

# Introduction to Experimental Psychology

## Nature of Psychology

What is “psychology”? There is no easy definition. Its origins come from the words “logos” (the study) and “psyche” (the mind). Logically, therefore, psychology is the study of the mind, but this does not help much if we cannot define what we mean by the mind. Many claim that mental events take place within the mind. By mental events, we mean activities such as attention-consciousness, information processing, thought-language, memory, and decision-making. These labels are, however, still vague and abstract. If Psychology is a science, like any other science, we need to define and measure our terms. These vague terms are neither easily defined nor measured. Some claim that Psychology is (or should be) the study of overt (what we can “see”) behaviour. A scientist cannot directly observe “mental events” because they occur somewhere within your mind (or brain). A scientist can observe overt behaviour. For this course, we shall use a compromise definition of psychology – the study of mental events and behaviour.

Modern psychology consists of many different branches. These branches and divisions are somewhat arbitrary and are based on (1) whether the psychologist is a basic, fundamental researcher (an experimental psychologist), an applied psychologist using the applications of experimental psychology (thus an “applied” psychologist) or a clinical psychologist. The general public and many students first studying psychology assume that all psychologists are clinical psychologists (psychotherapists, counsellors). While many psychologists are clinical psychologists, many are not. Psychology really began as a branch of Physics (and was called Psychophysics). There is real physical energy in the universe. This is studied by physicists. Humans (and other animals), however, experience (or are conscious) of only a small portion of this energy. This is because our sensory receptors are sensitive to only a tiny fraction of the physical energy in the universe. Moreover, our information processing systems assure that we are conscious of only a small portion of all the energy that bombards our receptors, that which is most relevant for our survival. Our attentional systems thus filter stimulus input, only allowing a tiny portion of it “through”. Psychophysicists study the what and the why of consciousness.

We shall first examine the three major divisions of Psychology. Within each of these branches, there are also several divisions or what I call “schools”.

## Major Divisions of Psychology

### Experimental Psychology

- Began in mid- to late-1800s. First experimental psychology lab considered to be that of Wilhelm Wundt in Leipzig, Germany. Wundt studied basic and simple concepts of consciousness.
- Structuralism. One of Wundt’s students, Edward Titchener attempted to isolate the basic elements of the mind. This was known as *structuralism* (the basic structures of the mind). Our experience of the external world is probably also made up of a mixture of simpler elements. He used the analogy of chemistry. Salt is made up of a “mixture” of sodium and chloride. Is human

consciousness (the “mind”) similar? What we see and experience as a “yellow” light is not in fact a yellow light. The retina in our eyes has receptors for only 3 types of colour, red, green and blue. When the “red” receptor fires, we experience red light. But how can we experience “yellow”. There is no yellow receptor. It represents the firing of two receptor cells, those corresponding to red and green. We are conscious of yellow; we are not conscious of the fact that the red and green cells in the retina are simultaneously active which in turns activates very different, but highly specific areas of the visual “pathway” of the brain. The red-green signals are thus being translated by the brain-mind. Titchener asked his research participants to verbally state what they were “experiencing” when, for example, they smelled a flower, heard music, and so forth. This method of looking inward and reflecting on one’s own conscious experience was called *introspection*. It however proved to be very subjective and unreliable. What one individual might report following introspection might be very different from what another individual might report.

- Nevertheless, the initial studies indicated that the basic principles of experimentation can be used to explain psychological phenomena. The principles of experimental psychology had thus been initiated.
- William James at Harvard University is considered to be the father of American psychology. James wrote a great deal about what we would now consider to be “cognitive” psychology (see section on Schools of Psychology). James did little actual experimentation. Thus, he did not experimentally test most of his theories. James is also considered by many to be an important (if not the most important) contributor to a branch of (an almost unique American) philosophy called pragmatism (following in the tradition of other American thinkers such as Benjamin Franklin). Philosophers had long debated whether human existence was mainly material or nonmaterial in nature (the materialism versus idealism debate). As an example, is the mind “strictly” material in nature? Is it simply part of the physical brain? We shall see more about this debate later when we discuss scientific methods. The James pragmatic approach declared, in essence, that the philosophical debate was really of no concern. What counted was the pragmatic end result. Pragmatism also forms the basis of another American philosophy, this one economic, capitalism. For many philosophers, pragmatism is an exceedingly empty principle. James is also credited with writing the first major textbook in psychology, a volume that is still often cited.

## Clinical Psychology

- Counselling; psychotherapy. Sigmund Freud, in Vienna, Austria is generally considered to be the founder of psychotherapy but Freud was not a psychologist. He was a psychoanalyst. Major roots of clinical psychology and therapy are recent – perhaps as late as the 1940s in the U.S. Now the major field in Psychology.

## Applied Psychology

- Social, developmental, educational, industrial psychology

## Schools of Psychology

Each of the above divisions (experimental, clinical, applied) can also be sub-divided into a number of other branches, that we shall call “schools”. Again, these are somewhat arbitrary. Thus, many experimental, clinical and applied psychologists might take a so-called “cognitive” approach while others might take a more “biological” approach.

## Cognitive

- Initially began in late 19th Century (William James). Fell into disrepute. Revival in 1950s. Now a “boom” field.
- Study of higher “mental functions” -- memory, attention, decision-making, language.
- Attempts to *infer* hypothetical mental states of “information” processing based on current response patterns/performance.
- An example of an experiment in cognitive psychology: A group of participants is presented with 200 single words and 200 single pictures. They are asked to remember only the words. They are told that the pictures are there only to distract the participant from the task, remembering the words. The experimenter now presents a second series of words and pictures, some of which were presented before, some of which were not presented before. The participant recognizes perhaps 80% of the previously presented words, but surprisingly also recognizes about 80% of the pictures. The experimenter *infers* that images (or pictures) are stored in memory automatically even if the experimenter does not ask the participant to do so. But perhaps words are also stored automatically. The clever experimenter now changes the task. A second group of participants is tested again, being presented with the same long list of words and pictures. This time however they are told to remember all of the pictures and that the words are irrelevant. Again, they are shown another list of words and pictures and asked if they were previously presented. This time only 30% of the words are correctly recognized but 80% of the pictures are correctly recognized. The cognitive psychologist thus infers that pictures are processed automatically even if the subject is told to ignore them. Words are not however processed automatically.
- Note that the cognitive psychologist cannot directly observe the mental processes. In the example above, the psychologist cannot observe memory being stored. Nor can the psychologist observe how memories for words are stored differently than memory for pictures. The psychologist can infer however that the storage process **MUST** be different. To store words in memory requires effort (or attention) to the task. Thus is not the case for the storage of pictures. They are stored whether the intent of the participant is to actually store the pictures or not.

## (Sub-Divisions of Cognitive Psychology)

Cognitive psychology has proven to be immensely powerful and popular (although there are major criticisms of the cognitive approach... see the scathing comments of behaviourists below).

- Cognitive Psychology
  - As outlined above, use measures such as performance and decision-time to *infer* about *hypothetical* brain functions
- Cognitive Neuroscience
- A problem with the usual methods employed in Cognitive Psychology is that the experimenter cannot directly *observe* the cognitive functions (for example, the automatic processing of pictures) that are of interest. Rather they are inferred on the basis of variance in performance. In science, we must be able to observe the measures of interest. How do we actually know that words and

pictures are indeed processed differently in the brain? Recent innovations in neuroscience provide a method of overcoming this criticism. Modern brain imaging techniques permit the experimenter to actually observe the changes in brain activity as the participant is engaged in some cognitive task. Thus, in the word-picture task above, certain brain regions will be activated when you are presented with a word and asked to remember it. Now, when you are asked to ignore the words (or at least not remember them), not all of the same brain regions will be activated. This may not be the case with pictures. When you are asked to remember the pictures, certain brain areas will be activated (and these will be different from words, because pictures are not words). Now you are asked to ignore the pictures. If you cannot, the same brain regions are again activated.

- Neural/Cognitive Modelling
  - Use of computers to mimic cognitive/information processing. How many “decisions” must the computer make to arrive at a solution to a problem?

## Biological

- Manipulate psychological state (attention, memory, decision-making) and see effect of this manipulation on brain activity, brain structure
- Manipulate brain (stimulate, lesion, drugs) and determine effect on psychology.

## Behavioural

- Began in 1920s with J. Watson and his criticism of cognitive psychology and psychoanalysis (see below). B.F. Skinner (1935-1990!!!) laid out much of the tenets of “behaviourism”
- Psychology as an objective science. All psychological events must be directly observable. Cognitive events cannot be observed (only inferred). The study of cognition is therefore unscientific according to behaviourists. Similarly, psychoanalytic principles cannot be observed. The existence of the unconscious, so critical to psychoanalytic principles, also cannot be observed.
- Only behaviour can be observed. Thus, this school is called “behaviourism”.
- The study of unobservable, undefinable, unmeasurable mental events (the field of study of cognitive psychology) is unscientific. The study of the mind is unscientific and thus a waste of time.
- All behaviours can be explained by their consequences! Behaviour is caused by what happened once the individual acted (behaved) in the past (i.e., the consequences of the behaviour). Behaviours that are rewarded (technically “reinforced”) will be repeated. . A strict, environmental explanation of behaviour. We do not need to hypothesize about some inner, hidden, unobservable cause of behaviour.
- Deterministic -- all behaviour is determined by consequential events (reinforcement, punishment). Behaviour that is reinforced will be repeated. That which is not reinforced will not be repeated.
- All behaviour is learned. To stop inappropriate behaviour, remove what is causing it to be repeated, the reinforcer.
- Most of clinical psychology and psychotherapy does not follow principles of behaviourism and thus is rejected as being unworthy of study.

## Social

- Emphasis on social “behaviour”.
- Study of social environment and its effects.
- Social attitudes; social learning.
- There are certain social psychologists who believe that most of human behaviour can be explained through evolutionary/genetic principles. These are called socio-biologists. Emphasis on the study of animal behaviour (ethology). Deterministic theory. This is almost the opposite of behaviourists who believe that it is learning that determines our behaviour. Social biologists claim it is largely our biology and genetic endowment that determines our behaviour.
- A newer branch of social psychology is social neuroscience (not the same as sociobiology). Social neuroscientists use neuroscience methods to study social phenomena (social interaction, emotions, attitudes)

## Psychoanalytical

- S. Freud (late 19th, early 20th century)
- Role of the unconscious in determining our behaviour
- Much of behaviour and “emotion” is repressed (especially sexuality) and it is these repressed, unconscious influences that dictate our personality and behaviour.
- Deterministic -- behaviour is determined by unconscious “drives”.

## (Differences among psychoanalysis, psychiatry, clinical psychology, experimental psychology)

- Psychoanalyst -- trained in psychoanalysis. May or may not be a psychiatrist. Emphasis on Freud and post-Freudian (e.g., Jung) theory.
- Psychiatrist -- Must have an M.D. and then a residency in “psychiatry”. Theory that psychiatric disorders are a mental “illness”. Psychiatrists employ a medical model. Treatment methods can include psychotherapy but most often use drug therapy. This is because mental illness is often viewed as a chemical imbalance. In Canada, only psychiatrists can prescribe medication.
- Clinical psychologist -- In most provinces in Canada and states in the U.S., must have a research degree, a Ph.D. Is trained in both research and clinical psychology. In some regions in the U.S., a D.Ps will suffice (i.e., not trained in research). Emphasis on “abnormal” behaviour and not necessarily “illness”. Emphasis on “change” through counselling/ psychotherapy.
- Experimental psychologist -- Trained as a researcher (in one of several different areas) Degree is Ph.D. Not trained in clinical psychology. Legally, cannot provide psychotherapy or counselling (cannot claim to be a “psychologist” to the public).
- Anyone can call themselves a “counsellor” or a “therapist”. A counselor or therapist does not have to be a trained clinical psychologist. This does not mean that the non-psychologist “counselor” is a poor counsellor. It simply means they do not have a Ph.D. in clinical psychology.

## Phenomenological / Humanistic (clinical psychology)

- *Humanistic* theories -- Emphasis on unique human quality of behaviour
- Concerned with individual's unique personal experience, their *phenomenology*
- Focus on subjective experience
- Concern with developing theories of inner life rather than explaining behaviour
- Criticized as being unscientific. Science can only study that which is objective and that which we can observe.