PYSC 322 - Adulthood & Ageing: Notes

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December 13, 2010

Contents

1 Theories of Ageing

1.1 Programmed Theories

- The notion of a **Biological Clock**, a certain amount of time allotted to you;
- The **Hayflick Number** is the number of times a cell can divide, about 50 times; the ends of DNA sequences, or **Telomeres** shorten after each replication, after time damaging DNA material, resulting in incomplete or cancerous cells; the length of telomeres are inherited genetically; cancer cells use **Telomerase** to replace telomeres, thus reseting their own biological clock; Evidence against the Hayflick number as a biological clock theory of ageing includes no shortening of telomeres in some cell types, (i.e. brain cells), no evidence of shortening in cloned rats;
- **Mutation Accumulation Theory**: natural selection favours longevity for reproduction, and thus there is no need to survive after child-rearing age;
- **Antagonistic Pleiotropy** is the characteristic of a gene which controls many traits, one gene being helpful in early life while having adverse effects in later life; e.g. p53 helps in early life to repair damaged cells, but is less effective in later life;
- Changes in **Hormone** levels as we age; some evidence of an optimal amount of human growth hormone helpful in fighting effects of ageing; **Melatonin** (Pineal gland) may affect ageing process, and may also be a anti-carcinogenic (evidence from animal studies); changing levels of **DHEA** (Adrenal glands) may also affect ageing process;

1.2 Unprogrammed Theories

- The **Wear & Tear** theory suggests tissue damage and entropic processes as a result of overuse, overexposure, damage, and weakening over time result in ageing; this theory is refuted by the positive effects of exercise and diets high in fibre;
- **Free Radicals**, charged particles that bind to other molecules (DNA, RNA, proteins) causing dysfunction, may also accumulate and result in ageing processes; sources include UV radiation and smoking; ingesting **Antioxidants** such as **Sodium Oxide Dismutase** into the body can fight off free radicals; other antioxidants include beta carotene, vitamin C;
- The **Garbage Accumulation** theory suggests that cells accumulate materials such as amyloid plaque; lipofuscin accumulates in skin cells as a result of exposure to UV light, resulting in a melanin expression (liver spots);
- **DNA damage** may accumulate over time; longer-lived species tend to have more DNA repair mechanisms;
- The **Immune System Hypothesis** suggests that t-cells are generated in lower amounts by the thymus gland (for fighting infection and disease) as we age, as the thymus gland turns to fat; the **Autoimmune Hypothesis** suggests that the immune system becomes hyperactive and begins to attack the body as though it were an invader;

2 Research Methods in Gerontology

- The **Lifespan Perspective** [Baltes 87] is one that suggests continuous development occurring across the entire human lifespan, including processes of compromise and plasticity as we age; differs from Jean Piaget's notion of **Discontinuous development**, in which distinct changes are said to signal the onset or end of a particular life stage;
- **Cohort Differences** are between lifespans which develop in different historical and cultural contexts;
- Dimensions and issues worth studying include **Nature vs. Nurture**, **Mechanistic vs. Organismic**, **Stability vs. Change**, and **Passive vs. Active**;
- Studying ageing involves both **Descriptive & Applied Research**, the latter including **Correlational** and **Quasi-Experimental** research studies;
- **Subject variables** such as age and gender, **Cohort variables**, and time of measurement will all affect responses;
- **Cross-sectional research** omits the **Cohort Effect**; **Longitudinal Research** limits to a single cohort over a long period of time, susceptible to **Selective Attrition** (those who willingly choose to leave the study); **Cross-sequential research** combines cross-sectional and longitudinal research, separating contributions from cohorts and age, however still ignoring time of measurement;

- **Descriptive Research** includes **Observational techniques**: studying natural behaviour occurring in context, **Participant Observer**: in which the researcher joins a group in order to study it, involving trust and camaraderie, **Case Studies**: studying 1-2 people intensely over time, **Focus Groups**, and studying **Archival Data**, such as medical records and statistics;

3 Biological Changes

3.1 Changes in Appearance

- An Ohio State study of obituary photographs found that pictures of women are older (from when they were younger), a reflecting a desire to appear younger;

  Skin - composed of the **Epidermis** and **Dermis**, supplied nutrients by blood vessels; contain skin cells, pigment, protein; also contains Subcutaneous layer of fat, sweat glands, blood vessels, hair follicles; as we age, the epidermis thins and becomes more perforatable, **Melanocytes** diminish in number, leaving the skin paler; surviving melanoctyes get bigger and become visible as **Age/Liver Spots**; the strength and elasticity of also diminishes (Collagen breaks down), resulting in wrinkles and saggy skin; blood vessels supplying the skin become more fragile, resulting in increased susceptibility to bruising; sebaceous glands for moisturizing the skin with oil secrete less oil, resulting in dry, irritable skin, brittle nails; the subcutaneous layer of fat thins, resulting in diminished temperature regulation (less insulation), thus older adults are more susceptible to **Hypothermia** and **Heatstroke**; sweat glands reduce their output, so the body doesn't cool down and is more susceptible to heat stroke; warts and blemishes are more common with older skin, and repairs are slower; some damage can be repaired or delayed with Anti-Ageing products, but many claims are exaggerated, and products tend to be very expensive; **Retinol** is a chemical that rejuvenates skin, **Anti-Lipoic Acid** is an antioxidant that helps hypochondria in skin cells, replaces old skin cells and acts as an anti-inflammatory, aiding in collagen production; **Glycolic Acid** is a natural wrinkle remover; sun damage may result in **Melanoma (Skin Cancer)** of the Melanocytes (enlargement of moles), which are cached early if removed superficially; sun damage may also lead to crow's feet, which are also a result of muscles weakening and diminished collagen; use of **Costmetics** and **Botox** (Botulism Bacteria) can relax muscles, but must be re-administered every 3-6 months;

  Face & Head - more cartilage in the nose and ears grows as we age; the head grows 1/2 an inch during adulthood;

  Hair - the hair follicle's **Melanin** diminshes with age, and thus colour fades; **Alopecia** (hair loss) common, with pattern baldness for males (first occurring at temples and crown); female hair loss also occurs but the pattern is less uniform; the **DHT Hormone** builds up and affects the follicle, weakening it until hair falls out; **Rogaine**, originally intended for regulating blood pressure, can be used to combat or reverse hair loss; among men, hair grows around the ears, nostrils, eyebrows, and on the back; for women, especially of Mediterranean or Middle Eastern descent, hair grows on the upper lip, chin, chest, abdomen (may be related to hormones and genetics);

Height - it is typical for men to lose approximately 1.25 inches in height as they age, while women lose approximately 2 inches; the **Functional Height (Reach)** loss is much more substantial, with women losing up to 7 inches;

Voice - there are many individual differences in the changes of one's voice as they age; womens' voices, especially in extreme old age, can lower in pitch, while mens' voices tend to raise slightly in pitch; one's voice may also have lower volume, and it may be difficult to project one's voice or have vocal endurance; a shakiness in the voice can also develop with age; **Smoking** exacerbates changes in one's voice, contributing to an added raspiness;

3.2 Internal Changes

Metabolism - Efficiency declines 3% with every passing decade after birth, resulting in weight gain and muscle loss until a plateau; can be exacerbated or altered with changes in eating habits, choice of lifestyle;

Cardiovascular System - the heart increases in size as one ages, especially the left ventricle; ventricle walls thicken; calcium deposits in blood vessels, cholesterol and plaque also accumulates, potentially forming blockages, increasing the risk of stroke or heart attack (**Myocardial Infarction**); vessels also become increasingly rigid; **Blood Pressure** (**Systolic** / from heart over **Diastolic** (to heart) is 120/80 if healthy, higher ratio may lead to **Hypertension** and other cardiovascular problems; **Coronary Heart Disease**, the #1 killer in North America occurs when plaque builds up in arteries around the heart, also known as **Ateriosclerosis**; bypass surgery grafts a detour around blocked vessels to the heart (during the procedure, a machine oxidizes the blood for you); **Strokes**, the #3 killer in North America; an **Ischemic Stroke** accounts for 80% of stroke cases, in which blood flow is cut off from part of the brain (the part subsequently dies or infarcts due to lack of oxygen) as a result of an air bubble in the blood (**Embulos**) (potentially entered the system following heart surgery) or a blockage caused by plaque (**Thrombosis**); A **Hemorrhagic Stroke** is one in which a blood vessel bursts due to an **Aneurysm** (a weakening of the vessel), wherein fluid pressure is put on the brain; an I**intracerebral Hemorrhage** may be due to high blood pressure; the most serious strokes occur in the brain stem where involuntary actions such as respiratory function take place; strokes in the left side of the brain may result in **Aphasia**, the loss of language ability; To treat an ischemic stroke, JPA administered within 3 hours of the onset of stroke symptoms will open blood flow and reverse damage; **Aspirin** is good for preventing this form of stroke as it tends to thin the blood, conversely, it is bad for hemorrhagic strokes as it may cause the individual to bleed out; a CT scan or MRI can quickly determine the type of stroke; a Pacemaker can regulate heartbeat for those suffering from heart arrhythmia, placed on top of the right atrium;

Skeletal System - **Osteoblasts** (bone builders), require calcium and vitamin D; **Osteoclasts** are responsible for bone loss; more calcium is lost after menopause, affected by hormones, exercise, and diet; bone density decreases with age, and is worse for women; **Tooth Decay** occurs due to gum disease (plaque buildup), and may need to be replaced with implants, dentures, or crowns; **Osteoperosis** is a degenerative and abnormal problem which accelerates rate of bone and height loss, wherein **Antiresporptive Agents** block osteoclasts, possible use of

hormone therapy, but having the increased risk for heart disease and cancer; **Arthritis** occurs due to joint damage: bone-on-bone friction as a result of trauma is the most common form of arthritis, resulting in joint locking; arthritis may also be due to infection; **Rheumatoid Arthritis** is an progressive inflammatory condition affecting muscles, joints, tissue, organs; Over 100 types of arthritis exist; **Falling** can severely damage the skeletal system and can be caused by a variety of factors, including decreased sensory acuity, diminished strength, mobility, or bone density, an acute or chronic illness, hazards in one's environment, and drug interaction; 20-40% of older patients dies following a fall due to hospitalization and loss of mobility, independence; wearing **Hip Protectors** renders one 60% less likely to sustain fractures, 80% less likely if worn with jeans, however compliance is a large issue as many older adults forget or choose not to wear them; Lean body mass tends to decrease with age regardless of one's level of physical activity, corresponding to a change in **Adipose Tissue**, resulting in less muscle and more fat on the body;

Respiratory System - air resources diminish with age: less oxygenated air enters the bloodstream, lungs become more rigid, cilia decrease over time, and thus the ability to trap invading particles in the respiratory tract is diminished; mucus in the lungs increase, leading to increased likelihood of a blocked airway (**Bronchitis**, **Pneumonia**); the ability to monitor and control one's breathing is also impaired with age; **Emphysema**, a disease commonly experienced by heavy smokers is a chronic lung disease in which the alveoli are increased in size, and less oxygen is taken in, resulting in wheezing, shortness of breath, feeling weak; **Non-Small Lung Cancer** is most common and progresses slowly, while **Small-Cell Lung Cancer** is increasingly likely for those who smoke, are exposed to asbestos or air pollution; Respiratory health is usually indicative of overall health;

Digestive System - a loss of **Epithelium** in the mouth occurs with age, as does a recession of the gum line; a loss of absorption of vitamin B12 also occurs, which is important for cognitive processing; **Peristalsis** is also constrained, as less water is present in the intestine, leading to constipation; **Liver Function** does not seem to change with age; **Kidneys** become smaller, processing efficiency is diminished, and thus medication and other chemicals reside in the body longer; the **Bladder** becomes rigid and more difficult to void completely, resulting in more frequent urination;

Reproductive System (Men) - men experience **Andropause**, a gradual process resulting in lower sperm counts, smaller testicles, erectile dysfunction; lack of blood flow to the penis is exacerbated by diabetes and heart disease; products such as **Viagra or Cialis** improve blood flow to the penis, but does not change one's libido; the **Prostate** increases in size with age, and becomes larger with **Prostate Cancer**; **Prostate-Specific Androgen (PSA)** is produced in higher levels, can result in back pain (prostate presses on the spine, bladder; older males should routinely assess PSA levels and prostate integrity;

Reproductive System (Women) - women experience **Menopause**, defined as no monthly period for a year, signaled by abrupt changes in hormones in the pituitary gland coinciding with egg release: eventually the ovaries cease responding, and hormones produced by the ovaries (**Estrogen, Progesterone**), also decrease significantly; **Anti-Menopausal Hormone Replacement Therapy** is possible but not without risks of developing cancer and heart disease; menopause may be accompanied with depression or other psychological issues, hot flashes, insomnia, increased risk of osteoporosis, **Ovarian Cancer**, which is difficult to

detect; **Vaginal Walls** become thinner, and are less lubricated;

Immune System - **T-Cells** attack viruses, and are produced by the **Thymus** gland, which is reduced to fat as we age; the hormone **Thyroxin** (produced by the **Thyroid** gland) regulates the production of T-Cells; T-Cells affect **B-Cells**, which manufacture antibodies, a first defense against bacterial infection; **Natural Killer Cells** attack cancer cells and hunt out infection; T-Cells decrease in frequency as we age, as the Thymus gland decreases to 5% of its original size; Thyroxin is also produced in less quantity, leading to a subsequent decline in B-Cells and fewer antibodies produced; **Auto-Immune Disorders** may develop and attack the body, a possible theory of ageing; (such as Multiple Sclerosis, in with the immune system attacks myelin on neurons); boosting the immune system is possible by ingesting vitamin C, echinacea, zinc, however no conclusive evidence is available;

Nervous System - **Sensory Neurons** decline in sensitivity with age, and it becomes more difficult to appreciate differences in sensation; **Motor Neurons** decrease in number, resulting in a loss of sensitivity, some muscles control; **Interneurons** (90% of which being in the brain) serving communicating functions are less likely to be replaced with age, and existing neurons get smaller; the brain itself decreases in mass by 5% by age 60; there is no evidence that the role of **Neurotransmitters** change with age, however some change is possible in post-menopausal women;

Sleep - individuals do not necessarily sleep less with age, however **Insomnia** increases with age, and the amount of **Deep Sleep** (REM sleep associated with **Delta Waves**, having a potential restorative effect on the body) decreases; **Frequent Urination** disturbs sleep; sleep times are shifted (typically earlier in the evening); **Melatonin** (produced by the Pineal gland) affects one's sleep cycle and is the biochemical explanation for why we go to sleep when we do; reduction of this hormone occurs with age; the **Human Growth Hormone** is associated with deep sleep, as such, we experience less deep sleep once adulthood is reached; **Menopausal Changes** affect sleep; **Health Changes and Chronic Pain** affect sleep (such as **Osteoarthritis**); **Cardiovascular Conditions** may affect breathing and disturb sleep; **Sleep Apnea** (stopping breathing, increased likelihood for overweight individuals) occurs more with age; **Anxiety** and other stressors may disturb sleep; Less **Sunlight and Vitamin D** contributes to less fatigue; **Sensitivity to Caffeine, Nicotine, and Alcohol** changes with age and may affect ability to fall asleep; **Changes in Blood Pressure** affect the roles of such depressants and stimulants, also affecting sleep; with regards to **Dreaming**, older individuals report less visual imagery, less emotionally-charged dreams, fewer aggressive or erotic dreams (a potential cohort effect and general unwillingness to discuss such matters);

Nutrition & Diet - changes in **Sensory Acuity**, seeing labels, dials on kitchen appliances affect one's food intake; food is less appetizing and the ability to taste is diminished, resulting in an affinity for spicier, saltier, sweeter, or generally more flavourful food; changes in **Nutritional Requirements** change occur as we age, with an increased need for more **Iron, Vitamins D and B12**; many hospital or doctor visits by older adults are the result of a vitamin deficiency; Vitamin **Mangosteen** is associated with improved immune function; **Vitamin D** is associated with lower rates of pancreatic cancer in men, can be attained from sunlight; intake of **Folic Acid** is important during gestation, else the fetus may develop **Spina Bifida** (exposed spine); Vitamin E is associated with fighting coronary heart disease; **"Joint Juice"**, either in pill or liquid form, combines **Vitamin C and Glucocamine**, which is found in normal

cartilage: apparently reducing pain in joints, however no conclusive evidence is available; **Ginko Biloba** is a herbal supplement for improving memory and eliciting clearer thinking, a potential fighter of dementia, however potential side effects include hemorrhages in blood vessels behind the eyes causing blindness;

Medication - adverse side effects due to confusion and forgetfulness may lead to **Accidental Overdoses**; medication **Compliance** is also an issue, which could be due to an inability to read medication bottle, or due to the denial of a disease such as dementia; medication is a significant expense and many cannot afford to cover 100% of this expense; technological solutions and **Medication Safety Management Systems** may increase compliance and reduce likelihood of overdoses; it is estimated that 20-30% of hospital visits are due to medication misuse;

3.3 Sensory Changes

Vision - the eye: **Pupil Size** and **Accommodation** changes with age, as does the number of colour receptors, leaving many unable to disambiguate between blue and green; visual disorders may include **Detached Retina** (thinner fluid behind retina, resulting in a loss of vision), **Cataracts** (30% of older people, in which the lens clouds and becomes blurry, surgery may replace the lens), **Glaucoma** (increased pressure in the eye, ducts that drain the eye get clogged and results in a loss of peripheral vision), **Macular Degeneration** (atrophy of the cells in the macula, with wet and dry variants: blood on the retina damages visual cells), **Floaters** (proteins that accumulate in ocular fluid, constantly changing); **Tumors of the Pituitary Gland**, which has increased likelihood of occurring after age 60, disrupts the **Optic Chiasm**, as such visual information stops being communicated, or results in **Tunnel Vision**, appearing similar to symptoms of Glaucoma, removing the tumor can be performed through the nose and usually restores vision;

Audition - **High-Frequncy Sounds** become harder to distinguish, and recognizing voices becomes difficult, especially those of women and children, known as **Presbyucis**; **Earwax** buildup may also be a source of hearing loss; **Auditory Acuity** drops due to both **Sensorineural and Conductive Hearing Loss**; **Tinnitus** (a ringing in the ears) increases with age;

Balance - The **Semicircular Canals** in the ears do not respond as well with age, resulting in impaired balance;

Smell & Taste - adults have about 9000 **Taste Buds**, but this number decreases with age; less **Saliva** is produced and it becomes harder to swallow and digest; the **Olfactory Epithelium** gets thinner with age or after prolonged exposure to toxins; these changes affect behaviour in that older adults may be less interested in eating, may not smell unpleasant odours (i.e. body odour), or may be at risk of **Asphyxiation** due to an inability to detect smoke in a fire;

Somatosensation - the ability to detect pressure, vibration, temperature, and pain diminishes with age as blood flow to receptors is also diminished; thus older adults may be at an increased risk of not realizing they are injured; as such, routine body inspections are encouraged for older adults; **Fine Touch Sensitivity** also diminishes with age;

4 Cognitive Changes

4.1 Theories of Cognitive Ageing

- **Processing Speed Theory** [Salthouse 96] posits that changes in processing speed underlie cognitive changes as we age; there is a limited capacity of working memory regardless of age, however the ageing process compromises the processing efficiency; the resources themselves are not smaller, but longer processing time is required; Multi-stage problems take longer as earlier steps take longer, constraining later steps, known as **Simultaneity**, wherein information from earlier steps is forgotten at later stages; limitations are exposed when time constraints are placed on tasks; measures of processing speed include the **Digit-Symbol Coding Task**, **Ravan's Progressive Matrices** (testing reasoning), **Simple Reaction Time Test**: an average response time is 210ms, which slows with age; the theory is supported by longitudinal studies and strong negative correlations of age with processing speed;
- **Working Memory Theory** [Craik & Byrd 82] posits that self-initiated processing declines in older age, manifested in working memory; measures of working memory include the **Backwards Digit Span Test**, the **N-Back Test** (visual, digit, or auditory modalities possible), the **Corsi Block Test** (spatial working memory); see http://cognitivefun.net/; may be a cohort difference as older participants may not be familiar with computerized tests; deficits in working memory also evident from survey responses, wherein older respondents show a primacy and recency effect for long lists of survey question options; use of **Associated Cues** or **Priming** improves working memory performance [Park et al 90]; **Additional Context** also aids recall [Cherry et al 96]: increased complexity of sentences or use of sentence + picture combinations improves recall as more information is available;
- **Inhibition Theory** [Hasher & Zacks 88] posits that the ability to shield out distractions or irrelevant information declines with age: the information gateway is compromised; **Displacement** is the process of items in working memory being displaced with interfering information; **Disinhibition** can be measured using the **Go/No-Go Test**, in which one must inhibit erroneous responses, wherein older users are more likely to make mistakes when distracted; older adults are less slow to respond after inhibition, and are more likely to make errors, being unable to suppress other factors; their **Impulse Control** is reduced; anecdotal evidence from older adults includes frequent mention of high **Distractibility**, and increased tendency to act or speak impulsively;
- **Sensory Function Theory** [Lindenberger & Baltes 94] posits that reduced visual and auditory acuity leads to reduced processing speed; One's visual and auditory may be a crude measure of overall brain integrity or one's **Cognitive Resources**; higher education has been known to boost one's cognitive resources; a negative correlation with age has been shown between visual and auditory acuity and other age-related declines in cognitive functioning: perceptual speed, reasoning, memory, knowledge, fluency, intelligence;

4.2 Perception of Time

- William James observed the anecdotal reports of time perception changing as one ages: the influence of memory and novel activities throughout one's life may affect this, in that the good memory of an event or activity may aid in the perception of time passing more slowly;

4.3 Attention & Distractibility

- Changes in **Sustained Attention** and **Divided Attention** evident as one ages; the Inhibition Theory of cognitive ageing helps to explain changes in attention;
- **Enhancement and Suppression** [Gazzeley 05] are important processes for maintaining attention and shutting out distractions; activation occurs in the Pre-Frontal Area in younger adults for relevant items; the ability to suppress information is compromised with age; the **Prefrontal Cortex** (PFC) is responsible for these processes, as well as **Goal Activation, Attentional Modulation and Dampening**; [West 96] studied changes in the PFC as we age, and observed effects on **Prospective and Retrospective Memory, Interference Control and Suppression, Response Inhibition, Recall and Recognition Memory**; additional evidence for this functioning in the PFC comes from patients with damage to this area;
- ADHD drugs are in fact stimulants that act upon the PFC to improve the inhibition process;
- It is difficult to measure distractibility as it is difficult to design experimental studies to capture valid effects;
- A large research and development community is devoted to designing products which act as training programs for helping older adults to focus and improve cognitive functioning; the effectiveness of such products are disputed and uncertain;

4.4 Memory Changes

- The **Modal Memory Model** is most common and tends to follow **Sensory Input** entering **Sensory Memory**, with **Attention** allowing some information to enter **Working Memory**, which can be kept there with **Maintenance**, or **Encoded** into **Long-Term Memory**, which can be later **Retrieved** back into working memory;
- **Sensory Memory** has a large capacity but a short duration, as it must capture environmental data; **Iconic Memory** is the visual store while **Echoic Memory** is the auditory Store; information must enter Sensory Memory in order to be remembered;
- Baddeley's **Working Memory** model includes a central **Control Executive** for the direction of cognitive resources and **Rehearsal**, a **Visuospatial Sketchpad** for maintaining visual information, and a **Phonological Loop** for maintaining auditory information; in typical cases precedence is given to either auditory or visual information, but not both simultaneously; the location of the Central Executive of Working Memory is unknown; the capacity of working memory is limited to about 5 +/- 4 chunks of information (i.e. 7-digit phone numbers);

- **Long-Term Memory** (LTM) is a permanent repository with potentially limitless capacity;
- **Declarative Memory** are explicit memories that can be discussed, including **Episodic Memories** (memories with context), and **Semantic Memory** (memories without context, including general knowledge and facts); learning information passes through the Hippocampus into LTM, which can be compromised following trauma, such as a concussion;
- **Non-Declarative Memory** are difficult to discuss, and include **Procedural Memory**, used in processes of **Skill Acquisition**; such memories do not take up many cognitive resources; learning **Associations** (i.e. **Conditioning**) also fall under this category, relying on the Cerebellum and Basal Ganglia; damage to these areas may affect **Skilled Movement or Motor Responses**;
- **Changes in Sensory Memory** are difficult to assess due to the brevity of this memory store: little research addresses this and imaging resolution is unavailable; lower activation of sensory stores has been shown in older adults, however enhanced visual contrast enhance sensory processing, and has been shown to be effective for older adults and those suffering from Alzheimer's Disease; Memory encoding also improves in understandable contexts;
- **Changes in Working Memory** include a pronounced decline in **Manipulation**, carrying out complex instructions, especially when spoken aloud; no expressed changes in Maintenance have been reported; **Functional Compensation** occurs such that brain activation is higher in older adults in areas responsible for Maintenance, with other brain regions showing additional compensatory activation; compensatory activation has also been shown in attention or memory activation processes; older adults may be trained to boost brain activation; increased compensatory activation helps to explain mental fatigue reported by older adults [Cabeza 02,04];
- **Changes in Episodic LTM** may include decreased recall ability; notion that recall difficulty is attributed to buildup or overflow of other memories is not convincing; the decline may be due to decreased availability of attentional resources; exhaustive search may be fatiguing; episodic LTM may be improved with strategies encoding hints, retrieval and recall hints; the **Truth Effect** is one in which Repetition works for encoding; **Source Memory** diminishes with age: the ability to remember the source of a memory, binding what with where (i.e. repetitive storytelling), which could be either a retrieval or encoding problem [McIntyre 87]; Problems with source memory are exacerbated with dementia;
- Older adults with reduced memory ability display low or no activation in the hippocampus during fMRI, the functional centre for theses processes;
- **Changes in Semantic LTM**: some argue that Semantic LTM improves with age, however the strategies for storage and retrieval may differ from younger adults; this may be synonymous with Wisdom; Word-finding problems are indicative of semantic LTM problems (also known as **Tip-of-the-Tongue** phenomena), a retrieval error along the link between temporal and frontal memory structures (a potential early indicator or some forms of dementia); **Effortful Retrieval** may block frontal lobe activity and disrupt priming and ongoing frontal memory processes;
- **Changes in Prospective Memory** [Uttl 08]; changes are disputed and between studies and the ability to accurately and validly study Prospective Memory is difficult;

- **Changes in Procedural Memory**: no age-related changes likely, but are dependent upon motor skill and frequency of use of the skill;
- With respect to **Priming**, older adults are faster than younger adults, as indicated by results of the **Stem Completion Task**; this may be related to increased **False Memories** (thinking that you have already done something), which is stronger in older adults and tends to override declarative memory;
- **Metamemory**: the general beliefs and expectations that cognitive and memory declines are imminent with old age may result in a self-fulfilling prophecy (for those with an external locus of control); experiments reveal no major deficits in memory; those who begin to notice problems early are at risk for developing dementia; education and learning about memory helps to delay or inhibit declines in memory; belief in **Cognitive Fitness** and an **Internal Locus of Control** maintain memory longer at older ages;
- **Acetylcholene**, a chemical used by the brain in memory processes is diminished for older adults, especially those with dementia;

4.5 Intelligence & Creativity

- **Executive Functioning** occurring in the Frontal Lobes (first 1/3 of the cortex are not well understood: in terms of the evolution of the brain, the PFC is the youngest part; it is massively interconnected with other brain regions and this allows us to control behaviour flexibly; [Miller & Cohen 07] have proposed functionalizing parts of the PFC and 4 features for controlling executive functioning, the region may:

  Tell other parts of the brain what to do ;

  Protect and Maintain Goals in working memory in the face of distraction;

  House Appropriate Representations , be well informed about the environment and functioning occurring in other brain regions;

  Exhibit Plasticity : change goals flexibly, change behaviour accordingly, focus on different things;

- Damage to the PFC may result in inability to perform these actions;
- **Changes in Executive Function** with age: neurons in the PFC show age, affecting behaviour [West 96] and being less able to control emotions, suppress actions and utterances, being less able to focus, and have difficulty planning [Cabeza 04, 02]; the ageing PFC shows **Compensation** or visible cognitive decline;
- **Strategic Memory** can be examined using the **Verbal Fluency** Test; those with PFC damage show an inability to group items; older brains do not typically show a loss of strategic memory; Verbal Fluency occurs as a result of activity in the Dorsal-Lateral PFC, critical for Working Memory (left side in 90% of individuals); older adults may produce less that younger adults in a set amount of time, which may be due to diminished processing speed; Verbal Fluency is not a good measure of cognitive ageing, but is for testing for PFC damage;
- The **Switch Cost** of earning new information is exaggerated in older adults;

- Testing **Cognitive Flexibility** possible with the **Wisconsin Card Sorting Task**, which relies upon changing strategies upon making mistakes; those with PFC damage due to stroke display an inability to change strategies;
- With respect to brain development and decay, PFC is a last-in-first-out region, with development occurring until about the age of 25, and can degenerate as early as age 40; this could be exacerbated by problems occurring in the parietal lobe;
- **Testing Executive Function** may include inhibition tasks such as the **Stroop Task**; those highly trained to read perform poorly; older adults are slower and make more errors: poor inhibition or automatic reading response;
- **Interference Resolution**: something that happened earlier interferes with current task; younger adults display more activation in brain regions responsible for interference resolution;
- Intelligence can be measured using the **Weschler Adult Intelligence Scale (WAIS-IV)**, which measures both **Crystallized (Semantic) and Fluid (Reasoning) Intelligence**; crystallized intelligence increases linearly with age while fluid intelligence peaks at young adulthood and begins to decline; the decline is steeper if you don't keep mentally active; the peak is lower without a post-secondary education; Intelligence is highly malleable and is also influenced by SES (social-economic status); Intelligence is not a stable concept; SES differences can be seen in brain activation of children;

4.6 Cognitive Training

- Many believe that target brain functions can be trained to fight off or prevent decline, including working memory, inhibition, executive functioning, etc. The amount of training is unknown; **Motivation** is also a factor, as many individuals are unwilling to adhere to a cognitive training regiment; Training may not generalize to real-world situations, nor may effects be persistent over longer periods of time;
- There is potential for computer games, a multi-billion dollar industry, to be used for cognitive training purposes; they are motivating and fun, however there is little evidence regarding their effectiveness or generalizability; many games rely on the speed of processing theory of cognitive ageing; *Posit Science* is one such suite of games, which relies upon the sensory acuity theory of cognitive ageing; some evidence is available that demonstrates improvement of auditory memory, and that benefits may be sustained without practice;
- Cognitive Training games and regimes may be susceptible to a placebo effect, and may not be as challenging as real-world tasks;
- **Training Executive Functioning** must include activities that are goal-directed, challenging, and adaptive to individual needs and diagnoses; multiple modalities should be used;
- *The Binding Room* prototype attempts to reduce distractibility by testing re-engagement and task resumption; evidence that short breaks help reduce distractibility;
- **Regular Exercise** has been shown to improve executive function, motor function, auditory attention, cognitive processing speed, visual attention, and can slow or delay the effects of normal cognitive ageing;

5 Psychopathology

5.1 Dementia

- **Dementia** often confused with **Alzheimer's disease** (a subtype of dementia), but has a far broader coverage: a problem with memory and sometimes other mental faculties: language, executing functioning, visuospatial skills;
- Stages of dementia include normal, **Mild Cognitive Impairment (MCI)**, and full-blown dementia; boundaries may be fuzzy; MCI could be, but is not always a precursor to dementia, in other cases no degeneration occurs;
- Dementia may arise due to an **Infection** such as AIDS or syphilis, a **Metabolic** problem such as alcoholism or a vitamin B12 deficiency (often associated with bulimia), **Trauma / Dementia Pugilistica** (also known as punch-drunk syndrome), **Vascular** problems resulting from diabetes or hypertension, or due to a **Neurodegenerative** disease such as Pick's disease / Frontal-Temporal Dementia, Lewy Bodies, Huntington's Chorea, Alzheimer's;
- Symptoms of Dementia:

  Cognitive deficits - memory deficits, both **Anterograde and Retrograde Memory**: ability to form new memories and ability to recall older memories, respectively; **Temporally-Graded Amnesia** occurs as disease advances: memory from earlier in life disrupted; whole temporal lobe is affected; **Spatial awareness** cannot be maintained;

  Language deficits - **Anomia**: the ability to name things, concepts in knowledge attacked; empty speech: no meaning conveyed, circumlocutory speech;

  Behavioural deficits - Pick's disease is often associated with a sudden change in personality, Alzheimer's not typically associated with a change in personality; a lack of awareness or denial may occur, as being unmotivated to seek treatment; no sensory or motor deficits tend to occur; confusion or uncharacteristic behaviour after sundown (**Sundowner syndrome**: agitation, restlessness, confusion, wandering, screaming);

  Psychotic symptoms - May include **Hallucinations**, drugs may not affect psychotic behaviour;

5.2 Alzheimer's Disease

- **Alzheimer's** (A.D.) is the most prevalent form of dementia, with the prevalence of Alzheimer's dementia in the 85+ demographic increasing; Discovered by Alois Alzheimer in 1906; age of onset typically in 70s or older, however earlier onset is possible; a typical progression can last 3 – 20 years, 7 – 8 years being the average;
- Stages of Alzheimer's include:

  MCIa - very early, amnestic mild cognitive impairment;

  Mild A.D. - memory problems, confusion, impaired judgment, forgetting how to do skilled work or basic skills, uncharacteristic behaviour, subtle mood and personality problems;

Moderate A.D - anomia and other language problems, losing ability to name familiar things, places, disorganized thoughts (akin to schizophrenia), learning difficult, increased confusion, psychosis;

Severe A.D. - loss of independence, communication, loss of control over bodily functions, forgetting one's identity, loss of mobility; death usually occurring as a result of immobility and hospitalization (i.e. pneumonia, infection);

- Paradoxically, nursing home patients die during early stage if hospitalized too soon, if hospitalized in later stages, patients are likely to live longer;
- Diagnosis possible using the **Mini-Mental State Examination (MMSE)**;
- Biological changes occurring as a result of Alzheimer's include:

  Cortical Atrophy - less brain (**Sulci**), more space (**Gyri**), brain decreases in size as disease progresses, atrophy in the temporal lobe, hippocampus, parietal and temporal lobes first, no damage to thalamus (otherwise sensory damage would be expected);

  Neurofibrillary Tangles - while a hallmark of the disease, it is uncertain if these are a byproduct or a cause of the disease; abnormal protein behaviour form tangles within neurons, breaking down in cells;

  Beta Amyloid Plaque - another hallmark of the disease; the protein **Secretase** is normally broken down into **APP**, however as the disease progresses, these fragments are cut too short; recent evidence shows that increased levels of plaque does not result in a clinical worsening;

  Degeneration of the Default Network - the part of the brain that allows us to think to ourselves is damaged; Beta-Amyloid plaque tends to accumulate here;

  Acetylcholene Production - chemical is critical for generating new memories; the parts of the brain that regulate and create this chemical are less active, especially in the temporal lobe; this occurs even before individuals are symptomatic or are classed as MCI; in the body, this chemical is associated with motor movement, but not in the brain; levels of acetylcholene may be observed using PET scan imaging;

- **Genetic Factors** may include an abnormality on chromosome 21, also associated with **Down Syndrome**;
- **Treatment** may include taking drugs such as **Aricept** that act on acetylcholene, supplementing the brain with more of the drug, compensating for the loss and allowing more independence; this does not repair damage to the basal forebrain; **Anti-Amyloid Agents** have been used in animals for removing plaque, however not repairing damage, plaque returns if taken off the drug; drugs such as **Flurizan** have not been very successful in treating humans;
- **Prevention** or delay of A.D. onset may be possible with increased education (increasing one's cognitive reserve, learning strategies, having complex interactions with others), having a career with many interpersonal interactions, keeping mentally active, taking anti-inflammatory drugs, eating fish (high in omega-3 fatty acids), engaging in regular physical activity, maintaining a healthy diet;

- **Caregivers** of patients with A.D. are often stressed, at risk for developing cases of depression, suffer from communication problems; periods of **Respite Care**, or caring for one's self are needed periodically;

5.3 Vascular Dementia

- The 2nd most prevalent form of dementia, caused by many small strokes all over the brain, also known as **Multi-Infarct Dementia**; Small blood vessels are plugged due to plaque on artery walls;
- **Symptoms** included cognitive symptoms akin to A.D., and mobility problems (varies between individuals depending on the areas of damage); a progressive decline, with cumulative factors occurring after many strokes; Death resulting from a massive stroke;
- **Risk factors** are typically related to lifestyle, diet (cholesterol, fat), smoking, diabetes (poor blood flow to brain);
- **Treatment**: damage is irreversible, however use of blood thinners to reduce clotting, use of A.D. medication such as Aricept for producing acetylcholene to improve memory;

5.4 Wernicke's Encephalopathy & Korsakoff's Syndrome

- Result of chronic alcohol abuse or prolonged eating disorder, a vitamin deficiency: no nutrients absorbed (calories may only be absorbed in alcohol); associated with trouble moving eyes, walking, poor balance, memory problems, confusion;
- A **Thiamine Deficiency** over 6 weeks may result in **Korsakoff's Syndrome**, typical in older Russian men; a thiamine injection can usually reverse the symptoms; onset very acute, a lack of thiamine, causes bleeding of the thalamus and mammillary bodies (critical for memory, as is hippocampus), once damage reaches critical level, it becomes a chronic impairment; Anterograde and retrograde amnesia likely, as with **Confabulation**, the ability to reason, due to damage in frontal lobes; similar to **Alien Hand Syndrome**, and delusional thinking;

5.5 Pick's Disease / FTD

- Frontal lobes afflicted, cognitive deficits in executive functioning (memory, spatial skills, and language tend to remain unaffected), no sensorimotor issues;
- **Behavioural deficits** are pronounced, inappropriate behaviour, sexually lewd conduct, profound personality changes, at onset, irresponsible, disinhibited, unable to realize problems, poor judgment, either euphoric or angry;
- Inability to suppress **Lip-pursing response**, a snouting reflex, or the **Bubinski Response** to the foot: toe spanning as seen in infants;
- **Age of Onset** is typically between 50-60; typically among men;

- **Biological changes** include wide sulci, gyri thinning in frontal lobe, no blood flow to frontal lobe, diagnosis cane be made after fMRI scan of frontal lobe and executive function tasks; prevalence of **Pick's bodies**: tau protein buildup and disruption of neurons in the frontal lobe;
- No treatment exists, a progressive disease resulting in death as a result of hospitalization and infection;

5.6 Parkinson's Disease

- **Symptoms** and clinical features include a resting tremor in the limbs, but not for purposeful, goal-directed movement; depending on where damage in Basal Ganglia occurs, tremor may be localized to part of a limb or to more than one limb; **Bradykinesia**: slow-moving, reduced arm-swinging while walking, shuffling gait, rigidity and trembling of head, little or no facial expressions, a forward tilt/posture, no fight/flight response, **Cogwheel rigidity**: locked up muscles, resistance to forced movement, postural impairment (not to be confused with osteoperosis), will not correct their balance when pushed; **Hypophonic Speech**: almost at a whisper, **Micrographia**: small writing; sometimes cognition may be impaired;
- **Biological changes**: the **Substantia Nigra**, or "black substance" is affected, wherein neurons die and do not produce dopamine; symptoms tend to appear only after 90% of neurons in the S.N. are destroyed; the **Basal Ganglia** initiates movement, requiring dopamine from the S.N., forming the **Nigrostriatial system**; movement is dramatically reduced;
- The reverse of this condition, too much dopamine, may be due to drug abuse, leading to sporadic movement, appearing like Huntington's disease or schizophrenia;
- **Age of onset** between 40 and 70 years, debilitation occurs between 10 and 20 years; over 100,000 new patients a year diagnosed in the US;
- **Treatment**: the drug **L-Dopa** can produce dopamine, as dopamine itself cannot pass the blood-brain barrier; **Pallidotomy surgery** involves placing an electrode into the Basal Ganglia and destroying locally-affected region that impairs movement, a surgery that is performed while the patient is awake; **Deep-Brain Stimulation** using a device akin to a brain pacemaker, surgically implanted in the upper chest cavity, stimulates part of the brain at onset of tremor, however symptoms may appear later;
- The resting tremor symptom is somewhat paradoxical in that a patient has an inability to move globally but can move sporadically locally;

5.7 Depression

- A range of conditions from a **Depressive mood**, a **Dysthymic disorder**: a low-grade temporary mild disorder, or **Chronic Depression**;
- **Symptoms** include feelings of hopelessness, worthlessness, changes in mood, changes in diet;

- **Prevalence** is not greater in older adults than in younger adults; older adults tend to be more prone to dysthymic disorders; this may be a cohort effect as older adults may be less willing to discuss their problems, or have more coping strategies available to them;
- **Stressors and Risk Factors** include loss of independence or onset of disability, loss of social support, unfulfilled basic needs, difficulty managing one's finances;
- **Treatment** includes use of **Anti-depressant** medication such as **Selective Serotonin Reuptake Inhibitors (SSRIs)**, which increase serotonin and neuroepeniphren; **Therapy** and **Life Review**, talking about positive aspects of one's life, physical exercise (resistance training, aerobic exercise, walking);
- Risk of **Suicide** highest in older white males, those who were once highly successful;

6 Personality

- A distinction must be made between **States** and **Traits**, the former temporary, the latter tend to linger; states and moods tend to be classed together; large individual differences;
- **Levels of Personality**: traits, personal concerns, identity;

6.1 Traits

- Traits affect choice of mate, nature of work;
- Source of one's personality: genetics, temperament (reactivity); tends to change over time (dependent upon environment, how one was treated by their parents (both nature and nurture));
- McCrae & Costa's **Big Five Theory**: openness to experience, conscientiousness, extroversion, agreeableness, neuroticism;

  Openness - dimensions: imaginative vs. down-to-earth, seeking variety vs. routine, independent vs. conforming;

  Conscientiousness - dimensions: planned vs. impulsive behaviour, organized vs. disorganized, careful vs. careless, self-disciplined vs. weak-willed;

  Extroversion - seeking out stimulation in company of others; dimensions: social vs. retiring, fun-loving vs. sober, affectionate vs. reserved;

  Agreeableness - associated with compassion, cooperation, social harmony; dimensions: softhearted vs. ruthless, trusting vs. suspicious, helpful vs. uncooperative;

  Neuroticism - emotional stability; high level of neuroticism and stress can elicit or bring out pre-disposed disorders such as schizophrenia; may often be sick, prone to vascular problems, high risk of psychological breakdown; dimensions: worried vs. calm, insecure vs. secure; self-pitying vs. self-satisfied;

- Relationships common between many traits; Determining expressive levels of traits possible **MMPI**: Minnesota Multi-phasic Personality Inventory; survey relies on honesty; **CPI**: 4 main sub-scales, high overlap with Big Five; **Freudian Projective Methods**: Rorschach inkblot test, thematic apperception tests, wherein extreme cases psychological dysfunction can be indicated from subjective interpretation;
- Traits may change with age: older adults tend to score higher in conscientiousness, agreeableness, lower levels of extroversion, neuroticism, openness; inconstancies between studies cast doubt on such generalizations; longitudinal studies have shown that extroversion, neuroticism, openness tend to remain relatively stable; increase in agreeableness may be due to cohort differences; some subtle differences in neuroticism and conscientiousness may be associated with age;
- **Globalization** or **Westernization** tends to elicit changes in traits in younger Chinese adults;
- Beliefs and memories about one's personality are distorted, often leading to a perception of larger changes in personality;

6.2 Personal Concerns

- Changing social roles and stressors tend to change over time;

  Young Adulthood: Intimacy vs. Isolation

  Middle Adulthood: Generativity vs. Stagnation - decision to contribute to future generations, through one's children and/or one's work; through mentoring or training; most people productive and generative at this stage; those in 40s-50s tend to be making money, have positive views;

  Older Adulthood: Ego Integrity vs. Despair - mentality of being too late in life to change one's self, or an attempt to fix; **Life Review** a useful activity to determining whether one's life was fulfilling; stage coinciding with retirement and reassessing one's identity, with the acceptance of bodily changes; **Ego Transcendence vs. Ego Preoccupation**: associated with neuroticism and question of whether one had a lasting impression; many older adults feel accomplished and satisfied;

6.3 Coping Strategies

- More coping strategies available as we age due to experience; on the other hand, biological and cognitive changes place limitations and reduce the number of strategies;
- Evidence from twin studies show a large genetic component to how we cope;
- Association with traits: extroversion and openness focus on social implications of problems, neurotic people focus on emotions;
- Problem approaches include: **Problem Solving**: divorced from emotion; **Passive Emotion Regulation**: focus on calming, emotional stability; **Proactive Emotion Regulation**: focus on emotional and social aspects of a problem; **Avoidance**: not addressing the problem;

- Men more likely to use problem solving or avoidance, women on controlling emotional aspects; may be source of miscommunication between spouses; many differences in "Would do" vs. "Have Done" responses for coping with problems with family or at work; Problems with a superior at work likely to use avoidance or suppression;
- More likely to use passive emotion regulation as we age; w.r.t. family problems with emotional content, a shift from problem solving to emotion regulation occurs with age; middle-aged adults adopt passive emotion regulation; older adults past 65 tend to adopt proactive emotion regulation with family problems;

  Assimilation - making problem fit with one's personality, how you typically behave; more prevalent with younger adults;

  Accommodation - changing one's goals or situation to fit best with your personality; more prevalent with older adults;

  Immunization / Reappraisal - one reevaluating something that has happened to us to minimize the effects; more prevalent with older adults;
- Older adults simultaneous use of assimilation and accommodation elicits boost in happiness, less likelihood of reporting problems than younger adults;
- **Coping Strategies of Caregivers** for those with degenerative diseases include denial caused by ambiguity of disease, guilt; telling others may alleviate this burden; guilt may be so overwhelming that they de-value the worth of their efforts, do not take care of themselves, compare against other caregivers; many dread loss of mutuality, personality (psychological death of an individual as as a result of mental illness), loss of communication, physical intimacy, sense of belonging, sense of self, standard of living; **Ambiguous Loss**: loss of a person who is physically but not mentally/psychologically present, grieving before physical loss without ritual or acceptance of loss; one must learn to grow, learn, adapt to situation, as the care recipient will not; caregivers with age-matched counterparts tend not to live as long due to incredible stressors;
- **Locus of Control**: those with external locus of control tend to believe the things that happen to them are unavoidable; those with an internal locus of control believe that they can change circumstances; those with an external locus of control are more stressed; mixed results in how control changes with age (may depend on nature of stressors); **Primary Control** is one's ability to change the situation, **Secondary Control** is one's ability to change aspects of one self (relates to Assimilation and Accommodation), related to one's well-being; younger adults tend to exert primary control, older adults secondary control (i.e. becoming a coach after sports injury); adopting religious or spiritual views in older age a form of exerting secondary control;
- Optimists tend to live longer;

6.4 Identity

- Large cultural dependencies (independent vs. interdependent or individualist vs. collectivist) affects one's identity; influences negative views of the elderly;

- Changing one's identity (assimilation, accommodation), more common at younger ages, changes are often protective to establish a stable sense of self as we progress through life;
- Developing a **Life Story**: must be **Coherent**: flow, discourse, logic, not a random series of events, **Assimilation**: interpretation of events in a timeline, not just recollection, **Structure**: a beginning, middle, end, not omitting large periods of time in one's life; must be truthful (no distortion of reality);
- Loss of a job or death of a family member may affect one's story's coherence; significant qualitative differences between the life stories of generative and non-generative people;

7 Relationships

7.1 Social Support

- Assistance provided by family or friend in one's network;
- **Instrumental Support**: helping or donating one's time, effort, money (food, shelter, physical comfort);
- **Emotional Support**: making someone feel better about themselves;
- **Social Circles**: women have larger circles, more people in inner circle (close friends, sisters), men typically only have spouse in inner circle; tougher on men when spouse dies; large individual differences possible;
- Race and ethnicity differences: African Americans have more family and friends, church groups in social circles; Hispanics have more extended family in inner circle;
- SES, education differences: larger outer circles with higher SES, education;
- Benefits of social support: provides social buffer; physiological effects include elevated mood, focus on making one feel better; behavioural effects can include interventions (i.e. discouraging addictive behaviour); one's best interests are kept in mind;

7.2 Marriage

- Legal partnership and sometimes dissolution; typically religious; satisfaction with a marriage tends to exhibit U-shaped curve (typically due to presence of children); **Passionate Love** exhibits pattern with high initial peak and gradual decay; correlating with partners being on best behaviour during first few months; **Compassionate Love** exhibits pattern of gradual exponential growth;
- **Divorce** rate 60% in early 1980s in USA; currently around 50%; divorce rates for subsequent marriages higher; risk factors: low SES, low level of education, young age of marriage, no or little shared religious view, cohabitation before marriage;

- **Same-sex unions** often struggle with legal status - visitation rights in hospitals and access to inheritance, health insurance; relationship satisfaction comparable to heterosexual unions;
- **Cohabitation**: increased likelihood with older adults over 50; viewed as alternative to marriage; for many younger adults, seen as step to marriage;

7.3 Religion

- Potential cohort effect; younger generation less religious; longitudinal and cross-sectional studies have examined religion; more religious people report a better quality of life, tend to live longer;
- Many religions impose restrictions on behaviour, such as drinking or promiscuity;
- Many religions ease stress, provide social support, offer opportunities for relaxation and meditation;
- Social network offered by religion involves shared beliefs and ideologies, opportunities for social network expansion;
- **Prayer** as social support may reduce one's chances of recovery following traumatic experience or ongoing health problem - a feeling of being ignored by God or as though recovery is out of one's hands;
- Religion provides positive outlook, positive view of afterlife, combined with strong family ties;

7.4 Isolation & Loneliness

- Most oftenly experienced by women (due to male life expectancy and tendency to marry older men);
- Perception and reality of loneliness indicative of effectiveness of social support: **Perceived vs. Received support**: perception that others' support is out of duty or pity, not out of genuine care; more prevalent with widowers than with widows;
- Participation in structured activities within the community plays important role;

8 Work & Retirement

8.1 Work

- Avg. age of worker getting older: approx. 41 years old; facing discrimination and misconceptions: less productive, harder to train, not worth the expense, injured more often - longer to heal; (while in reality the 25 and younger demographic are most likely to be injured or truant on the job; job performance may depend on job sector; many changes associated with ageing do not affect productivity;

- **Learning** may take longer for older adults (i.e. computer use); more assistance needed; once learned, performance doesn't differ between older and younger adults;
- **Job Satisfaction** early in career likely indicative of job satisfaction later in career;
- Older adults more likely to be dismissed, age-based discrimination - lack of resources to fight policy available; many forced into early retirement (company buys years of early retirement), especially true in large companies, cheaper than paying salary;
- **Bridge Jobs** - bridges career and retirement; often part-time, people report enjoyment of these jobs as same or greater than full-time career;

8.2 Retirement

- **Planning for Retirement** - financial planning (RRSP, life insurance, appointing beneficiaries of one's accounts); development of hobbies; travel planning; downsizing one's home; moving or relocating to be near family, activities one enjoys, or to have lower cost of living;
- **Retirement** - choosing to no longer work; 90% by age 70; occurs often after spouse retires, after deteriorating health, when spouse is ill (must become caregiver), after an injury;
- Large proportion of lifespan spent in retirement, larger in recent decades; financial planning necessary; those with low SES less likely to ever retire;
- **Stages of Retirement**:

  Pre-Retirement - starting to consider retirement goals, informing colleagues and training replacements;

  Honeymoon - elevated mood (provided retirement was not imposed);

  Routine - creatures of habit; routine needed;

  Disenchantment (possible) - reappraisal of situation;

  Termination (possible) - returning to work, about 10%; may lead to depression, age-based discrimination; not typically due to financial constraints but out of need of a routine; sometimes done out of need to alleviate unexpected financial constraints (i.e. spouse illness)

- **Financial Adjustments**: Canadian Pension plan, social security, RRSP, defined benefits, contribution plans, personal savings, assets, valuables, house; still a gender and race gap with salary and retirement pension amount;
- **Activities for Retirement**: hobbies, interests, developing new skills, travel (not necessarily far), taking classes, continuing education, volunteering: (giving back to community, soup kitchens, retirement homes), usually discounts or free courses available for continuing education - living longer, more likely to seek education;

9 Death & Bereavement

- Distinctions between **Medical and Legal Definitions of Death**: current medical definition of whole brain death: no spontaneous movement, no spontaneous respiration for 1 hour, no motor response, no EEG, no response to painful stimuli; no successful resuscitation attempts;
- 100 years ago, definition of death was no heartbeat and no respiration;
- **Terror Management Theory**: dealing with one's own mortality; death with death anxiety: fear of pain, body malfunction, humiliation, rejection, non-being, punishment, interrupting life goals;
- Being afraid to die has value in society (great lengths gone to preserving life);
- Definition of death doesn't refer to consciousness;
- **Accidents** account for 5% of deaths in Canada;
- **Life expectancy** in Canada is 80.7 years;
- **Approved Advance Directives** - active and passive euthanasia (i.e. removing a feeding tube vs. deliberately ending one's life via lethal injection; living with dignity law in Washington, Oregon - includes controls for dementia and depression
- **Physician-Assisted Suicide** - legal in Switzerland, Belgium, Columbia
- **Living Will** - making one's intentions known; affects how we may prolong one's life through artificial/extreme means, only in effect after medical decisions cannot be made for one's self;
- **Hospice & Palliative Care** - includes grief support workers, councilors, high value of care;
- **Cost of Death** - funerals $5K-$7K; grave plots $1K-$5K; casket $1K; cremation $100 prevalence at 46.2%;
- **Grief** - suffering a loss (no clear way to grieve); **Bereavement** - state/condition caused by loss through death; acknowledge loss, work through emotional turmoil, adjust to new environment where deceased is absent, loosen ties to deceased; social support necessary; stage theories (Tubler-Ross, Bowley);
- **Disenfranchised Grief** - not accepted by culture/society: anticipatory grief of caregivers, broken relationships, death of a pet, broken goals;