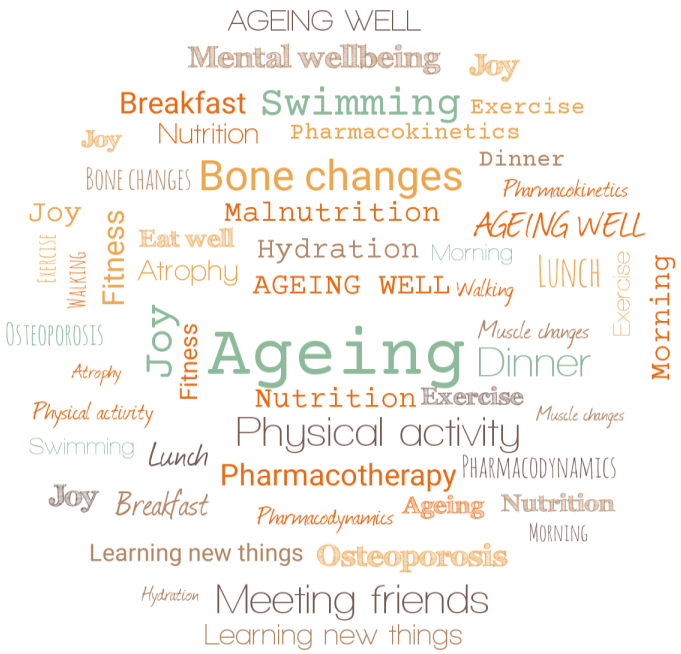


The Open University

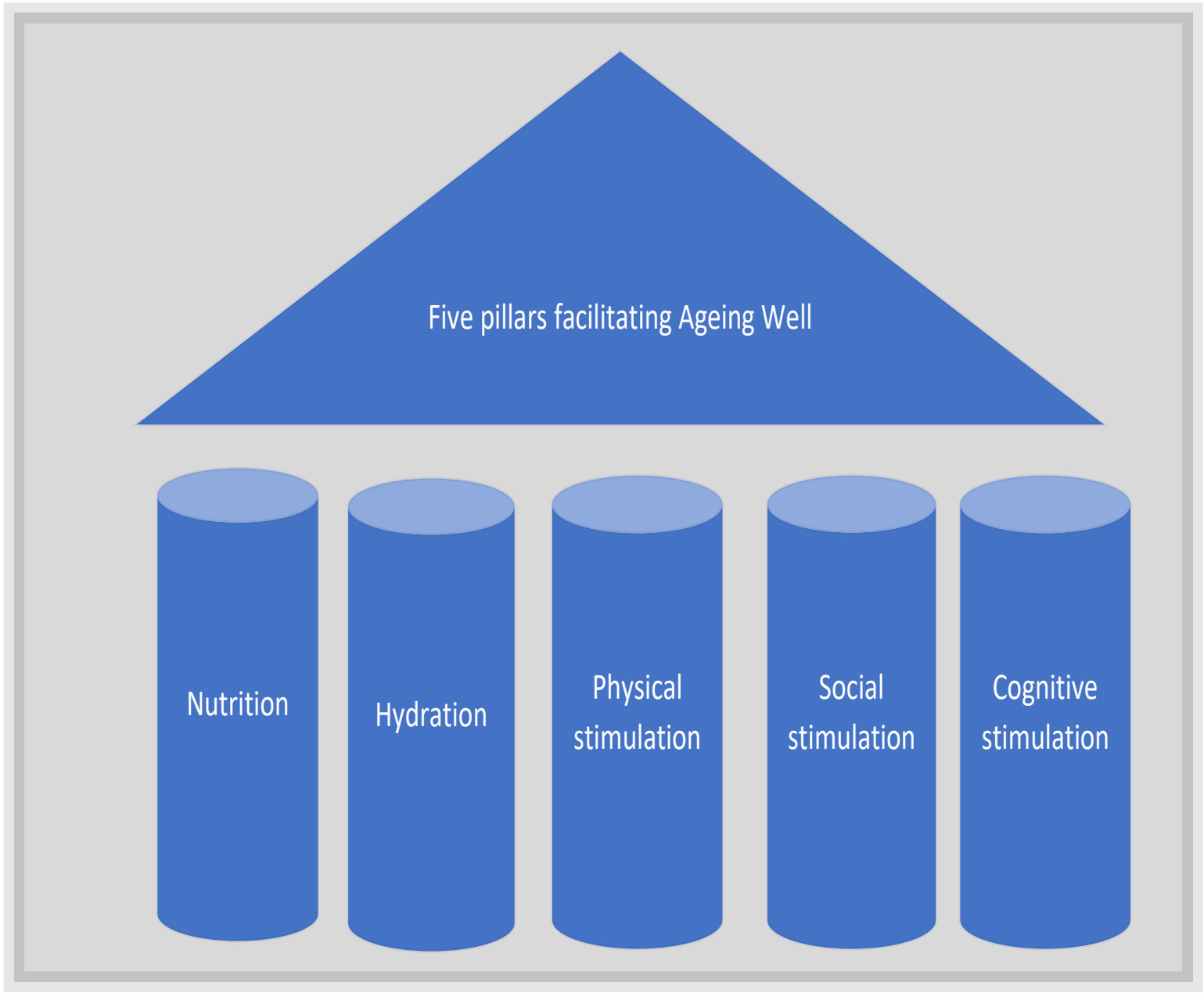
vhs
voluntary health scotland

Ageing Well Series
Talk 4. Pharmacotherapy while ageing

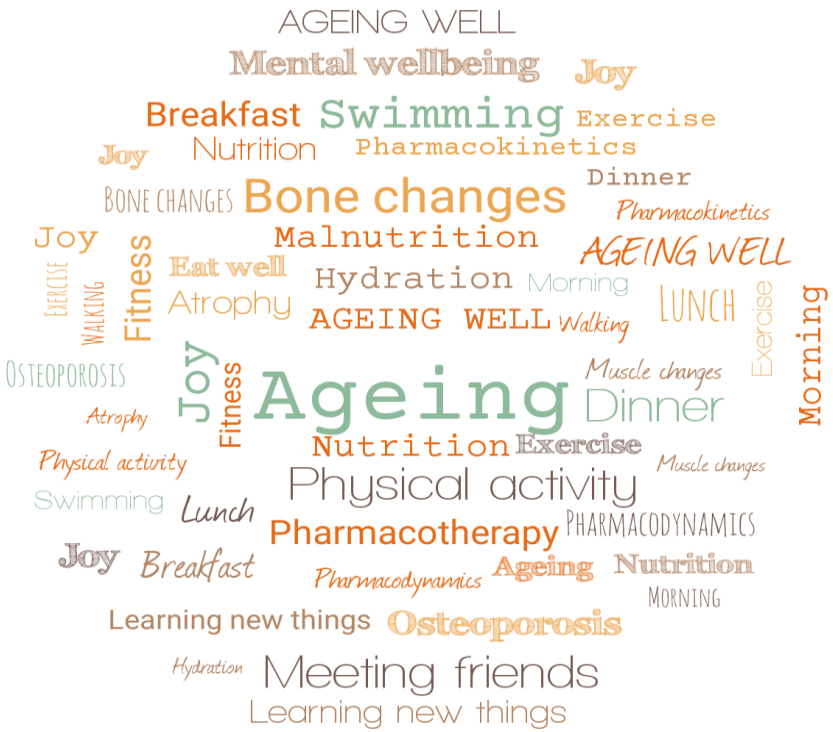
Dr Jitka Vseteckova , Senior Lecturer health and Social Care, PhD, D.Prof, SFHEA,
Faculty WELS
The Open University

Today's talk – in partnership with Voluntary Health Scotland

- The world population is rapidly ageing & we are all ageing since the day we are born.
- Physical and psychological/cognitive decline that happens at different speeds for different individuals.
- Ageing processes are in general very difficult to predict.
- Genetic predispositions we may need to take into account regarding the overall ageing the process is also co-defined by what we actually do about it.
- **USE IT OR LOSE IT** - in other words, both cognitive and physical stimulation while ageing, help to preserve cognitive and physical functions we don't want to lose. **Especially during COVID-19 times.**
- **The Five Pillars of Ageing Well**



The Open University



1. Are we prepared to live longer? (basic biomedical and psycho-social aspects of ageing, age-related conditions e.g. bone health, frailty etc. and overview of the next talks)

2. Ageing brain (basic facts on neurodegenerative conditions associated with ageing and age-related and non age-related memory loss)

3. Nutritional needs of ageing (What nutrients we tend to lose while ageing and what nutrients and diet/eating habits we should keep an eye on)

4. Pharmacotherapy while ageing (age-related changes in pharmacokinetics and pharmacodynamics – how the drugs behave in our body while ageing)

5. Move it and breathe (more detailed journey into age-related changes in muscles, tendons, bones and the importance of breathing well, exercising well and enough)

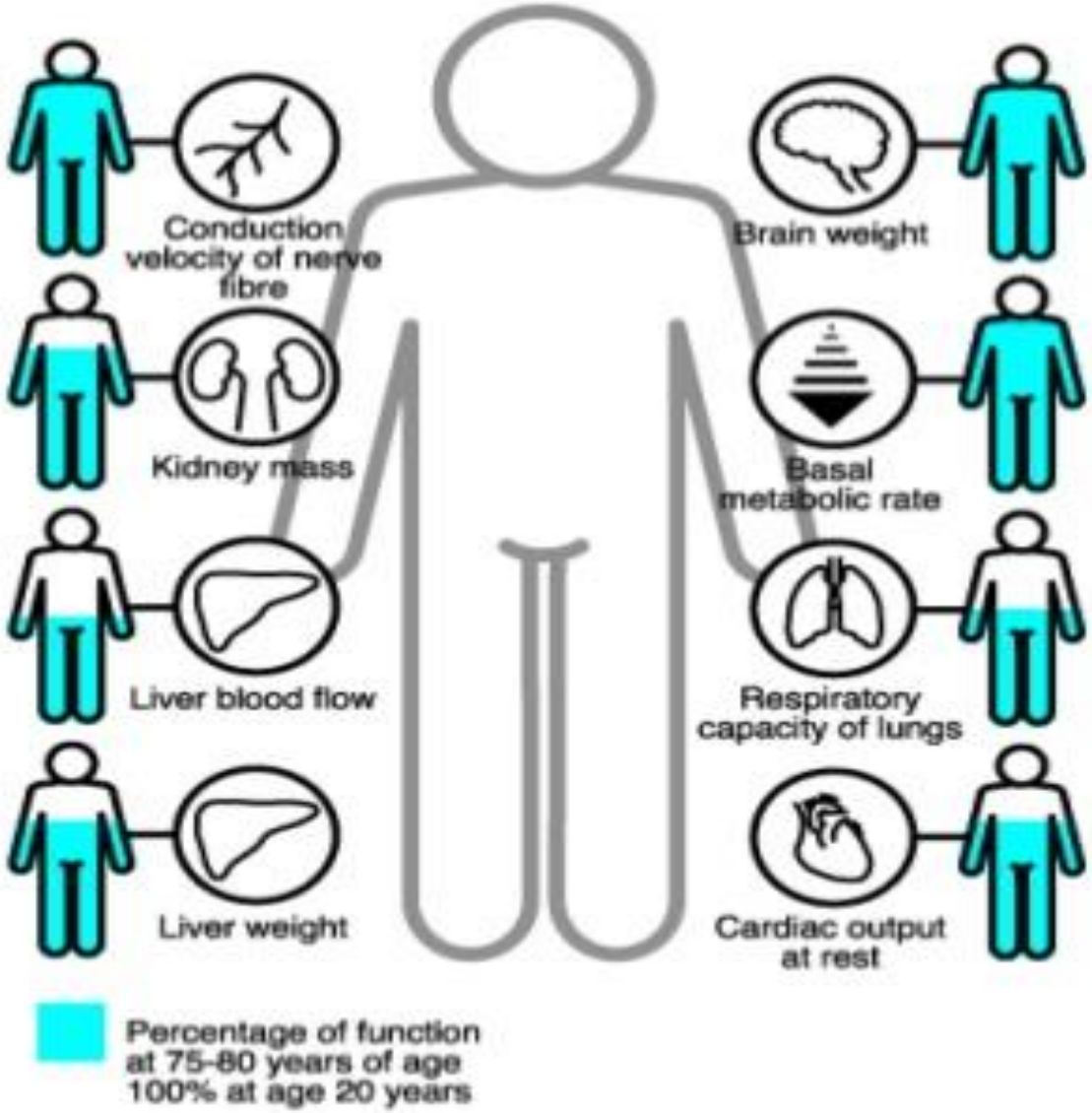
6. Standing tall (more detailed journey into age-related postural alignment changes affecting postural stability and balance, and ways to compensate for 'gravity of ageing')

- All the way through the '**Ageing Well'** talks we explore how using this knowledge might facilitate self-management, become partners in our care and delay the ageing processes for as much as we can.

- The **emphasis** of the '**Ageing Well'** series is on **optimizing cognitive and physical well-being,** physiological ageing and self-management. To a lesser extent, on pathological processes while ageing.

- **Promoting physical activity, social activity, networking, learning and healthy lifestyle**
- **Building bridges**

Effect of Aging on Body Physiology



- Decrease in :
  - Conduction velocity of verves
  - Brain weight
  - Cerebral flow
  - Kidney mass
  - Basal metabolic rate
  - Liver blood flow
  - Liver weight
  - Capacity of lungs
  - Cardiac output
- More prone to electrolyte disbalances

Pharmacotherapy while ageing

- Changes related to physiological ageing (muscle, metabolism, kidney, liver)
- Comorbidity / poly-morbidity resulting in **poly-pharmacy**

- **Dehydration**
- Malnutrition/undernutrition

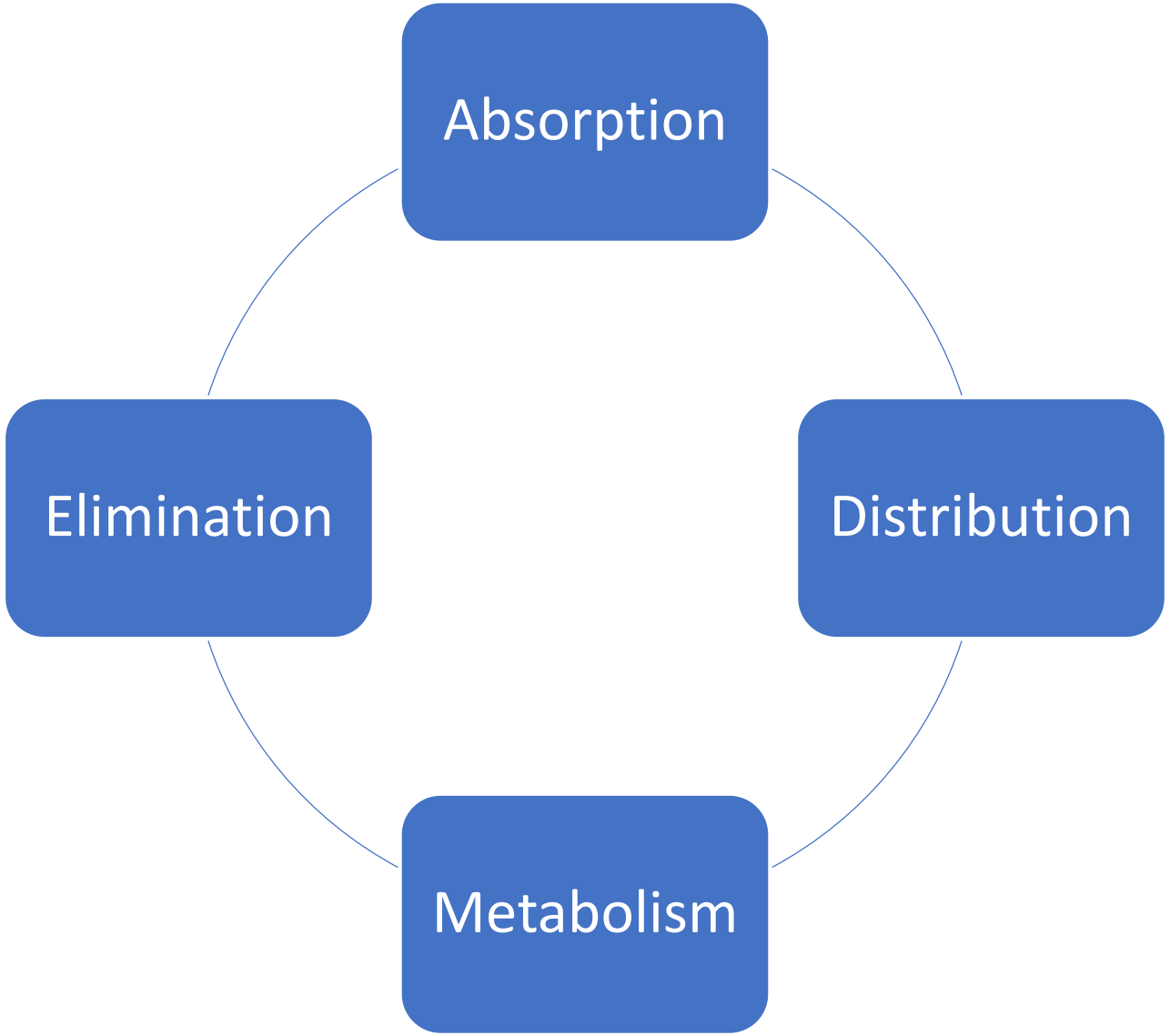
- **Pharmacokinetics**
- **Pharmacodynamics**

- Polypharmacy & drug interaction & severe drug side effects

- **Exercise & Five Pillars of Ageing Well**

- **THE LESS TIME THE DRUG STAYS IN THE BODY THE BETTER**

Drug journey



What affects drug absorption

- gastric PH
- taking drugs on an empty stomach
- having vitamins or minerals or caffeine at around the same time as the drug
- solubility of the drug (water, lipid)
- dosage, chemical nature, route of administration,
- hydration/dehydration

What affects drug distribution

- capacity of a blood vessel wall to allow for the flow of small molecules in and out of the vessel
- regional blood flow & cardiac output
- type of the tissue and the ability of the drug to bind tissue and plasma proteins,
- its lipid solubility,
- pH
- hydration/dehydration

What affects drug metabolism

- **anything that increases** the rate of **metabolism will decrease the duration** and intensity of the drug action **and vice versa**
- **EXERCISE**
- **HYDRATION**
- dose
- frequency
- route of administration,
- liver & kidney & heart **FUNCTION**
- **hydration/dehydration**

What affects drug elimination

- **kidney function** (altered while ageing)
- urine pH and urine flow - **HYDRATION**
- tears, perspiration, saliva, respiration, milk, faeces, bile
- **metabolic rate** & liver enzymes
- reduction in total liver size (associated with ageing or pre existing condition)
- **reduction in liver blood flow** (40-50% reduction between 25 and 65 years of age)
- Lack of **EXERCISE**

Biology & ageing

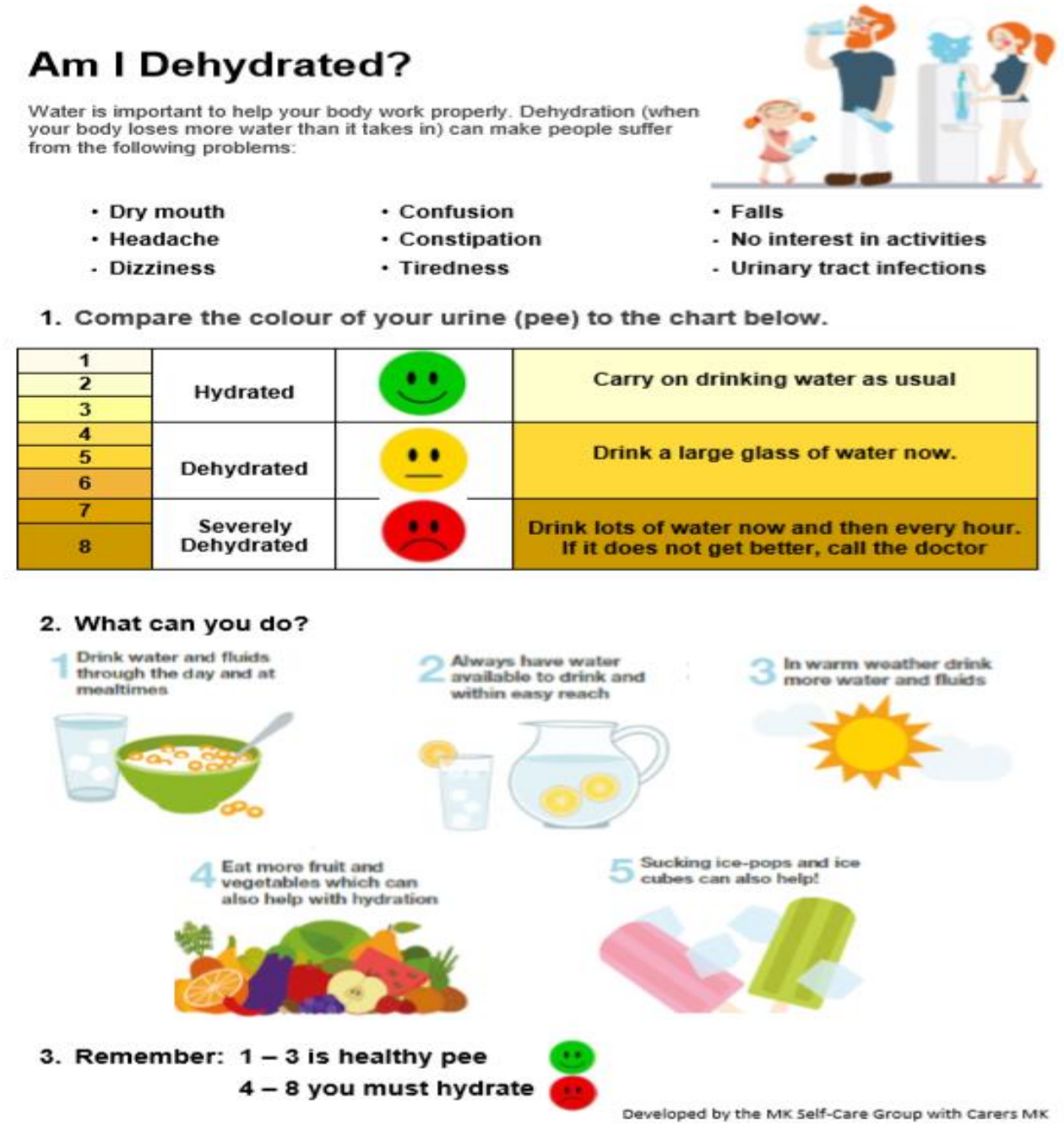
- Mechanisms of **changes in basal metabolism during ageing**. A considerable number of physiological functions are known to show a gradual decline with increasing age
- **Muscle mass and total body water are reduced**, which can affect pharmacokinetics, especially of hydrophilic drugs- water soluble drugs
- Conversely, **body fat increases** from 20 to 40% with age, affecting absorption and metabolism especially of lipophilic drugs – fat soluble drugs

- Age-related **CARDIO-VASCULAR CHANGES** decrease in the overall blood flow – heart rate, heart function, flexibility of vessels and arteries
- **LOWER HEART RATE AT REST**
- Decrease in **kidney function and liver blood flow**
- As a consequence, **drug clearance decreases**

- **DEHYDRATION & LACK OF EXERCISE**

TO SUM UP

- Many of the effects of aging on the heart and blood vessels can be reduced, slowed down by regular **exercise**
- Helps people **maintain cardiovascular fitness as well as muscular fitness** as they age.
- **EXERCISE** is beneficial regardless of the age at which it is started.
- **Dehydration**



Am I Dehydrated?

Water is important to help your body work properly. Dehydration (when your body loses more water than it takes in) can make people suffer from the following problems:

- Dry mouth
- Headache
- Dizziness
- Confusion
- Constipation
- Tiredness
- Falls
- No interest in activities
- Urinary tract infections

1. Compare the colour of your urine (pee) to the chart below.

1 2 3	Hydrated		Carry on drinking water as usual
4 5 6	Dehydrated		Drink a large glass of water now.
7 8	Severely Dehydrated		Drink lots of water now and then every hour. If it does not get better, call the doctor

2. What can you do?

1 Drink water and fluids through the day and at mealtimes

2 Always have water available to drink and within easy reach

3 In warm weather drink more water and fluids

4 Eat more fruit and vegetables which can also help with hydration

5 Sucking ice-pops and ice cubes can also help!

3. Remember: 1 – 3 is healthy pee
4 – 8 you must hydrate

Developed by the MK Self-Care Group with Carers MK

Drug related problems in older adults

- **Dehydration**
- **Overuse** – **polypharmacy –** may lead to cumulative effect – **TOXICITY (brain, kidneys, CV system, liver)**

- **Inappropriate prescribing** (inappropriate prescribing can be defined as prescribing drugs whose use should be avoided because their risk outweighs their potential benefit) - may lead to cumulative effect – **TOXICITY (brain, kidneys, CV system, liver)**

- **Underuse or omission –** may not get you treated for the specific condition

- **It doesn't work!!!** – the same drug and the same amount of it can take longer to take its effect when we are older…wait for it… **don't take another pill** – **TOXICITY (brain, kidneys, CV system, liver)**

- **Diuretics**

- A study showed that **25% of the adverse drug reactions** reported in an older adult population were **related to diuretic therapy,** and all those admitted to hospital with **medication-related falls** were on diuretics

- Dehydration of as little as **2% of total body water** can result in a significant **impairment in physical, visuomotor, psychomotor and cognitive performances**

Drug related effects in the older adults

- Analgesia & increased sedation
- Decreased BP, decreased heart rate
- Vasoconstriction / vasodilatation – blood circulation not ideal
- More regular blood tests required by the GP

Side effects

- Psychomotor dysfunction, confusion
- Sedation, slowed reaction time & **LACK OF EXERCISE**
- Dizziness, worsened coordination
- **Massively increased risk of falls!!!!!**

Accumulation of age related changes results:

- **Drugs take longer to act and stay for longer** (2– 3 times)
- Drugs **accumulation & drug to drug interaction**
- **Increased sedation** effect
- **Increased risk of falls** and **fractures**
- **Cognitive dysfunction**
- Dependence – **withdrawal syndrome**
- **Limited mobility, limited**
- **Independence, limited engagement** as cognitive functions and/or attention span may be impaired
- Adding **DEHYDRATION** and **LACK OF EXERCISE**…

Kidney and age related changes

- Irreversible **structural** and **functional** changes
- Loss of renal mass due to glomerular loss

- Ability to secrete potassium and excrete hydrogen is impaired
- **Reduction** in **renal blood flow**
- **Clearance** in the aged kidney is also **reduced**

- These changes impair the ability of the kidney to control water and electrolyte balance, predisposing to **dehydration** and **electrolyte abnormalities**, particularly in situations of **physiological stress**.

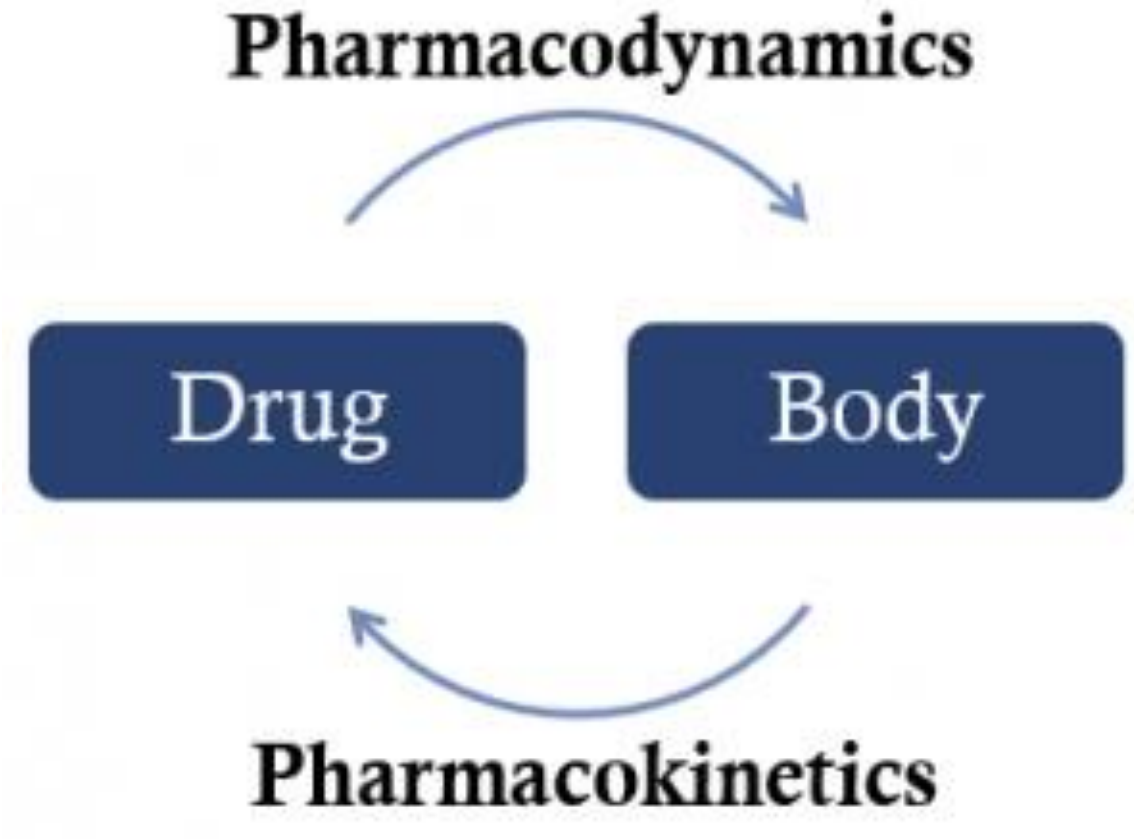
Hormonal changes associated with ageing

- Affect fluid and electrolyte homeostasis → **electrolyte abnormalities** & **dehydration**
- Antidiuretic hormone **ADH** - in older adults there is loss of the nocturnal rise in ADH, high prevalence of **nocturia**
- Along with **reduced renal sensitivity** to ADH, limits the ability to respond to extracellular fluid depletion – **further dehydration**

The thirst response while ageing

- **Feel less thirsty**
- Is blunted and we may forget to drink or not remember whether we drank…
- Spontaneous consumption of fluids decreases
- **Extreme vulnerability** to **dehydration** in a state of **physiological stress**

Impact of ageing on the drug journey and its action



Drug absorption

Ageing may slow down the rate at the which drugs are absorbed, but it is rarely considered clinically significant

Drug distribution

- Decreased muscle mass and dehydration leads to higher concentration of water soluble drugs for a given dose
- Lipophillic drugs concentrate in adipose tissue and the brain. Drugs are slower to clear from fatty tissue – accumulation more likely, CNS effects
- Certain drugs are highly protein bound. Liver damage and malnourishment lead to lower circulation proteins and increase in concentration of free drug
- Blood flow to tissues and organs and active uptake of drugs into tissues may also be influenced by ageing.
- The blood-brain barrier may be more permeable as we age

Drug metabolism

- The liver is the major organ responsible for drug metabolism
- Small amount of age-related decline due to reduced hepatic volume and reduced activity of certain hepatic enzymes
- Rarely significant in the absence of liver disease
- Age-related decreases in hepatic blood flow can decrease the metabolism of drugs with a high first pass metabolism
- Ability of the liver to withstand stress decreases – increased injury due to hepatotoxic medicines
- Some drugs have the ability to induce or inhibit enzymes
- Liver function is not easily measurable and clinical significance can be hard to determine

Drug elimination

- Excretion via the kidneys is the most significant age related change – predictable and measurable
- Reduction in rate of clearance leads to accumulation – can happen very slowly and signs of toxicity may take a while to appear
- Certain drugs rely on good renal functioning to exert their effect
- Some drugs are actually nephrotoxic and the overall risks and benefits may need balancing
- Regular blood tests support decision making on dose and appropriateness
- Older people are at a higher risk of acute kidney injury – occurs quickly but can be managed if identified early. Causes can include dehydration, acute illness, infection, drug interactions

Pharmacodynamics

- Drug action in the body is affected by receptor binding, post receptor effects, and chemical interactions, residence time
- Pharmacological effect can be therapeutic or undesirable (side effects and drug interactions)
- Homeostatic changes associated with ageing can be manageable until the introduction of a medicine
- Blunted reflex tachycardia -> orthostatic hypotension so drugs that lower BP can lead to dizziness and falls
- Reduction in dopamine receptors hampers postural stability; postural sway also becomes an issue so drugs causing drowsiness can lead to falls
- Drugs can affect water balance in the body due to effects on sodium levels and bladder function

- Older people can struggle to regulate their body temperature. Drugs that act on the brain can lead to hypothermia, even in the summer
- Polypharmacy becomes problematic when someone is not deriving clinical benefit from a medicine or the negative effects of treatment outweigh beneficial outcomes
- Ageing and polypharmacy increases the risk of adverse drug reactions (ADRs) and exacerbations of chronic conditions
- Identifying ADRs is more difficult – often they are vague and non-specific
- The consequences are more serious in older people – ADRs account for 5-17% of hospital admissions
- Balancing the risks and benefits of prescribing in the older population is an art not a science!

Adapting treatment while ageing

- Reduce the dose of water soluble drugs
- Lipophillic drugs should be administered less frequently in addition to lower dose
- Where appropriate, use medicines when required e.g. pain relief
- Regular blood tests
- Older people on multiple medication should have 6 monthly reviews to review ongoing need, efficacy and potential harm
- Combination of factors to consider – physiology, multimorbidity, polypharmacy
- Heath status can change quickly - symptom relief & quality of life v. prevention
- Drug holiday – only where appropriate
- Practical issues – dexterity, sight, cognition, swallow, housebound, complex regimens, adherence

Personalised Care

- Knowledge of ageing and health behaviours are growing
- Lack of evidence for many treatments in older people with multimorbidity
- Complex medication regimes reduce adherence
- Patient activation
- Shared decision making – example patient decision aid
- Social issues – formal and informal carers
- Palliative care/end of life
- Medication review with a pharmacist

Alcohol

- **Very little research has been done**, and there are some particular problems for the older person.
- Health problems in older age can make us more susceptible to alcohol and can **interfere with the effectiveness of many medicines**. Check with your doctor about whether it is safe for you to drink with your particular health problem or medication.
- Hidden **dehydration**

- Drinking too much can damage many parts of the body and increase the risk of health problems including: Stomach lining – ulcers or bleeding; **Liver – cirrhosis**; Cancer – mouth

- **Malnutrition** - alcohol has calories but can not provide the essential nutrients a balanced varied diet provides to keep us healthy.
- Excessive alcohol intake can also **affect mental health including** increasing anxiety, depression, confusion.
- Excessive alcohol intake is **toxic to brain cells**, and alcohol abuse leads to memory loss. Over time, alcohol abuse may also increase the risk of dementia.

Dehydration

- **Ageing** produces a **decrease in our thirst sensation** so it is easy for dehydration to go unnoticed. So as we age, it is especially important to drink plenty of water and other non-alcoholic beverages.

- **Early signs of dehydration include dizziness, tiredness, headaches, drowsiness, memory loss, and other symptoms that look like dementia**.
- **Long-term mild dehydration increases the risk of kidney stones, constipation and cholesterol problems, as well as diminished physical and mental performance**.
- **Severe dehydration can cause 'dementia like' symptoms**

- It's important to stay hydrated (aim for 6-8 cups per day, **strict minimum 1.5 l / day**). Be particularly vigilant if you take diuretics or laxatives or suffer from diabetes, high blood sugar, or diarrhoea.

Exercising regularly

- **Increase the metabolic rate**
- **Increase life expectancy**
- Help **protect against heart**
- **disease, stroke, diabetes, some cancers, depression and dementia**
- **Help you to maintain a good appetite**
- Help you to **keep mobile**
- **Reduce bone loss and strengthen muscle** – reducing your risk of falling and fracturing bones
- **Improve** your sleep, **mood** and sense of well-being
- **Help with joint stiffness and pain associated with arthritis**
- The more of the above the less medication you need

Links

NICE guidelines

- Medicines optimisation: the safe and effective use of medicines to enable the best possible outcomes https://www.nice.org.uk/guidance/ng5
- Multimorbidity: clinical assessment and management https://www.nice.org.uk/guidance/ng56
- https://www.nice.org.uk/about/what-we-do/our-programmes/nice-guidance/nice-guidelines/shared-decision-making
- https://www.nice.org.uk/guidance/cg180/resources/patient-decision-aid-243734797

COVID-19 related

- Vseteckova J, **How to age well, while self-isolating** (2020) https://www.open.edu/openlearn/health-sports-psychology/how-age-well-while-self-isolating
- Vseteckova J, (2020) **SHORT FILM - Ageing Well in Self-isolation** https://youtu.be/LU4pXFgcGos
- Vseteckova J, (2020) ANIMATION - **Keeping healthy in Self-isolation** https://youtu.be/M9yUC-MUugA
- Vseteckova J et al (2020) **The effects of self-isolation and lack of physical activity on carers** https://www.open.edu/openlearn/health-sports-psychology/social-care-social-work/the-effects-self-isolation-and-lack-physical-activity-on-carers
- Vseteckova J & King J (2020) **COVID-19 Interview podcast for The Retirement Café: *'Ageing Well Under Lockdown'*** https://theretirementcafe.co.uk/077-dr-jitka/

AGEING WELL related

- Vseteckova J (2020) **Ageing Well Public Talk Series- landing page OpenLearn** https://www.open.edu/openlearn/health-sports-psychology/health/the-ageing-well-public-talks
- Vseteckova J (2019) **5 reasons why exercising outdoors is great for people who have dementia** https://www.open.edu/openlearn/health-sports-psychology/mental-health/5-reasons-why-exercising-outdoors-great-people-who-have-dementia https://doi.org/10.21954/ou.rd.c.4716437.v1
- Vseteckova J (2019) **Depression, mood and exercise** https://www.open.edu/openlearn/health-sports-psychology/mental-health/depression-mood-and-exercise?in_menu=622279 https://doi.org/10.21954/ou.rd.c.4716437.v1
- Vseteckova J (2019) **Five Pillars for Ageing Well** https://www.open.edu/openlearn/health-sports-psychology/mental-health/five-pillars-ageing-well https://doi.org/10.21954/ou.rd.c.4716437.v1
- Vseteckova J (2020) **Ageing Brain** https://www.open.edu/openlearn/health-sports-psychology/health/the-ageing-brain-use-it-or-lose-it

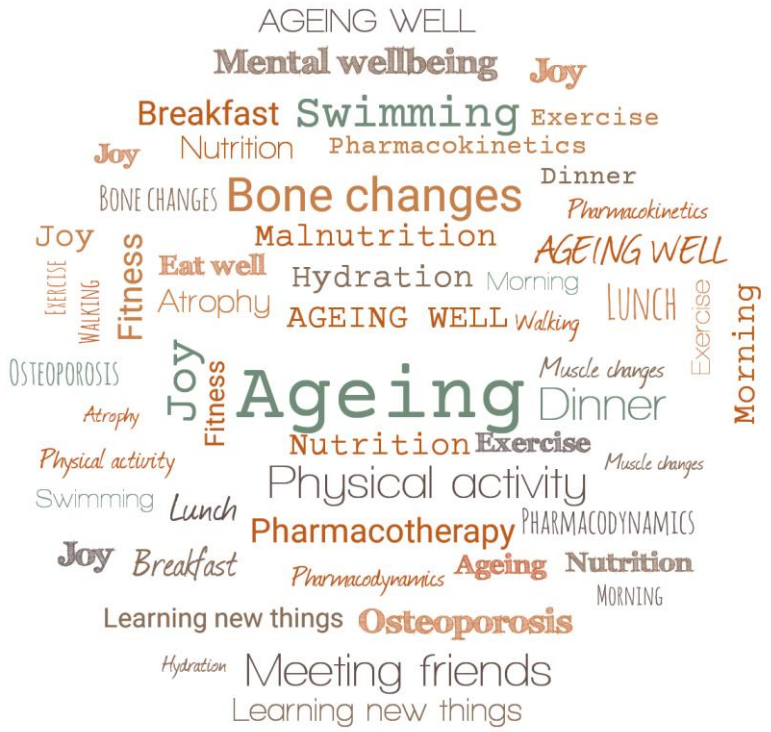
Ageing Well series of Public Talks

"*Being mindful of eating well, hydration, physical activity, learning new things and social connections can delay the decline caused by ageing.*

Come and join us for the series of public talks with the title "Ageing Well"

Dr. Jitka Vseteckova

Senior Lecturer, Health and Social Care



Venue: online recorded & Berrill Lecture Theatre, Walton Hall, Milton Keynes, MK7 6AA, talks held 11AM-1PM

Ageing Well series of Public Talks - topics

- ***Are we prepared to live longer?*** *(Jitka Vseteckova)* ***September 23rd 2020***
- ***Advanced care planning*** *(Barbara Gale & Erica Borgstrom)* ***October 21st 2020***
- ***Ageing brain*** *(Jitka Vseteckova & Stephanie Warren)* ***November 18th 2020***
- ***Learning languages and digital technologies in older age*** *(Ursula Stickler)* ***December 2nd 2020***
- ***Care and caring in older age*** *(Mary Larkin)* ***January 20th 2021***
- ***Nutritional needs while ageing*** *(Jitka Vseteckova)* ***February 24th 2021***
- ***Pharmacotherapy while ageing*** *(Jitka Vseteckova & Sonal Mehta)* ***March 24th 2021***
- ***Mindfulness and ageing*** *(Adele Pacini)* ***April 14th 2021***
- ***Move it and breathe*** *(Jitka Vseteckova & Declan Ryan)* ***May 19th 2021***
- ***Standing tall*** *(Jitka Vseteckova & Jason Gibb)* ***June 16th 2021***
- ***The things we don't talk about – Intimacy and ageing*** *(Andreas Vossler)* ***July 14th 2021***

Useful resources:

https://ordo.open.ac.uk/collections/Ageing_Well_Public_Talk/4716437

https://www.open.edu/openlearncreate/course/view.php?id=5016

Thank you for supporting the ‘Ageing Well Public talk’ series