UNIT 3 HISTORICAL PERSPECTIVE OF NEUROPSYCHOLOGY

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3.0 INTRODUCTION

In this unit we will be discussing the historical perspective of neuropsychology. We start with history of neuropsychology within which we will be presenting trephanation, ancient Egyptian methods, Ancient Greek methods and then follow it up with cell doctrine. We then discuss phrenology and how this helped in understanding the functions of the brain. Then we take up localisation in which we present some of the disorders arising due to pathology in certain localised areas. Then we have a discussion about the relationship between brain and behaviour.

3.1 OBJECTIVES

After going through this unit, you will be able to:

- understand the evidence of neuropsychology;
- know various studies which got neuropsychology into existence;
- discuss the relation between the brain and behaviour; and
- understand the current developments in neuropsychology.

3.2 HISTORY OF NEUROPSYCHOLOGY

Neuropsychology is the basic scientific discipline that studies the structure and function of the brain related to specific psychological processes and overt behaviours. The term neuropsychology has been applied to studying lesions in humans and animals. It has also been applied to efforts to record electrical activity from individual cells (or groups of cells) in higher primates (including some studies of human patients).

Neuropsychology and neuroscience in general have a history that is quite a bit older than one would think. Written records of the nervous system date back as far as 1700 B.C. But the bulk of knowledge about the brain and its functions did not become known until the 17th century. This is when men like Rene Descartes and Thomas Willis began studying the human nervous system and how it worked. The brain has really only recently been linked to the behaviours of individuals. This was begun in the 1900's when scientists started to look at how the mind affected people's behaviours.

Neuropsychology is the study of the relationships between brain function and behaviour. It observes changes in thoughts and behaviours that relate to the structural or cognitive integrity of the brain. It is a method of studying the brain by examining its behavioural product.

The developments which led up to the emergence of an autonomous discipline of neuropsychology have a long and chequered history and provide insights into the perennial issues which still occupy neuropsychologists.

3.2.1 Trephanation

Trephanation is the ancient surgical procedure of operating on the human skull by scraping, chiseling, or cutting bone from the skull. This method was discovered by archaeologists. It is reported that at that time when this method was used many who underwent trephanations survived which showed that this method was very effective in healing some of the brain disorders. Those disorders for which trephanation was used included Traumatic Brain disorders, psychiatric disorders etc. This method was rather a crude method and many also died and never got alright. Some even underwent multiple trephanations. Many had their skulls damaged due to trephanation. Trephanation was also carried out for religious purposes that is to release and drive away the evil spirits etc. perhaps a religious rite - to release evil spirits.

In a study conducted by Verona & Williams (1992), they examined 750 skulls from Peru and measured trephinated skulls for technique, location, size, healing, and presence of fractures. Results suggest that most trephinations were performed in the frontal and upper parietal regions following injury to the skull from clubs and other weapons of the pre-Columbian era. Scraping and circular grooving had the highest success rates as opposed to straight cutting and drilling. Techniques used were similar to modern day methods of drilling burr holes to relieve pressure and release trapped blood.

In one process, the practitioner had even produced ring of small holes. The next step in the procedure is to cut the bone between each hole and pry off the bone piece in the center. The patient probably would die before the trephination is completed. There is no evidence of healing. There is also a large linear skull fracture besides the trephination opening. It is clear that this trephination was used to treat the associated skull fracture. Perhaps the practitioner believed that a blood clot was underneath the skull, near the fracture. Such blood clots are a frequent result of this type of traumatic skull injury.

This skull on the right shows evidence of multiple head injuries and trephinations. There is a well-healed trephination and a fresh one. The patient probably died soon after receiving this recent head injury and fresh trephination. This one demonstrates the great survival rate associated with the procedure. This person

lived for many years after the first trephination. There is considerable healing. This trephination was done with the scraping method.

In another process, the practitioner begins with cuts that surround the central area. They began cutting the outer perimeter in order to create a larger opening. This trephination shows no signs of healing because the patient dies.

3.2.3 Ancient Greek

The knowledge of brain function at that time was limited by the strong aversion to dissecting the brain. They had a number of mistaken beliefs, including *Aristotle's* localisation of mental functions in the heart. This theory explained that people with heavy upper bodies were intellectually dull due to the extra weight bearing on the heart. The view that the heart is the organ of the human mind or consciousness is called the "cardiac or cardio centric hypothesis". Aristotle identified the heart as "the most important organ of the body," and the first to form according to his observations of chick embryos. It was the seat of intelligence, motion, and sensation - a hot, dry organ. Aristotle described it as a three-chambered organ that was the center of vitality in the body. Other organs surrounding it (e.g. brain and lungs) simply existed to cool the heart.

Why? After death, the heart was weighed to see if one would enter into eternal afterlife, but the brain was usually discarded. Aristotle believed in "dualism" which divides the world into two spheres: mind and matter. The mind (or soul) is a nonphysical entity, which somehow interacts with the material body. In particular, mind-body dualism claims that neither the mind nor matter can be reduced to each other in any way, and is sometimes referred to as "mind and body" and stands in contrast to philosophical monism, which views mind and matter as being ultimately the same kind of thing. According to Aristotle, the mind and body interacted through a "point of interaction" which he identified as the heart. To this day, we continue to perpetuate this belief by giving cards with hearts on Valentine's day, and by using terms such as "heartbroken" or "cold-blooded."

Pythagoras (circa 550 BC, best known for the Pythagorean theorem) was one of the first to propose that the thought processes and the soul were located in the brain and not the heart. This belief is the "brain or cephalocentric hypothesis", stating that the brain is the source of reasoning and all human behaviour. Pytharoras also claimed to have lived four lives that he could remember in detail, and heard the cry of his dead friend in the bark of a dog.

Hippocrates (circa 400 BC, influenced by Socrates) was considered one of the most outstanding figures in the history of medicine, is referred to as the "father of medicine", and was the founder of the Hippocratic school of medicine. The Hippocratic school held that all illness was the result of an imbalance in the body of the four humours, fluids which in health were naturally equal in proportion (pepsis). When the four humours, blood, black bile, yellow bile and phlegm, were not in balance (dyscrasia, meaning "bad mixture"), a person would become sick and remain that way until the balance was somehow restored. Hippocratic therapy was directed towards restoring this balance.

However, Hippocrates also believed the brain to be the seat of intelligence, and the controller of the senses, emotions, and movement, and was the first to

recognise that paralysis occurred on the side of the body *opposite* the side of a head injury.

History of cognitive neuropsychology

Cognitive neuropsychology first began to flourish in the second half of the Nineteenth Century, initially in relation to disorders in the comprehension and production of spoken language (aphasia). Continental neurologists such as Broca (1861), Lichtheim (1873) and Wernicke (1874) studied patients with aphasia and inferred information-processing models of the normal language-processing system from the patterns of preserved and impaired language abilities they saw in their patients. They even expressed these models as box-and-arrow flowcharts of information processing, which is the universal notation in modern cognitive neuropsychology. This cognitive-neuropsychological approach was also applied to the understanding of disorders of written language, both reading and spelling (Bastian, 1869; Dejerine, 1891), and soon spread to other cognitive domains such as object recognition (Lissauer, 1890), calculation (Lewandowsky & Stadelmann, 1908) and many others.

Cognitive neuropsychology was thus flourishing by the early Twentieth Century. But then it rapidly lost favour. This happened for two reasons, one to do with psychology and the other to do with neurology.

Re psychology: the whole idea that it is possible to study the structure and nature of mental information processing systems that is, the idea that it is possible to do cognitive psychology was directly attacked by John B Watson in 1913 argued that mental processes were not directly observable and therefore could not be studied scientifically. All that should be studied by psychologists is what could be objectively observed. Stimuli and an organism's responses to them. This doctrine is known as behaviourism. It became very strong in the psychology of the first half of the twentieth century, and since it was completely incompatible with an interest in developing models of mental processing systems, it provided a hostile climate for cognitive psychology and hence for cognitive neuropsychology.

Regarding neurology, the nineteenth century cognitive neuropsychologists were also neurologists. So they were not satisfied just with developing modular models of cognitive processes. They also wanted to localise these modules in the brain. This was a hopelessly premature endeavour which was bound to fail, and when it failed this left them highly vulnerable to criticism.

The endeavour was premature for two reasons. Firstly, the only way they could acquire information about the location in the brain of any patient's lesion was extremely crude by autopsy after the patient's death. Secondly, even if the information about lesion location could have been obtained by less crude methods, the models themselves were not sufficiently detailed for questions to be sensibly asked about where the modules were located in the brain. That may even still be true even today; cognitive neuroscientists believe that it isn't.

Early in the twentieth century, a number of anti modular and anti localisationist neurologists attacked the work of Broca, Wernicke and others, and their attacks made highly effective use of the unconvincingness of the attempts by the nineteenth century cognitive neuropsychologists to demonstrate relationships between particular lesion sites and particular cognitive impairments.

Particularly effective were the attack on Broca by Pierre Marie in 1906 and, especially, the attack on the whole field of cognitive neuropsychology by Henry Head in 1926, which was expressed in the most brutal of terms: "Wernicke failed to recognise the wide-spread nature of the difficulty owing to the preconceptions with which it was approached: in the solemn discussion which follows that report we can only wonder at his clinical obtuseness and want of clinical insight . . We are astonished at the serene dogmatism with which the writers assume a knowledge of the working of the mind and its dependence on hypothetical groups of cells and fibres. Most of the observers mentioned in this chapter failed to contribute anything of permanent value to the solution of the problem."

The "Cognitive Revolution" the abandonment of behaviourism and the acknowledgement that there are scientifically acceptable ways of investigating the structure and nature of mental information-processing systems even if these are no more directly observable than neutrons and electrons - occurred in Britain and North America in the mid-1950s. New and more detailed modular models of various forms of cognitive processing, initially language and also selective attention, were developed and applied to the explanation of data collected from experiments on normal subjects.

Then there developed certain research collaborations between cognitive psychologists who had been doing this kind of work and clinical neuropsychologists who saw in the clinic various kinds of breakdowns of cognition caused by brain damage. The clinicians were interested in understanding these breakdowns in more detail. The cognitive psychologists were interested in learning more about normal systems by studying how they could break down.

The 1960s saw two such seminal collaborative papers, which marked the rebirth of cognitive neuropsychology: Marshall and Newcombe (1966) on reading and Warrington & Shallice (1969) on memory. A decade later, cognitive neuropsychology had been fully reestablished, according to Selnes (2001), who notes that in 1977 "a meeting to discuss deep dyslexia was convened in Oxford, and this is often considered by many to be a convenient marker for the early beginnings of cognitive neuropsychology (E. Saffran, personal communication, 2000). The book *Deep Dyslexia* (Coltheart, Patterson & Marshall, 1980) which resulted from the conference is considered by many to be the first major book that deals with the cognitive approach to neuropsychology. The journal *Cognitive Neuropsychology* was first published in 1984." (Selnes, 2001, p. 38). Not long afterwards, in 1988, the field's first textbook, *Human Cognitive Neuropsychology*, was published (Ellis & Young, 1988), and so was the first book critically reviewing the field (Shallice, 1988).

Cognitive neuropsychology has two major domains of application: assessment and rehabilitation.

Cognitive-neuropsychological assessment is assessment that is based on an explicit modular information-processing model of the relevant cognitive domain. The existence of the model permits the construction of tests specific to the individual modules of the model, so that a comprehensive analysis can be made of which of these cognitive modules is operating normally and which have been perturbed by brain damage (in the case of acquired disorders of cognition) or have not been acquired to age-appropriate levels (in the case of developmental

disorders of cognition). The best-developed cognitive-neuropsychological assessment batteries are the PALPA battery for the assessment of disorders of spoken and written language (Kay, Lesser & Coltheart, 1992) and the BORB battery for the assessment of disorders of visual perception and visual object recognition (Riddoch and Humphreys, 1993).

Cognitive-neuropsychological rehabilitation (Coltheart, Brunsdon & Nickels, 2005) is similarly model-based: it is treatment that is specifically directed at improving the functioning of the particular cognitive modules or pathways that have been identified, via cognitive-neuropsychological assessment methods, as specifically impaired. Other approaches to neuropsychological rehabilitation differ from this in typically being rather generally aimed at the entire cognitive domain within which the patient shows some or other symptoms. Numerous examples of the cognitive-neuropsychological approach to rehabilitation can be found in Humphreys & Riddoch (1994) and Whitworth, Webster & Howard (2005).

The volume by Coltheart and Caramazza (2006) is a recent review of the field which contains state-of-the-art accounts of contributions of cognitive neuropsychology to our understanding of a variety of domains of cognition, showcasing in particular what we have learned so far from cognitive neuropsychology about conceptual representation, speech production, sentence comprehension, reading and spelling, short-term memory, visual object recognition, spatial attention and skilled action.

Self Assessment Questions

1) Match the Following:

1)	Trephenation	a)	Aristolte
2)	Ancient Egyptian	b)	Vermona & Williams
3)	Localisation	c)	Edwin Smith

2) Give one word for each of the following statement:

a) Relationship between brain function and behaviour. .....

b) Ancient surgical procedure of operating on the human skull is ....

c) Weaknmess on the one side of the body is .....

d) Thought processes and soul were located in the brain and not the heart .....

e) The brain is the seat of intelligence, and the controller of senses, emotion and movement. .....

3.2.4 The Cell Doctrine

This theory postulated that mental and spiritual processes/functions were localised in the ventricles (called Cells) of the brain. The theory was proposed by *Nemesius* and *Saint Augustine* in approximately 130-200 A.D. It was strongly influenced by the anatomical studies of *Galen* in the second century, in which he described the ventricles in detail and developed his own theory of "psychic gases and humours" that flowed through the body and ventricles (thus, the ventricular localisation hypothesis"), giving rise to mental functions. (He also characterised the brain as a "large clot of phlegm".)

The idea that the ventricles were merely a sewer system through which passed bodily fluids, led to the theory of the importance of "humors" which has persisted for 1000 years. Mental functions derived from the descriptions of Aristotle, such as memory, attention, fantasy and reason, were assigned locations within the ventricles. These images depict the connections between the senses (vision, hearing etc.) and the "Common Sense", located in the first ventricle. Cognitive functions were then arrayed from front to back in the ventricles. This Doctrine was proven to be totally false, as we now know that the ventricles are the site through which cerebrospinal fluid passes.

From this period, many important discoveries and theories were noted. Dissections of condemned criminals (who, at that time, were at the disposal of scientists and physicians) led to the knowledge that specific parts of the brain control specific behaviours (discussed later as localisation). As well, the discovery of ascending (sensory) and descending (motor) nerves occurred.

Galen (circa 200 BC) was a prominent ancient Greek physician, who also served as a physician in a gladiator school. During this time he gained much experience with treating trauma and especially wounds, which he later called "windows into the body". He performed many operations, including brain and eye surgeries, and also "vivisections" of numerous animals to study the function of the kidneys and the spinal cord. From these studies, Galen hypothesised that the mind controlled fluids known as pneuma (animal spirits): the brain was the reservoir of pneuma, which were stored in the ventricles.

Pneuma traveled through nerves, which Galen believed were tubes, throughout the body - sent out from the brain to the muscles (i.e., controlled by the mind, causing the body to move) and sent back to the brain due to sensory stimulation. Physical functioning was dictated by the balance of four bodily fluids or humors: Blood, Mucus, Yellow bile, Black bile, which were related to the four elements - air, water, fire, and earth. Galen also showed that pressing on the heart in human subjects did not lead to loss of consciousness or loss of sensation but severing the spinal cord in animals abolished sensory responses after brain stimulation.

The First Anatomical Studies: *Vesalius* (1514-1564) was the first to conduct careful observations of brain anatomy and qualify the teachings of the cell doctrine in which he was trained. He represents the beginning of a period in which careful observations and empirical science began to triumph over the ideas that had been handed down since the time of Aristotle and Galen. Vesalius introduced the anatomical theater in which students and doctors could watch dissections from above. Vesalius made careful diagrams of human anatomy.

Mind-Body Dualism: *Descartes* (1596-1650) introduced the concept of a separate mind and body. He believed that all mental functions were located in the pineal gland, a small centrally-located brain structure which is now believed to play a role in sleep/wake and dark/light cycles. The dualist philosophy suggested a complete split between mental and bodily processed, and explained automatic bodily reflexes (body) while purposeful behaviours were a product of free-will (mind).

Descartes did subscribe to some of Galen's theories (that the brain was a reservoir of fluid), as demonstrated by one of his illustrations, in which the fire displaces

the skin, which pulls a tiny thread, which opens a pore in the ventricle (F) allowing the "animal spirit" to flow through a hollow tube, which inflates the muscle of the leg, causing the foot to withdraw. This would now be described as a reflex, for which Descartes is credited. Popular culture has many references to dualism.

3.2.5 Phrenology

Phrenology is a hypothesis stating that the personality traits of a person can be derived from the shape of the skull. It is now considered a pseudoscience. Developed by German physician Franz Joseph Gall in 1796, the discipline was very popular in the 19th century.

Phrenology is based on the concept that the brain is the organ of the mind, and that certain brain areas have localised, specific functions or modules. Phrenologists believed that the mind has a set of different mental faculties, with each particular faculty represented in a different area of the brain.

These areas were said to be proportional to a person's propensities, and the importance of the given mental faculty. It was believed that the cranial bone conformed in order to accommodate the different sizes of these particular areas of the brain in different individuals, so that a person's capacity for a given personality trait could be determined simply by measuring the area of the skull that overlies the corresponding area of the brain.

Gall (1758-1828) introduced the idea that the brain was comprised of separate organs, each localised and responsible for a basic psychological trait. These traits controlled complex mental faculties, such as Cautiousness, Combativeness and Agreeableness, and simpler functions, such as Memory, Calculation Ability and Color Perception. Phrenology correlated the mental faculties described by philosophers with the development of specific brain areas. The development of these brain areas, called cerebral organs, resulted in skull prominences. These bumps could be analysed and a Phrenology practitioner could determine the subject's personality and intelligence from analysis of the skull, called cranioscopy.

Followers of phrenology categorised individuals on the basis of skull, and thus, brain size. Men were believed to have larger "social regions" with more "pride, energy, and self-reliance", as compared to female skulls which were thought to possess more "inhabitivness (love of home), a lack of firmness and self esteem." Many studies have refuted the notion that skulls of different races reflect superiority, and it is impossible to distinguish between murders and geniuses on the basis of skull size or shape.

Phrenology was a complex process that involved feeling the bumps in the skull to determine an individual's psychological attributes. Franz Joseph Gall first believed that the brain was made up of 27 individual 'organs' that created one's personality, with the first 19 of these 'organs' believed to exist in other animal species.

Phrenologists would run their fingertips and palms over the skulls of their patients to feel for enlargements or indentations. The phrenologist would usually take measurements of the overall head size using a caliper. With this information, the phrenologist would assess the character and temperament of the patient and address each of the 27 "brain organs".

Gall's list of the "brain organs" was lengthy and specific, as he believed that each bump or indentation in a patient's skull corresponded to his "brain map". An enlarged bump meant that the patient utilised that particular organ extensively. The 27 areas were varied in function, from sense of colour, to the likelihood of religiosity, to the potential to commit murder.

Each of the 27 "brain organs" was located in a specific area of the skull. As a phrenologist felt the skull, he could refer to a numbered diagram showing where each functional area was believed to be located.

There is no relationship between the bumps on the skull and the underlying brain tissue, nor is there a relationship between the size of an area of brain and the size of the function that it supports (skulls are hard, brains are not). Although he was almost completely incorrect, Gall's Phrenology represents the beginning of the strong modern day localisationist doctrine.

3.2.6 Localisation

Broca (1824-1880) described most famous case, "Tan", and a patient who suffered a stroke of the left hemisphere who could only utter the phrase "Tan". The patient could accurately comprehend language. Broca then used this case and a number of others to show that the expression of language was localised to the left frontal lobe. If you look carefully at the brain, you can detect a soft, fluid-filled area in the frontal lobe. This represents the empty space, or infarction that is caused by the drop in blood supply to that brain area (stroke). The third convolution of the inferior posterior frontal lobe has since become known as "Broca's area", and patients with damage to Broca's area are referred to as having "Broca's aphasia".

Several years after Broca presented his cases of frontal lobe lesions, **Wernicke** (1848-1904) presented cases in which patients had lesions of the superior posterior part of the left hemisphere and had trouble comprehending language. This resulted in the idea that component processes of language were localised. On the basis of Wernicke's observations, the modern doctrine of component process localisation and disconnection syndromes was begun. This doctrine states that complex mental functions, such as language, represent the combined processing of a number of subcomponent processes represented in widely different areas of the brain. A mental faculty like "Combativeness" described by the Phrenologists was not discreetly localised in the brain. Such faculties, if they have validity at all, are the result of a number of primary cognitive operations.

Responses to Localisation: *Freud* described several types of language disorders wich could not be explained by lesions to Broca's or Wernike's areas. He postulated that lesions in the subcortical areas would produce similar behavioural disorders. Similar anti-localisation concepts were presented by *Flourens* (1794-1867). He asserted that while sensory input was localised, to an extent, at an elementary level, the more compels process of perception was dependent on the entire brain (Luria later explained this in terms of primary, secondary and tertiary zones). Based on ablation studies of hens and pigeons, he concluded that loss of function is more a product of the amount of damage rather than the location of that damage. Flourens also offered the notion of equipotentiality of brain tissue, or that if there is enough intact tissue following brain damage, the remaining tissue will compensate and take over the function of the missing area. By utilising dependent measures such as wing-flapping and eating behaviours in pigeons, Flourens erroneously suggested that only 10 percent of brain tissue of used.

Munk (1839-1912) produced temporary "mind-blindness" in dogs following lesions in their association cortex. This notion that an animal will recognise an object (i.e., see the object) but fail to recall the conditioned significance is similar to the concept of "anosognosia." Following lesions to the association cortex of the right hemisphere, *Babinski* (1857-1932) described a similar unawareness of deficit.

Lashley supported Flourens' notion of equipotentiality based on his own research on rats. While the specific area of the lesion had no effect on subsequent performance, Lashley found that the amount of brain tissue removed from rat brains effected the ability to negotiate previously learned mazes. From his studies, Lashley offered the theories of "mass action" and "multipotentiality"; the amount of damaged brain tissue influences subsequent behaviour and each part of the brain participates in multiple functions.

3.3 BRAIN AND BEHAVIOUR

Brain and behaviour is concerned with determining the neural and chemical correlates of motivation, development, and cognition. This includes reward, feeding, maternal behaviour, biological rhythms, drugs, and psychiatric disorders; the anatomy, physiology, and chemistry of brain change associated with learning, aging, retardation, and epilepsy; and cognitive changes in brain-injured human patients.

The brain has really only recently been linked to the behaviours of individuals, this was begun in the 1900's when scientists started to look at how the mind affected people's behaviours.

1913 John Watson presented his theory that human behaviour is based upon conditioned responses to stimuli. His theory was somewhat against the eugenics theory which had reached its height at this time. This marked the beginning of the behaviour of the behaviourist school of psychology.

Eugenics According to this, human behaviour is said to be an inherited trait. In 1930's scientists try to affect the workings of the brain in order to treat mental illnesses such as anxiety, depression and schizophrenia.

Lobotomy This method was developed by Monis,. This involved was the surgical sieving of connections in the frontal lobe of the patients. This actually resulted in adverse side effects such as mood problems and changes in personality.

Electric Shock Therapy. This was developed by Cerletti and Boni. Used electric shocks to induce positive chemical changes in the brain. This like lobotomy had detrimental side effects.

The use of both these techniques declined in the 1950's after the development of the medicine Thorazine.

1950's and 60's. Wilder Penfield identified specific areas of the brain that control motor impulses, sensory inputs and memories.

1970's and 80's. New scanning devices like the CT scanner and MRI allow for detailed mapping of the brains functions.

1975 The roles of brain chemicals such as endorphins are discovered. Behaviour is now thought of as biochemical events.

1990. With new knowledge more effective drugs are developed for the treatment of mental illnesses.

Genes also are beginning to be studied in order to see if there are ties to behaviours. This could lead to evidence supporting eugenics or knowledge that could link eugenics and behaviourism together.

Today there are several different approaches to the study of the brain behaviour relationships, but the method which has figured most prominently is the one that is the natural successor or complement to the work of the early neurologists, namely study of the effects of lesions in specific areas of the brain by carefully observing associated changes in behaviour.

Self Assessment Questions

1) What do you understand by cell doctrine?

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2) Discuss phrenology and localisation.

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3) Discuss the relation between the brain and behaviour.

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3.4 LET US SUM UP

The developments which led up to the emergence of an autonomous discipline of neuropsychology have a long and chequered history

Attempts to localise mental processes to particular bodily structures can be traced back at least to the 5th century BC, when Hippocrates identified the brain as the organ of intellect, and the heart as the organ of the senses.

Recent research (Bruce 1985) suggests that the term 'neuropsychology' was first used in 1913 by Sir William Osler in an address he gave at the opening of the Phipps Clinic at the Johns Hopkins Hospital.

Hans-Lukas Teuber, one of the early pioneers in neuropsychology, argued that the task of neuropsychology is twofold.

To help the patient with the damaged brain to understand his disease and to provide essential insights into the physiological basis of normal brain function.

Today there are several different approaches to the study of the brain–behaviour relationships, but the method which has figured most prominently is the one that is the natural successor or complement to the work of the early neurologists, namely study of the effects of lesions in specific areas of the brain by carefully observing associated changes in behaviour.

Neuropsychologists study the individual's awareness of the world in which one moves. But it is not only sensory and motor processes that may be altered by changes in the nervous system: higher functions such as language, thought, and memory may also be changed.

Another approach to the study of brain function arises at times in the course of major brain surgery when a neurosurgeon may briefly stimulate the exposed surface of the brain electrically in order to ascertain which part of the brain he is treating, and also to establish with as much certainty as possible on which side of the brain speech is lateralised.

The flow of blood to the neocortex increases in areas where the neurons are particularly active. In some cases batteries of tests have been applied to large groups of patients in an attempt to analyse quantitatively the patterns of deficits that emerge between the different brain-damaged groups.

Each of these distinctive approaches to neuropsychology has contributed significantly to its development and will continue to do so.

3.5 UNIT END QUESTIONS

1) Trace the history of Neuropsychology.

2) What is meant by localisation?

3) Discuss the relationship between brain and behaviour.

3.6 SUGGESTED READINGS

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