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# **UNIT 1 COGNITIVE PSYCHOLOGY**

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*“Mind and world ... have evolved together, and in consequence are something of a mutual fit”.*

– William James

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## **1.0 INTRODUCTION**

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Cognitive psychology is the study of mental processes such as perceiving, remembering, and reasoning. Why do psychologists study mental processes? Since the beginning of recorded history, people have expressed curiosity about the operation of the mind, largely because they believed that behaviour is the result of mental processes. For example, how are we to understand the very behaviour in which you are engaged at this moment, reading this course book? At one level, we are interested in explaining your ability to comprehend what you are reading, and in so doing, we are likely to appeal to processes of perception of words and computation of meaning. At another level, we might explain your motivation for reading in terms of your goal to complete this course, which in turn is motivated by your goal of obtaining a degree in order to follow some plan that you have for a career. The point is that your behaviour of reading this book is determined in part by your intent to meet some goal and fulfill some plan. Intentionality, goals, and plans are mental phenomena that affect behaviour. Further, the specific behaviour, in this case, reading, is understood by appeal to the specific mental processes involved in perception and comprehension of text. In short, the study of mental processes is important because these processes are responsible for much of our behaviours. In this unit you will be studying the definition and description of cognitive psychology, distinctive research methods, domains of cognitive psychology, metaphor of cognition etc.

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## 1.1 OBJECTIVES

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After reading this unit, you will be able to:

- Field of cognitive psychology;
  - Provide a foundation on which to build an understanding of the topics in cognitive psychology;
  - Describes some of the intellectual history of the study of human thinking; and
  - Emphasises some of the issues and concerns that arise when we think about how people think.
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## 1.2 COGNITIVE PSYCHOLOGY: AN INTRODUCTION

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Cognitive psychology is the study of how people perceive, learn, remember, and think about information. A cognitive psychologist might study how people perceive various shapes, why they remember some facts but forget others, or how they learn language. Consider some examples of everyday experiences that are also of theoretical interest to cognitive psychologists:

*How many times have you carefully proofread written work, only to be embarrassed later by an obvious error you overlooked?*

Many times what we see is determined as much by the context in which it occurs as by what is actually there, an issue of pattern recognition.

*Have you noticed the difficulty of simultaneously taking notes in class and understanding a lecture?*

Explanations of this kind of difficulties are found in the discussion of attention.

*When you dial the telephone directory assistance for a telephone number and do not have a pen to note it down, why do you have to repeat the number until you have dialed it? And why you have to make your call again to enquire the number if someone talks to you before you dial the number?*

These are problems associated with the short term memory.

*Do you remember the experience of working on a problem or a puzzle that you were unable to solve, but after taking a break from the problem, you subsequently obtained a solution?*

This phenomenon, known as incubation effect, along with other commonly experienced events is an aspect of problem solving.

*Why do objects look farther away on foggy days than they really are?* This discrepancy of perception can be dangerous, even deceiving drivers into having accidents.

These are just a few of the many examples of everyday experiences which are discussed and explored by the experiments and theory of cognitive psychology.

Two points about these examples should be considered as we attempt to gain an overview of cognitive psychology.

- 1) All represent instances of difficulty or failure of mental processes. We rarely think of them unless they fail to work. Failure of mental processes are immediately noticed because they can be frustrating, embarrassing, and sometimes even dangerous and, consequently, such failures become useful tools for the psychological analysis of mental phenomena.
- 2) Cognitive psychology is interested in what is generally called mental phenomena. In this sense, the examples just discussed are consistent with the dictionary definition of cognitive psychology: “the scientific study of the mind”.

While it is hoped that examples help clarify the definition, questions undoubtedly remain concerning how one goes about this ‘scientific study of mind’. To address these questions, here’s a brief discussion of the scientific methods, followed by an extensive description of the important historical events leading up to modern cognitive psychology.

Next is a brief overview of the major methods, issues, and content areas of cognitive psychology.

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## 1.3 RESEARCH METHODS IN COGNITIVE PSYCHOLOGY

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This consists of the various research methods that we use in cognitive psychology. Every research has a goal and it is achieved through appropriate methodology. Let us see what are the goals of research.

### 1.3.1 Goals of Research

To better understand the specific methods used by cognitive psychologists, one must grasp the goals of research in cognitive psychology. Briefly, those goals include data gathering, data analysis, theory development, hypothesis formulation, hypothesis testing, and perhaps even application to settings outside the research environment. However, most cognitive psychologists want to understand more than cognition. They also seek to understand the *how* and the *why* of thinking. That is, researchers seek ways to explain cognition as well as describe it. To move beyond descriptions, cognitive psychologists must leap from what is observed directly to what can be inferred regarding observations.

### 1.3.2 Distinctive Research Methods

Cognitive psychologists use various methods to explore how humans think. These methods include (i) laboratory or other controlled experiments, (ii) psychobiological research, (iii) self-reports, case studies, naturalistic observation, and (iv) computer simulations and artificial intelligence. Each method offers distinctive advantages and disadvantages.

- i) ***Experiments on Human Behaviour:*** In controlled experimental designs, an experimenter conducts research, typically in a laboratory setting. The experimenter controls as many aspects of the experimental situation as possible. There are basically two kinds of variables in any given experiment – *independent variables* and *dependent variables*. The irrelevant variables are held constant and are called control variables. In implementing

experimental method, the experimenter must use a representative and random sample of the population of interest. S/he must also exert rigorous control over the experimental conditions. If those requisites for the experimental method are fulfilled, the experimenter may be able to infer probable causality. This influence is of the effects of the independent variable (the treatment) on the dependent variable (the outcome) for the given population.

- ii) ***Psychobiological Research:*** Through *psychobiological research*, investigators study the relationship between cognitive performance and cerebral events and situations. The various specific techniques used in the psychobiological research generally fall into three categories. The first category is that of techniques for studying an individual's brain *post-mortem*, relating the individual's cognitive function prior to death to observable features of the brain. The second category is techniques for studying images showing structures of or activities in the brain of an individual who is known to have a particular cognitive deficit. The third is techniques for obtaining information about cerebral processes during the normal performance of a cognitive activity (e.g. by using brain imaging techniques).
- iii) ***Self-Reports, Case Studies, and Naturalistic Observation:*** Individual experiments and psychobiological studies often focus on precise specification of discrete aspects of cognition across individuals. To obtain richly textured information about how particular individuals think in a broad range of contexts, researchers may use *self-reports* (an individual's own account of cognitive processes), *case studies* (in-depth studies of individuals), and *naturalistic observation* (detailed studies of cognitive performance in everyday situations and no laboratory contexts). On the one hand, experimental research is most useful for testing hypotheses. On the other hand, research based on qualitative methods is often particularly useful for the formulation of hypotheses. These methods are also useful to generate descriptions of rare events or processes that we have no other way to measure.
- iv) ***Computer Simulations and Artificial Intelligence:*** Digital computers played a fundamental role in the emergence of the study of cognitive psychology. One kind of influence is indirect through models of human cognition based on models of how computers process information. Another kind is direct, that is through computer simulations and artificial intelligence. In computer simulations, researchers program computers to imitate a given human function or process. Some researchers even have attempted to create computer models of the entire cognitive architecture of the human mind. Their models have stimulated heated discussions regarding how the human mind may function as a whole. Sometimes the distinction between simulation and artificial intelligence is blurred. It is also possible to combine the two approaches.

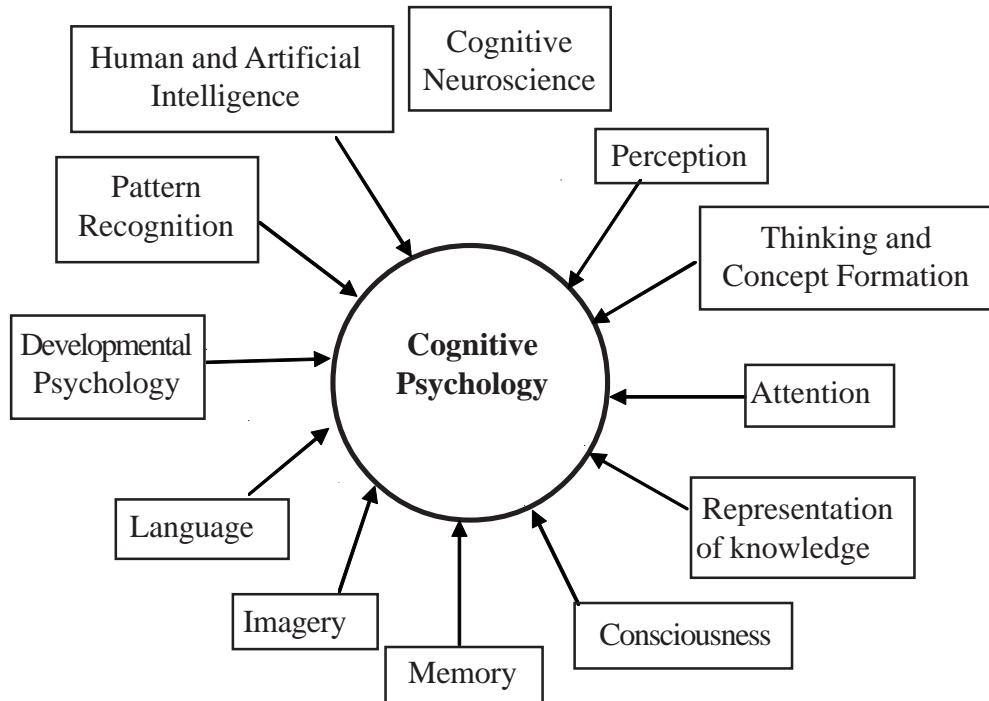
Cognitive psychologists often broaden and deepen their understanding of cognition through research in cognitive science. Cognitive science is a cross-disciplinary field that uses ideas and methods from cognitive psychology, psychobiology, artificial intelligence, philosophy, linguistics, and anthropology. Cognitive psychologists use these ideas and methods to focus on the study of

how humans acquire and use knowledge. They also work in collaboration with other psychologists, such as social psychologists (in the field of social cognition), psychologists who study motivation and emotion, and engineering psychologists (who study human-machine interactions).

## 1.4 DOMAINS OF COGNITIVE PSYCHOLOGY

Modern cognitive psychology freely draws theories and techniques from twelve principal areas of research (see Figure 1.1). Each area, in brief, is described below:

- i) **Cognitive Neuroscience:** Only within the past few years have cognitive psychologists and cognitive neuroscientists formed a close working relationship. Thus far, this union has produced some of the most provocative developments in the study of our mental character. Cognitive psychologists are seeking neurological explanations for their findings, and neuroscientists are turning to cognitive psychologists to explain observations made in their laboratories. Every part of the cognitive process from sensation to memory is supported by basic electrochemical processes taking place in the brain and nervous system.



**Fig. 1.1: Principal research areas of cognitive psychology**

- ii) **Perception:** The branch of psychology directly involved with the detection and interpretation of sensory stimuli is perception. From experiments in perception, we have a good understanding of the sensitivity of the human organism to sensory signals and more important to cognitive psychology of the way we interpret sensory signals. The experimental study of perception has helped identify many of the parts of this process. However, the study of perception alone does not adequately account for the expected performance; other cognitive systems are involved, including pattern recognition, attention, consciousness, and memory.

- iii) **Pattern Recognition:** Environmental stimuli rarely are perceived as single sensory events; they usually are perceived as part of a more meaningful pattern. The things we sense – see, hear, feel, taste, or smell—are almost always part of a complex pattern of sensory stimuli. Think about the problem of reading. Reading is a complex effort in which the reader is required to form a meaningful pattern from an otherwise meaningless array of lines and curves. By organising the stimuli that make up letters and words, the reader may then access meaning from his or her memory. The entire process takes place in a fraction of a second, and considering all the neuroanatomical and cognitive systems involved, this feat – performed daily by all sorts of people – is wondrous.
- iv) **Attention:** Although we are information-gathering creatures, it is evident that under normal circumstances we are also highly selective in the amount and type of information to which we attend. Our capacity to process information seems to be limited to two levels – sensory and cognitive. If too many sensory clues are imposed upon us at any given time, we can become overloaded; if we try to process too many events in memory, we can become overloaded, which may cause a breakdown in performance. All of us have felt the same way at one time or another.
- v) **Consciousness:** Consciousness is defined as “the current awareness, of external or internal circumstances.” Rejected as being “unscientific” by the behaviourists, the word *consciousness* and the concept it represents simply did not fade away. For most people, consciousness and unconscious thoughts (such as you might have on a first date) are very real. For example, when you glance at your watch while studying and it reads “10:42 (P.M.),” you are conscious, or, aware, of that external signal. However, your reading of the time also brings up another conscious thought, one that was initially activated by reading the time but is from “inside.” That conscious thought might be, “It’s getting late: I’d better finish this chapter and go to bed”. Consciousness has gained new respectability recently and now is a concept studied seriously in modern cognitive psychology.
- vi) **Memory:** Memory and perception work together. The information available to us comes from our perception, short-term memory, and long-term memory. Most obvious long-term storage is the knowledge of the language. We draw words from LTM and more or less use them correctly. In a fleeting second, we are able to recall information about an event of years before. Such information does not come from an immediate perceptual experience; it is stored along with a vast number of other facts in the LTM.
- vii) **Representation of Knowledge:** Fundamental of all human cognition is the representation of knowledge: how information is symbolised and combined with the things stored in the brain. This part of cognition has two aspects: the conceptual representation of knowledge in mind and the way the brain stores and process information. The conceptual representation in different individuals can be considerably different. In spite of these inherent dissimilarities between representations of knowledge, most humans do experience and depict experience in similar enough ways to get along well in the world. The content of this information is also hugely different. But our neurological web entraps information and experiences and holds them in structures that are similar in all human brains.

viii) **Imagery:** Cognitive psychologists are especially interested in the topic of internal representations of knowledge. The mental images of the environment are formed in the form of a *cognitive map*, a type of internal representation of the juxtaposed buildings, streets, street signs, spotlights, and so on. From the cognitive maps, we are able to draw out significant cues. Although the experimental study of mental imagery is relatively new to psychology, some significant research has recently been reported.

- ix) **Language:** One form of knowledge shared by all human societies is the knowledge of language. Language is the principal means by which we acquire and express knowledge; thus, the study of how language is used is a central concern of cognitive psychology. Human language development represents a unique kind of abstraction, which is basic to cognition. Language processing is an important component of information processing and storage. Language also influences perception, a fundamental aspect of cognition.
- x) **Developmental Psychology:** Developmental psychology is another important area of cognitive psychology that has been intensely studied. Recent studies and theories in developmental cognitive psychology have greatly expanded our understanding of how cognitive structures develop. As adults, we have all lived through childhood and adolescence and we share maturational experiences with all members of our species.
- xi) **Thinking and Concept Formation:** Thinking is the crown jewel of cognition. Thinking is the process by which a new mental representation is formed through the transformation of information. Advances in cognitive psychology have led to a formidable arsenal of research techniques and theoretical models. An ability to think and form concepts is an important aspect of cognition. Similar concepts help in the understanding and processing of information. There is a considerable body of knowledge about the laws and processes of concept formation.
- xii) **Human and Artificial Intelligence:** Human intelligence includes the ability to acquire, recall, and use knowledge to understand concrete and abstract concepts and the relationships among objects and ideas, to understand a language, to follow instructions, to convert verbal descriptions into actions, and to behave according to the rules, and to use knowledge in a meaningful way.

The specialty within the computer science called artificial intelligence has had a major influence on the development of cognitive science, especially since the design of programs requires knowledge of how we process information. Cognitive psychology also addresses to find out whether a perfect robot can simulate human behaviour.

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## 1.5 A BRIEF HISTORY OF COGNITIVE PSYCHOLOGY

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As we have learned, a great portion of cognitive psychology deals with how knowledge is represented in the mind. In this section on the history of cognitive psychology we will review three major periods (for a detailed history see Solso & MacLin, 2000; Wilson & Keil, 1999). First, we will deal with traditional ideas

from a very early period. Then we touch on the way knowledge and thinking was conceptualised by Renaissance scholars. Finally, we will deal with the modern period with emphasis on current ideas and methods.

### 1.5.1 Early Thoughts on Thinking

Where did knowledge come from, and how is it represented in the mind? That eternal question is fundamental to cognitive psychology as it has been through the ages of humankind. Basically, two answers have been proposed. The *empiricists* maintain that knowledge comes from experience, and the *nativists* suggest that knowledge is based on innate characteristics of the brain. From a scientific perspective, neither case can be definitively proved, so the argument continues without clear resolution. With these issues clearly before us, let's consider the way ancient philosophers and early psychologists grappled with the issue. The fascination with knowledge can be traced to the earliest writings. Early theories were concerned with the seat of thought and memory. Ancient Egyptian hieroglyphics suggest their authors believed that knowledge was localised in the heart—a view shared by the early Greek philosopher Aristotle but not by Plato, who held that the brain was the locus of knowledge.

### 1.5.2 Cognition in the Renaissance and Beyond

Renaissance philosophers and theologians seemed generally satisfied that knowledge was located in the brain. They considered that knowledge was acquired not only through the physical senses (*mundus sensibilis* – touch, taste, smell, vision, and hearing) but also from divine sources (*mundus intellectualis—Deus*).

During the eighteenth century, when philosophic psychology was brought to the point where , scientific psychology could assume a role, the British empiricists, George Berkeley, David Hume, and, later, James Mill and his son John Stuart Mill suggested that internal representation is of three types: (1) direct sensory events, (2) faint copies of percepts, or those that are stored in memory; and (3) transformation of these faint copies, as in associated thought. These notions are the basis of much current research in cognitive psychology.

During the nineteenth century, the early psychologists like Gustav Fechner, Franz Brentano, Hermann Helmholtz, Wilhelm Wundt, G; E. Muller, Oswald Kulpe, Hermann Ebbinghaus, Sir Francis Galton, Edward Titchener, and William James and others started to break away from philosophy to form a discipline based on empirical results rather than on speculation. By the last half of the nineteenth century, theories of the representation of knowledge were clearly dichotomous: that emphasised the structure of mental representation (Wundt, Titchner); and the processes or acts (Brentano).

About the same time in America, James critically analysed the new psychology that was developing in Germany. He established the first' psychological laboratory in America, wrote the definitive work in psychology in 1890 (*Principles of Psychology*), and developed a well-reasoned model of the mind. Perhaps James's most direct link with modern cognitive psychology is in his view of memory, in which both structure and process play an important role. F. C. Donders and James Cattell, contemporaries of James's, performed experiments using the perception of brief visual displays as a means of determining the time required for mental operations. The technique, subject matter, procedures, and even the interpretation

### 1.5.3 Cognitive Psychology in Early Twentieth Century

The representation of knowledge took a radical turn with the advent of twentieth-century behaviourism and Gestalt psychology. The behaviourist views of human and animal psychology were cast in a framework of stimulus-response (S-R) psychology, and Gestalt theorists built elaborate conceptualisations of internal representation within the context of isomorphism – one-to-one relationship between representation and reality.

Psychological studies of mental processes as conceptualised in the late nineteenth century suddenly became unfashionable, displaced by behaviourism. Studies of internal mental operations and structures such as attention, consciousness, memory, and thinking were laid to rest and remained so for about fifty years. To the behaviourists, internal states were subsumed under the label of “intervening variable,” that mediated the effects of stimuli on responses and were neglected in favor of making observations on behaviour rather than on the mental processes.

In 1932, some years before the cognitive revolution swept across psychology, learning psychologist Edward Tolman from the University of California at Berkeley published *Purposive Behavior in Animals and Men*. In this seminal work, Tolman observed that what rats learn in a maze is the layout of the land rather than simply a series of S-R connections. The animal, according to Tolman’s interpretation, gradually developed a “picture” of his environment that was later used to find the goal. This picture was called a cognitive map. Tolman’s postulate about cognitive maps in animals did anticipate the contemporary preoccupation with how knowledge is represented in a cognitive structure.

Also in 1932 Sir Frederick Bartlett from Cambridge University wrote *Remembering* in which he rejected the then popular view that memory and forgetting can be studied by means of nonsense syllables, as had been advocated by Ebbinghaus in Germany during the previous century. In the study of human memory, Bartlett argued, the use of rich and meaningful material under naturalistic conditions would yield far more significant conclusions. Bartlett introduced the concept of schema as a unifying theme that describes the essence of an experience. Schema theory plays a central role in modern theories of memory. The fecund ideas of Tolman in America and Bartlett in England highly influenced the thinking of future cognitive psychologists.

### 1.5.4 Cognitive Psychology—As it is Today

In the 1950s interest again began to focus on attention, memory, pattern recognition, images, semantic organisation, language processes, thinking, and even consciousness (the most dogmatically eschewed concept), as well as other “cognitive” topics once considered outside the boundary of experimental psychology (vis-à-vis behaviourism). New journals and professional groups were founded as psychologists began more and more to turn to cognitive psychology. As cognitive psychology became established with even greater clarity, it was plain that this was a brand of psychology different from that in vogue during the 1930s and 1940s. Among the most important forces accounting for this neocognitive revolution were the following:

*The “failure” of behaviourism.* Behaviorism, which generally studied overt responses to stimuli, failed to account for the diversity of human behaviour as in the case of language. Furthermore, there were some topics ignored by the behaviourists that seemed to be profoundly related to human psychology. These included memory, attention, consciousness, thinking, and imagery. It was apparent that internal mental processes were very real parts of psychology and required investigation.

*The emergence of communication theory.* Communication theory prompted experiments in signal detection, attention, cybernetics, and information theory – areas of significance to cognitive psychology.

*Modern linguistics.* New ways of viewing language and grammatical structure became incorporated into attitudes concerning cognitions.

*Memory research.* Research in verbal learning and semantic organisation provided a sturdy empirical base for theories of memory, which led to the development of models of memory systems and the appearance of testable models of other cognitive processes.

*Computer science and other technological advances.* Computer science, and especially a subdivision of it—artificial intelligence—caused reexamination of basic postulates of problem solving and memory processing and storage, as well as of ‘language processing and acquisition. Research capabilities were greatly expanded by new experimental devices.

*Cognitive development.* Psychologists interested in development psychology discovered an orderly unfolding of abilities with maturation. Notable among developmental psychologists during this period was Jean Piaget, who described how children develop an appreciation for concepts from infancy to adolescence. Such progress of abilities seems to be natural.

From the earliest concepts of representational knowledge to recent research, knowledge has been thought to rely heavily on sensory inputs. That theme runs from the Greek philosophers, through Renaissance scholars, to contemporary cognitive psychologists. But are internal representations of the world identical to the physical properties of the world? Evidence is increasing that many internal representations of reality are not the same as the external reality—that is, they are not isomorphic. Tolman’s work with laboratory animals and Bartlett’s work with human subjects suggest that information from the senses is stored as an abstract representation. Furthermore, studies of neurology clearly show that information from the outside world is sensed and stored as in a neurochemical code.

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## 1.6 KEY ISSUES IN THE STUDY OF COGNITIVE PSYCHOLOGY

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If the important ideas are reviewed, it is observed that some major themes underlie all of cognitive psychology. Some of these issues are discussed dialectically here:

*Nature versus Nurture* – Which is more influential in human cognition – nature or nurture? If we believe that innate characteristics of human cognition are more

important, we might focus our research on studying innate characteristics of cognition. If we believe that the environment plays an important role in cognition, we might conduct research exploring how distinctive characteristics of environment seem to influence cognition.

*Rationalism versus Empiricism* – How should we discover the truth about ourselves and about the world around us? Should we do so by trying to reason logically, based on what we already know? Or should we do so by observing and testing our observations of what we can perceive through our senses? And how can we combine theory with empirical methods to learn the most we can about cognitive phenomena?

*Structures versus Processes* - Should we study the structures (contents, attributes, and products) of the human mind? Or should we focus on processes of human thinking?

*Domain generality versus Domain specificity* – Are the processes we observe limited to single domains, or are they general across a variety of domains? Do observations in one domain apply also to all domains, or do they apply only to specific domains observed?

*Validity of causal inferences versus Ecological validity* – Should we study cognition by using highly controlled experiments that increase the probability of valid inferences regarding causality? Or should we use more naturalistic techniques?

*Applied versus Basic research* – Should we conduct research into fundamental cognitive processes? Or should we study ways in which to help people use cognition effectively in practical situations?

*Biological versus Behavioural methods* – Should we study the brain and its functions directly, perhaps even scanning the brain while people are performing cognitive tasks? Or should we study people's behaviour in cognitive tasks, looking at measures such as percentage correct and reaction time?

Note that these questions can be posed in the “either/or” form of thesis/antithesis, or in the both/and form of a synthesis of views or methods, which often proves more useful than one extreme position or another.

## **1.7 KEY IDEAS IN COGNITIVE PSYCHOLOGY**

Certain key ideas seem to keep emerging in cognitive psychology, regardless of the particular phenomenon one studies. Here are what might be considered the five major ideas:

Data in cognitive psychology can be fully understood only in the context of an explanatory theory, but theories are empty without empirical data.

Cognition is generally adaptive but not in all specific instances.

Cognitive processes interact with each other and with noncognitive processes.

Cognition needs to be studied through a variety of scientific methods.

All basic research in cognitive psychology may lead to applications, and all applied research may lead to basic understandings.

**Activity:** Think about some of the fields of cognitive psychology to which these key themes and issues may apply.

### 1.7.1 Computer Metaphor and Human Cognition

Although Pascal, Descartes, and others dreamt of computing machines centuries ago, it was not until the development of high-speed digital computers more than fifty years ago that practical machines were invented. These machines gained enormous acceptance and are presently used in virtually every aspect of modern life. Originally, such devices were thought to be wonderful number crunchers capable of performing a multitude of complex mathematical operations in a fraction of the time required by humans. However, it was quickly discovered that they could perform functions that resembled human problem solving.

However, what computers do well (perform high-speed mathematical functions and abide by rule-governed logic) humans do poorly, relatively speaking. And what humans do well (form generalisations, make inferences, understand complex patterns, and have emotions) computers do poorly, or not at all. Despite this problem, a second generation of cognitive-computer scientists is working toward building computers that looked something like a brain.

These new computers are sometimes called neural networks and act more like humans than the earlier versions. They are able to make generalisations and understand complex visual patterns, are slow at math, and make witless mistakes. Although they still do not have emotions, they are nevertheless a mark of success. We now know that there are fundamental differences between the internal workings of computers and the internal workings of the brain. Nevertheless, the computer metaphor continues to have a profound and generally positive impact on the development of cognitive psychology.

### 1.7.2 Cognitive Science

Three powerful areas of scientific development, namely, computer science, neuroscience, and cognitive psychology, converge to create a new science called cognitive science. The boundaries between these disciplines are sometimes hard to distinguish, that is, some cognitive psychologists may be closer to neuroscience, others to computer science. One thing is clear, that is the science of human cognition is undergoing a radical transformation as a result of major changes in computer technology and brain science. Cognitive psychology makes full use of recent discoveries in neuroscience and computer science that illuminate the cognitive properties of the human species.

### 1.7.3 Neuroscience and Cognitive Psychology

During the early stages of cognitive psychology, little attention was given to physiological psychology or neuroanatomy. Much of the early information on the brain and its functions resulted from head traumas incurred during wars and accidents. The central issue neurologists struggled with was whether the brain was a holistic organ, with operations distributed throughout its infrastructure, or whether activities were localised and tied to specific regions. For example, did learning a specific act take place in a localised area of the brain, or was learning distributed throughout many parts of the brain? Among the most prominent of the scientists who wrestled with these issues was Karl Lashley (1929). Recently,

progress has been made in the field of neuroscience, which comprises both the structural aspects of the brain and its peripheral components, as well as the functional aspects.

With the beginning of the twenty-first century, cognitive psychology seems poised to make another paradigm shift. While the traditional topics of perception, memory, language, problem solving, and thinking and the method of experimental analysis are still central to the cognitive theme. As is well known, the use of neuro cognitive imagery promises to become one of the major means of investigating cognitive functions in this century.

Neuro cognitive techniques, which have been developing very rapidly in the past several decades, allow us to see deeper and more clearly into the brain—and the brain is believed to be the engine of cognition. Virtually every area of cognition has been investigated with neuro cognitive techniques. These, techniques, MRI, PET, EEG, and the like, show not only the structures of cognition but also the processes involved. And, in many instance, the results have been remarkable. While this trend is likely to continue and grow, it is important to recognise the central themes in cognition mentioned above.

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## 1.8 LET US SUM UP

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Cognitive psychology is the study of how people perceive, learn, remember, and think about information. A cognitive psychologist might study how people perceive various shapes, why they remember some facts but forget others, or how they learn language.

Cognitive psychology is interested in what is generally called mental phenomena. In this sense, cognitive psychology IS the scientific study of the mind. Then we took up the various research methods that we use in cognitive psychology. Every research has a goal and it is achieved through appropriate methodology. It was noted that the goals of research in cognitive psychology was to find the how and why of thinking. It was pointed out that there are distinctive research methods in cognitive psychology. Each method has distinctive advantages and disadvantages. It was also noted that Cognitive psychologists often broaden and deepen their understanding of cognition through research in cognitive science. Cognitive science is a cross-disciplinary field that uses ideas and methods from cognitive psychology, psychobiology, artificial intelligence, philosophy, linguistics, and anthropology.

Modern cognitive psychology freely, draws theories and techniques; from twelve principal areas of research, namely cognitive neuroscience, human and artificial intelligence, perception, thinking and concept formation, pattern recognition, developmental psychology, attention, language, representation of knowledge, imagery, memory and consciousness. Then we dealt with a brief history of cognitive psychology and highlighted the early thoughts on thinking, renaissance and beyond and the status of cognitive psychology as of today. We then discussed some of the key issues in cognitive psychology highlighting nature vs. nurture, rationalism vs. empiricism, structure vs. processes etc.

## 1.9 UNIT END QUESTIONS

- 1) Describe the major historical schools of psychological thought leading up to the development of cognitive psychology.
- 2) Analyse how various research methods in cognitive psychology reflect empiricist and rationalist approaches to gaining knowledge.
- 3) Design a rough sketch of a cognitive-psychological investigation involving one of the research methods described in this chapter. Highlight both the advantages and disadvantages of using this particular method for your investigation.
- 4) Describe Cognitive Psychology as it is today. How might you speculate that the field will change in the next 50 years?
- 5) How might an insight gained from basic research lead to practical use in an everyday setting?
- 6) Describe some real life situations related to different domains of cognitive psychology.
- 7) How might an insight gained from applied research lead to deepened understanding of fundamental features of cognition?
- 8) What was the importance of the computer to the development of cognitive psychology?
- 9) Next time you visit a supermarket or mall, pause for a few moments and observe the various examples of cognitive psychology which surround you. Pay particular attention to: 1) the use of forms and colours to gain attention, 2) your own reaction to environmental cues, 3) the use of memory in understanding language, context, and the interpretation of the sights and sounds of your environment. Note down your impressions of these matters and read them over in about a week. What principles discussed in this chapter apply?

## 1.10 SUGGESTED READINGS AND REFERENCES

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