Reflecting on the relationship between nutrition and health.

Exploring the characteristics of motivation and learning for healthy aging

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Nutritional needs while ageing

Today's lecture

- The world population is rapidly ageing.
- 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.

- **Nutrition plays an important role**

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 (26th November 2019)

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

3. Nutritional needs of ageing (28th January 2020)

(explore what we need to consider around nutrition while ageing and how to support people to eat regularly and well)

4. Pharmacotherapy while ageing (25th February 2020)

(age-related changes in pharmacokinetics and pharmacodynamics)

5. Move it and breathe (24th March 2020)

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

6. Standing tall (28th April 2020)

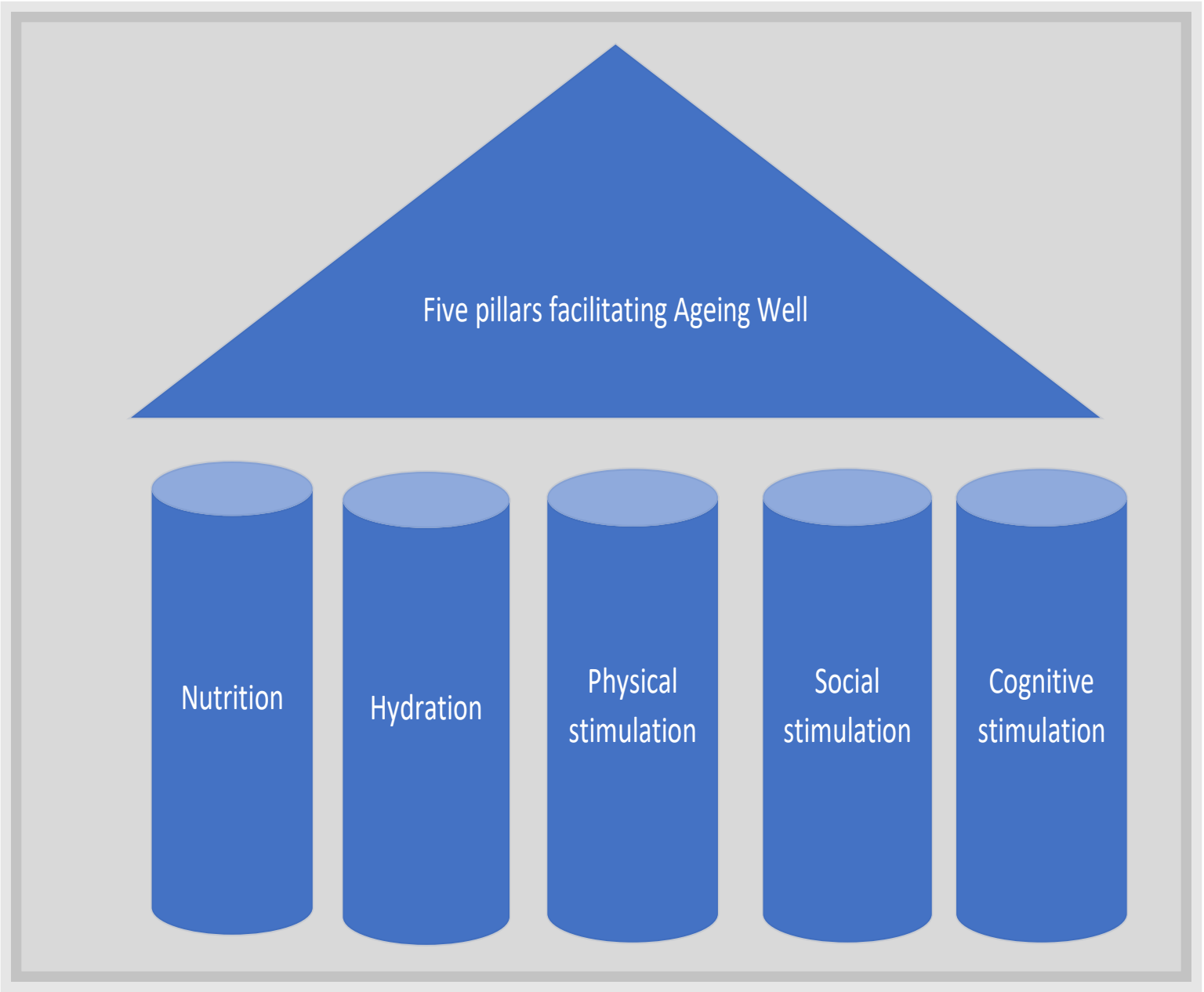
(more detailed journey into age-related postural alignment changes affecting postural stability and balance, and ways to compensate for 'gravity of ageing')

- 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 - socialising, learning anything at any point in time, the more the better and healthy lifestyle**
- **2 stretching session in each lecture**
- **Short evaluation forms**

- **EXIT AND LAVATORIES**


Five pillars facilitating Ageing Well
Nutrition
Hydration
Physical stimulation
Social stimulation
Cognitive stimulation


AGEING WELL
Mental wellbeing
Joy
Breakfast
Swimming
Exercise
Joy
Nutrition
Pharmacokinetics
Dinner
BONE CHANGES
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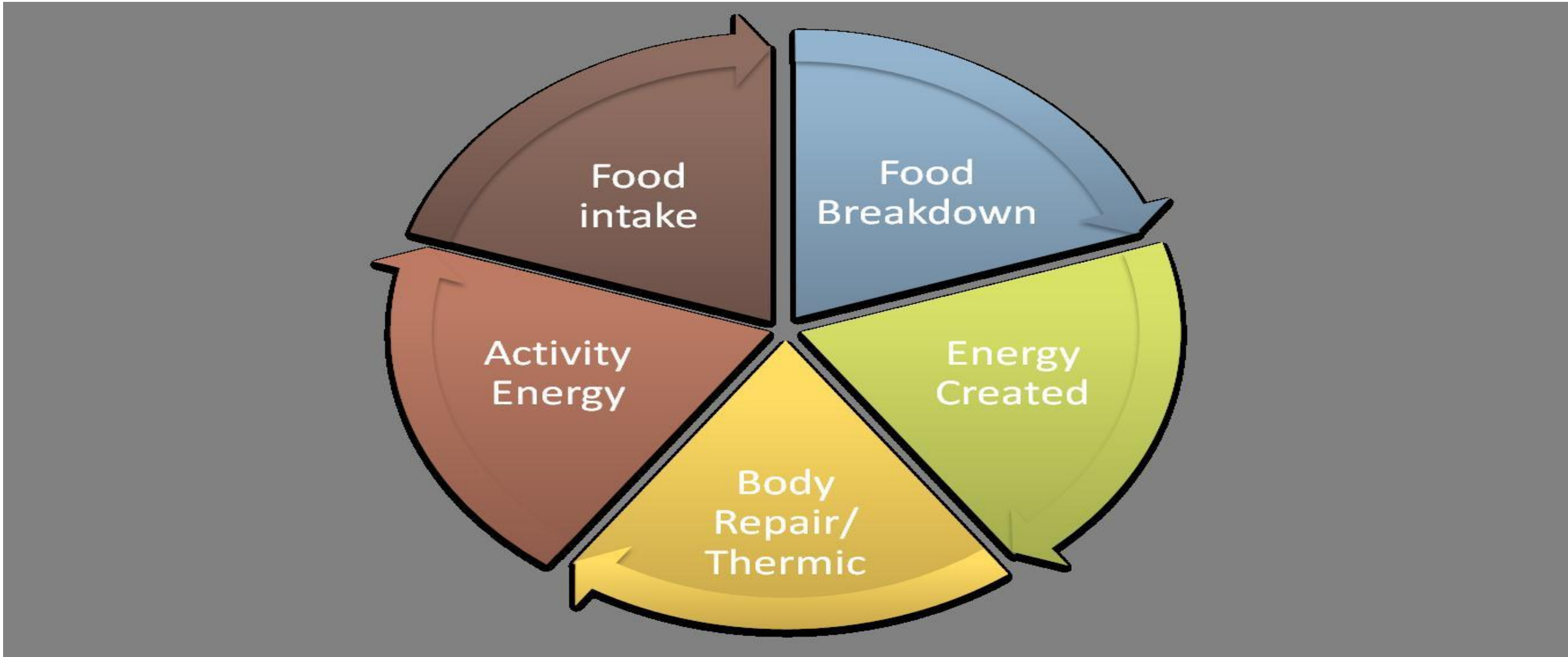
STANDING UP / SITTING DOWN

- Raising up principle - STRAIGHTENING YOUR SPINE
- Proprioception – feeling different parts of your feet on the floor
- Slightly pressing the inner side of your foot to the floor
- Stretching your toes
- Pushing yourselves away from the ground
- Moving head or arms should not necessarily change the way we stand

Why do we need food?



Metabolism & Nutrition & Energy

Metabolism is a term that is used to describe all chemical reactions involved in maintaining the living state of the cells and the organism.

Metabolism is closely linked to nutrition and the availability of nutrients.

Metabolism can also refer to the sum of all **chemical reactions** that occur in living organisms, including **digestion** and the **transport of substances** into and between different cells and tissues. https://en.wikipedia.org/wiki/Metabolism

Three basic metabolic systems

1. Anaerobic A-Lactic (ATP-CP) Energy System

- The anaerobic a-lactic (ALA) system, provides high bursts of start-up energy for activities that last **less than ten seconds in duration** (weight lifters, sprint runners etc).
- The ALA system does not create energy for sufficient duration to create a great deal of waste products (lactic acid).

2. Aerobic Lactic (Glycolytic) System

- The anaerobic lactic (AL) provides energy **for medium to high intensity bursts** of activity that lasts from ten seconds to two minutes. Middle distance runners (400m-800m) and sprinters rely on this system.
- The anaerobic lactic system, as well as the ATP-CP system, **are capable of high intensity levels, and do not rely on oxygen for fuel.**

3. Aerobic Energy System

- The aerobic system is the most utilized of the three. It provides **energy for low intensity activities** that last anywhere from two minutes to a few hours. Unlike the other two systems, **the aerobic system requires oxygen and takes much longer to overload.** Sports and activities that use continuous sustained efforts such as long distance swimming, walking etc.

- **Nutrition & Hydration & Physical activity are the key to good functioning metabolism**.

- **Food provides a variety of substances that are essential for the building, upkeep, and repair of body tissues, and for the efficient functioning of the body.**

- **Measure / variety**
- The major elements are supplied in **carbohydrates, lipids/ fat, and protein**. **In addition, vitamins, minerals and water are necessary.**

Carbohydrates

- Foods supply carbohydrates in three forms: **starch, sugar, and cellulose (fibres).** Starches and sugars form major and essential sources of energy for humans.

- **Body tissues & brain (2% or body weight - 20%) depend on glucose for all activities**. Carbohydrates and sugars yield glucose by digestion or metabolism.

- Not enough – **headaches, weakness, feeling sick, dizziness and irritability**
- Too much – **high blood sugar levels, more insulin needed, we save more as fat**, increased thirst, **headaches & tiredness, brain functional connectivity, memory loss, impaired learning, concentration, linking to diabetes – depression, anxiety, cognitive dysfunction**

- Most people consume around half of their diet as carbohydrates. This comes from rice, wheat, bread, potatoes, pasta etc. NHS suggests between 30-50% wholegrains, potatoes, vegetables, fruits etc. https://www.nhs.uk/live-well/eat-well/

Proteins

- **Proteins are the main tissue builders in the body**. They are part of every cell in the body. **Proteins help in cell structure, functions, haemoglobin formation to carry oxygen, enzymes to carry out vital reactions**.

- Foods with the best quality protein are **eggs, nuts, milk, soybeans, meats, vegetables, mushrooms and grains**.

- https://www.nhs.uk/live-well/eat-well/

Fat

Fats are concentrated sources of energy. They produce twice as much energy as either carbohydrates or protein on a weight basis. Fatty acids – body cannot produce itself, helps absorb vitamins (A, D, E, K)

Further functions of fats include:

- helping to form the cellular structure; build and repair cell membranes (skin, hair, eyes & brain)
- forming a protective cushion and insulation around vital organs;
- providing a reserve storage for energy

Too much (in bloodstream) - high cholesterol, fatigue, shortness of breath, chest pain,

Not enough – worsened body temperature regulation, very little padding and protection for our organs, dry hair/hair loss, inability to concentrate, mental fatigue, constant fatigue

- https://www.nhs.uk/live-well/eat-well/different-fats-nutrition/

Minerals & Vitamins

The minerals in foods do not contribute directly to energy needs but are important as body regulators and play a role in metabolic pathways of the body. More than 50 elements are found in the human body. About 25 elements have been found to be essential, since a deficiency produces specific deficiency symptoms.

- **calcium**
- **phosphorus**
- **iron**
- **sodium**
- **potassium**
- **chloride ions**
- **Copper, cobalt, manganese**
- **zinc**
- **magnesium**
- **fluorine**
- **iodine**
- Vitamins are essential organic compounds that the human body cannot synthesize by itself and must therefore, be present in the diet. Vitamins particularly important in metabolism include:
- **Vitamin A**
- **Vitamins B B2 (riboflavin)**
- **Niacin or nicotinic acid**
- **Pantothenic Acid etc.**

6 Winning strategies to preserve long term muscle health

Borecole Nutrition

Plenty of antioxidants

Vitamin D

ω 3 fatty acids

Adequate protein intake

Resistance training

Folic acid and B12

British Nutrition Foundation

- Eat an enjoyable and varied diet
- Watch your weight and waist size
- Eat plenty of fruit and veg
- May wish to opt for healthier fats
- Include oily fish in your diet
- Get enough fibre
- Reduce your salt intake
- Eat calcium-rich foods
- Boost B vitamins
- **Keep well hydrated**

- Discuss taking vitamin D supplement if you are over 65 with your GP
- Remember supplements and functional foods don't replace a healthy diet

- **Be physically active**
- **Go easy on alcohol**
- **Look after your teeth**
- **Don't smoke**
- **Get enough sleep**
- **Keep your brain stimulated**

https://www.nutrition.org.uk/healthyliving/healthyageing.html

Enjoyable and varied diet

- Our sense of **taste and smell can change as we age**, which can affect our appetite and how much we like food.
- Dental problems and ill fitting dentures
- Less interested in food
- Less hungry
- Forgetfulness

- **Good & REGULAR** nutrition - **PRIORITY** (will hep body work round the clock)
- Make food time a social time, make foods as tempting and tasty as possible so that eating stays enjoyable.
- Keep meals from becoming bland and uninteresting by varying colours and textures as much as possible. **CAREFUL WITH SALT**
- Try adding herbs and spices such as mint, rosemary, cinnamon or paprika.
- Certain medicines, smoking and alcohol may affect the way the body absorbs nutrients.

Excess weight and waist circumference

- Our body composition changes and we tend to lose muscle and gain fat.
- Many people also become less physically active as they age
- As we get older our energy needs can decrease so it can be **easier to gain weight**

- Hormonal changes as we get older also mean we become more likely to lay fat around the middle
- This is because obese people who carry too much weight around their middle have a greater risk of **developing heart disease, high blood pressure, some types of cancer (colorectal, PM breast, uterine, ovarial, oesophageal, gall bladder, kidney, pancreatic) and type 2 diabetes**

- Weight is usually converted to Body Mass Index or BMI (weight (kg)/height (m2)). The standard World Health Organisation classifications for BMI:

	BMI
Normal weight	18.5-24.99
Overweight	25-29.99
Obese	30 and over

Our BMI is a good starting point but we should also measure our **waist**. People who carry too much weight around their middle have a greater risk of developing heart disease, high blood pressure, cancer and type 2 diabetes.

	Your health is at risk if you have a waist size of:	**Your health is at high risk if you have a waist size of:**
Men	Over 94cm (about 37 inches)	Over 102cm (about 40 inches)
Women	Over 80cm (about 31.5 inches)	Over 88cm (about 34.5 inches)
Asian men		Over 90cm (about 35.5 inches)
Asian women		Over 80cm (about 31.5 inches

https://www.nutrition.org.uk/healthyliving/healthyageing/top-tips-for-healthy-ageing?start=2

Diabetes

- Type 1 https://www.diabetes.org.uk/type-1-diabetes
- Type 2 https://www.diabetes.org.uk/diabetes-the-basics/what-is-type-2-diabetes

- One of the most undiagnosed conditions of our times.
- One that causes massive complications if untreated/**un-compensated**

Main symptoms:

- Going to the toilet a lot, especially at night, being really thirsty
- Feeling more tired than usual
- Losing weight without trying to
- Genital itching or thrush
- Cuts and wounds take longer to heal
- Blurred vision

Diabetes Type 1

- **Type 1 diabetes** is a serious, lifelong condition where the blood glucose level is too high because our body can't make a **hormone** called **insulin.**
- About 8% (in the UK)
- Insulin allows the glucose in our blood to enter our cells and fuel our bodies.
- Our body still breaks down the carbohydrate from food and drink and turns it into glucose (sugar). But when the glucose enters our bloodstream, there's no insulin to allow it into the body's cells. More and more glucose then builds up in the bloodstream. **Long-term**: high glucose levels in the blood can seriously damage heart, eyes, feet, kidneys…
- Our body tries to get rid of the glucose through our kidneys, and that makes us wee a lot – one of the main symptoms
- **Management**: injecting insulin/using a pump; checking blood sugar levels; keeping a careful eye on **FOOD & EXERCISE;** if untreated severe complications (coma, death)

Diabetes Type 2

- The vast majority of people with diabetes have type 2
- Severely undiagnosed in the population
- Starts usually with impaired glucose tolerance (the body's response to glucose in the blood stream is impaired – less and less insulin created/injected into the system when needed) causing raising glucose levels in the bloodstream
- **Management**: with the right treatment and care, the effects of diabetes and high blood sugar levels can potentially be reversed and certainly managed
- **healthier eating**; **EXERCISE**; **medication** (serious side effects – especially if we are not hydrating well, we don't exercise and don't adjust eating habits and further exhausts kidneys and liver)

Saturated vs non saturated fats

- On one hand - **Butter, lard, ghee, palm oil and coconut oil contain a high proportion of saturated fat**. Other foods with a relatively high saturated fat content **include cakes, chocolate, biscuits, pies and pastries. The white fat you see on red meat and underneath poultry skin is also high in saturated fat**.
- On the other hand - High-fat dairy products like butter have been linked to a reduced risk of obesity, diabetes, and heart problems if consumed with moderation.

- **Vegetable oils (such as rapeseed, olive, sunflower, soya, sesame oils) and fat spreads made from these oils are a healthier alternative to saturated fats.** These are high in unsaturated fatty acids. **Oily fish, including mackerel, sardines, pilchards and salmon, contain unsaturated fatty acids called omega-3s, which can also benefit heart health.**

- **Moderation, variety** – we have butter on the bread with eggs in the morning – perhaps we don't need to have the cake in the afternoon…
- **Processed/unprocessed** https://www.nhs.uk/live-well/eat-well/what-are-processed-foods/

- https://www.nutrition.org.uk/healthyliving/healthyageing/top-tips-for-healthy-ageing?start=4

Salt

- While some sodium in the diet is necessary for health, it can raise blood pressure (raised blood pressure is a major risk factor for stroke and heart disease). Salt (sodium chloride) is the main source of sodium in our diet.

- Adults should not have more than 6g of salt per day. The food industry are reducing the amount of salt in many foods but a lot of the salt we eat is found in processed foods and it is important to look at the labels to select lower salt options.

- A decreasing sense of taste as we age can encourage us to add more salt to meals for flavour.
- Watch the amount we add at the table and use herbs, spices and a variety of different foods to flavour meals instead of adding salt.

Fibre

- Eating plenty of fibre-rich foods, such as wholegrain breads, wholegrain breakfast cereals, brown rice, wholemeal pasta and some vegetables, fruit and pulses, will improve digestive health and can help to protect against heart disease, diabetes and some cancers.

- High fibre foods helps us to stay fuller for longer so can be useful if we are watching our weight. But if you have a poor appetite, **eat fibre rich foods in moderation** as filling up on bulky foods may prevent you from getting all the nutrients you need. It is also very **important to drink enough water when eating a diet high in fibre**.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- Raising up principle - STRAIGHTENING YOUR SPINE
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Calcium

- Calcium is important for the **development and maintenance of bones**. We lose bone mass as we age, so it is important that we consume plenty of calcium. Less calcium - **higher risk of osteoporosis** (thinning of the bones) and reduced bone density.

- As a result, it is particularly important that as we grow older especially as women we get plenty of calcium in the diet to minimise bone loss. Milk, cheese and yogurt are rich in calcium, but other sources include fish with edible bones (e.g. salmon, sardines), some green leafy vegetables like kale, calcium fortified soy products (e.g. soya drink, tofu), white bread and fortified breakfast cereals.

- We should be able to get all the calcium we need from our diet, but if we do take calcium supplements, be careful not to take too much.

- **Calcium & Vitamin D**

B vitamins

B vitamins have a range of important functions in the body, including contributing to healthy red blood cells, metabolism, nerve function, healthy skin, vision and reducing tiredness.

Sources of B vitamins in the diet:

- **Folate/Folic acid**: some green vegetables, and fortified grains and grain products
- **Vitamin B6**: fortified cereals, peanuts, pork, poultry, fish, milk and vegetables
- **Vitamin B12**: animal products (such as fish, meat, eggs, or dairy); fortified breakfast cereals and other fortified foods such as soya drink.
- **Vitamin B12** protects neurons and is vital to healthy brain functioning. In fact, a lack of B12 can cause permanent damage to the brain and create memory problems. Older people have a slower nutritional absorption rate, which can make it difficult for you to get the B12 your mind and body need. If you smoke or drink, you may be at particular risk.

D vitamin

Department of Health recommends certain supplements for some groups of people who are at risk of deficiency. People aged 65 years and over and people not exposed to much sun should also take a daily supplement containing 10 micrograms (0.01mg) of vitamin D.

- Vitamin D plays an important role in **bone health** (it is needed by the body to absorb calcium) and muscle function.
- Low levels of vitamin D can increase the risk of falls followed by fractures.
- Most of the vitamin D that your body needs is made in the skin from sunlight but our skin becomes less efficient in producing vitamin D from the sun as we age (fewer receptors in our skin) and our exposure to sunlight often declines, particularly for those who are less mobile.
- People with darker skin are at higher risk of deficiencies than those with whiter skin.
- Some vitamin D can also be obtained from dietary sources such as oily fish and eggs and fortified breakfast cereals, fortified fat spreads and fortified dairy products.

Alcohol

Alcoholic drinks can be enjoyed and are unlikely to be harmful for most people within the limits (max 14 units per week).

- **But very little research has been done**, and there are some particular problems for the older person. For example, 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
- Damage to brain cells with excessive drinking

- 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.

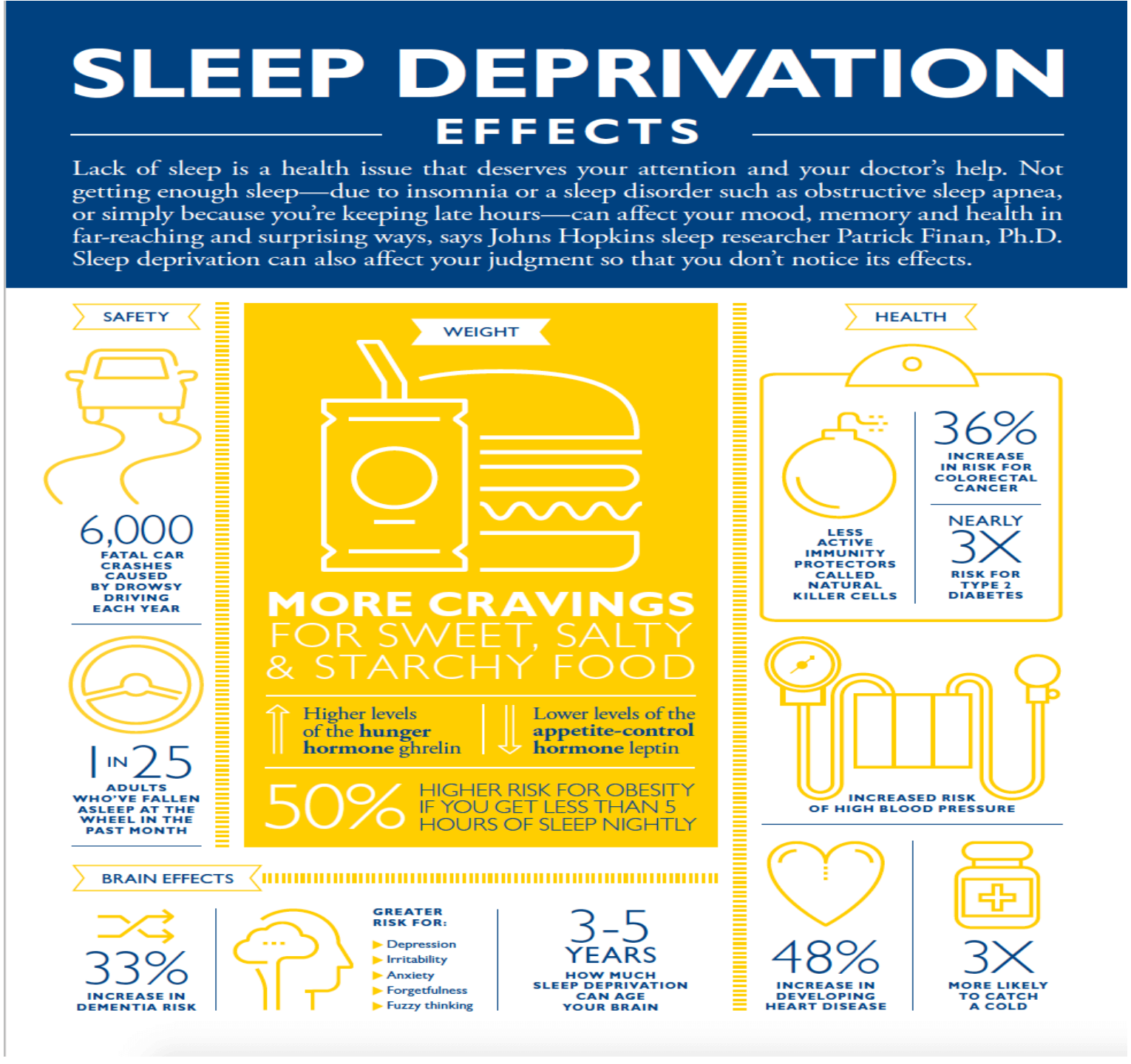
Sleep

- Have increased levels of a hunger hormone called ghrelin and decreased levels of the satiety/fullness hormone called leptin, which could lead to overeating and **weight gain**
- When we are sleep deprived we tend to eat more (more junkier food)
- Sleep is necessary for memory consolidation, the process of forming and storing new memories so you can retrieve them later. Sleep deprivation reduces the growth of new neurons in the hippocampus and causes problems with memory, concentration, and decision-making. It can even lead to depression—another memory killer.
- Sleep deprivation

- https://www.nhs.uk/oneyou/every-mind-matters/sleep/?WT.tsrc=Search&WT.mc_id=Sleep&gclid=EAIaIQobChMIhI_Q1Iak5wIVQuDtCh3zhg4LEAAYASAAEgLuAvD_BwE

- Memory issues
- Thinking & concentration
- Mood changes
- Accidents
- Weakened immunity
- Higher blood pressure
- Weight gain & risk for diabetes
- Heart disease
- Poor sexual drive
- Worsened balance

- https://www.healthline.com/health/sleep-deprivation



Thyroid problems

- The thyroid gland controls metabolism: if our metabolism is too fast, we may feel confused, dizzy, and if it’s too slow, we can feel sluggish and depressed. In both cases it would affect our appetite.
- Thyroid problems can cause memory problems such as forgetfulness (**we may forget to eat and drink**) and difficulty concentrating.
- Hormonal supplements can reverse the symptoms.

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

Side effects of medication

- Many prescribed and over-the-counter drugs or combinations of drugs can make us lose our appetite, cause cognitive problems and memory loss as a side effect especially if we don’t keep well hydrated.

- This is especially common in older adults because breaking down and absorbing medication is slower. Common medications that affect memory and brain function include sleeping pills, antihistamines, blood pressure and arthritis medication, muscle relaxants, anticholinergic drugs for urinary incontinence and gastrointestinal discomfort, antidepressants, anti-anxiety meds, and painkillers.

Socialising

- It is important to keep socially active – socialising over a meal is a great opportunity to enjoy our meal in a stimulating company

- People who aren’t socially engaged are at higher risk for memory problems than people who have strong social ties.

- Quality face-to-face social interaction can greatly reduce stress and is powerful medicine for the brain, so schedule time with friends, join a book club, or visit the local senior centre.

Exercising regularly

- **Increase life expectancy**
- Help **protect against heart disease, stroke, diabetes, some cancers, depression and dementia**
- **Helps us to maintain a good appetite and might help with getting better sleep**
- Helps us to **keep mobile**
- **Reduces bone loss and strengthen muscle** – reducing the risk of falls causing fracturing bones
- **Improves** our **mood** and sense of well-being.
- **Help with joint stiffness and pain associated with arthritis**

- The recommendation for older people is the same as for younger adults – **at least 150 minutes** of moderate activity a week in bouts of 10 minutes or more. One way to achieve this is to do **30 minutes of activity 5 days a week**. https://www.who.int/dietphysicalactivity/factsheet_adults/en/

- **Starting a regular exercise routine**, including cardio and strength training, **may reduce your risk of developing dementia by up to 50 percent**. What's more, exercise can also slow further deterioration in those who have already started to develop cognitive problems. **Exercise protects against Alzheimer's by stimulating the brain's ability to maintain old connections as well as make new ones.**

No to Smoking

- Smoking heightens the risk of vascular disorders that can cause stroke and constrict arteries that deliver oxygen to the brain.

- **Smoking can supress our appetite and make the food seem tasteless**

- Smoking speeds up the biological ageing process, increasing the risk of **cancer, heart disease, diabetes, osteoporosis, cataracts and other age-related diseases**. It also causes **premature skin ageing** and increases **risk of eye damage and poor gum health**. Stopping smoking improves health at any age.

Managing stress

- Cortisol, the stress hormone, damages the brain over time and can lead to memory problems. But even before that happens, stress or anxiety can cause memory difficulties in the moment. When we're stressed out or anxious, we're more likely to suffer memory lapses and have trouble sleeping, learning or concentrating.

- When stressed we may find it **difficult to sit down and enjoy food**, when we eat you may just snack - not nutritious & healthy enough

Things to remember

- If you do decide to take supplements, it's important to remember that **supplements will not replace a balanced diet**!

- Supplements have to be **taken with caution and our GP and Pharmacists** should know we are taking them, which ones and how often.

- For example according to some research, having more than an average of 1.5 - 2mg a day of **vitamin A** over many years may affect your bones, making them more likely to fracture. As a precaution, it may be advisable for people at increased risk of osteoporosis, such as postmenopausal women and older people, not to consume vitamin A at intakes greater than 1.5 - 2mg/day. (supplements containing fish liver oil, liver and its products like pate are particularly high in vitamin A).

- Fortified foods can play a role in a healthy diet. For example, fortified soya drinks can be fortified with calcium, which is important for those who do not consume dairy products, the major source of calcium in the UK diet. As vitamin B12 is predominantly found in foods of animal origin, fortified foods are an important source of vitamin B12 for vegans.

- **Physical activity/exercise cannot be supplemented or substituted by anything**.

- New research indicates that walking six to nine miles every week can prevent brain shrinkage and memory loss. According to the American Academy of Neurology, older adults who walked between six and nine miles per week had more grey matter in their brains nine years after the start of the study than people who didn't walk as much. https://www.helpguide.org/articles/alzheimers-dementia-aging/age-related-memory-loss.htm

- When it comes to memory or other function of our body, it's **"use it or lose it."** Just as physical exercise can make and keep your body stronger, physical & mental exercise can make your body & brain work better and lower or slow down the risk of functional decline associated with ageing.

Thank you for coming today & please fill the evaluation form.

- jitka.vseteckova@open.ac.uk
- http://www.open.ac.uk/people/jv2595

- Vseteckova J (2019) Five Pillars for Ageing Well https://www.open.edu/openlearn/health-sports-psychology/mental-health/five-pillars-ageing-well

- 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

- Vseteckova J (2019) Depression, mood and exercise https://www.open.edu/openlearn/health-sports-psychology/mental-health/depression-mood-and-exercise?in_menu=622279

- **Next time…**

- Nutrition roadshows MK
- https://www.eventbrite.com/d/united-kingdom--milton-keynes/nutrition/
- Diabetes UK
- https://www.diabetes.org.uk/
- British Heart Foundation
- https://www.bhf.org.uk/what-we-do/influencing-change/our-campaign-successes
- Health watch
- https://www.healthwatch
- WHO – World Health Organisation
- https://www.who.int/dietphysicalactivity/factsheet_adults/en/.co.uk/

- British Nutrition Foundation
- https://www.nutrition.org.uk/
- NHS Eat Well
- https://www.nhs.uk/live-well/eat-well/
- Department of Health
- https://www.gov.uk/government/organisations/department-of-health-and-social-care
- That sugar movement
- https://thatsugarmovement.com/high-blood-glucose-and-the-brain/
- National cancer institute
- https://www.cancer.gov/about-cancer/causes-prevention/risk/obesity/obesity-fact-sheet#how-many-cancer-cases-may-be-due-to-obesity


AGEING WELL
Mental wellbeing
Joy
Breakfast
Swimming
Exercise
Joy
Nutrition
Pharmacokinetics
Dinner
Bone changes
Bone changes
Pharmacokinetics
Joy
Malnutrition
AGEING WELL
Exercise
Walking
Fitness
Eat well
Hydration
Morning
Atrophy
LUNCH
Exercise
AGEING WELL
Walking
Morning
Osteoporosis
Joy
Fitness
Ageing
Muscle changes
Dinner
Atrophy
Nutrition
Exercise
Physical activity
Muscle changes
Physical activity
Swimming
Lunch
Pharmacotherapy
PHARMACODYNAMICS
Joy
Breakfast
Pharmacodynamics
Ageing
Nutrition
Morning
Learning new things
Osteoporosis
Hydration
Meeting friends
Learning new things