

Definition and scope of Cognitive Psychology

The word 'cognition' is derived from the Latin word *cognoscere*, meaning "to know" or "to come to know". Thus, cognition includes the activities and processes concerned with the acquisition, storage, retrieval and processing of knowledge. In other words, it might include the processes that help us to perceive, attend, remember, think, categorize, reason, decide, and so on. Cognitive psychology, as the name suggests, is that branch of psychology that deals with cognitive mental processes.

Sternberg (1999) defined Cognitive psychology as that which deals with how people perceive, learn, remember, and think about information." In 2005, Solso gave another definition of Cognitive psychology as the study of processes underlying mental events. In general, Cognitive psychology can thus be defined as that branch of psychology that is concerned with how people acquire, store, transform, use and communicate language. The cognitive psychologists study the various cognitive processes that make up this branch. These processes include attention, the process through which we focus on some stimulus; perception, the process through which we interpret sensory information; pattern recognition, the process through which we classify stimuli into known categories; and memory, the process through which information is stored for later retrieval, and so on.

Cognitive psychology is the branch of psychology that studies mental processes such as how people think, perceive, remember and learn. In other words, cognitive psychology examines how people diagnose, realize, perceive, evaluate and consider/think.

Cognition factually means "knowing". In other words, psychologists from this method study cognition which is the psychological act or procedure by which information is learned. Cognitive psychology involves experimentation. It examines internal mental procedure such as problem solving, memory, and language. Cognitive psychology is the subdiscipline of psychology, It is a comparatively early branch of mindset that became a chief force throughout the "cognitive revolution" of 1960s & 1970s.

Broad Definition: Empirical Investigation of mental events and knowledge involved in recognizing an object, remembering a name, having an idea, understanding a sentence and solving problems.

Scientific Definition: The empirical investigation of mental processes used in perceiving, remembering, thinking and the acting of using these processes.

Cognitive psychology is not only centered to everything what happens in everyday life, it is even central to psychologist's quest to understand how of the behaviour. **The scope of**

cognitive psychology could be understood by understanding its sub disciplines and the work done in it.

1. **Social Psychologists:** Social psychologists try to investigate the mental processes involved in thinking about others.
2. **Clinical Psychologists:** Clinical psychologists investigate the role that mental processes play in psychopathology.
3. **Developmental Psychologists:** Developmental psychologists' study about the ways that cognitive processes change throughout the life span.
4. **Neuropsychologists:** Cognitive psychology is also related with neuropsychology, in which neuropsychologists try to understand the association between mental processing and brain activity.
5. **Organizational Psychologists:** Cognitive psychology plays its role in industrial or organizational set up where in organizational psychologists are insisted to know how cognitive processes such as remembering and decision making strategies work out in organizational or industrial workplace.

SCOPE of Cognitive Psychology:

The scope of cognitive psychology could be assumed by realizing its sub disciplines and the effort or the work done on it.

1. Social/Communal Psychologists:

Social psychologists try to examine the mental process involved in thinking about other persons.

2. Scientific Psychologists:

Clinical psychologists inspect the role that mental practice play in psychopathology.

3. Developmental Psychologists:

Developmental psychologists examine about the ways that cognitive procedure amend throughout the life time.

4. Neuropsychologists:

Cognitive psychology is also connected with neuropsychology, in which neuropsychologists stab to understand the connotation between mental dispensation and brain action.

5. Managerial Psychologists:

Cognitive psychology plays its role in manufacturing or structural set up where in administrative psychologists are maintained to know how cognitive procedure such as memorizing and decision-making plans work out in administrative or industrial workstation.

History of Cognitive Psychology

At the beginning of the 21st century, cognitive psychology is a broad field concerned with memory, perception, attention, pattern recognition, consciousness, neuroscience, representation of knowledge, cognitive development, language, thinking, and, human and artificial intelligence. But contemplation about the source of knowledge, how people think, solve problems, and perceive their world is as ancient as human history and has occupied a venerated position in the musings of philosophers, theologians, mystics, and scientists for as long as we can tell. These notions started to be tested empirically during the latter part of the nineteenth century and throughout the twentieth century and became known in the history of science as cognitive psychology.

The history of cognitive psychology can be parsed into four periods: philosophical, early experimental, the cognitive revolution, and modern cognitive psychology.

Philosophical Period

Ancient Egyptian hieroglyphics suggest that thoughtful people were concerned with processes such as thought, memory, and most of all the “ka”, or soul, Great energy was directed toward preserving the soul but also some theorized that knowledge was localized in the heart. Greek philosophers were obsessed with knowledge and cognitive matters and current models of cognition often have some ties to ancient Greece. Aristotle’s views on the locus of knowledge were similar to the Egyptians. However, Plato postulated that the brain was the true locus of knowledge. Renaissance scholars considered thinking, logic, and the nature of the soul and, although divergent views were expressed, the locus of the knowledge and rationality was thought to be in the brain.

During the eighteenth century, philosophic debate over the source of knowledge took place between the empiricist and the nativist. A British empiricist believed knowledge came from experience. However, the nativist believed knowledge was innate and based on structural characteristics and properties inherent in the brain. Modern cognitive psychologists continue to argue these matters, although usually with scientific data.

The philosophic period provided a context for understanding the mind and its processes. In addition, these early thinkers identified some major theoretical issues that would later be studied empirically using scientific research methods.

Early Experimental Period

Cognition has been studied scientifically since the end of the nineteenth century. In 1879, the philosophical aspects of mental processes gave way to empirical observations when Wundt founded the first psychological laboratory in Germany in 1879. Psychology began to break away from philosophy and form a discipline based on objective science rather than on

speculation, logic, and conjecture. Many forces propelled the break with moral philosophy, but certainly the development of new methods that allowed for the examination of mental events changed the way cognition was studied. Introspection, or looking within, was one such method that allowed the observer to examine consciousness and the structure of mental representation by breaking down an experience into sensations and images. By detecting patterns within introspective reports, the mind's contents were presumed to be revealed.

Theories of knowledge representation became divided between introspectionists who studied observable sensations, and act psychologists, led by Brentano, who studied the activities of the mind. Brentano considered internal representations meaningless to psychology and chose to study mental acts of comparing, judging, and feeling physical objects.

By the beginning of the twentieth century American psychology was beginning to take a distinctive form with a wide range of topics under investigation. Leading this expanded experimental psychology was William James, the first president of the American Psychological Association. His ideas on philosophy, religion, and psychology shaped the intellectual history of these topics throughout the twentieth century. No less important were his thoughts about attention and memory, and his distinction of a dichotomy memory store—primary and secondary memory—led directly to experiments in the 1960s on that topic. Clearly, James's ideas were important in shaping modern cognitive psychology.

During this time, American psychologists became interested in educational matters and were greatly influenced by the objective nature of act psychology. Psychologists such as Thorndike were concerned with the effects of reward and punishment on learning and less concerned with consciousness. The introspective technique, in which a subject asks himself what sensations he might experience, for example, were considered by American psychologists as being sterile and leading to inconsistent results. There was, argued many, a need for a purely objective and scientific psychology in which mental processes, such as memory, sensations, and learning, could be reliably measured. Behaviorism, led by John Watson, was predicated on the idea that overt behavior could be objectively observed, offered an attractive scientific approach to psychology, and was an appropriate foil to the rapidly developing interest in psychoanalysis.

Despite interest in overt behavior, cognitive process were not totally neglected. During the early 1900s Donders and Cattell were conducting perception experiments on imageless thought using brief visual displays to examine the time required for mental operations to take place and using reaction time data as dependent measures.

In several laboratories in America interesting research was being done on memory, attention, perception, language, concept formation, and problem solving that was the preformal stage of cognitive psychology. In addition to these efforts within psychology, several forces outside of traditional experimental psychology helped shape cognitive psychology. Among these forces are the considerable influence of the Swiss psychologist, Jean Piaget, whose central idea was that there are distinctive cognitive stages through which children develop. In Russia, the brilliant young savant, Lev Vygotsky, suggested a model of development psychology in which learning precedes development. Another important influence was the work of Frederic Bartlett, from England, who investigated memory from a naturalistic viewpoint and was particularly concerned with the remembering of stories. From recall of stories, Bartlett hypothesized that memory is largely determined by schemata, or the way knowledge is organized and represented in the brain. Even some animal studies were beginning to embrace cognitive themes. In 1932, Tolman, a well-known behavioral psychologist, observed that rats learned a cognitive map of their environment while learning to run a maze. Although cognition was not the dominant school of psychological thought in America during this time, some experimental psychologists demonstrated that scientific methodology could be used in the study of mental events. The techniques, subject matter, procedures, and even the interpretations used by these researchers anticipated the emergence of a cognitive discipline.

Concepts such as sensation, thinking, and mental imagery were anathema under the behaviorist's influence, as they were considered subjective. Internal states were considered intervening variables and not necessary to understand human behavior. Psychology had been concentrated on observable behaviors and human subjects were largely replaced with rats and pigeons.

Gestalt psychology offered an alternative way to study sensory perception to the problematic method of introspection that diffused the research on cognition. Concurrently the behaviorists attempted to create a purely objective psychology by successfully attacking the cognitive psychologists and Gestaltists as well.

Cognitive Revolution

Cognitive psychology began to take form as a new way of understanding the science of the mind during the late 1950s. These formative events were spurred on by research discoveries in memory, learning, and attention as well as ideas outside of the mainstay of experimental psychology, such as communication theory, developmental psychology, social psychology, linguistics, and computer science, which gave cognitive psychologists additional breadth to deal with the complexity of human information processing and thinking.

The reemergence of cognitive psychology during this period is commonly referred to as the Cognitive Revolution, emerging in 1956 with a conference on communication theory at Massachusetts Institute of Technology (MIT) (Solso, 1998) in which seminal papers were presented by Noam Chomsky, Jerome Bruner, Allen Newell and Herbert Simon, and George Miller. The coalescence of cognitive psychology during this period was probably not due to a single group of people (and certainly no precise date of a movement is possible) but was a reflection of a larger Zeitgeist in which psychologists appreciated the complexity of the thinking human. At the same time, cognitive psychologists rejected the traditional, simplistic theories of the mind, but in many cases held on to the scientific methodology as had developed in the early part of the twentieth century. The paradigm that offered a pertinent methodology and embraced a sufficiently wide latitude of intellectual topics was cognitive psychology, which enjoyed widespread acceptance and growth.

Research in verbal learning and semantic organization led to the development of testable models of memory and cognition, providing another empirical base for the study of mental processes. George A. Miller made a distinction between short-term and long-term memory and his influential paper *The Magic Number Seven, Plus or Minus Two* (Miller, 1956) addressed the limited capacity of short-term memory and introduced the concept of chunking—the idea that the limits of short-term memory could be extended by grouping information into larger units of information. In 1958, Peterson and Peterson in America and John Brown in England found a rapid loss or decay of memory after the study of nonsense syllables after a few seconds when verbal rehearsal was absent, thus promoting the idea of a separate stage of short-term memory. In 1960, Sperling showed that a very transitory memory (or information storage system) held information for a very brief period of time. This discovery further advanced the notion that humans were complex information-processing creatures who processed incoming information through a series of stages. That simple idea was a perfect model for researchers and theorists interested in memory, and several models appeared about this time by Atkinson and Shiffrin, Waugh and Norman, and later by Craik and Tulving.

Prior to this period, information theory was introduced by Shannon and Weaver, who used box diagrams to describe how information is communicated and transformed along a series of stages. Donald Broadbent, a psychologist at Cambridge, began applying Shannon and Weaver's ideas to selective attention processes and introduced the concept of information flow to psychology and used box diagrams to describe cognitive processes. Broadbent's information flow referred to the series of operations that analyze, transform, or change mental events such as memory encoding, forgetting, thinking, concept formation, etc. As such, Broadbent provided

“a language to talk about what happened inside a man which was not a mentalistic introspective language” (Cohen, 1986, p. 23).

Elsewhere, technological advances in computer science called for reexamination of basic postulates of cognition. In 1955, Simon and Newell developed a computer capable of solving a mathematical proof. Cognitive psychologists were excited that machines could simulate human thought and computers could possibly be operating according to the same rules and procedures as the human mind. Furthermore, since computers were seen as intelligent, it required us to analyze our own intelligence so that the intelligence of a machine could be determined. As a result the hypothetical Turing test was devised to determine if observers could discriminate the output of a computer from that of human responses.

Meanwhile, the behaviorists came under attack from Chomsky, a linguist from MIT, who developed a method of analyzing the structure of language. Chomsky argued that language was too complicated to learn and produce via behavioral principles of reinforcement and postulated the existence of a cognitive structure of an innate language acquisition device.

Another influence that aided cognitive psychology's foothold was World War II. Financial support in areas of military interest became readily available during the war. Because of the military's interest in developing and using new technology, research in vigilance, creativity, and human factors was encouraged. One outcome was a seminal report in 1954 by Tanner and Swets on signal detection demonstrating that cognitive processes can have a mediating effect on sensory thresholds. Another outcome of the war was that many soldiers suffered from brain injuries. A vast amount of clinical data in perception, memory, and language was a by-product of these victims' afflictions.

In the 1950s, interest turned to attention, memory, pattern recognition, images, semantic organization, 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. Behaviorism and its dogma failed to account for the richness and diversity of human experience. Behaviorists could not account for the results found by Piaget's and Chomsky's developmental studies. And information theory and computer science gave psychologists new ways to conceptualize and discuss cognition.

Modern Cognitive Psychology

By the 1960s, cognitive psychology had experienced a renaissance. Cognitive Psychology, which systematized the new science, was written by Ulric Neisser and was published in America (1967). Neisser's book was central to the solidification of cognitive psychology as it gave a label to the field and defined the topical areas. Neisser used the

computer metaphor for selecting, storing. Recovering, combining, outputting, and manipulating information. And in 1966 Hilgard and Bower introduced a chapter in their *Theories of Learning* (New York) that developed the idea of using computer programs to serve as models on theories of cognition.

The 1970s saw the emergence of professional journals devoted to cognitive psychology such as *Cognitive Psychology*, *Cognition*, *Memory & Cognition*, and a series of symposia volumes, including the Loyola Symposium on Cognition edited by Solso and the Carnegie-Mellon series edited by Chase and others, based on the Carnegie Symposium on Cognition. In the 1970s and 1980s cognitive laboratories were beginning to be built, symposia and conferences appeared at national and regional meetings, courses in cognitive psychology and related topics were being added to curricula, grants were awarded to people investigating memory, language processing, attention, and like topics, new textbooks were written on the theme of cognition, and universities recruited professors of cognitive psychology to replace those of traditional experimental psychology. In the 1980s and 1990s serious efforts were made to find corresponding neural components that were linked to cognitive constructs. Thus, the cerebral location for a word, like hammer, as a noun, might be far different than the location for the same word if the word were used as a verb. Furthermore, influential memory theories (such as Tulving's semantic and episodic memory theory) were manifest in cerebral localization experiments using brain imaging technology. The science of human cognition is still undergoing transformation due to major changes in computer technology and brain science. As a result cognitive psychology has converged with computer science and neuroscience to create a new discipline called cognitive science.

Finally, with the advent of new ways to see the brain (e.g. functional magnetic resonance imaging [fMRI], positron emission tomography [PET], electroencephalogram [EEG]) cognitive psychologists have expanded their operations to neuroscience, which promises to empirically display the parts of the brain involved in cognition that were hypothesized by twentieth-century psychologists.

ALTERNATIVE APPROACHES TO COGNITIVE PSYCHOLOGY

A number of different approaches have been proposed in order to better understand the field of cognitive psychology. Each of these approaches emphasizes a different aspect and highlight distinct features underlying the cognitive processes. These methods provide us with an insight into how the human mind functions by giving us a general idea about the workings of the basic cognitive processes that we engage in. Broadly, there are four major approaches

that try to explain the various cognitive processes by highlighting the different important features.

These approaches are: Experimental Cognitive Psychology, Computational Cognitive Science, Cognitive Neuropsychology, and Cognitive Neuroscience.

Experimental Cognitive Psychology – This approach involves conducting tightly controlled experiments under laboratory conditions on healthy individuals. It generally includes experiments that designed in such a way that they might disrupt the cognitive processes and reveal their workings. The findings obtained through such experiments then lead to formulation of the theories, which in turn lead to testable claims. For example, a researcher wants to examine the effect of arousal on reaction time. He uses the experimental approach, and the reaction time is assessed through a machine where the buttons light up and the time to respond is measured. The arousal is also assessed through heart rate measurement, under the following conditions; after rest, after cognitive overload, after exercise, after caffeine, and after both exercise and caffeine. The results obtained through such experimental methods can thus lead to formulation of some theories, which later can be tested.

Computational Cognitive Science – This approach involves computational modelling through the recreation of some of the aspects of human cognition in the form of some computer program, or formula in order to predict behavior in novel situations. In other words, this approach basically involves creating computer-based models of human cognitive functions, as well as some work on artificial intelligence. Usually, there are a number of ways in which a particular cognitive phenomenon can be modelled. However, there is a lack of a definite method for relating a computational model's behavior to human behavior, and thus, It is extremely difficult, if not impossible, to take every cognitive factor into account when creating a model (e.g. Do models of language processing take into account the emotional connotations of particular sentences for particular individuals?).

Cognitive Neuropsychology- This approach to cognition investigates the various cognitive processes by studying the people who have suffered brain damage, and to find out whether damage to a particular brain region would result in a specific cognitive impairment. For example, damage to region X disrupts ability Y, and the people who have lost ability Y also have problems with ability. Thus, such studies involving people with brain damages help us to make assertions regarding the healthy brain functions. However, such studies are difficult and cannot be manipulated according to the wishes of the researcher as it would be unethical to cause damage to a particular brain region of a person so that its role in a specific cognitive

function can be observed. Also, if a person has suffered damage to several brain areas, then the interpretation of the resultant findings is difficult.

Cognitive Neuroscience - This approach has gained popularity over the past decade or so, and involves brain-imaging devices to study cognitive functions. This can help to discover where these processes occur in the brain, and when. In other words, this approach involves using brain imaging and brain anatomy to study 'live' cognitive functioning in healthy individuals. As the technology improves, these studies are becoming more influential and potentially useful. Some of the methods used in the cognitive neuroscientific approach include: Single Unit Recording Event Related Potentials (ERPs) Positron Emission Tomography (PET) (Functional) Magnetic Resonance Imaging (fMRI, MRI) Magneto-encephalography (MEG) Transcranial magnetic stimulation (TMS) However, these techniques might be of questionable use with high-order functioning which might not be organized in a concise way. Also, if data from several individuals is averaged the interpretations become accordingly blunt. Sometimes, when using these methods, tendency for research to be conducted is just for the sake of research. Papers can often be lacking any theoretical basis, and result in ad hoc hypotheses. Furthermore, threshold levels need to be set to disregard noise, and these levels are a debatable issue.