Psychology 2019 v1.3

Unit 1 annotated bibliography

Unit 1: Individual development

Unit description

In Unit 1, students explore the scientific method as the process for producing contemporary research in psychology. An understanding of the original philosophical debates to inform psychology — including free will versus determinism, and nature versus nurture — provides an essential lens for examining all perspectives within psychology. Students investigate the structure and function of the human brain and how this affects individual development and behaviour. They examine factors within cognitive development, and explore changes that occur over the lifespan. Lastly, they explore different forms of consciousness and theories for the function of sleep.

Contexts that could be investigated in this unit include the impact of orphanages on childhood development, the influence of technology on 21st century lives, and the effect of sleep deprivation on cognition.

Annotation	Evaluation	Similar/related research
Topic 1: Psychological science A		
Bibliographic citation: Dominus, S 2015, 'The mixed-up brothers of Bogota', *The New York Times Magazine*, 9 July, www.nytimes.com/2015/07/12/magazine/the-mixed-up-brothers-of-bogota.html.		
• Susan Dominus is a columnist at *The New York Times*. • This article is a story about two sets of Colombian identical twins and how it was discovered that they were mixed up at birth. They were raised as fraternal twins and had no idea that they had an identical twin living with a different family. • The story begins with the chance discovery by a woman named Laura, who worked with one of the brothers (Jorge). One day she sees someone who looks exactly like Jorge working in a butcher's shop (William). The story goes on to explain how the truth was revealed, first through the sharing of a photo, and then with a face-to-face meeting. • In part 2, the writer provides a summary of research focused on twins. The nature vs. nurture debate is referenced and the story of the twins is continued in this context. • Part 3 identifies and dispels some of the myths surrounding identical twins referring to research studies. It concludes by relating back to the story of the 'mixed-up brothers of Bogotá'.	• This article – has photos and video of the twins and, though long, is highly readable for a teenage audience – provides no specific evidence from research to support its assertions – gives a detailed description of twin research – could be used as a pre-reading or homework activity.	—
Topic 2: The role of the brain		
Bibliographic citation: Sabbatini, RME 1997, 'Phrenology: The history of brain localization', *Brain & Mind*, vol. 1, www.cerebromente.org.br/n01/frenolog/frenologia.htm.		
• Renato Sabbatini is a neuroscientist and specialist in biomedical informatics. He has worked in São Paolo, Brazil and Munich, Germany and is the founder and former director of the Center for Biomedical Informatics at the State University of Campinas, Brazil. • This web article details the history of brain localisation, from the early researchers such as Franz Joseph Gall through to today. • It begins with a discussion of phrenology and includes pictures of topological maps of the brain from Gall's research.	• This article – references the works of famous early brain researchers and would be a good way to introduce early brain investigation techniques – uses language accessible for high school students – is limited in that it doesn't include a bibliography of works cited.	—

Annotation	Evaluation	Similar/related research
Bibliographic citation: Kumar, R & Yeragani, VK 2011, 'Penfield — A great explorer of psyche-soma-neuroscience', *Indian Journal of Psychiatry*, vol. 53, no. 3, pp. 276–278, www.indianjpsychiatry.org/article.asp?issn=0019-5545;year=2011;volume=53;issue=3;spage=276;epage=278;aulast=Kumar.		
• When this article was published, Rahul Kumar was a researcher in the Department of Neurology at University Hospital, Zurich, Switzerland. Vikram Yeragani was a researcher in the Department of Psychiatry at the University of Alberta, Canada. • This article is a review of the life and work of pioneering Canadian neurosurgeon Wilder Penfield. • Penfield's initial research was in the treatment of epilepsy, during which he learned from surgeons and researchers throughout the world. • While developing treatments for epilepsy, Penfield began to map the brain and determine which parts of the body were controlled by which segments of the brain. • Penfield's surgical studies yielded reports on brain tumours, the mechanisms of headache, the localisation of motor, sensory and speech functions, and the role of the hippocampus in memory. • He developed a new surgical approach called the 'Montreal procedure' in which patients would be awake and talking during surgery. • Penfield's treatments led to the advancement of brain surgery techniques and neurological knowledge. It also resulted in the development of new nursing techniques for spinal patients and the creation of electroencephalography to treat conditions such as epilepsy. • In drawing together the disciplines of neurosurgery, neuropathology, neurology and related basic sciences, Penfield transformed the study of the brain.	• This review – uses plain language to describe Penfield's major research directions and findings – gives a detailed description of the professional life and discoveries of Wilder Penfield – uses clear, factual, scientific knowledge (strength) – is lengthy and contains erroneous information and neurological terminology (e.g. focal epilepsy) that may need further clarification (limitation).	—
Bibliographic citation: Damasio, H, Grabowski, T, Frank, R, Galaburda, AM & Damasio, AR 1994, 'The return of Phineas Gage: Clues about the brain from the skull of a famous patient', *Science*, vol. 264, pp. 1102–1105.		
• Hanna Damasio is the lead author and a leading scientist in the field of cognitive neuroscience. • This article aims to confirm that damage to the brain of Phineas Gage likely caused the changes observed in his personality. • In 1848, Phineas Gage was a construction foreman on a railroad in England. One day, a charge filled with explosive powder was detonated, causing a 3 cm thick, 1 metre long iron rod to be propelled through Phineas's face, skull and brain before piercing through the other side of his head. • After the accident, Phineas could talk, walk and live independently but he had lost the ability to follow social conventions and his personality changed. John Harlow, his physician at the time, hypothesised that this was due to damage to his left frontal lobe, which was thought to have affected his inhibitions. This was not confirmed at the time as the necessary technology was not available. • Using modern brain imaging technology on the preserved skull of Phineas Gage, the authors of this article found that there was a pattern of damage in the prefrontal cortex of both the left and right hemispheres. This area of the brain has been found to be related to the interpretation of emotions and social responsibility and inhibitions. • The researchers concluded that the damage to the prefrontal cortex affected Phineas Gage's emotional responses and decision-making abilities.	• Current researchers were able to confirm the diagnosis made by the original surgeon using X-ray technology. This increases the reliability of the original findings and, since the current study used neuroimaging technologies, which limits bias, it can be said that there is a high level of reliability. • However, it cannot be definitively concluded that particular brain sections were affected by the injury as only the skull was tested. This could affect the reliability of the study. • A strength of the study is that it confirms localisation of function, especially for decision-making and emotional response, to the prefrontal cortex. It also uses an objective method (i.e. neuroimaging) to achieve this. • This study confirms the findings from a very old case study and could be used to – show students how modern technology can clarify research from the past – encourage a better understanding of the localisation of brain function.	—

Annotation	Evaluation	Similar/related research
Bibliographic citation: Maguire, EA, Woollett, K & Spiers, HJ 2006, 'London taxi drivers and bus drivers: A structural MRI and neuropsychological analysis', *Hippocampus*, vol. 16, no. 12, pp. 1091–1101, doi:10.1002/hipo.20233.		
• Lead author of this paper, Eleanor Maguire, is a well-known researcher who investigates brain imaging technology and localisation of brain function. Her research has been conducted as part of the Wellcome Department of Imaging Neuroscience at University College, London. • The aim of the investigation was to identify if taxi drivers and bus drivers experience changes in the neurophysiology of their brains because of their profession. • The basis for this study was previous research conducted by Maguire (1997, 2000) on differences in the size and activity of the hippocampus in taxi drivers. It was proposed that the size of the hippocampus was increased due to their increased use of spatial memory. • The bus drivers and taxi drivers in this investigation were matched for driving experience and baseline stress levels. The study used a correlational design and brain imaging technology. Brain functioning tests were also performed to investigate attention and memory capacity. • The results showed an increased grey matter (brain volume) in taxi drivers, especially in the right posterior hippocampus, compared to bus drivers, and a lowered anterior volume. The increase in volume was also directly proportional to the years of driving experience. • An additional finding was that taxi drivers had trouble retaining new spatial information. The authors suggest that this may be due to the already larger grey matter in the posterior hippocampus, which could restrict new information being learnt. • The paper's conclusion is that neuroplasticity seems to occur in taxi drivers due to their increased use of spatial memory, because they travel to many different areas of a city, as opposed to bus drivers, who often travel the same route. The longer the driving experience, the more significant the change of the brain structures associated with memory (hippocampus).	• The audience for this study is academics and neuroscience professionals, so the language is very technical. • This study – could be used as an introduction to the use of magnetic resonance imaging (MRI) in investigating brain structures, neuroplasticity and localisation of brain function – further confirms the findings from Maguire's earlier research that neuroplasticity can occur as a result of spatial navigation used by London taxi drivers. This indicates high reliability and the use of an MRI scan limits researcher bias. • The participants in the investigation (i.e. bus drivers and taxi drivers) were matched well compared with the Maguire et al. study (2000). This is a strength of the study, as it increases its reliability and validity, especially internal validity. • There are limitations to the study, including that – a structural scan (MRI) was used, which does not indicate increased activity or functioning – it only shows correlational data, which decreases the applicability of the results, since no cause-and-effect relationship could be ascertained. • Figures 1 and 3 (Maguire et al., 2006, p. 1094 and p. 1096) are useful visual aids for seeing the changes in the brains of the taxi drivers and bus drivers. • This study is useful for the study of localisation of brain function and brain imaging technologies, both of which are part of Unit 3.	Maguire, EA, Frackowiak, RSJ, Frith, CD 1997, 'Recalling routes around London: Activation of the right hippocampus in taxi drivers', *The Journal of Neuroscience*, vol. 17, no. 18, pp. 7103–7110, www.jneurosci.org/content/17/18/7103.
Bibliographic citation: Raine, A, Buchsbaum, M & LaCasse, L 1997, 'Brain abnormalities in murderers indicated by positron emission tomography', *Biological Psychiatry*, vol. 42, no. 6, pp. 495–508, doi.org/10.1016/S0006-3223(96)00362-9.		
• Currently based at the University of Pennsylvania, Adrian Raine is a world leader in research into forensic psychology and neuroscience. His work is mainly focused on criminal behaviour and using brain imaging technologies to identify correlations between localisation of brain function and abnormal/antisocial behaviours. • In this study, Raine et al. (1997) used brain imaging technology, specifically positron emission tomography (PET) scans, to examine the brains of murderers who have pled not guilty by reason of insanity (NGRI). This research was aiming to establish if localisation of brain function may have a part to play in criminal behaviour, especially in those who have pled NGRI. • The study recruited 41 criminals imprisoned for murder or manslaughter from the state of California. A control group, matched by age, sex and schizophrenia diagnosis, were used as a comparison group. A correlational design was used, as brain imaging technology cannot show cause and effect. • PET scans indicate which areas of the brain are used more often by measuring glucose metabolism in the brain, with areas of high glucose metabolism indicating increased activity in this section of the brain. • The results showed that the criminals who pled NGRI had lowered glucose metabolism in the areas of the brain associated with planning and decision-making (prefrontal cortex) and decreased activity in areas responsible for emotion (left amygdala), filtering of information from the environment (thalamus) and associated with memory (medial temporal lobe). • The conclusions made by the authors include a possible correlation between the abnormal functioning of certain brain centres, which may be associated with a predisposition to violence, in murderers who have pleaded NGRI. • This article – provides insight into how brain imaging technologies can be used to understand behaviours – introduces the idea of localisation of brain function – shows that many areas of the brain are associated with violence and no one specific area can be identified.	• This article – uses complex and technical language and is written for an academic audience with some background knowledge of neuroscience or brain anatomy and a basic knowledge of brain imaging technology – is useful for introducing neurosurgery techniques that were used in the past and why these now have limited use – is highly reliable, as the researchers tested the largest criminal population available at the time (large sample size) and the participants presented with very similar brain imaging findings – uses a matched control group (age, sex and schizophrenia diagnosis), which allows researchers to compare against non-offenders, increasing the validity of the evidence. • The use of PET scanning technology limits the chance of researcher bias and establishes a clear comparison for localisation of function. • While there is a suggestion that biology (brain anatomy and functioning) may predispose individuals to violence, there is no indication that this is the sole reason for violent behaviour. Raine et al. suggest that other factors, such as social and environmental factors, must be considered. • As the study uses brain imaging technology, it cannot give a cause-and-effect result, since it only produces correlational data. Therefore, it is unclear whether the violent behaviour changed brain structure or if the brain structure caused the violent behaviour.	—

Annotation	Evaluation	Similar/related research
Topic 3: Cognitive development		
Bibliographic citation: Lorenz, K 1937, 'The companion in the bird's world', *Auk*, vol. 54, no. 1, pp. 245–273, https://sora.unm.edu/sites/default/files/journals/auk/v054n03/p0245-p0273.pdf.		
• Konrad Lorenz was an Austrian zoologist, ethologist and ornithologist. He won the 1973 Nobel Prize in Physiology or Medicine and is regarded as one of the founders of modern ethology, the study of animal behaviour. Lorenz's work focused on instinctive behaviour and he coined the term 'imprinting' to describe the process by which birds bond instinctively with the first moving object they see. • This paper is a translation and summary from an earlier work published in 1935 in German. It details observations about instinctive behaviours in numerous animal species. Lorenz particularly focused on the distinction between lower and higher organisms in regard to this phenomenon and most of the examples are bird species, particularly mallard ducks. • Through experimentation, Lorenz discovered that most birds do not recognise their own species 'instinctively' and when raised in isolation, imprint on their human keeper. Once this imprinting has occurred they will forever favour that person; even their own species is viewed as a poor substitute. The results were consistent even when subjects interacted with their own species over an extended period of time. • Lorenz argued that this process is different from associative learning, as it is confined to a very definite period of individual life (i.e. when the chick is drying off after hatching) and is totally irreversible.	• The paper is translated from German and uses sophisticated language. • The experimental and observational work performed by Lorenz still has currency in modern research literature. • Limitations of the paper are that – the conclusions were based on observation, so it is difficult to quantify the findings – the research was conducted on birds and has little applicability to human subjects. • This paper could be used as an introduction to attachment theory, particularly when used before the work of Harlow and Zimmerman (1958).	—
Bibliographic citation: Harlow, HF & Zimmermann, RR 1958, 'The development of affective responsiveness in infant monkeys', *Proceedings of the American Philosophical Society*, vol. 102, pp. 501–509.		
• Harry Harlow was an American psychologist best known for his maternal separation and social isolation experiments with rhesus monkeys. His experiments, viewed as controversial due to the treatment of the infant monkeys, demonstrated the importance of caregiving and companionship in social and cognitive development. • In this paper, researchers removed infant rhesus monkeys from their mothers 6–12 hours after birth and suckled them on tiny nursing bottles that were attached to a wire replica of a monkey mother (surrogate). Previous studies had shown that baby monkeys will attach to cloth pads in their cages, so the researchers sought to determine whether it was food or comfort the infant monkeys craved. • This paper details several trials in which researchers manipulated different variables, recording the amount of time spent on wire surrogates vs. cloth surrogates. • The findings were that monkeys preferred to spend more time with the cloth surrogate, only moving to the wire surrogate for sustenance. Harlow suggested that the cloth surrogate provided the monkeys with a haven of safety and that nursing should be viewed as an affectional variable, not just to satisfy hunger. • Further trials strengthened these findings when monkeys were placed in different environments. The group of monkeys that spent up to 24 months in isolation emerged intensely disturbed, further demonstrating the importance of early comfort to an infant.	• This paper is very easy to read and would be suitable for high school students. • Harlow's research demonstrated the importance of affectional ties between mothers and infants. His work spurred the work of John Bowlby and Mary Ainsworth and created the movement in developmental psychology toward studying maternal caregiving and what happens when it is withheld. • The experiments used a control group, which increases the reliability of the findings. However, these monkeys could hear other monkeys and would occasionally view surrogates in other cages, which may have affected the validity of the findings. • A strength of the study is the use of multiple objective techniques, enhancing reliability and face validity. • The research has been criticised by animal activists, who express concern about the treatment of the infant monkeys and the long-term negative effects experienced by them. • This research could be used as an introduction to attachment theory and the importance of caregiving in early development. Harlow's later studies, which show the effects of deprivation, could be used to support the work of Bowlby (maternal deprivation) and Rutter (Romanian orphanages).	• Harlow, HF, Rowland, GL & Griffin, GA 1964, 'The effect of total social deprivation on the development of monkey behavior', *Psychiatric Research Reports*, vol. 19, pp. 116–135. • Rutter, M, O'Connor, TG & English and Romanian Adoptees (ERA) Study Team 2004, 'Are there biological programming effects for psychological development? Findings from a study of Romanian adoptees', *Developmental Psychology*, vol. 40, no. 1, pp. 81–94.

Annotation	Evaluation	Similar/related research
Bibliographic citation: Bowlby, J 1969, *Attachment and Loss*, vol. 1, Attachment, Basic Books, New York.		
• John Bowlby was a British psychologist, psychiatrist and psychoanalyst who pioneered work into child development and attachment theory. • This book details the research undertaken into the effect of child–mother separation, including possible long-range effects into adulthood. It builds on the work done by James Robertson in the 1950s and begins with a discussion of instinctive behaviour. The book describes the theory that from birth children instinctively attach to increase their chances of survival. • It then outlines a theoretical formulation of attachment behaviour — how it develops, how it is maintained and what functions it fulfils. Key ideas put forward include the age at which attachment behaviour develops, and various phases of attachment. It emphasises the importance of the first two years of a child's life and their influence on later attachment. The book also details other theoretical findings, such as the use of the mother as a secure base and proximity-seeking by infants. • This book also identifies a 'primary attachment figure' (typically the mother) and the role played by subsidiary figures. It finishes with a discussion of the potential long-term consequences of maternal deprivation, including delinquency, reduced intelligence and other behavioural deficits. • There is a second addition to this book (1982) that has additional chapters and substantial revisions based on up-to-date research findings.	• This book was the culmination of 29 years of research, including observations and theoretical conceptualisation, and was viewed as ground-breaking in the field of developmental psychology. • A strength of the theory presented in this book is that it draws on the works of Sigmund Freud and Konrad Lorenz and research conducted by Mary Ainsworth. It is a comprehensive review of attachment theory at the time. • A limitation of the theory is that subsequent research suggests it is over-simplified and that not all later behavioural problems are the result of a lack of attachment to a mother figure. Further research has also shown evidence that a happy mother figure (even if she is not present) may have a lasting effect on a child's attachments in the future. • Throughout his career, John Bowlby shaped attachment theory and early development programs for children. This book could be used as an introduction to attachment theory and could be followed by the works of Mary Ainsworth, who further investigated Bowlby's theoretical ideas.	• Robertson, J & Robertson, J 2017, 'Young children in brief separation', *The Psychoanalytic Study of the Child*, vol. 26, no. 1, pp. 264–315, https://doi.org/10.1080/00797308.1971.11822274.
Bibliographic citation: Ainsworth, MDS, Blehar, MC, Waters, E & Wall, S 1978, *Patterns of Attachment: A psychological study of the strange situation*, Erlbaum, Hillsdale, NJ.		
• Mary Ainsworth, a student of John Bowlby, is a pioneer of attachment theory. This book describes her seminal experiment, 'the strange situation', which tested how infants responded to reunion episodes with their mothers. • The procedure consisted of eight episodes lasting three minutes each – mother, baby and the experimenter – mother and baby alone – a stranger joins mother and infant – mother leaves baby and stranger alone – mother returns and stranger leaves – mother leaves; infant left completely alone – stranger returns – mother returns and stranger leaves. • The classifications produced by the experiment (i.e. attachment styles) were based primarily on four interaction behaviours between mother and infant – proximity and contacting-seeking – contact-maintaining – avoidance of proximity and contact – resistance to contact and comforting. • The book details how Ainsworth and her colleagues were able to identify securely attached infants and two types of insecurely attached infants. • Securely attached infants represented 70 per cent of the sample and were identified as – confident that their needs would be met – happy to explore the environment using the attachment figure (mother) as a safe base – easily soothed by the attachment figure when upset. Insecurely attached infants were further classified into insecure avoidant (15%) and insecure ambivalent (15%). Insecure avoidant infants did not orientate to their attachment figure while investigating their environment, were independent both physically and emotionally, and did not seek contact with the attachment figure when distressed. Insecure ambivalent infants showed distress when the mother left the room and sought contact on her return, but at the same time rejected it. • Ainsworth et al. conclude by suggesting the 'caregiver sensitivity hypothesis' as an explanation for different attachment types. This hypothesis suggests that an infant's attachment style is dependent on the behaviour of their mother (or attachment figure).	• Ainsworth's study provided the first empirical evidence for Bowlby's attachment theory. • The strength of the findings in this book is that long-term follow-up studies by other researchers have confirmed the results and show that there are long-term consequences for those infants who suffer attachment pathology in the early months of their life. This has been demonstrated across different cultures. • A limitation of the study is that the correlation between parental sensitivity and an infant's attachment type is weak. This suggests that there could be other reasons why children develop different attachment types. • Opposing research by Kagan et al. (1984) suggests that a child's attachment type may be derived from their temperament.	• Kagan, J, Reznick, JS, Clarke, C, Snidman, N & Garcia-Coll, C 1984, 'Behavioral inhibition to the unfamiliar', *Child Development*, vol. 55, pp. 2212–2225.

Annotation	Evaluation	Similar/related research
Bibliographic citation: Rutter, M, O'Connor, TG & The English and Romanian Adoptees (ERA) Study Team 2004, 'Are there biological programming effects for psychological development? Findings from a study of Romanian adoptees', *Developmental Psychology*, vol. 40, no. 1, pp. 81–94, www.psy.miami.edu/faculty/dmessinger/c_c/rsrcs/rdgs/emot/rutter20014.dp.adoption.pdf.		
• Michael Rutter is a professor of developmental psychopathology at King's College London and was the first professor of child psychology in the UK. He has been described as the 'father of child psychology' and was responsible for establishing the Medical Research Council (UK) Child Psychiatry Research Unit in 1984. He led The English and Romanian Adoptees Project, which observed Romanian orphans adopted into western families across multiple domains. • The study sought to investigate whether the adverse effects of deprivation during infancy and early childhood persisted after deprivation ceased. To determine this, the dependent variables were – evidence of cognitive impairment – disinhibited attachment. • The sample consisted of 165 children from Romanian institutions who were adopted into UK families between February 1990 and September 1992. At that time, Romanian institutions were classed as deprived environments. A stratified random sampling design was used based on the child's age at the time of entering the UK. At adoption, the children were aged from early infancy (< 6 months) to 42 months. The children were measured on psychological, behavioural and physical attributes at the time of entry and at 6 years of age. These children were compared with 53 non-deprived UK-born children placed into adoptive families. • The researchers found that at 6 years of age, most of the children showed relatively normal cognitive and social functioning but that duration of deprivation was a significant predictor of cognitive impairment and those children who spent the most amount of time in deprived environments were the most likely to be adversely affected. • In addition, the pattern of disinhibited attachment was much more common in the adoptees from the Romanian institutions and was strongly associated with the duration of institutional deprivation. • The researchers concluded that some form of early biological programming or neural damage stemming from institutional deprivation was likely to have caused the differences observed in the outcomes of the children, and that this effect is not necessarily deterministic.	• This research is an example of a natural experiment. • It is an accessible study for students to read and provides insight into how large research teams collect data over time. • The validity and reliability of the study's findings are enhanced by: – the scale of this study (including the number of researchers involved) and the fact that it is a longitudinal study – the use of a mixture of physiological measures, such as height and weight, interviews, observations and questionnaires, combining both qualitative and quantitative data from which to draw conclusions – the sample size (N = 165) being quite large, which increases the population validity of the conclusions – the use of a comparison sample of adopted children. • A limitation of the research is the short period of time that the children were measured (only 24 months) after entering the UK. There was no data in the research that assessed the long-term outcomes of these children compared to the control group, e.g. whether the findings were persistent or if later issues were reported. • This longitudinal study could be used to introduce the effects of deprivation on cognitive development.	—
Bibliographic citation: Piaget, J 1936, *Origins of Intelligence in the Child*, Routledge & Kegan Paul, London.		
• Jean Piaget was a Swiss developmental psychologist known for his epistemological studies with children. His theory of cognitive development and epistemological view are known as 'genetic epistemology'. • This book discusses the origins of intelligence in children and contains observations of young children along with novel experiments. • There are two basic components to this aspect of Piaget's cognitive theory – schemas – the adaptation process. • Schemas are described as the basic building blocks of knowledge and are a way of organising knowledge. They are thought to be 'units' of knowledge, each relating to one aspect of the world, including objects, actions and abstract concepts. • Adaptation processes include assimilation, accommodation and equilibrium. – Assimilation involves using existing schemas to deal with a new object or situation. – Accommodation is when existing schemas do not work, so there needs to be a change to deal with a new object or situation. – Equilibrium is defined as the force that moves development along. • Piaget argues that development does not happen at a steady rate but rather in leaps and bounds.	• Piaget defined the field of child cognitive development. Before his theories it was thought that children were simply less competent thinkers than adults. Piaget showed that young children think in very different ways to adults. • The strengths of Piaget's work are that he – has had enormous influence in developmental psychology and inspired many researchers that came after him – generated a huge amount of research that has been of practical use in understanding and communicating with children. • Criticisms and limitations of Piaget's work include – that Piaget did not consider the influence of social and cultural determinants on children, especially the role of social interaction – the use of an observational research method and interviews by Piaget, which limit the reliability of the research as they are open to bias – that the concept of schemas is incompatible with behaviourist theories, which can be objectively measured. • Piaget went on to identify four stages of development – sensorimotor (birth to 2 years of age) – pre-operational (from 2–7 years of age) – concrete operational (from 7–11 years of age) – formal operational stage (11+ years of age) (Inhelder & Piaget 1958).	• Inhelder, B & Piaget, J 1958, *The Growth of Logical Thinking from Childhood to Adolescence: An essay on the construction of formal operational structures*, Basic Books, New York. • Vygotsky, LS 1978, *Mind in Society: The development of higher psychological processes*, Harvard University Press, Cambridge, USA.

Annotation	Evaluation	Similar/related research
Bibliographic citation: Vygotsky, L S 1978, *Mind in Society: The development of higher psychological processes*, Harvard University Press, Cambridge, USA.		
• Lev Vygotsky was a Soviet-era developmental psychologist who proposed that human psychological development emerged through interpersonal connections and actions with the social environment. He strongly believed that community plays a central role in the process of 'making meaning'. His theories were developed at around the same time as Piaget, but had a greater focus on social learning. • This book presents some of the essays produced by Vygotsky before his death from tuberculosis at the age of 39. It begins by introducing Vygotsky and setting the historical context in which he developed his theories, i.e. post-revolutionary Russia. Vygotsky set himself apart from many other researchers, who subscribed to either behaviourism or Gestalt psychology. He believed that the mechanism for individual development is rooted in society and culture. • To investigate his theories, Vygotsky combined experimentation and observation to produce quantitative and qualitative data. • Vygotsky places a strong emphasis on culture and social factors affecting – cognitive development – the role of language in cognitive development. • Adults are seen as an important source of cognitive development, because they transmit a culture's tools of intellectual adaptation for children to internalise. • Notably, Vygotsky proposed the 'zone of proximal development' as a concept, which relates to the difference between what a child can achieve independently and what a child can achieve with guidance and encouragement from a skilled partner.	• The book uses language that is accessible to students. It was written for an academic audience, but uses plain language to explain many of the concepts. Summaries of the important aspects of Vygotsky's theories can be found on numerous websites. • The theories in the book were developed in the early 20th century but still hold relevance today. They have been developed over time to inform educational literature, including the concept of 'reciprocal teaching' and apprenticeships. • These theories are often seen as the emergence of behavioural science as a unified subject, due to Vygotsky postulating the convergence of psychological functions as a product of the brain. • A limitation of Vygotsky's work is that the experimentation was not overly scientific and much was not recorded or published. From what is available, evidence suggests he typically used small sample sizes. • Vygotsky's work has not received the same level of scrutiny as other researchers of his time, as it requires translation from Russian. • Vygotsky claimed that his theories are appropriate for all cultures. Several researchers reject this claim and believe that the use of language in cognitive development may not be equally useful in all cultures and for all types of learning.	
Bibliographic citation: Lally, R 2014, 'Learning early in life may help keep brain cells alive', *Rutgers Today*, 11 April, https://news.rutgers.edu/research-news/learning-early-life-may-help-keep-brain-cells-alive/20140526#.WupCb3-tSmS.		
• Professor Tracey Shors is a neuroscientist at the Department of Psychology and Centre for Collaborative Neuroscience at Rutgers University. This article, published in the university's online newspaper, describes the method and findings of the research conducted by Shors and her colleagues. • The article summarises the study and its aims. The researchers used rats to investigate the effect of learning on brain cell development and survival. To do this, they examined a portion of the hippocampus after rats had learned to associate a sound with a motor response. • The researchers found that cells injected with dye a few weeks earlier were still alive in those rats that had learned the tasks, while the cells in those who had failed did not survive. • Researchers concluded that learning does not make new cells; rather, the process of learning keeps alive cells that are already present at the time of the learning experience. • The article attempts to extrapolate these findings to adolescents, saying that it is important that adolescent children learn at optimal levels.	• The article in summarises the research by Shors and colleagues, though it does not include the full method, data analysis or conclusions made by the researchers. • The research is referenced and appears to have been conducted using an experimental method with highly controlled variables. This increases the reliability and validity of the findings. • A limitation of the article is that although the research was conducted on rats, the researchers have attempted to extrapolate the findings to human adolescents, whose brains are different. • The article could be used – as an introduction to brain plasticity – to support learning in Unit 3 Topic 4: Learning.	Curlik, DM, DiFeo, G & Shors, T 2014, 'Preparing for adulthood: Thousands upon thousands of new cells are born in the hippocampus during puberty, and most survive with effortful learning', *Frontiers in Neuroscience*, 23 April, www.frontiersin.org/articles/10.3389/fnins.2014.00070.
Bibliographic citation: Rosenzweig, MR, Bennet, EL & Diamond, MC 1972, 'Brain changes in response to experience', *Scientific American*, vol. 226, no. 2, pp. 22–29, www.scientificamerican.com/magazine/sa/1972/02-01.		
• Mark Rosenzweig was an American research psychologist whose research focused on neuroplasticity in animals. • This study aimed to investigate whether environmental factors, such as rich or impoverished environments, affect the development of neurons in the cerebral cortex in rats. • The procedure involved placing rats into one of three conditions: a control, impoverished or enriched environment. The enriched environment contained up to 12 rats, who had different stimulus objects to explore and play with. In contrast, rats in the impoverished environment were placed into individual cages that lacked the toys of the enriched environment. The rats typically spent between 30 and 60 days in their respective environments. • Results found a difference in the brain anatomy of the rats in the enriched and impoverished environments. In rats exposed to the enriched environment, their cortex had an increased thickness and higher weight compared to the rats in the impoverished environment. The researchers also reported that rats in the enriched environment had significantly greater activity in the neurons in the cerebral cortex associated with transmission of acetylcholine (a chemical that functions as a neurotransmitter). • Researchers concluded that enriched environments can lead to greater brain plasticity. They also said that the findings have implications for humans, because we can also be affected by environmental factors like intellectual and social stimulation, e.g. it is known that poverty is a major risk factor in children's cognitive development.	• The paper uses quite sophisticated language, but has been summarised for ease of use. • The strengths of this research are that the – method was a highly controlled laboratory experiment, so it is possible to establish a cause-and-effect relationship between the variables studied – results of the study have been replicated many times, with researchers establishing similar findings, which increases the validity of the results and conclusions. • Limitations of the research are that – it used animals, so it is difficult to generalise the result to humans – it is unclear whether it was the toys, social interaction or the exercise in the enriched environment that caused the difference in the findings. This reduces the reliability of the results because these variables were not individually controlled and/or measured. • This research illustrates the effect that environment can have on the plasticity of the brain.	—

Annotation	Evaluation	Similar/related research
Bibliographic citation: Hyde, KL, Lerch, J, Norton, A, Forgeard, M, Winner, E, Evans, AC & Schlaug, G 2009, 'The effects of musical training on structural brain development: A longitudinal study', *The Neurosciences and Music II: Disorders and plasticity*, vol. 1169, no. 1, pp. 182–186, doi.org/10.1111/j.1749-6632.2009.04852.x.		
• Krista Hyde was the lead researcher of this longitudinal study. She works at the Auditory Brain and Cognitive Development Laboratory, McGill University, Quebec, Canada. • This study is part of an ongoing longitudinal research project into the effects of musical training on brain, behavioural and cognitive development in young children. The aim of the experiment was to investigate whether structural brain changes occur in young children who received 15 months of instrumental musical training relative to a group of children who did not. • The procedure consisted of two conditions: an instrumental group and a control group. – The instrumental group had 15 children (mean age at start of study: 6.32 years). – The control group had 16 students (mean age at start of study: 5.90 years). – All students were right-handed and, where possible, gender and socioeconomic status were equal between the groups. • All participants were pre-tested using musically relevant and non-relevant behavioural tests. They also underwent MRI scans. The instrumental group were then tasked to complete keyboard instruction for 15 months. After that time, all participants were re-tested on all measures. • The results at the beginning of the study showed no behavioural or brain differences between the two groups. At 15 months, the instrumental children showed greater behavioural improvements in the musically relevant tests and greater relative size of certain brain areas believed to be responsible for musical ability, including the corpus callosum, right auditory cortex and the motor cortex. • The researchers concluded that plasticity can occur in brain regions that control primary functions important for playing a musical instrument. Additionally, they claimed that this study provides new evidence for training-induced structural brain plasticity in early childhood and that the findings could potentially have implications for intervention programs in the future.	• This study is short and easy to interpret. There are photos of the results of the scans that may be of interest to students. • As this study used an experimental method with a control and experimental group, as well as baseline measurements, a cause-and-effect relationship could be established. These measures increase the reliability and validity of the findings. • The use of an unbiased testing method, such as MRI, increases the reliability of the findings. • A limitation of this study is that the number of participants was small (N = 31) and so care should be taken in drawing conclusions. • The sample comprised young children (mean age of 6.32 and 5.90 years respectively) so care should be taken in generalising to other age groups and adults in particular. • This study could be used to support the teaching of brain plasticity in children.	—
Bibliographic citation: Draganski, B, Gaser, C, Busch, V, Schuierer, G, Bogdahn, U & May, A 2004, 'Neuroplasticity: Changes in grey matter induced by training', *Nature*, vol. 427, pp. 311–312, www.nature.com/articles/427311a.		
• Bogdan Draganski is a principal investigator and associate professor of neurology and neuroscience. This short article reviews and explains neuroplasticity caused by environmental stimuli. • The study aimed to investigate whether juggling could cause structural changes in the brain. This was tested using neuroimaging to identify changes in participant brain structures by using a voxel-based morphometry — a brain imaging technique similar to magnetic resonance imaging (MRI). • The study involved 21 participants matched for age and sex. Participants were randomly allocated to the control and juggling groups. • Both groups initially underwent brain imaging to establish a baseline. The juggling group was given three months to learn how to juggle with three balls. A second scan was performed. The juggling group was then asked to stop juggling for three months. Following this break in the activity, a third scan was conducted. • The results showed – no significant differences between the juggling and control group in grey matter volume at the first brain imaging procedure – a significant increase in grey matter in the areas of the temporal lobes and the parietal lobes of the juggling group at the second scan – that this difference between the groups had significantly declined at the third scan, indicating a loss of neuroplasticity in the juggling group due to lack of practice. • The authors concluded that environmental enrichment in the form of juggling can cause neuroplasticity to occur in the areas of the brain that are responsible for movement (parietal lobe) and learning and memory (temporal lobe).	• The language used in this study is simple, which allows students to read and discuss it in class. • The strengths in the study include the elimination of individual differences due to the research methods used and the use of brain imaging technology to give an objective measure of neuroplasticity. • The limitations are that it is unclear if juggling was the only environmental enrichment that affected the participant's brain functioning during that time of measurement, as neuroimaging can only provide correlational findings, and that the study had a relatively small sample size (N = 21) so it lacked population validity. • This study could be used – as an introduction to neuroimaging, neuroplasticity and localisation of brain function – to demonstrate how research methods can be used together to compensate for their individual limitations – as stimulus for a debate or similar activity about whether genetics or environment have a larger part to play in cognitive development.	—
Bibliographic citation: University of Waterloo 2015, 'Shy babies need secure parent bond to help prevent potential teen anxiety', *Waterloo News*, 16 February, https://uwaterloo.ca/news/news/shy-babies-need-secure-parent-bond-help-prevent-potential?utm_source=eurekalert&utm_medium=pressrelease&utm_campaign=20150216_ShyBabies.		
• Professor Henderson is a researcher at the University of Waterloo, and co-author of a study focused on the role of early temperament on children's social development and the cognitive influences on self-regulation in typically and atypically developing children. • This article details the first long-term empirical study of the combined influence of attachment and behaviour inhibition as predictors of teen anxiety. • The procedure included 165 adolescents aged 14 to 17 years from middle- to upper-class European American families. These adolescents had been periodically assessed from early childhood (beginning at 4 months old), through to adolescence. The researchers measured each child's attachment to their parents, as well as laboratory observations and maternal report measures. Once the children reached adolescence, they completed anxiety assessments. • The researchers found that behaviour inhibition was associated with high anxiety when toddlers had insecurely attached relationships. This finding was particularly prominent for boys. • The researchers concluded that competent responsive parents, who form a secure relationship with their young children, can be an extremely important protective factor in their child's later development.	• The sample size of the study was relatively large (> 100), increasing the validity of the results. • Additionally, the longitudinal nature of the study allowed researchers to assess age changes and not just age differences. This type of study allows researchers to determine real differences or changes in individuals over time. • A disadvantage of longitudinal studies is that they are subject to cohort effects, as only one group of subjects is studied. • This study presents a different type of research technique and interesting findings about the long-term effects of attachment in infancy.	Lewis-Morrarty, E, Degnan, KA, Chronis-Tuscano, A, Pine, DS, Henderson, HA, Fox, NA 2014 'Infant attachment security and early childhood behavioural inhibition interact to predict adolescent social anxiety symptoms', *Child Development*, vol. 86, no. 2, https://doi.org/10.1111/cdev.12336.

Annotation	Evaluation	Similar/related research
Bibliographic citation: Killeen, T, Easthope, CS, Filla, L, Lorincz, L, Schrafl-Altermatt, M, Brugger, P, Michael, L, Curt, A, Zörner, B & Bolliger, M 2017, 'Increasing cognitive load attenuates right arm swing in healthy human walking', *Royal Society Open Science*, vol. 4, p. 160993, doi.org/10.1098/rsos.160993.		
• Tim Killeen and Christopher Easthope are the two lead researchers on this paper. They work out of the Spinal Cord Injury Center at the University Hospital Balgrist in Zurich, Switzerland. With their colleagues from the Department of Neurology in Zurich and Germany, they sought to build on the work of Plate et al. (2014) by confirming the presence of a lateralised effect of the Stroop task on arm swing. • Researchers sought to determine whether there were age and gender differences in increasing cognitive load (the Stroop task) and the effect on arm swing. They hypothesised that there would be a marked effect, particularly in older adults. • To establish this, researchers used convenience sampling to recruit participants aged between 18 and 80 years of age. Participants were recruited into three age groups: 18–39 years old, 40–59 years old and 60–80 years old, with recruitment stopped once 20 males and 20 females were included in each group. • A repeated measures research design was used, in which participants were assessed using gait analysis (while walking on a treadmill) at the same time as undertaking a congruent and incongruent Stroop test. • Researchers used a combination of the paired t-test and Pearson's correlation coefficient to analyse the data. The results showed that with increased cognitive load (i.e. during the incongruent Stroop test) there was a significant decrease in arm swing amplitude on the right. They also found that those participants over 60 years old showed the greatest effect. Surprisingly, they found gender differences, with females under 60 showing the least effects. • The researchers concluded that reduction in right arm swing appears to be the norm in humans performing motor-cognitive dual-tasks, confirming the prominent role of the brain in arm swing behaviour. They believe these findings may be significant for patients suffering detriments due to stroke and spinal cord injury.	• This article uses technical language to describe the assessment of gait and arm swing. It was written for an academic audience but does include several images that show the treadmill walking in the procedure. • The relatively large sample size and use of a repeated measures experimental design increases the reliability and validity of the findings. • Researchers compared gait using three conditions, allowing baseline measurements to be taken to determine a cause-and-effect relationship. • A limitation of the research is the use of convenience sampling, which limits generalisability. • A further limitation is that within-group sample sizes were relatively small, so caution should be taken in generalising the findings related to age differences. • This paper could be used to demonstrate the role of the brain in movement and the use of an experimental method to investigate the phenomenon.	• Plate, A, Sedunko, D, Pelykh, O, Schlick, C, Ilmberger, JR & Bötzel, K 2014, 'Normative data for arm swing asymmetry: How (a)symmetrical are we?', *Gait and Posture*, vol. 41, no. 1, pp. 13–18, www.gaitposture.com/article/S0966-6362(14)00647-X/fulltext.
Topic 4: Human consciousness and sleep		
Bibliographic citation: Carskadon, MA 2011, 'Sleep in adolescents: The perfect storm', *Paediatric Clinics of North America*, vol. 58, no. 3, pp. 637–647, www.ncbi.nlm.nih.gov/pubmed/21600346.		
• Mary Carskedon is an American sleep researcher and professor of psychology and human behaviour at Brown University, Rhode Island. She is an expert on sleep in children, adolescents and young adults. • This article is a review of literature investigating sleep in adolescence. It begins by assessing the findings about the amount of sleep that adolescents typically experience, by comparing data collected from samples of adolescents in the USA and Korea. The findings show that there is generally a decrease in the total amount of sleep experienced between pre-adolescence and older adolescence. • The article then assesses whether there is a correlation between adolescent development and sleep regulation. • Research in the article – supports the idea that the circadian timing system undergoes a phase delay in adolescence – suggests that psychological factors can affect sleep in adolescents, including wanting the freedom to set their own bedtime, the effect of electronic devices and school start times. • The article concludes by making several recommendations for improving sleep in adolescents. These include – school districts starting the school day later for adolescents and limiting late-evening activities – parents identifying and setting appropriate bedtimes, encouraging adolescents to avoid light and stimulating activities (e.g. electronic devices and television) in the evening, and empowering them to make informed choices about their sleep schedules.	• The article was written for paediatricians so that they could advise families about sleep in adolescence. Even though it was written for this audience, it uses plain language that students could easily interpret. • The article provides a good overview of the latest research in 2011 but may be lacking some historical validity. More recent research findings may have identified other determinants and further measures to assist adolescents with their sleep. • The findings in this article may be interesting to students as it directly addresses adolescent sleep. The recommendations made in the article could be used as a discussion point to introduce a sleep diary or sleep routine as part of a class practical.	—

Annotation	Evaluation	Similar/related research
Bibliographic citation: Craik, FIM, Govoni, R Naveh-Benjamin, M & Anderson, ND 1996, 'The effects of divided attention on encoding and retrieval processes in human memory', *Journal of Experimental Psychology*, vol. 125, no. 2, pp. 159–180.		
• Fergus Craik is a cognitive psychologist at the University of Toronto, Canada. He is known for research on 'levels of processing' in memory. In this study, Craik and his colleagues from universities throughout Canada focused primarily on the effects of divided attention, i.e. doing two tasks (encoding and retrieval) at once on different processes in human memory. • To investigate this, they examined the effect of divided attention on encoding and retrieval in free recall, cued recall and recognition memory. The article details four separate experiments that investigated this phenomenon using similar methodologies. • Researchers used convenience sampling to recruit 32 University of Toronto undergraduates. A repeated measures research design was used with counterbalancing to control for order effects. Lists of words or word pairs were presented auditorily and recalled orally; the secondary task was a visual continuous reaction-time task with manual responses. • The results showed that at encoding, divided attention was associated with – large reductions in memory performance – small increases in reaction time. • In contrast, at retrieval, divided attention resulted in – small or no reductions in memory – comparatively larger increases in reaction time, especially in free recall. • The researchers concluded that memory performance was sensitive to changes in task emphasis at encoding but not at retrieval. They also sought to establish links between evidence from neuropsychological findings and cognitive psychology.	• The article uses academic language and is difficult to interpret at times. • These experiments contributed to several new and replicable studies on dual-task processing and shed further light on the relationship between encoding and retrieval processes. • A strength of the research is the use of an experimental methodology that allowed the researchers to determine a cause-and-effect relationship. • Limitations of the research include the small sample size (N = 32) and the highly controlled nature of the experiment, resulting in low ecological validity. • Aspects of the methodology could be easily modified by students to be used as a practical or formative student experiment.	• Craik, FIM & Tulving, E 1975, 'Depth of processing and the retention of words in episodic memory', *Journal of Experimental Psychology: General*, vol. 104, no. 3, pp. 268–294. • Hyde, TS & Jenkins, JJ 1973, 'Recall for words as a function of semantic, graphic, and syntactic orienting tasks', *Journal of Verbal Learning and Verbal Behaviour*, vol. 12, no. 5, pp. 471–480. • Elias, CS & Perfetti, CA 1973, 'Encoding task and recognition memory: The importance of semantic encoding', *Journal of Experimental Psychology*, vol. 99, no. 2, pp. 151–156.
Bibliographic citation: Bartlett, T 2010, 'The stay-awake men', *The New York Times*, 22 April, https://opinionator.blogs.nytimes.com/2010/04/22/the-stay-awake-men.		
• Thomas Bartlett is an columnist with *The New York Times* and a self-confessed insomniac. He also writes the blog 'Percolator' for the online newspaper *Chronicle of Higher Education*. • Peter Tripp was a New York radio disc jockey (DJ) in the 1950s. In 1959, he decided to make a name for himself by taking part in a 'wake-a-thon' stunt. He subsequently stayed awake for 201 hours while broadcasting from a storefront in Times Square. • This article is a summary of what happened during Tripp's days without sleep. There were two psychologists monitoring Tripp throughout the stunt. Photographs from early in the stunt show him relaxed and confident. Doctors gave him stimulants to keep him awake. • As time progressed it was clear that Tripp was beginning to experience negative effects from the deprivation of sleep. He began experiencing hallucinations, including mice and kittens scampering around the studio, his shoes being full of spiders, a desk drawer being on fire and seeing a man in a coat as an undertaker who had come to take him away. • When the 201-hour mark was reached, Tripp slept for 13 hours. Initially he seemed to recover well, but later complained of emotional instability and recurring headaches. • The article goes on to discuss other people who went on to beat Tripp's record, including teenager Randy Gardner, who in 1964 is believed to have stayed awake for 264 hours (10 days). Similar to Tripp, Gardner experienced hallucinations. Unlike Tripp, he has not experienced any long-term effects, although interestingly, in later life he has suffered from insomnia.	• This article – is written for a general audience and can be easily read by students – recounts the stories of Peter Tripp and Randy Gardner without providing academic references for the information that is presented – could be used to illustrate the negative effects of sleep deprivation.	• *Secrets of Sleep Sleep Deprivation Peter Tripp Pt 1 of 2*, www.youtube.com/watch?v=0BCTLO9hfXE. • *Secrets of Sleep Sleep Deprivation Peter Tripp Pt 2 of 2*, www.youtube.com/watch?v=kDnBFmVF-3g.