PSYCH 101 – Exam 1 Textbook Notes

## Chapter 1: Introducing Psychological Science

### 1.2 How Psychology Became a Science

* In Ancient Egypt, military doctors documented patterns that existed amongst patients with head wounds; according to them, damage to different parts of the brain resulted in different types of impairments

#### Psychology’s Philosophical and Scientific Origins

* **Empiricism**: principle that knowledge comes from experience – “seeing is believing”
  + Knowledge about world is based on observation instead of common sense or speculation
  + Anyone who follows the same method should be able to observe the same result
* **Determinism**: all events are governed by lawful cause-and-effect relationships
  + Free will versus determinism: do nature laws control the way we think or act, or do we exercise free will?
  + Psychologists recognize that behaviour is determined by both internal (e.g. genes, brain) and external influences

##### Influences from the Ancients: Philosophical Insights into Behaviour

* Ancient Greek physician *Hippocrates* developed the first classification scheme for behaviour
  + Four humours (fluids): blood, yellow bile, black bile, and phlegm
  + Different combinations of four humours lead to different moods/behaviours
* Ancient Roman physician *Galen* believed the four humours created temperaments, emotional and personality traits that lasted a lifetime
  + Sanguine (blood): impulsive, pleasure-seeking, charismatic
  + Choleric (yellow bile): ambitious, energetic, aggressive
  + Melancholic (black bile): independent, perfectionistic, introverted
  + Phlegmatic (phlegm: quiet, relaxed, content
* **Zeitgeist**: set of beliefs of a culture at a particular time in history
  + Prevented psychology from emerging in the 1600s because people weren’t ready to accept that human behaviour/thought could be governed by science
  + **Materialism**: belief that humans are composed entirely of physical matter, complex machines that lack a self-conscious, self-controlling soul
  + **Dualism**: opposing belief that a mind or soul is separate from the body

##### Influences from Physics: Experimenting with the Mind

* **Psychophysics**: coined by *Fechner*, the study of relationships between the physical world and its mental representation
  + E.g. how people mentally react to changes in physical stimuli, such as the amount of weight being held in each hand

##### Influences from Evolutionary Theory: The Adaptive Functions of Behaviour

* Darwin’s theory of evolution by **natural selection**: genetically inherited traits that contribute to survival/reproductive success are more likely to be passed on the future generations
  + Like physical traits, behaviour is shaped by heredity

##### Influences from Medicine: Diagnoses and Treatments

* **Clinical psychology**: field of psychology dedicated to diagnosis/treatment of psychological disorders
  + Brain localization: idea that certain parts of the brain control specific mental abilities/personal characteristics
    - Phrenology: belief that different traits/abilities were distributed across different regions of the brain
* **Psychoanalysis**: *Freud’s* theory to explain how behaviour and personality are influenced by unconscious processes
  + Conscious experiences: perceptions, thoughts, sense of self
  + Unconscious mind: forgotten childhood episodes, self-serving sexual/aggressive impulses
  + Freud believed that early life experiences as well as physiological needs/urges could influence behaviour

##### The Influence of the Social Sciences: Measuring and Comparing Humans

* *Sir Francis Galton* believed that genetics explained psychological differences amongst people
  + His belief led him to pursue scientific justification for eugenics
* **Nature and nurture relationships**: inquiry into how genetics (nature) and environment (nurture) influence behaviour and mental processes

#### The Beginnings of Contemporary Psychology

* By the late 1800s, study of human behaviour became acceptable

##### Structuralism and Functionalism: The Beginnings of Psychology

* *Wundt* and *Titchener* researched **structuralism**: breaking down conscious experience into basic elements, to understand how those elements work together
  + Mental experiences are composed of sensations, which interact like chemical elements
  + Different sensations can combine to form complex compounds
* *William James* developed **functionalism**: the study of purpose and function of conscious experiences
  + To fully understand behaviour, need to look at their evolutionary purpose
  + Evolutionary psychology: approach that attempts to explain behaviour in terms of forces acting upon ancestors

##### The Rise of Behaviourism

* **Behaviourism** focuses on study of observable behaviour, with little to no reference to mental events/instincts as possible influences
  + Based on *Edwin Twitmeyer’s* mallet reflex experiment and *Ivan Pavlov’s* classical conditioning of dogs
  + *John B Watson* believed that all behaviours could be ultimately linked to conditioning
  + *B.F. Skinner* believed that the foundation of behaviour was response to rewards and punishments

##### Humanistic Psychology Emerges

* **Humanistic psychology** focuses on the unique aspects of humans, their freedom to act, and their rational thought; belief that humans are fundamentally different from other animals
  + *Carl Rogers, Abraham Maslow* focused on positive aspects of humanity and factors that lead to a productive/fulfilling life
  + Humanists sought to understand the meaning of personal experience – believed that humans could gain mental well-being by gaining a greater understanding of themselves
  + Rogers and Maslow believed humans strive to develop a sense of self and are motivated to grow to fulfill their potential

##### The Brain and Behaviour

* *Karl Lashey* was interested in locating the engram, the place in the brain where memories were stored
  + Found that long-term memories are stored in many different regions of the brain
  + Principle of mass action: size of brain damage causes greater performance impairment
  + Hebb’s Law: memory is related to activity occurring at a cellular level; cells that constantly stimulate each other strengthen their relationship

##### The Cognitive Revolution

* Earlystudy of cognitive perspective focused on the study of memory
  + Forgetting curves: showed that most of what a person learns is forgotten quickly, but rate of forgetting slows down, allowing us to remember some learned information
  + Memory is influenced by outside factors such as one’s cultural knowledge and experiences
* **Gestalt psychology**: emphasized need to focus on the whole of perception and experience, rather than its parts
* **Cognitive psychology**: modern psychological perspective that focuses on processes such as memory, thinking, and language
  + Thought of the mind like software

##### Social and Cultural Influences

* While behaviourism and cognitive psychology focused on an individual’s response to stimuli, they didn’t consider how people respond to stimuli in the presence of other people
* Personality psychology: study of how different personality characteristics affect how we think and act
* *Kurt Lewin*, founder of modern psychology, suggested that behaviour is a function of the individual and their environment: B = f {I, E}
  + All behaviours could be predicted/explained through understanding how an individual with a specific set of traits would respond in a context with a specific set of conditions
* Cross-cultural psychology: draws comparisons about individual/group behaviours across cultures – tries to understand the role of society in shaping behaviours, beliefs, and values

## Chapter 2: Reading and Evaluating Scientific Research

### 2.1 Principles of Scientific Research

* Objective: facts that can be observed/tested independent of the individual who describes it
* Subjective: when knowledge about an event is shaped by prior knowledge, experiences, expectations, or even mood

#### Five Characteristics of Quality Scientific Research

* Quality scientific research follows five criteria:

1. Based on valid, reliable, and objective measurements
2. Can be generalized
3. Uses techniques to reduce bias
4. Is made public
5. Can be replicated

##### Scientific Measurement: Objectivity, Reliability, and Validity

* **Objective measurements**: measurements of an entity that are consistent across measurement tools and who is measuring (with a small margin of error)
* **Variable**: the object, concept, or event being measured
* **Operational definitions**: statements that describe procedures/operations and specific measures that are necessary to record observations
  + E.g. depression is defined as “a score of 21+ on the Beck Depression Inventory”
* **Validity**: the degree to which an instrument or procedure actually measures what it claims to measure
* **Reliability**: capable of providing consistent and stable measurements across multiple observations and points in time
  + Test-retest reliability: examines whether scores for a measure of behaviour are consistent across test sessions
  + Alternate-forms reliability: examines whether different forms of a test produce the same results
  + Inter-rater reliability: when rating/scoring an open-ended response, whether or not multiple raters agree on the measurements that were taken

##### Generalizability of Results

* **Generalizability**: the degree to which one set of results can be applied to other situations, individuals, or events
* **Population**: the group of people that researchers want to generalize information about
* **Sample**: a select group of population members
  + Random sample: sampling technique where every individual in a population has equal chance of being selected
  + Convenience sample: samples of individuals who are most readily available
* **Ecological validity**: results of a lab study can be applied to/repeated in a natural environment
* **Over-generalization**: when results of a study on a sample are applied to a group that is not relevant, such as a study on adults being generalized to children

##### Sources of Bias in Psychological Research

* When creating research, it can be subject to many forms of bias:
  + Researcher biases: various types of bias that are unintentionally introduced by researchers into their research
  + Subject biases
  + Participant biases
* **Hawthorne effect**: a behaviour change that occurs due to being observed
* **Demand characteristics**: inadvertent cues given by experimenter or experimental context that provide information about how participants are expected to behave
  + Can increase **social desirability**, where research participants respond in ways to increase their chance of being viewed favourably

##### Techniques that Reduce Bias

* Anonymity: each individual’s responses are recorded without links to any personal information
* Confidentiality: results will only be seen by the researcher
* Bias can also occur due to participants’ expectations of the effects of treatment/manipulation
  + **Placebo effect**: measurable improvement in health that isn’t attributed to medication or treatment
  + **Single-blind study**: participants do not know the true purpose of the study, or they do not know which type of treatment they are receiving (e.g. a placebo vs. a drug)
  + **Double-blind study**: neither the participants nor experimenter knows the treatment for any individual

##### Sharing the Results

* Once research has been conducted, it is important to communicate findings to other scientists
* Main form of communication is academic journals
* Before research can be published, it must undergo **peer review**: papers submitted for publication in scholarly journals are read and critiqued by experts in the field of study
  + Reviewers critique methods and results, and make recommendations to editor regarding research merits

##### Replication

* **Replication**: process of repeating a study and finding a similar outcome each time
  + If an experiment used sufficiently objective measurements and techniques, it should be replicable
* Peer review and replication ensure that published results did not occur due to carelessness, dishonesty, or coincidence

#### Five Characteristics of Poor Research

* Poor evidence is generally due to:

1. Untestable hypotheses
   * + Good hypotheses should be **falsifiable**: precise enough that it can be proven false
     + Hypotheses that aren’t falsifiable mean that no data collected can ever prove it wrong – there is always a way to make the hypothesis fit the data
2. Anecdotes
   * + **Anecdotal evidence**: an individual’s personal testimony/story about an event is used as evidence
3. Biased selection of available data
   * + Data selection bias: when a selective portion of available data is presented as a biased result, when a thorough representation of data would present a different view
4. Appeals to authority
   * + Belief in an “expert’s” claim even when little to no supporting data/scientific evidence is presented
5. Appeals to common sense
   * + Claim that appear sound, but lack supporting scientific evidence
       - Appeals to tradition: “we have always done it this way”
       - Appeals to novelty: “it is the latest thing”

### 2.3 Ethics in Psychological Research

#### Promoting the Welfare of Research Participants

* All institutions that engage in research with humans are required to have a **research ethics board (REB)**: a committee of researchers and officials who are charged with protecting human research participants
  + Help ensure researchers abide by ethical rules created by the Government of Canada’s Panel of Research Ethics, *Tri-Council Policy Statement:* *Ethical Conduct for Research Involving Humans (2nd edition)*
  + Weighs potential risks to volunteers against benefits of research
  + Requires informed consent from all volunteers to participate in research

##### Weighing the Risks and Benefits of Research

* Psychological research can involve cognitive/emotional stress
  + Mortality salience: situations where participants are made more aware of death
  + Writing about upsetting/traumatic experiences
  + Providing sensitive/personal information
* The stresses tend to be short-term and can have potential benefits that may be applied to other people

##### Obtaining Informed Consent

* **Informed consent**: potential volunteers must know the purpose, tasks, and risks involved in a study, and agree to participate based on the provided information, without pressure
* Truly informed entails volunteers being told about:
  + Topic of study
  + Nature of any stimuli they’ll be exposed to
  + Nature of any tasks they’ll complete
  + Approximate duration of study
  + Any potential physical, psychological, or social risks
  + Steps that researchers have taken to minimize the risks
* Ethical practices often need to resolve conflict between need for informed consent and need for “blind” volunteers (to decrease subject biases)
* **Deception**: misleading or only partially informing participants about the true topic/hypothesis under investigation – “white lie”
  + Once the experiment is over, **debriefing** occurs: researchers explain the true nature of the study and why any deceptions were necessary
* Elements of **full consent**:
  + Freedom to choose: participants shouldn’t be at risk of damage if they choose not to participate
  + Equal opportunities: participants should have equal opportunity (e.g. to receive a course grade), whether or not they participate in studies
  + Right to withdraw: participants should have right to withdraw consent at any time during the study
  + Right to withhold responses: participants have the right not to answer questions where they feel uncomfortable

##### The Right to Anonymity and Confidentiality

* **Anonymity**: data collected during a study can’t be connected to individual participants
* **Confidentiality**: researchers cannot share any specific data that can be connected with an individual, and all records must be secured so that identities can’t be revealed unintentionally

##### The Welfare of Animals in Research

* Psychologists can administer treatments to animals that they would never do to humans
* By using animals with shorter life spans, successive generations can be observed
* Breeding of lab animals can be manipulated for desired results

##### REBs for Animal-Based Research

* There are differences in the standards that are applied to human vs. animal research
* Three main areas of ethical treatment are emphasized:
  + Basic care of lab animals
  + Minimization of pain/discomfort experienced by the animals
  + Researchers must ensure that any necessary pain can be justified by potential benefits of the research

#### Ethical Collection, Storage, and Reporting of Data

* Once data is reported in a journal or at a conference, it should generally be kept for 3-5 years
* Scientific misconduct: when individuals fabricate or manipulate their data to fit desired results

## Chapter 9: Intelligence Testing

### 9.1 Measuring Intelligence

#### Different Approaches to Intelligence Testing

##### Intelligence and Perception: Galton’s’ Anthropometric Approach

* *Sir Francis Galton* believed that because people learn about the world through senses, those with superior (more sensitive) sensory abilities are able to learn more about it
  + Created 17 sensory tests, including highest/lowest sounds people could hear, and ability to tell difference between objects of slightly different weights
* **Anthropometrics** is the methods of measuring physical and mental variation in humans
  + Research using Galton’s tests revealed that people’s abilities on different sensory tests didn’t correlate with each other (e.g. good eyesight doesn’t relate to hearing)
    - Concluded that the tests can’t be good indicators of the same thing – Galton’s sensory definition of intelligence, so tests were abandoned

##### Intelligence and Thinking: The Stanford-Binet Test

* *Alfred Binet* argued believed that intelligence is indicated by complex thinking processes, including memory, attention, and comprehension
  + **Intelligence**: the ability to think, understand, reason, and adapt to or overcome obstacles
    - How well people can solve problems based on accumulated knowledge
* Binet and *Theodore Simon* developed set of 30 tasks, ordered by increasing difficulty, to test for thinking processes that they believed comprised intelligence
  + **Mental age**: the average intellectual ability score for children of a specific age
  + **Stanford-Binet test**: test designed to measure innate levels of intelligence
    - Binet believed his tests were a measure of a child’s current abilities, as opposed to innate capacity
  + **Intelligence quotient (IQ)**: developed by *William Stern*, a calculation of one’s mental age divided by chronological age, multiplied by 100
    - Didn’t really make sense when applied to adults
    - **Deviation IQ**: calculates adults’ IQs, by comparing one’s test scores to the average score for people of the same age

##### The Wechsler Adult Intelligence Scale

* **Wechsler Adult Intelligence Scale (WAIS)**: developed by *David Wechsler*, an IQ test specialized for adults
  + Full Scale IQ score for each test taker, broken down into:
    - General Ability Index (GAI): Verbal Comprehension, Perceptual Reasoning
      * Measures intellectual abilities without much emphasis on how fast problems are solved
    - Cognitive Proficiency Index (CPI): Working Memory, Processing Speed
      * Greater memory capacity/processing speed allow more cognitive resources for solving problems

##### Raven’s Progressive Matrices

* Researchers attempted to develop more “culture-free” tests that don’t depend on familiarity with culture or fluency in English
* **Raven’s Progressive Matrices**: intelligence test developed by *John Raven* that is based on pictures instead of words
  + Relatively unaffected by language or cultural background

#### The Chequered Past of Intelligence Testing

* *Lewis Terman*, who developed the Stanford-Binet test, believed that intelligence tests used in schools should identify students who are more geared towards higher education vs. those who are better at skill-based topics

##### IQ Testing and the Eugenics Movement

* At the end of the 19th century/beginning of the 20th century, scientific understanding of the living world was being transformed by Darwin’s theory of evolution as well as the Industrial Revolution
  + Some people began to believe that dominance of Western cultures was due to genetic superiority
  + Eugenics: attempt to improve “good genes” in the gene pool of a population
    - Terman promoted eugenics, believing that his IQ tests provided empirical justification of eugenic practices
    - He concluded that non-Western cultures/non-White ethnicities did not have as high IQs from his tests, so they were justified towards lower status

##### The Race and IQ Controversy

* Over the last century, people of different ethnic groups have had consistent differences in IQ scores
  + Asians tended to have the highest IQs, then Whites, then Latinos and Blacks
* *Herrnstein and Murray* argued that human intelligence is a strong indicator of many personal/social outcomes, including workplace performance, income, likelihood of criminal activity involvement
  + They argued for meritocracy, where people with greatest ability should receive the most wealth, power, and status
* Idea that there are inherent genetic differences in intelligence between groups is controversial

##### Problems with the Racial Superiority Interpretation

* Tests can be culturally biased
* Process of testing could’ve also been biased
  + E.g. less familiarity of standardized tests in minority groups could lead to less motivation to do well
* **Stereotype threat**: when negative stereotypes about a group causes members of the group to underperform on ability tests
  + Increases arousal, which can undermine test performance
  + Causes people to be more self-focused, leaving fewer cognitive resources for focusing on the test
  + Increases tendency to actively inhibit negative thoughts, also leaving fewer cognitive resources for the test
* Test scores also reflect linguistic/cultural bias during test, not just IQ
* Even if intelligence differences between groups are valid, it may not be due to genetic differences – could be more related to social circumstances
* **Entity theory**: belief that intelligence is a fixed characteristic and relatively difficult/impossible to change
* **Incremental theory**: belief that intelligence can be shaped by experiences, practice, and effort

### 9.2 Understanding Intelligence

* **Savant**: an individual with low mental capacity in most domains but extraordinary talent in specific areas such as music, math, or art
* Generally, people believe that intelligence involves the ability to think, understand, reason, learn, and find solutions to problems

#### Intelligence as a Single, General Ability

* **Factor analysis**: statistical technique that involves looking at correlations between variables to find clusters of related variables, called “factors”
  + *Charles Spearman* used this technique to calculate correlations between different measures of mental abilities

##### Spearman’s General Intelligence

* **General intelligence factor “g”**: Spearman believed this represented a person’s “mental energy”, following the belief that some people’s brains are more powerful than others
  + Contributed to notion that intelligence is a basic cognitive trait, made up of the ability to learn, reason, and solve problems, regardless of their nature
  + General intelligence scores also predicted many seemingly unrelated phenomena like lifespan, speed at making snap judgements, and self control
  + General mental ability emerged as the best predictor of job performance, as well as predicting how well our brain works
* However, correlation doesn’t equal causation
  + Higher g could also mean higher motivation
  + There are many ways to be intelligent – for example, g wouldn’t be very good at capturing the genius exhibited by savants

#### Intelligence as Multiple, Specific Abilities

* Spearman himself believed that g doesn’t fully capture intelligence
* To account for specific skills and knowledge, Spearman introduced the factor **“s”**, which was task-specific
  + His two-factor theory of intelligence was comprised of both g and s, to represent both overarching intelligence and skill/ability for a given task
* *Louis Thurstone* sampled general intelligence scores using factor analysis and found seven clusters of primary mental abilities:
  + Word fluency
  + Verbal comprehension
  + Numeric abilities
  + Spatial visualization
  + Memory
  + Perceptual speed
  + Reasoning
* Thurstone argued that the seven abilities functioned independently from each other, rather than one general intelligence
* Spearman argued back that all seven abilities correlated with each other, suggesting an overarching general intelligence

##### Hierarchical Model of Intelligence

* Hierarchical models describe how certain types of intelligence are nested in others
  + Lowest-level: those relevant to a specific task (like Spearman’s s)
  + Middle-level: Thurstone’s primary mental abilities
  + Highest-level: general intelligence (like Spearman’s g)
* **Fluid intelligence (Gf)**: type of intelligence used in learning new information and solving new problems not based on previous knowledge
* **Crystallized intelligence (Gc)**: type of intelligence that draws upon past learning and experiences

##### Sternberg’s Triarchic Theory of Intelligence

* **Triarchic Theory of Intelligence**: theory that divides intelligence into three types: analytic, practical, and creative
  + Analytic intelligence: “book smarts” – ability to reason logically through a problem and find solutions
  + Practical intelligence: “street smarts” – ability to find solutions to problems encountered in daily life and those that involve other people
  + Creative intelligence: ability to create new ideas and come up with novel solutions to problems
* *Robert Sternberg* believed that practical and creative intelligence predict real-world outcomes better than analytic intelligence
* Psychologists have argued that creativity isn’t an intelligence, rather just a tendency to think in ways that challenge norms/conventions

##### Gardner’s Theory of Multiple Intelligences

* *Howard Gardner* proposed a theory of **multiple intelligences**: there are at least eight or nine different forms of intelligence, each independent from each other
  + Verbal/linguistic
  + Logical/mathematical
  + Visuospatial
  + Bodily/kinesthetic
  + Musical/rhythmical
  + Interpersonal
  + Self/intrapersonal
  + Naturalist
  + Existential
* Critics pointed out that few of Gardner’s forms of intelligence are measurable – requires wide variety of measurement techniques, and some (e.g. interpersonal/intrapersonal) are more like beliefs than intelligences
* Gardner’s theory has been widely adopted in education, when determining different children’s learning styles

#### The Battle of the Sexes

* A study using 42 different mental abilities tests found almost no differences in intelligence between males and females
* Some research has shown that although males and females have similar average IQ scores, there is greater variability in male scores
  + However, this can relate to skewed sampling, due to societal circumstances such as fewer females taking higher education math courses, or more low-IQ males dropping out of high school

##### Do Males and Females have Unique Cognitive Skills?

* When multiple intelligences are considered (rather than overall IQ), clear differences between genders does exist
  + Females tend to be better at verbal abilities, some memory tasks, and ability to read emotions
  + Males tend to be better at visuospatial abilities
* This may explain why males are more represented in fields such as engineering, math, and science
* However, underrepresentation of females in some disciplines can also be due to stereotype threat, where girls’ fear of living up to negative stereotypes such as “girls can’t do math” cause them to underperform

### 9.3 Biological, Environmental, and Behavioural Influences on Intelligence

#### Biological Influences on Intelligence

* Story of Einstein’s brain shows that behaviours and abilities are linked to biology
  + His brain contained extra folds and creases, increasing surface area and therefore neural connectivity

##### The Genetics of Intelligence: Twin and Adoption Studies

* Increase in genetic similarity increases similarity in intelligence test scores
* Regardless of whether twins are raised together or apart, their intelligence scores show strong correlation – same correlation as a person taking the test twice and comparing with themselves

##### The Heritability of Intelligence

* The heritability of intelligence is estimated to be 40%-80%
* **Heritability estimate** describes how much of differences between people in a sample can be accounted for by differences in their genes
  + This number depends on the number of people being studied
    - E.g. around 72% for wealthy people vs. around 10% for poor people
  + It also depends on other factors, such as how similar/different people’s environments are
    - Wealthy people tend to grow up in similar environments, while people in poverty can grow up in very different circumstances
* Genes also do not operate in isolation from the environment; environmental factors determine how genes express themselves and influence organisms
* Genes can also influence intelligence indirectly by operating through other factors

##### Behavioural Genomics

* **Behaviour genomics**: technique that examines how specific genes interact with environment to influence behaviours, including those related to intelligence such as cognitive abilities like learning and problem solving
* Scanning of the entire human genome showed that intelligence can be predicted to an extent by collections of genes that individuals inherit, which influence cognitive ability
  + Each contribute a small amount, but adding their contributions together creates a large effect
* **Gene knockout (KO) studies**: removing specific genes and comparing the characteristics of animals without that gene
* **Transgenic animals**: inserting genetic materials into chromosomes to study the changes associated with the new gene

#### Environmental Influences on Intelligence

* Environmental conditions influence which genes are expressed (“turned on”) in an individual
* Experiments with animals have shown that growing up in physically and socially stimulating environments results in faster learning and enhanced brain development

##### Birth Order

* A study in Norway showed that first-born children have, on average, 3 more IQ points than second-born children, and 4 more than third-born children
* Older children tend to tutor/mentor younger children – teaching leads to deeper processing of information, which increases likelihood of remembering it

##### Socioeconomic Status

* Children growing up in wealthy homes tend to have higher IQ than those growing up in poverty
  + Wealthier people generally have better access to resources and opportunities, which leads to environmental differences
  + Many environmental factors affecting intelligence are not evenly distributed between rich and poor families – e.g. children with professional working parents will have learned 30 million words compared to 10 million for those with unemployed parents
* People in higher SES households tend to be more supportive of children’s intellectual development

##### Nutrition

* Research has shown that diets high in saturated fat can lead to sharp declines in cognitive functioning
* Diets low in fats and high in fruits, vegetables, fish, and whole grains are associated with higher cognitive function
* Research has shown that “poor” diets lead to reliably lower IQ scores by age 8.5 than “health-conscious” diets, even when effects of socioeconomic status are factored in
* Whole grains, omega-3 fats, fruits, and veggies are best for contributing to intelligence

##### Stress

* High levels of stress in economically poor populations is a major factor in explaining the IQ gap between the rich and poor
* Stress increase the level of stress hormones such as cortisol in the body, which has been related to poorer cognitive functioning
* High stress levels also interfere with working memory, and perseverance in getting through difficult tasks
* Chronic stress can damage neural circuitry in the prefrontal cortex and hippocampus, which are integral to working memory, long-term memory, and other cognitive abilities

##### Education

* Children’s IQ scores are significantly lower when they aren’t attending school
* Education has the potential to remote the poor-rich IQ gap, but it depends on whether they have access to the same quality of education, and other resources to help them make full use of education opportunities

##### The Flynn Effect: Is Everyone Getting Smarter?

* **Flynn effect**: the steady population level increases in intelligence scores over time – IQ scores have been rising about 1 point per 3 years
* The most likely reason for this is that modern society requires increasingly emphasized intellectual skills such as abstract thinking, scientific reasoning, and logical analysis
  + Each successive generation spends more time manipulating and processing information from different forms of media, as well as spending time in school

#### Behavioural Influences on Intelligence

##### Brain Training Programs

* Computer tasks (“N-back task”) have been proven to improve memory performance and IQ scores
* This demonstrated that practicing cognitive exercises can affect the cognitive abilities that underlie intelligence

##### Nootropic Drugs

* **Nootropic substances**: substances that are believed to beneficially affect intelligence
  + They can increase overall alertness, stimulate nerve growth in the brain, or change the availability of certain neurotransmitters
* Ritalin and Provigil are two commonly used drugs that can boost cognitive functioning
  + However, the long-term effects of taking these drugs aren’t well understood
  + There are potential side effects to the drugs
* Nootropic drugs provide unfair advantages to people willing to take the drugs

##### Meditation

* Numerous studies have linked mindfulness meditation to improvements in cognitive function
  + They can also help increase IQ indirectly, through helping people keep stress/other negative feelings from interfering with concentration
  + Mindfulness meditation can increase thickness and density of white-matter pathways in brain networks that play roles in helping people maintain attention and control emotional reactions
* Other forms of meditation have been proven to slow down the rate of cognitive decline and the loss of grey matter in the brain associated with aging
* Meditation can also improve the thickness of parts of the brain associated with performance on intelligence tests
* A mere five minutes of a mindfulness-based program can increase IQ scores; the longer and more regularly one practices mediation, the greater the benefits on both cognitive abilities and general brain structure