser et al 2018)

→ Hearing Loss has a strong impact on quality of life

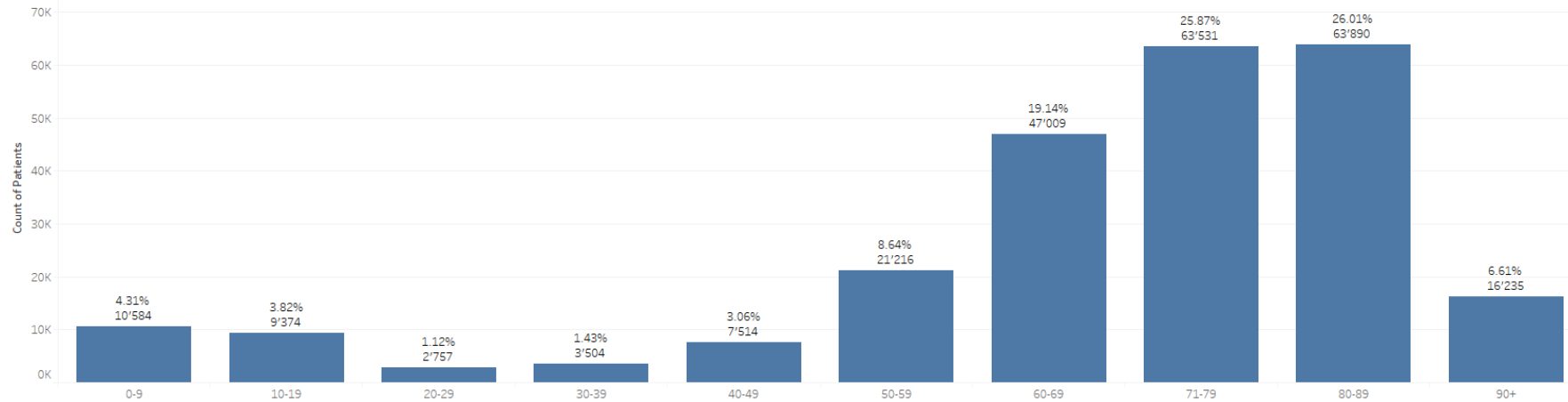


A majority of clients in audiology are in old age

A majority of clients in audiology are in **old age**

Age Distribution

Without Age 70, which represents default in Target

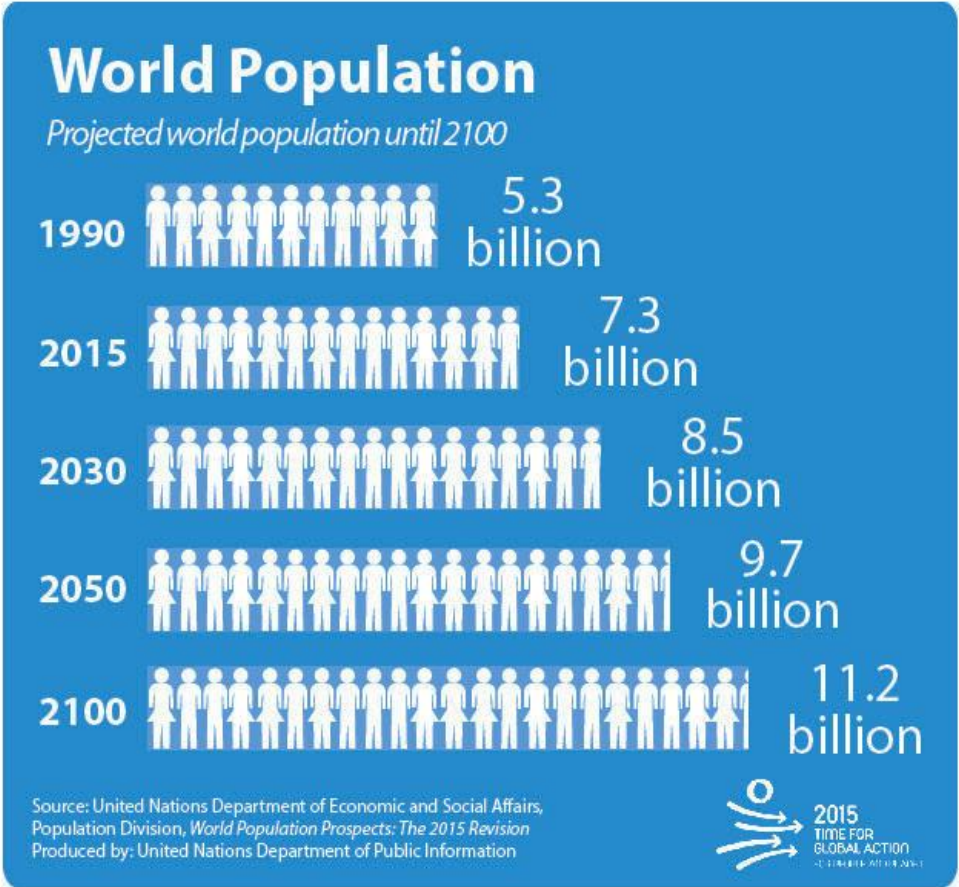


- **64% over 70 years of age**
- **36% over 80 years of age**
- **7.2% over 90 years of age**

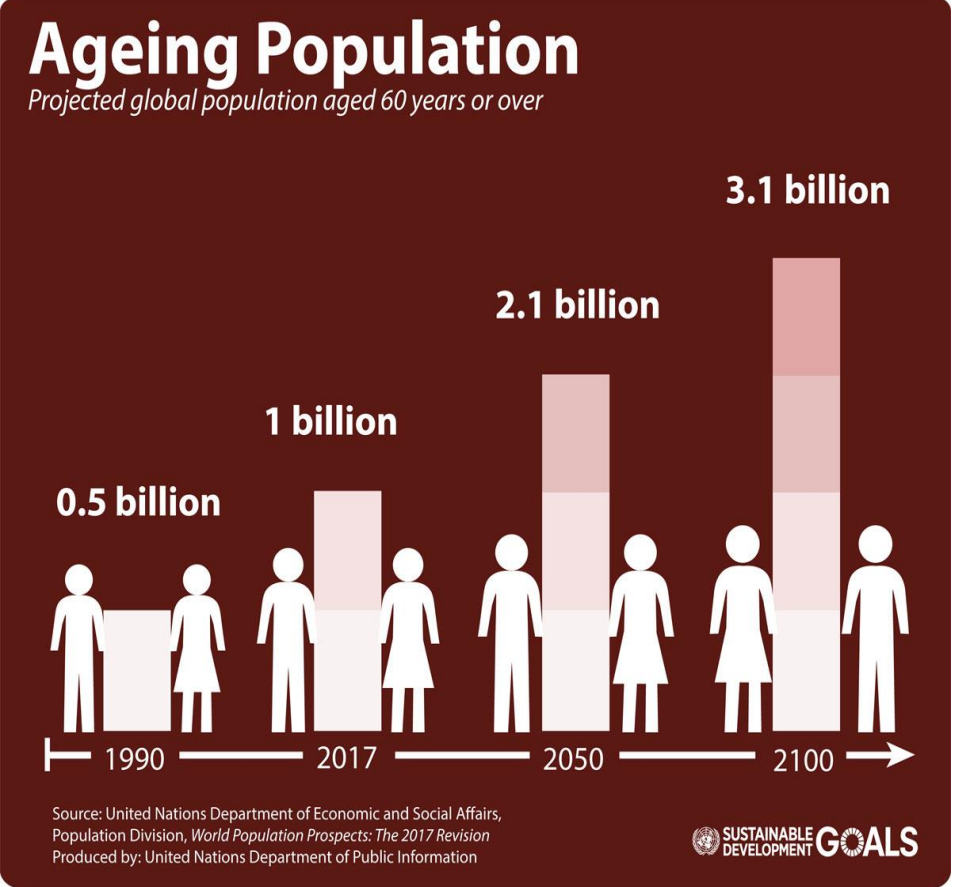
(CUPeR data: mainly USA, BE, AT, IL)

Some numbers – Population Prospects

Growth

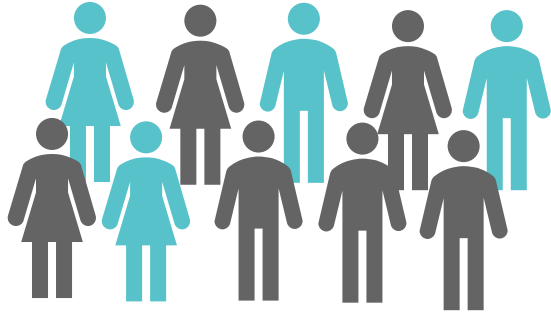


Ageing



(2019 Revision of World Population Prospects - UN)

Some numbers – Ageing Population Prospects

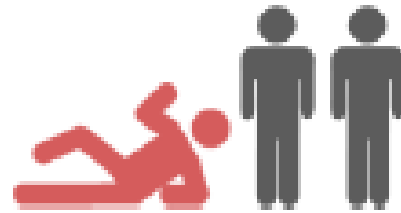


→ Hearing loss is often age-related

→ Prevalence of hearing loss increases with age:

30% - 40% at ages of **65 to 74 years**

50% - 80% at **75 years** and older



→ **1 in 3 people age 65 and older** fall each year

→ Up to **50%** of residents of long-term care facilities fall at least once a year



→ **1 in 2 people age 80 and older** fall each year



(2019 Revision of World Population Prospects - UN)

(Agrawal et al., 2010)

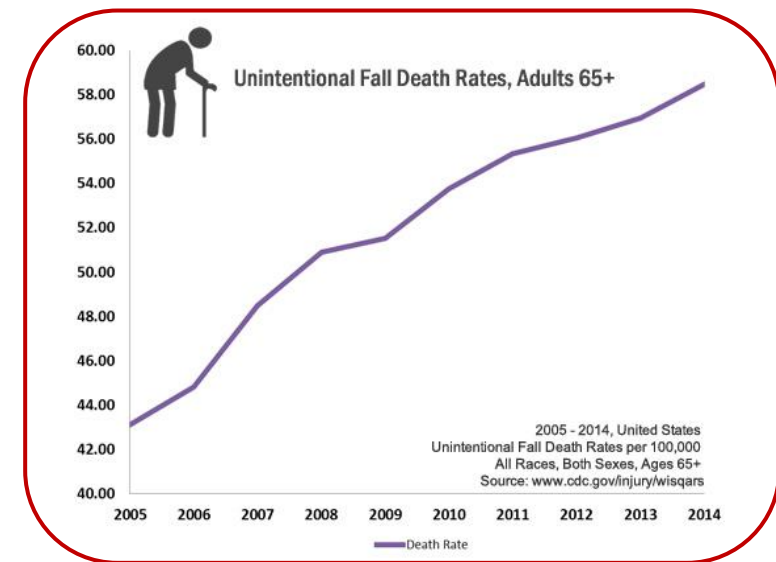
A fall constitutes a major risk

Fall characteristics and impact

26.11.2019



Falls in the elderly population have been identified as a major public health issue



- 1 out of 5 falls causes a serious injury such as broken bones or a head injury
- In Germany more than 100.000 people experience hip fractures annually that are associated with *loss of confidence in their physical abilities and independence*
- Fall-related health costs in Germany 3.3 billion EUR / year, in the USA 15 billion USD / year
- Every 7 minutes, an older adult dies from a fall (across the world)

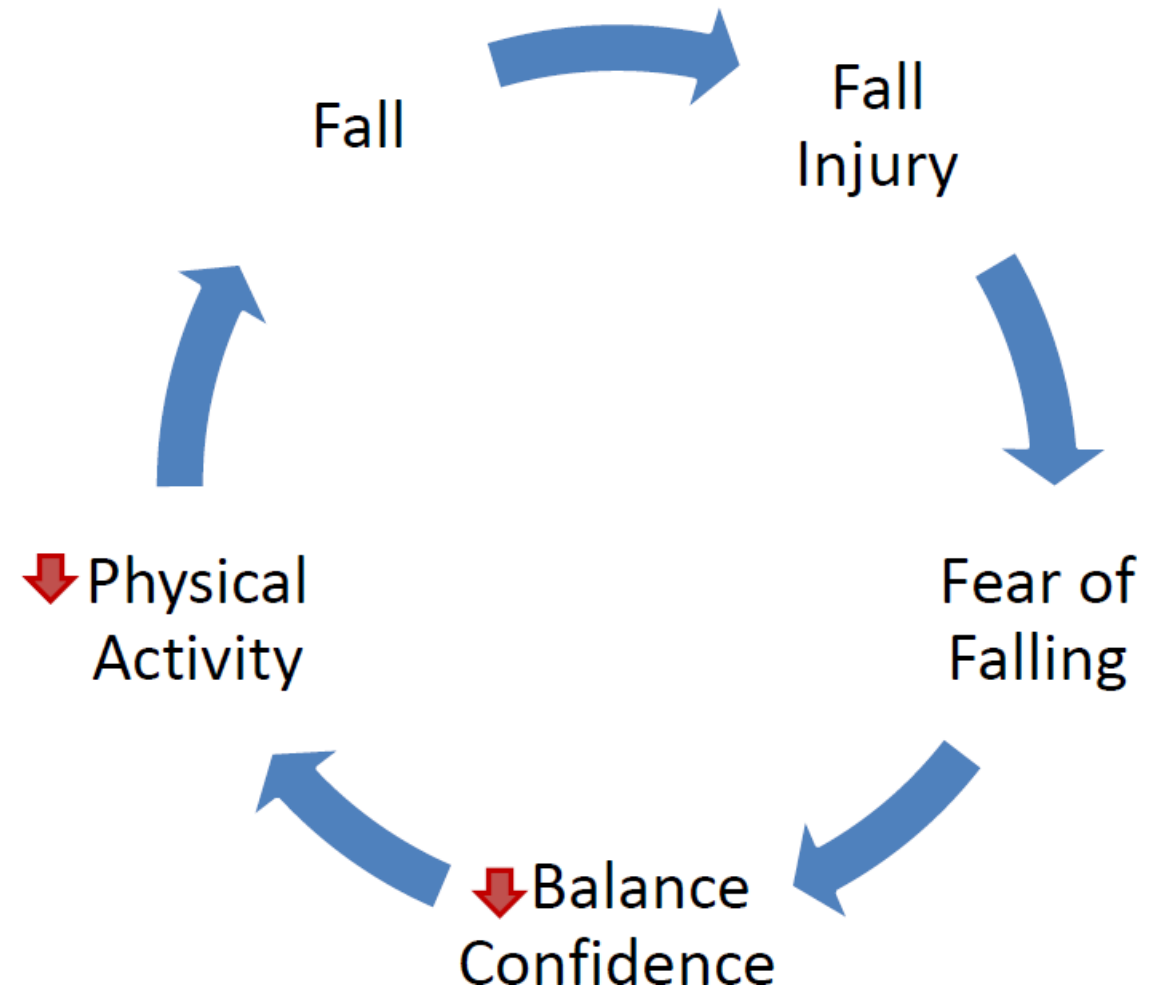
(Becker 2019; NICE, 2013; EU Health Report 2012; Balzer, Bremer, Schramm, Lühmann, & Raspe, 2012)

A fall constitutes a major risk

WHY?

- Leading to injuries
- Potentially threatening the independence of a person
- Cycle of fall risk consequently impacts QoL

**Quality
of life**

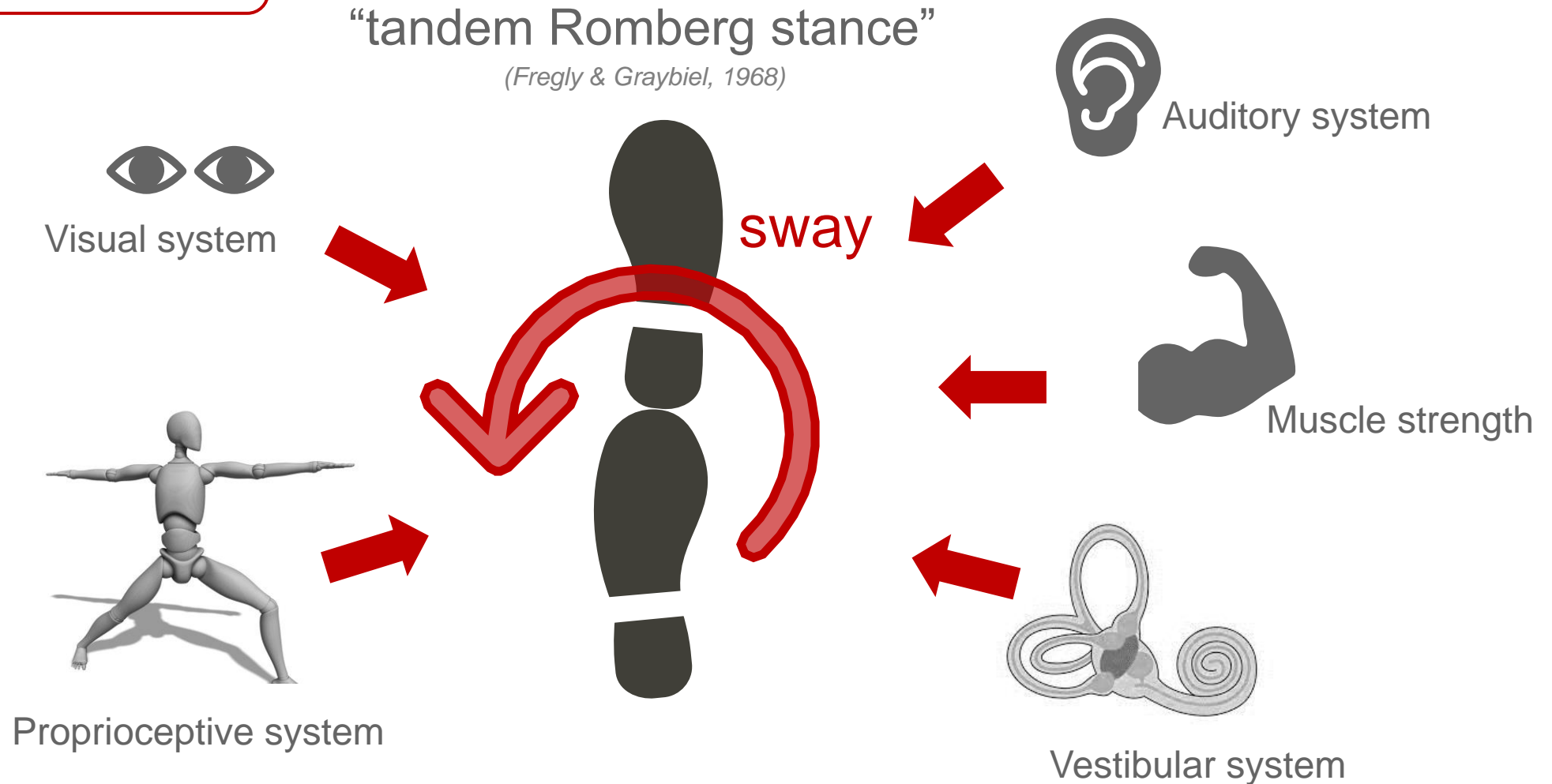


(adapted from Criter 2014)

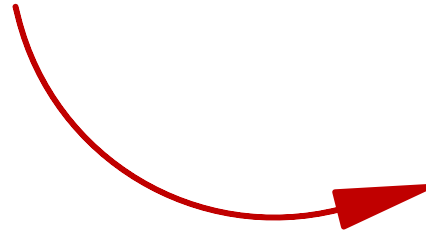
The role of hearing/ -loss

Hearing loss
Balance/ fall risk
Hearing aids

Postural stability



→ Compromised sensory input must be compensated for and results in more sway and instability



postural control

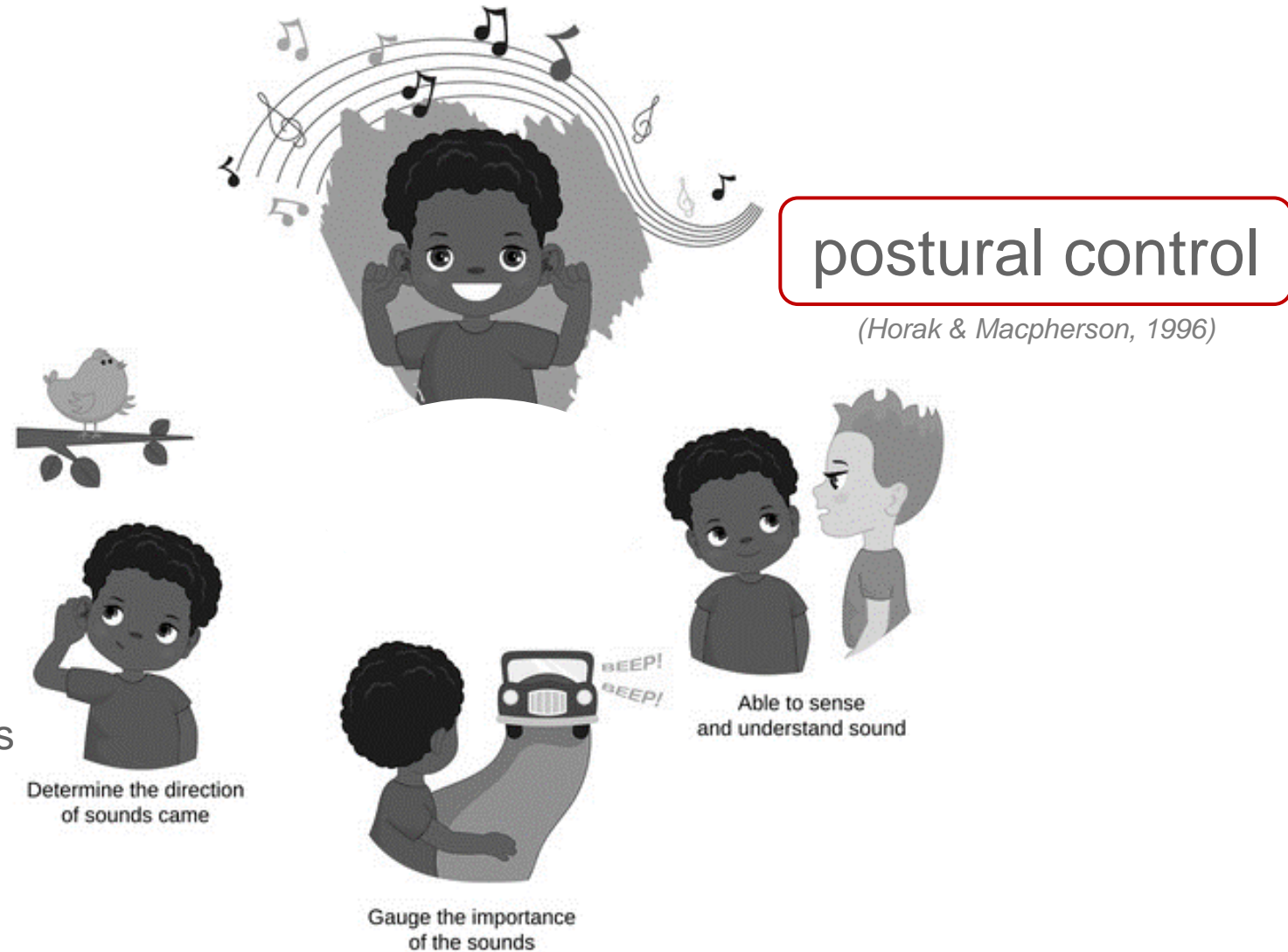
(Horak & Macpherson, 1996)

- = a complex motor skill that allows us **to maintain balance**
- Coordinating the position of body (segments)
- Balancing out forces that act on the body
- Allows us to achieve / maintain / restore balance
- Allows us to stay in a certain position (static)
- Allows us to move in a controlled way (dynamic)

→ Postural control is what prevents us from falling down, while sitting, standing, walking, running...

Postural stability

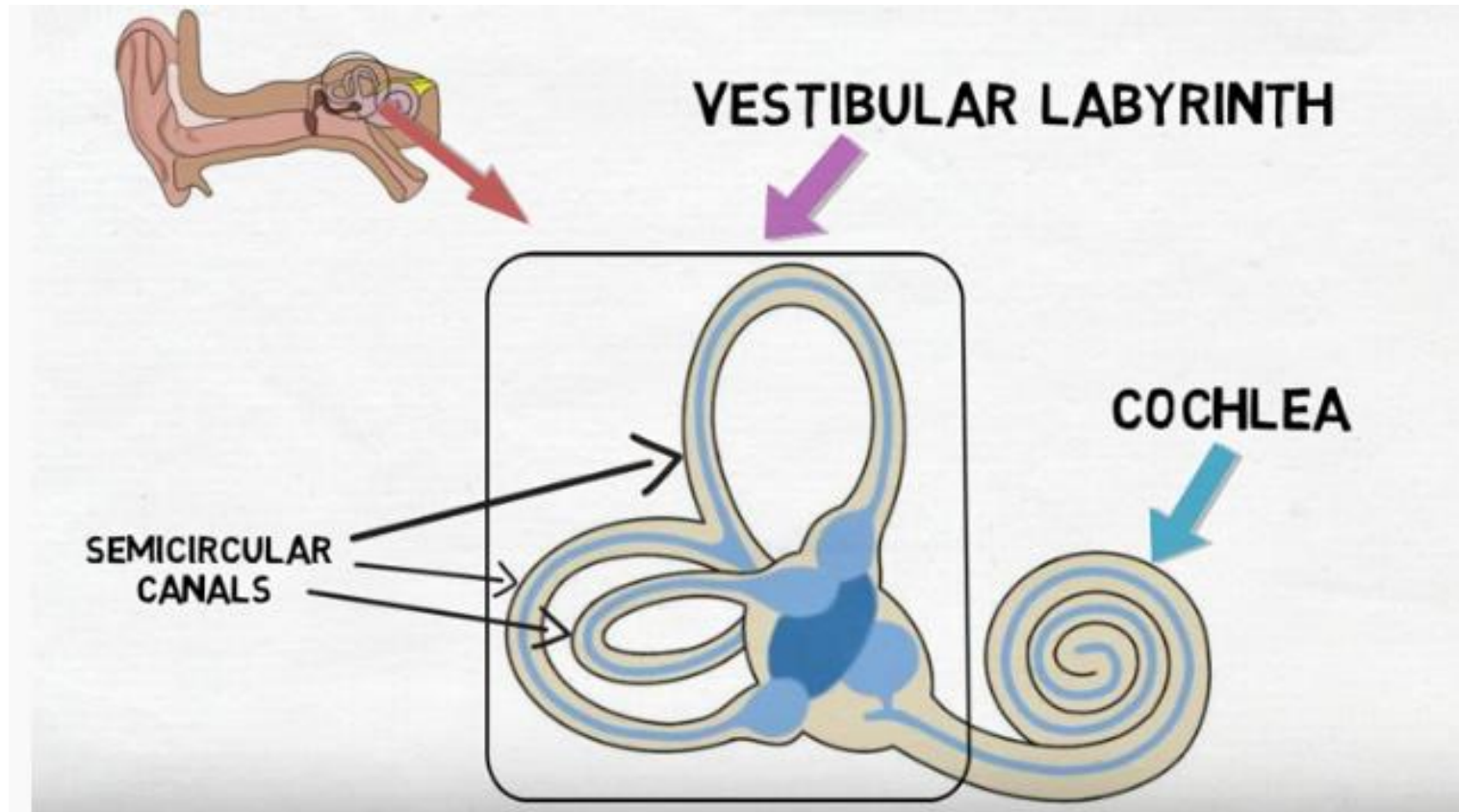
- Vestibular system
- Visual system
- Proprioceptive system
- **Auditory system**
 - Spatial information
 - Localization
 - Environmental awareness
 - Body feedback



→ **Removing auditory input results in imbalance / postural sway**

How does the ear affect balance?

→ The **inner ear** contains organs responsible for hearing and balance.

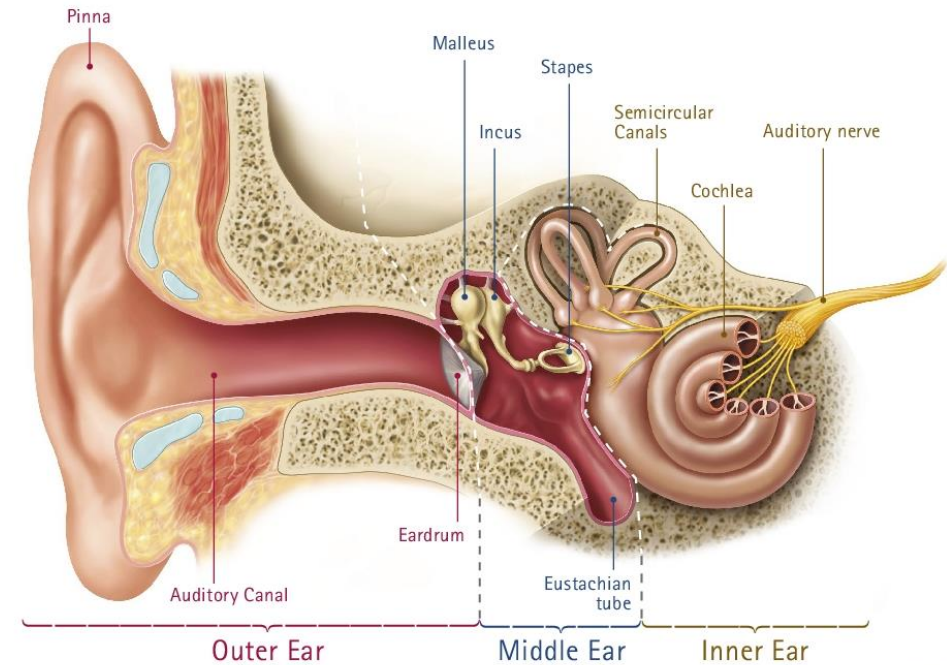


→ **Anatomical link between auditory & vestibular system**

Hearing aids

- Anatomical link between auditory & vestibular system
- New area of research
- Improvements for older individuals with hearing loss
(Rumalla et al., 2015; Vitkovic et al. 2016; Negahban et al., 2017)
- Results mediated by vestibular functioning?
(Vitkovic et al. 2016; Maheu et al., 2019)

Anatomy of the ear



www.phonak.com

→ **Fall risk is correlated with hearing loss**

- One-third report hearing difficulty (*Stevens et al, 2012*)
- Use of sound for postural control is diminished in HL; overcome with HI use (*Vitkovic et al. 2016*), if no vestibular impairment (*Maheu et al. 2019*)
- There are significant inter-relationships between hearing loss, aging and risk of falls (*Lopez et al., 2011; Lin and Ferrucci, 2012; Koh et al., 2015*).

→ **Independent risk factors for falls**

- Individuals with HL show stronger restrictions of mobility than NH individuals and restrictions increase with increasing HL (*Mikkola et al., 2015; Polku et al., 2015*).
- Balance problems are common amongst older individuals and can lead to reduced QoL, limited independence, and severe injuries, which in turn lead to a decline of health status or even death (e.g., *Agmon et al., 2017; Verghese et al., 2006*).

Hearing loss and falls are closely linked

Some concluding Facts:

- The same consumers who have hearing issues are also at at risk of falling
- The odds of falling increases 2-3 times in the elderly group with mild hearing loss
 - The odds of falling increases by 1.5 per 10 dB increase in hearing loss
- Hearing instruments may reduce the risk of falling in those suffering from a hearing loss
- Untreated HL is a public health concern and has significant associations with falls (+ other conditions)

(Tin-Lok Jiam et al 2016, Lin & Ferrucci 2012, Rumalla et al 2014, Vitkovic et al 2016, Mahmoudi et al 2019)



Sonova's research and business motivation

Falls in Audiology Clinic Patients

Audiology patient fall statistics and risk factors compared to non-audiology patients

Robin E. Criter & Julie A. Honaker

International Journal of Audiology 2016; Early Online: 1-7

- Age (± 2 years) and gender matched controls, average 69 years (60-77 years), n=25/group
- Over two-thirds (68%) fell in one year
 - Compared to matched controls (28.0%)
 - Almost two-thirds (64.7%) fell more than once



→ Falls are a pervasive issue in general hearing clinics

What are audiologists doing about falls?

J Am Acad Audiol 25:388–404 (2014)

Survey of Audiologists' Views on Risk of Falling Assessment in the Clinic

DOI: 10.3766/jaaa.25.4.10

Jessie N. Patterson*
Julie A. Honaker*

→ Findings:

- 83.1% of audiologists see patients > 60 years old
- 3.9% evaluate fall risk on some level
- 48.5% do not make any recommendations based on these measures

→ Barriers to fall risk assessment:

- Time
- Reimbursement
- Knowledge / education



Sonova's view...

The same patients/customers who seek advice for their hearing problems have usually a balance problem as well which becomes obvious and medically relevant after the occurrence of falls.

In many countries around the world hearing and balance issues are managed by the same healthcare practitioner – the Audiologist – often in joint center for Hearing & Balance

Counsel elderly people and assess their individual risk of falling

Provide rehabilitation therapy @clinic & @home incl a training device and training procedure

→Open: clinical pathway and intervention

Home

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Clinical education ▾

Current Studer

→ Research initiated

Balancing act: funding boost to reduce falls for hearing impaired

24 Jan 2019

A [University of Queensland](#) study designed to improve balance in older adults with a hearing impairment has been made possible thanks to funding from [Sonova](#), a global provider of innovative hearing care solutions.

UQ School of Health and Rehabilitation Sciences Head and study co-lead [Professor Louise Hickson](#) said the funds will directly impact older adults who are more prone to falls due to a hearing impairment

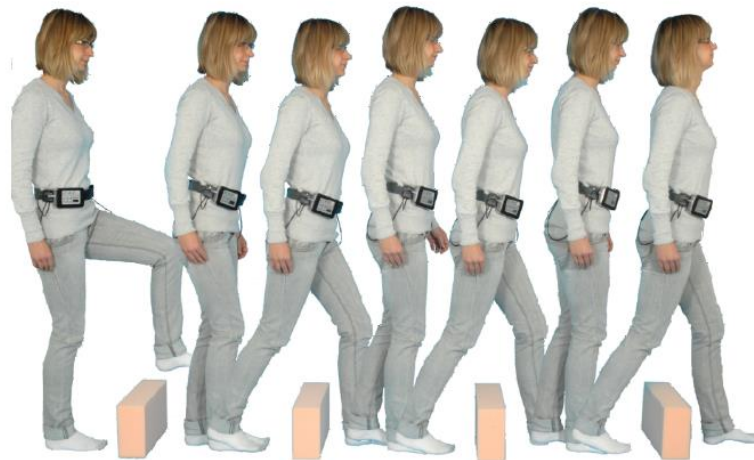


L-R: Adjunct Professor Stefan Launer, Professor Sandy Bauer, Professor Louise Hickson and Professor Bruce Abernethy²⁸

VibraNT Trial

The effect of individualised, vibrotactile neurofeedback training on postural stability in older adults with hearing impairment: a randomised double-blind, placebo-controlled multi centre trial.

- **Brisbane:** School of Health and Rehabilitation Science, University of Queensland
- Primary aim of the study is to assess the efficacy of 10-days of individualised vibrotactile neurofeedback training on postural stability and balance performance in the older adult with hearing loss, compared with placebo and control groups.
- Participants will be 60 years or older, moderate to severe hearing loss and self-reported dizziness, vertigo or unsteadiness for at least 12mths



Primary:

- Geriatric Standard Balance Deficit Test as measured by Vertiguard device (baseline, post-training, 6 months)

Secondary:

- Dizziness will be measured using the DHI
- Hearing disability and status will be measured using HHIE and SSQ12
- Physical activity levels will be measured using Physical Activity Scale for the Elderly and # steps/day from Garmin activity monitor
- Balance confidence will be measured using Activity-specific Balance Confidence (ABC) Scale
- Gait capacity will be measured using the Timed Up and Go (TUG) test
- Gait speed and spatio-temporal gait parameters will be measured during a 10m walk, at self-selected pace along an instrumented GAITrite mat

“The greatest glory in living
lies not in never falling,
but in **rising** every time we fall.”

- Nelson Mandela (1918 - 2013)
Former South African President
and 1993 Nobel Peace Prize

