Biological Psychology

Biological psychologists *are interested in* measuring biological, physiological, or genetic variables in an attempt to relate them to psychological or behavioural variables. Because all behavior is controlled by the central nervous system, biological psychologists seek to understand how the brain functions in order to understand behaviour. Key areas of focus include sensation and perception; motivated behavior (such as hunger, thirst, and sex); control of movement; learning and memory; sleep and biological rhythms; and emotion. As technical sophistication leads to advancements in research methods, more advanced topics such as language, reasoning, decision making, and consciousness are now being studied. The early structural and functional psychologists believed that the study of conscious thoughts would be the key to understanding the mind. Their approaches to the study of the mind were based on systematic and rigorous observation, laying the foundation for modern psychological experimentation. In terms of research focus, Wundt and Titchener explored topics such as attention span, reaction time, vision, emotion, and time perception, all of which are still studied today.

Wundt's primary method of research was introspection, which involves training people to *concentrate and report on their conscious experiences as they react to stimuli*. This approach is still used today in modern neuroscience research; however, many scientists criticize the use of introspection for its lack of empirical approach and objectivity. Structuralism was also criticized because its subject of interest – the conscious experience – was not easily studied with controlled experimentation. Structuralism's reliance on introspection, despite Titchener's rigid guidelines, was criticized for its lack of reliability. Critics argued that self-analysis is not feasible, and that introspection can yield different results depending on the subject. Critics were also concerned about the possibility of retrospection, or the memory of sensation rather than the sensation itself.

As structuralism struggled to survive the scrutiny of the scientific method, new approaches to studying the mind were sought. One important alternative was functionalism, founded by William James in the late 19th century, described and discussed in his two-volume publication *The Principles of Psychology* (1890). Built on structuralism's concern for the anatomy of the mind, functionalism led to greater concern about the functions of the mind, and later on to behaviourism. One of James's students, James Angell, captured the functionalist perspective in relation to a discussion of free will in his 1906 text *Psychology: An Introductory Study of the Structure and Function of Human Consciousness*:

Inasmuch as consciousness is a systematising, unifying activity, we find that with increasing maturity our impulses are commonly coordinated with one another more and more perfectly. We thus come to acquire definite and reliable habits of action. Our wills become formed. Such fixation of modes of willing constitutes character. The really good man is not obliged to hesitate about stealing. His moral habits all impel him immediately and irrepressibly away from such actions. If he does hesitate, it is in order to be sure that the suggested act is stealing, not because his character is unstable. From one point of view the development of character is never complete, because experience is constantly presenting new aspects of life to us, and in consequence of this fact we are always engaged in slight reconstructions of our modes of conduct and our attitude toward life. But in a practical common-sense way most of our important habits of reaction become fixed at a fairly early and definite time in life.

Functionalism considers mental life and behaviour in terms of active adaptation to the person's environment. As such, it provides the general basis for developing psychological theories not readily testable by controlled experiments such as applied psychology. William James's functionalist approach to psychology was less concerned with the composition of the mind than with examining the ways in which the mind adapts to changing situations and environments. In functionalism, the brain is believed to have evolved for the purpose of bettering the survival of its carrier by acting as an information processor.[1] In processing information the brain is considered to execute functions similar to those executed by a computer and much like what is shown in Figure 2.3 below of a complex adaptive system. The functionalists retained an emphasis on conscious experience. John Dewey, George Herbert Mead, Harvey A. Carr, and especially James Angell were the additional proponents of functionalism at the University of Chicago. Another

group at Columbia University, including James McKeen Cattell, Edward L. Thorndike, and Robert S. Woodworth, shared a functionalist perspective.

Biological psychology is also considered *reductionist*. For the reductionist, *the simple is the source of the complex*. In other words, to explain a complex phenomenon (like human behaviour) a person needs to reduce it to its elements. In contrast, for the holist, *the whole is more than the sum of the parts*. Explanations of a behaviour at its simplest level can be deemed reductionist. The experimental and laboratory approach in various areas of psychology (e.g., behaviourist, biological, cognitive) reflects a reductionist position. This approach inevitably must reduce a complex behaviour to a simple set of variables that offer the possibility of identifying a cause and an effect (i.e., the biological approach suggests that psychological problems can be treated like a disease and are therefore often treatable with drugs).

The brain comprises four lobes:

1. Frontal lobe: *also known as the motor cortex, this portion of the brain is involved in motor skills, higher level cognition, and expressive language*.
2. Occipital lobe: *also known as the visual cortex, this portion of the brain is involved in interpreting visual stimuli and information*.
3. Parietal lobe: *also known as the somatosensory cortex, this portion of the brain is involved in the processing of other tactile sensory information such as pressure, touch, and pain*.
4. Temporal lobe: *also known as the auditory cortex, this portion of the brain is involved in the interpretation of the sounds and language we hear*.

Another important part of the nervous system is the peripheral nervous system, which is divided into two parts: (1) The somatic nervous system, which *controls the actions of skeletal muscles*. (2) The autonomic nervous system, which *regulates automatic processes such as heart rate, breathing, and blood pressure*. The autonomic nervous system, in turn has two parts: (1) The sympathetic nervous system, which controls the fight-or-flight response, a *reflex that prepares the body to respond to danger in the environment*. (2) The parasympathetic nervous system, which works to bring the body back to its normal state after a fight-or-flight response.

In further biologically oriented psychological research at the University of Toronto, Schmitz, Cheng, and De Rosa (2010) showed that visual attention — *the brain's ability to selectively filter unattended or unwanted information from reaching awareness* — diminishes with age, leaving older adults less capable of filtering out distracting or irrelevant information. This age-related "leaky" attentional filter fundamentally impacts the way visual information is encoded into memory. Older adults with impaired visual attention have better memory for "irrelevant" information. In the study, the research team examined brain images using functional magnetic resonance imaging (fMRI) on a group of young (mean age = 22 years) and older adults (mean age = 77 years) while they looked at pictures of overlapping faces and places (houses and buildings). Participants were asked to pay attention only to the faces and to identify the gender of the person. Even though they could see the place in the image, it was not relevant to the task at hand .

The authors noted:

In young adults, the brain region for processing faces was active while the brain region for processing places was not. However, both the face and place regions were active in older people. This means that even at early stages of perception, older adults were less capable of filtering out the distracting information. Moreover, on a surprise memory test 10 minutes after the scan, older adults were more likely to recognize what face was originally paired with what house. The findings suggest that under attentionally demanding conditions, such as a person looking for keys on a cluttered table, age-related problems with "tuning in" to the desired object may be linked to the way in which information is selected and processed in the sensory areas of the brain. Both the relevant sensory information — the keys — and the irrelevant information — the clutter — are perceived and encoded more or less equally. In older adults, these changes in visual attention may broadly influence many of the cognitive deficits typically observed in normal aging, particularly memory.

(Source: *Introduction to Psychology: 1st Canadian Edition*
(https://opentextbc.ca/introductiontopsychology/front-matter/about-bccampus/)

READING COMPREHENSION EXERCISES

A. Read the text and circle the correct answer.

1. Biological psychologists are primarily interested in:

A. Dream interpretation
B. Measuring biological, physiological, or genetic variables in relation to behavior
C. Cultural influences on behavior
D. Humanistic approaches to therapy

2. Which system controls automatic processes such as heart rate and breathing?

A. Somatic nervous system
B. Sympathetic nervous system
C. Autonomic nervous system
D. Central nervous system

3. Wundt's primary method of research was:

A. Functional analysis
B. Introspection
C. Classical conditioning
D. Neuroimaging

4. Which lobe of the brain is responsible for visual processing?

A. Frontal lobe
B. Parietal lobe
C. Temporal lobe
D. Occipital lobe

5. Functionalism, founded by William James, focused on:

A. The anatomy of the mind
B. The functions of the mind and adaptation to the environment
C. The unconscious mind
D. Laboratory-based reductionism

6. Structuralism was criticized mainly because:

A. It used too much laboratory experimentation
B. Conscious experience was difficult to study with controlled methods
C. It ignored emotions completely
D. It was based on evolutionary theory

7. Which of the following best describes reductionism in psychology?

A. Explaining behavior in terms of holistic experience
B. Reducing complex behavior to simpler elements
C. Viewing behavior as more than the sum of its parts
D. Using only qualitative data in analysis

8. The sympathetic nervous system is most directly involved in:

A. Resting and digestion
B. Processing sensory input
C. Fight-or-flight response
D. Language production

9. Who among the following was associated with functionalism?

A. Freud and Jung
B. Wundt and Titchener
C. William James and John Dewey
D. Skinner and Watson

10. According to Schmitz, Cheng, and De Rosa (2010), older adults have difficulty with:

A. Producing speech sounds

B. Filtering out irrelevant visual information
C. Regulating emotional responses
D. Forming long-term memories

B. Choose one of the words below to fill in the blanks of the text that follows

biological • behaviour • nervous system • introspection • structuralism • functionalism • reductionism • frontal lobe • occipital lobe • sympathetic • parasympathetic • attention • consciousness • memory • adaptation • experiment • perception

1. (Biological) psychologists study how the brain, body, and genetics influence behaviour.

2. Because all behaviour is controlled by the (nervous system), researchers in this field focus on how the brain works.

3. Wundt's main method of studying the mind was (introspection), where trained people reported on their conscious experiences.

4. Titchener's school of thought, known as (structuralism), was criticized because it relied too heavily on introspection.

5. William James developed (functionalism), which focused on how the mind helps people adjust through (adaptation) to their environment.

6. One criticism of (reductionism) is that it explains complex human behaviour by reducing it to simpler elements.

7. The (frontal lobe) controls higher-level thinking, motor skills, and language, while the (occipital lobe) processes vision.

8. The (sympathetic) nervous system prepares the body for "fight-or-flight," while the (parasympathetic) nervous system returns the body to its normal state.

9. Cognitive psychology studies processes such as (attention), (memory), and perception.

10. Modern methods such as the fMRI allow researchers to design a controlled (experiment) to test how the brain processes information.

C. Match the following terms from Column A with their definitions in Column B

Column A	Column B
1. Structuralism	A. A brain imaging method used to measure activity in different areas of the brain.
2. Functionalism	B. The school of thought founded by Wundt and Titchener that focused on analyzing conscious experience
3. Introspection	into its components.
4. Reductionism	C. Explaining complex behaviour by reducing it to simple elements.
5. Frontal lobe	D. The lobe of the brain responsible for motor skills, higher cognition, and expressive language.
6. Occipital lobe	E. The lobe of the brain responsible for vision.
7. Sympathetic nervous system	F. A method of self-observation where people report their conscious experiences.
8. Parasympathetic nervous system	G. The nervous system division that prepares the body for the fight-or-flight response.
9. Behaviourism	H. The nervous system division that calms the body after stress, restoring it to normal.
10. fMRI	I. The school of thought founded by William James, focusing on how the mind adapts to the environment.
	J. A psychological approach that emphasizes observable behavior and rejects introspection.

Key: 1/F, 2/A, 3/D, 4/B, 5/E, 6/C, 7/G, 8/I, 9/H, 10/J