CHAPTER – I

INTRODUCTION

Introduction

Academic research has always made rich contributions in the field of education - an area, which has captivated the minds of scholars all these years. After working for years among the student community, it made sense in doing a research which can be helpful to them.

To begin with, it was crucial to find what played an important role in a student's life. And the answer to this question led to the conclusion that the main goal of any student is to "learn".

Next in line, we explored what could be the factors which can affect the learning outcomes. To this, I realised that the answer will not be simple because learning is such an intriguing process that any attempt to simplify will result in missing out one or the other major component of the process. With a concious effort I was able to arrive at the first layer of identification, that it is both internal to a person as well as there are external factors which could have an impact on the process of learning.

An individual's cognitive abilities (i.e., intelligence, reasoning, thinking, memory), intrinsic motivation to learn, interests, study habits, self esteem, age and maturity, locus of control among others are some of the key internal variables which can affect the academic outcomes.

While social and economic status, cultural inclinations, teaching environment, curriculum, and availibilty of resources are few of the external variables which can also influence a student's learning dynamics.

My inclination was more towards exploring the factors which were intrinsic to the students. Hence, I narrowed down my reasearch area to include cognitive abilities, student's motivation and their study habits.

The role of cognitive abilities and psychological traits, amongst all the other factors, has garnered significant attention from researchers. And verbal working memory (VWM) is one such cognitive ability that has emerged as a crucial predictor of academic success.

It has been a researched subject for years and the abundance of study in this field fascinated me to finalize that the core of my research will be verbal working memory. Verbal working memory helps students process as well as retain the information in real-time. It enables them to remember and manipulate verbal information such as

directions, explanations, and lecture content, which is crucial for academic material comprehension and understanding.

While planning out this research, my guiding light was the fact that I wanted to accomplish something in the field of education and learning, which can have a meaningful impact on the whole learning ecosystem - however, big or small the imapct may be.

To give a final shape to my research, I narrowed down to a topic which could provide insights into how verbal working memory can impact achievement motive, academic performance and study habits among students.

Background

India, a diverse and rapidly developing nation, confronts unique challenges in the field of education. More so, because in India, academic performance is directly equated with future professional and personal success and hence coupled with study habits, academic performance has a major significance in the life of students, parents and the teaching community.

The pursuit of academic excellence has become increasingly competitive, necessitating a deeper comprehension of the underlying factors that contribute to student's achievement. Exploring the effect of verbal working memory on achievement motivation, study habits, and academic performance in India can shed light on the cognitive and psychological factors that influence educational outcomes which can become the basis in-depth understanding of the entire ecosystem.

Any accomplishment is deep seated in a person's innate desire to achieve success and reach their objectives, which we refer to as achievement motivation. It includes academic aspirations, expectations, and the drive to excel. With this study, I have tried to estabilish the link between verbal working memory and the development as well as the manifestation of achievement motives as by doing that we can obtain a thorough understanding of how this cognitive ability affects the student's drive to succeed.

Next comes the actual learning process which we can refer to as study habits. It includes a variety of learning strategies and techniques which are necessary for efficient information processing and knowledge acquisition. Prior research has demonstrated the significance of verbal working memory in shaping study habits, as it

affects the capacity to organise and retain information. Understanding the impact of verbal working memory on study habits in the educational context of India can shed light on the cognitive processes that reinforce effective learning practises.

The cognitive abilites and its effect on the student's desire to succeed and his/her study routines ultimately takes shape of how well the student has performed in the examinations or assessments which we can refer to as academic performance. It is a key indicator of students' knowledge, skills, and abilities. The role of verbal working memory in academic performance has been the subject of extensive research around the globe, revealing its substantial impact on a variety of academic disciplines. The ultimate aim of this research is to identify potential areas for improvement and intervention in order to improve educational outcomes.

As such, this whole research aims to examine the interaction of verbal working memory, with achievement motivation, study habits, and academic performance among Indian students. By analysing existing literature, conducting empirical research, and collecting data, we will gain valuable insights into the effects of verbal working memory on these essential educational variables. In addition, this research endeavour will offer the chance to develop context-specific strategies and interventions that can optimise educational practises and aid students in their pursuit of academic success.

To understand the overall concept of this study in a better way, it is imperative to begin with understanding and exploring the concept of working memory because verbal working memory is a component of working memory and one can get better insights if both these concepts are explored in a sequential manner.

The term **'working memory'** describes the capacity to temporarily retain and manipulate information in the mind. It creates a mental workplace that is utilised in numerous essential tasks, such as acquiring knowledge, and it can also be utilised freely to assist or conduct our daily cognitive activities. Such tasks require the concurrent processing and storage of data **(Alloway, 2006)**.

1.1 Working Memory

Working memory is a limited-capacity cognitive memory buffer critical for the transient retention, processing, and manipulation of data. It is a fundamental executive ability. Working memory is an essential mechanism for reasoning, making decisions,

and behavioural guidance. It is frequently utilised interchangeably with short-term memory (STM), but neurological professionals have observed that both types of memory have separate identities, especially because the origin of both are from distinct neurological subsystems in the prefrontal cortex. Working memory is a buffer of STM which enables the modification of data that is stored, whereas STM is limited to the temporary data storage and does not involve the manipulation or organisation of stored data. Working memory also develops subsequently and at a slower rate than STM.

Working memory is a straightforward indicator of a child's potential for learning. It indicates the ability of a child to learn because it is unaffected by the child's previous educational experiences or socio-economic variables. On the contrary, classroom-based evaluations and IQ exams evaluate previously acquired knowledge and are heavily influenced by socioeconomic status. There is a significant correlation between working memory skills and a variety of academic aptitude measures, including literacy and mathematics.

Working memory enables the retention of information sufficiently long for its application. It is crucial for concentration and following directions. Inadequate working memory skills can hinder learning in numerous subject areas, including literacy and mathematics.

Research demonstrates that working memory capacity differs between individuals and can be affected by age, cognitive abilities, and training. Working memory deficits have been observed in a variety of neurological and psychiatric disorders, including attention deficit hyperactivity disorder (ADHD), Alzheimer's disease, and schizophrenia.

1.2 History of Working Memory

Working memory theory has a long history that goes back to the beginning of the 20th century. Since its inception, the concept of working memory has evolved significantly. By analysing the historical context, theoretical frameworks, and empirical findings, we gain a deeper comprehension of working memory. Here's a quick rundown:

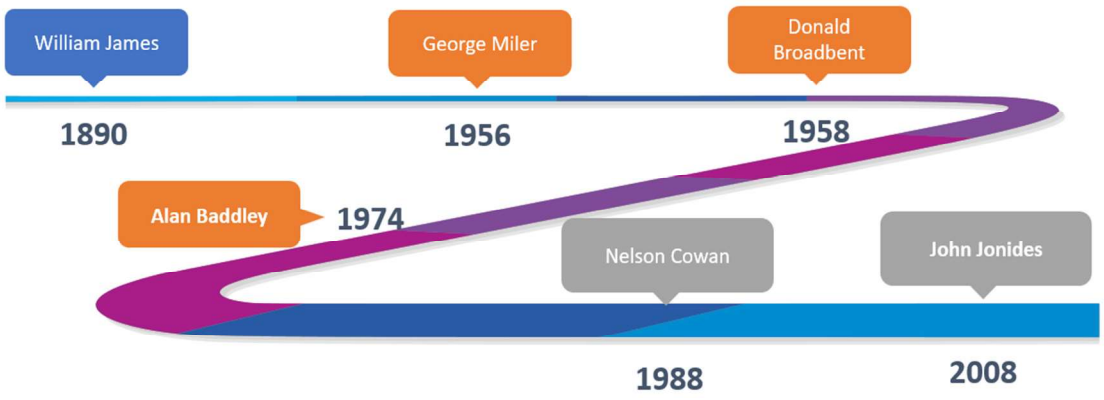

Fig. 1.1 : Timeline - Evolution of the concept of Working Memory

Early 20th century:

In the late 19th century, psychologist **William James** made the first mention of the concept of a "memory store".

He originated the concept of a memory system with a limited capacity. James introduced the concept of primary memory in his book "The Principles of Psychology," which he defined as the actively attended-to immediate contents of consciousness.

Allan Baddeley, a psychologist, expanded on the idea in the 20th century.

1950s–1960s:

Psychologist **George Miller** coined the term "working memory" and defined it as a system with a limited capacities that is used to temporarily store and process information. The renowned research article by George Miller in 1956, "The Magical Number Seven, Plus or Minus Two" contributed significantly to our comprehension of working memory capacity. He postulated that the average person's working memory can store roughly seven items (plus or minus two) at once.

Donald Broadbent's (1958) important model of attention presented the concept of short-term memory, laying the groundwork for subsequent models of working memory. He proposed that selective attention functions as a filter, permitting only pertinent data to enter short-term memory.

The multicomponent model of working memory proposed by **Baddeley and Hitch in 1974** overhauled our comprehension of short-term memory. This model introduced the concept of working memory as a system made up of numerous components. The system comprised the central executive, the phonological loop, and the visuospatial

sketchpad. The central executive was responsible for attentional control and cognitive processing, whereas the phonological loop and visuospatial sketchpad were responsible for the transient storage and manipulation of verbal and visual information, respectively.

Nelson Cowan (1988):

Cowan's important study on the "magical number four" contested Miller's notion of working memory's limited capacity. Cowan argued that the capacity of working memory is approximately four information fragments, as opposed to the previously proposed seven. Subsequent research has demonstrated the validity of this concept of limited capacity.

John Jonides and his colleagues (2008) conducted neuroimaging investigations that shed light on the neural foundation of working memory. Their study revealed brain regions, such as the prefrontal cortex, play an essential part in working memory processes and emphasised the significance of these regions in maintaining and manipulating working memory information.

Working memory became a focus of research in cognitive psychology, neuropsychology, and during the 1980s and 1990's.

In the 1990s and 2000s, improvements in neuroscience techniques, such as functional magnetic resonance imaging (fMRI), allowed researchers to examine the neurological foundation of working memory, revealing new details about the mechanisms underlying this ability.

1.3 Models of Working Memory

One of the earliest works done in the field of understanding the concept of working memory was undertaken by **Atkinson and Shiffrin** in 1968. As per them, memory is comprised of a series of stores. The multi store model (Atkinson & Shiffrin, 1968) characterises memory as a function of the transfer of information throughout a system.

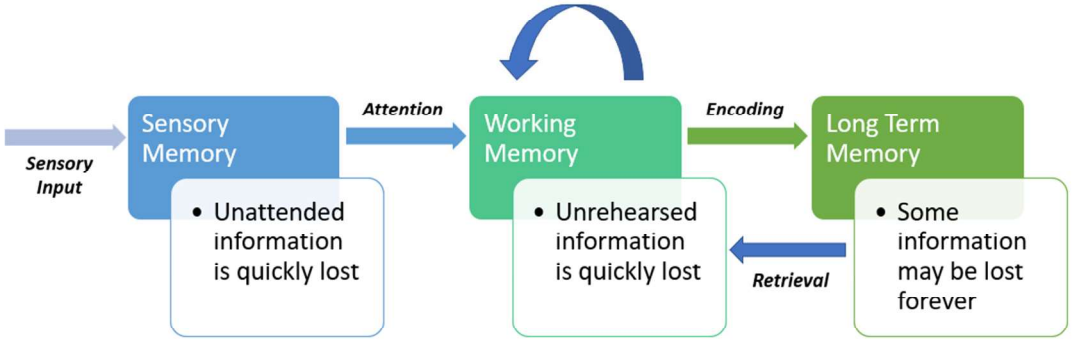

Fig. 1.2 : Modal model of Working Memory by Atkinson & Shiffrin (1968)

Source: https://practicalpie.com/atkinson-shiffrin-modal-model-of-memory.

As a result, it can be characterised as a paradigm of information processing, similar to a computer, which has 3 components:

i) an input,

ii) a process, and

iii) an output.

The data is identified by the sensory organs and preserved in the sensory database, according to this model. This information enters the short-term memory if it is attended to. Only when information is rehearsed is it transmitted from STM to long-term memory.

Atkinson and Shiffrin at first referred to the rehearsal as routine rehearsal, but Shiffrin subsequently proposed that rehearsal could also be creative **(Raaijmakers & Shiffrin, 2003).** Without repetition, STM loses information due to displacement or decay.

Using this research as a foundation, **Baddeley and Hitch (1974)** created an alternate framework of short-term memory which was termed working memory.

Baddeley's model of working memory:

Baddeley and Hitch (1974) argued that the Multi-Store Model by Atkinson and Shiffrin provides an overly simplistic representation of short-term memory (STM). In accordance with the Multi-Store Model, short-term memory keeps small amount for short period of time with minimal processing. As per them, it is an integrated system, which meant that short term memory is a single system (or store) which has no subsystems. However, as per Baddley and Hitch, short term memory is not a unitary

store. In fact, it is a more complex system with multiple components, which they referred to as working memory.

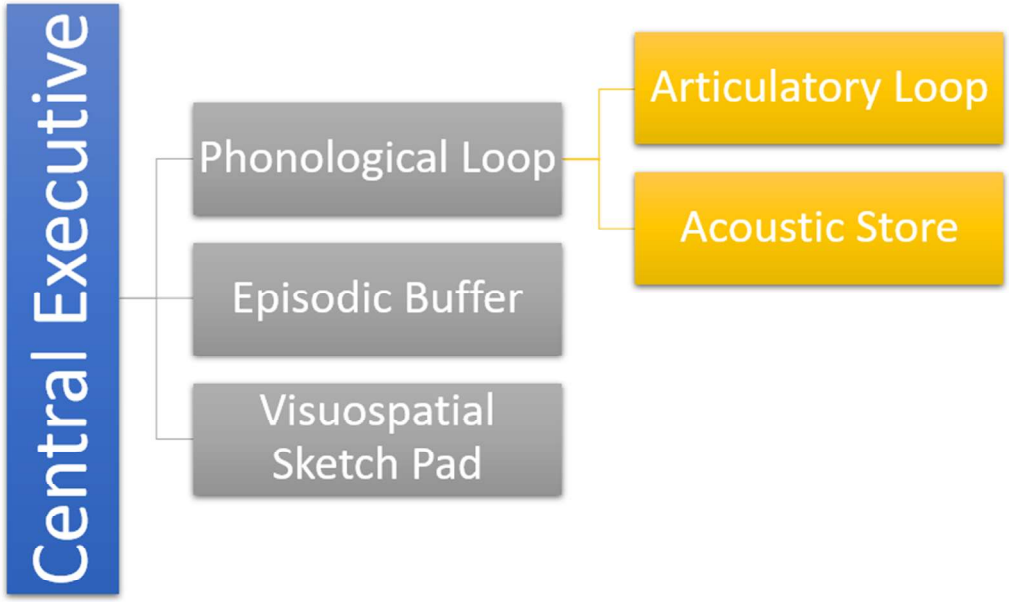

Fig. 1.3 : Latest Model of Working Memory

Source: https://www.simplypsychology.org/working%20memory.html

According to them working memory is a form of temporary memory. As opposed to all information being stored in a single repository, there are distinct systems for each variety of data. The central executive of working memory governs and regulates the functioning of two subsystems: the phonological loop and the visuospatial sketch pad.

Central Executive: Central executive is like the head of working memory allocating information to the two sub-systems, i.e., phonological loop and visuo-spatial sketchpad. It also covers mental activities like mental math and solving problems.

The central executive serves as the working memory's command centre. In addition to controling and coordinating the phonological loop and visuospatial sketchpad, it also regulates the long-term memory. It's in charge of directing attention, switching between duties, and assimilating data from various sources. Engaged in solving problems, making decisions, and higher-order cognitive processes, the central executive is a flexible, attention-demanding system.

Visuo-Spatial Sketchpad: Also known as the inner eye, it holds and manipulates data in a visual or spatial format. The VSS is a navigational aid.

The visuospatial sketchpad is a tool for the quick and easy manipulation of visual and spatial data. It enables people to create mental representations of scenes, objects, and spatial relationships, and to manipulate them. The graphical planner is subdivided into two parts:

- Cache of visual data, including shape, and
- Colour

The internal scribe is concerned with data related to movement and space.

Tasks like mentally rotating an object or recalling the location of things in a scene rely heavily on the visuospatial sketchpad because of its ability to facilitate mental imaging, spatial navigation, and manipulation of visual information.

Table 1.1 : Major components of Working Memory

Central Executive	Phonological Loop	Visuospatial Sketch Pad
CE is the supervisory component	PL = Auditory Info	VSS = Visual & Spatial Info (Inner Eye)
Can process information from any sensory modality	Responsible for holding auditory information (Inner Ear)	Temporary store for visual and spatial information
Co-ordinates activity	Articulatory loop is a verbal rehearsal loop which prepares words to speak (Inner Voice)	For example, what a classroom looks like and how to get there
Retrieves info from Long Term Memory		
Very limited capacity		
Delegates information to the Two-slave systems		

Source: http://mercercognitivepsychology.pbworks.com/

The phonological loop is the portion of working memory responsible for both written and verbal information. It is useful for, say, remembering a phone number. It is the region of the brain that controls verbal and auditory storage for brief periods and practise.

It is composed of two sections:

- **Phonological Store** (inner ear) – Information associated with speech perception (i.e., spoken syllables) is stored for about two seconds. It functions as a passive storage system that maintains auditory or speech-based information for a limited period of time.
- **Articulatory control process** (inner voice) – Associated with speech generation. It is employed to practise and retain phonological store's verbal data. The process of articulatory control is responsible for the repetition and renewing knowledge in the phonological store through the use of subvocal articulation, which is referred to as inner speech.

The phonological loop is especially crucial for activities that entail the processing and manipulation of auditory or aural data, such as memorising a contact information, following spoken instructions, or reading out loud. Examples of these types of tasks include: reading aloud and memorising a phone number.

The components in Baddeley and Hitch's model communicate with one another, and the central executive is liable for directing the movement of data between the various components. The model argues that working memory capacity is constrained, and those who have the ability to absorb and store information simultaneously may perform better on activities that need a greater working memory capacity.

The model developed by Baddeley and Hitch has had a significant amount of impact, and it has served as a useful framework for comprehending the many aspects of working memory and the roles they play. It has resulted in a significant amount of study and is backed up by empirical evidence from a variety of studies involving cognitive tests, imaging of the brain, and clinical groups.

In working memory models, the **episodic buffer** is a relatively recent idea. It is thought to function as a system for temporarily storing information that combines verbal and visual inputs into coherent episodes or experiences. It facilitates the creation of meaningful narratives by serving as a link between long-term memory and working memory.

The other components, such as visuospatial working memory, particularly handle visual and spatial information while verbal working memory specifically deals with language and auditory information. The episodic buffer aids in integrating

information from various sources to produce meaningful episodes, while the central executive controls the distribution of cognitive resources. These elements cooperate to allow humans to manipulate and analyze information in daily cognitive tasks.

Here is a chart that lays out the differences between verbal working memory, visuospatial working memory, the central executive, and the episodic buffer.

Table 1.2 : Differences between verbal working memory, visuospatial working memory, the central executive, and the episodic buffer

Component	Description	Example Task
Verbal Working Memory	Processes and manipulates verbal info (linguistic, auditory)	Repeating a phone number
		Mentally rehearsing a list of words
		Remembering spoken instructions
Visuospatial WM	Processes and manipulates visual/spatial info (images, shapes, locations)	Mentally rotating a 3D object
		Navigating through a complex space
		Drawing a complex geometric figure
Central Executive	Controls and coordinates working memory components, allocates cognitive resources	Switching between tasks
		Directing attention to a task
	Manages attention, inhibition	Filtering out irrelevant info
Episodic Buffer	Integrates info across components	Combining visual and verbal details
	Acts as a bridge between working memory and long-term memory	Forming a coherent memory of an experienced event

1.4 Introduction to Verbal working memory

There are numerous everyday situations in which we utilise our verbal working memory. Mental arithmetic is an excellent example of an activity that utilises verbal working memory. Imagine endeavouring to multiply two spoken numbers (such as 82 and 39) without having access to a pen, paper, or calculator.

You must initially hold the two numbers in your verbal working memory. The next step is to employ the previously acquired multiplying principles to figure out the results of successive number pairs, adding new results to working memory as you go. The final step would be to add the products stored in verbal working memory, yielding the correct solution.

Without verbal working memory, we would be unable to carry out this type of complex mental activity: retaining some information in mind while processing other information. A small distraction, like the emergence of an unconnected thought or a disturbance by another person, is probably going to end up in the loss of all stored data and, as a result, an unsuccessful calculation effort. We must begin the calculation from beginning because no effort is going to enable us to recall the neglected information. The majority of us cannot multiply larger numbers (such as 745 and 229) in our mind, despite the fact that it requires simple math abilities like the one in the preceding instance. Simply put, the activity's storage requirements exceed the capacity of verbal working memory.

Other examples are:

1. Navigating using verbal directions, such as “take first left, then take third right, go straight and the park on your right is where the birthday celebration will be happening.”
2. Mental calculation of the final bill after shopping at a supermarket and before the cashier hands out the final bill.
3. Trying to remember a phone number while talking over a phone and searching for a pen and paper to write it down. Till you find the paper and a pen, you will have to hold that phone number in your mind and then use your working memory to recall and finally write down the number.

These are examples of verbal working memory.

When you are trying to recall the telephone number that you have just heard and need to keep it in mind temporarily while dialing it, this is also a classic example of verbal working memory. Because you have the ability to keep and manipulate the digits in your mind while using verbal working memory, you will be able to input the number successfully.

Let's imagine a situation: someone provides you with the phone number "93459-82649." In the beginning, you will briefly retain the auditory information by using your **phonological loop**, which is a component of your verbal working memory. The telephone number "93459-82649" is stored in the **phonological store**, and the **articulatory control** process keeps it actively rehearsed in your mind in the background so that it is always accessible.

The next step would be to mentally alter the number by employing your **central executive**, which is another component of your working memory. For instance, you may mentally group the digits to make it simpler to remember them, or you could mentally repeat the number to yourself to ensure that it remains fresh in your mind.

The last step, which is dialing the number, involves **retrieving** the previously stored information from your verbal working memory and utilising it in order to precisely input the digits. After the task has been finished, the phone number is no longer required, and it is likely that the information currently stored in **verbal working memory** will be replaced by fresh data in the near future.

This example demonstrates how verbal working memory makes it possible to temporarily store and manipulate verbal information, such as a phone number, an address, or a list of objects, in order to carry out activities that require immediate processing and recall of verbal material.

The above skill of retaining the information in the brain and using it to perform tasks, is Verbal Working Memory (VWM). It is generally considered to be a temporary retention of linguistic information (that is, certain features of the language). A few investigators differentiate VWM from short-term memory (STM), which is inert transient memory, and immediate memory, and is used for interpreting data (such as translating language into meaning).

We need verbal working memory to save the meaning, sound and appearance of the linguistic information. However, when reading or spelling a new word, you need

reliable working memory so that you can sort and process the sounds of the letters in the correct order to get the meaning and spelling.

It is a mental ability to temporarily hold and modify spoken information. Following instructions, understanding spoken language, and completing mental calculations all require this kind of memory.

Research on verbal working memory sometimes involves having participants memorize and manipulate lists of words, sentences, or numbers. The digit span task is a typical exercise in which participants must repeat an array of numbers in precisely the same sequence in the way they were initially provided. Those taking part are asked to recall a sequence of words in a second exercise. This exercise is called the word span task.

1.5 Human brain and verbal working memory

According to research, verbal working memory is a sophisticated cognitive system that integrates numerous cognitive functions, including attention, encoding, and retrieval.

The prefrontal cortex, parietal cortex, and temporal cortex are a few of the brain areas that are involved in verbal working memory. Together, these areas build and sustain mental representations of spoken information.

To be more specific, working memory uses a network of parts of the brain that retain and manipulate information temporarily. Among the most important brain regions associated with working memory are:

Prefrontal cortex: The prefrontal cortex particularly the dorsolateral prefrontal cortex, is a centre for working memory. The dorsolateral prefrontal cortex (DLPFC) is crucial for cognitive control processes such as attention, inhibition, and task switching, as well as for maintaining and manipulating information.

Parietal cortex: The posterior part of cortex plays a role in spatial aspects of working memory, facilitating in tasks requiring the manipulation and organisation of spatial data.

Anterior Cingulate Cortex: This region is responsible for error detection, monitoring task performance, and coordinating various cognitive processes.

Inferior Temporal Cortex: The inferior temporal cortex plays a role in the processing of visual information, which is important for tasks that require visual working memory.

Broca's Area: It exists in the left frontal region of the brain's left hemisphere. Although it is commonly associated with language production and speech generation, it is also involved in certain elements of working memory requiring the processing and sequencing of verbal information. For instance, when mentally rehearsing a sentence you intend to say, Broca's area helps you maintain the correct order of words and structure of the sentence.

Amygdala: It is situated inside the temporal region of the brain, and it is well-known for its function in processing emotions and emotional memories. Even though it is not the primary memory centre, the amygdala can influence working memory processes, especially when emotional content is involved. Due to the involvement of the amygdala, emotionally charged information can increase the salience and storage of that information in working memory.

Basal Ganglia: Parts of the basal ganglia are associated with procedural learning and cognitive control, which are functions of working memory.

Hippocampus: The hippocampus plays a function in the movement of data from STM to long-term memory, thereby influencing working memory processes.

Superior Temporal Sulcus: This region processes social cues and information, which can be pertinent for tasks involving social aspects of working memory.

Frontoparietal Network: A network connecting the prefrontal and parietal cortices is essential for the coordination and integration of working memory processes.

Occipital lobe: Located at the rear of the brain, the occipital lobe is primarily responsible for visual processing and perception. Although it may not play a central role in working memory processes, it does contribute to certain visual information-related aspects of working memory.

The occipital lobe, specifically the regions known as the primary visual cortex along with the higher-level visual association areas, performs a crucial role in processing and storing visual information in working memory. When imagining a scene, an item,

or any spatial arrangement, the occipital lobe aids in maintaining and manipulating this mental imagery.

While the occipital lobe is primarily responsible for processing visual cues, its outputs integrate with other brain areas which are associated with working memory. Visual information from the occipital lobe, for instance, can be transferred to the parietal and prefrontal cortices, where it is combined with other sensory and cognitive cues to support working memory tasks.

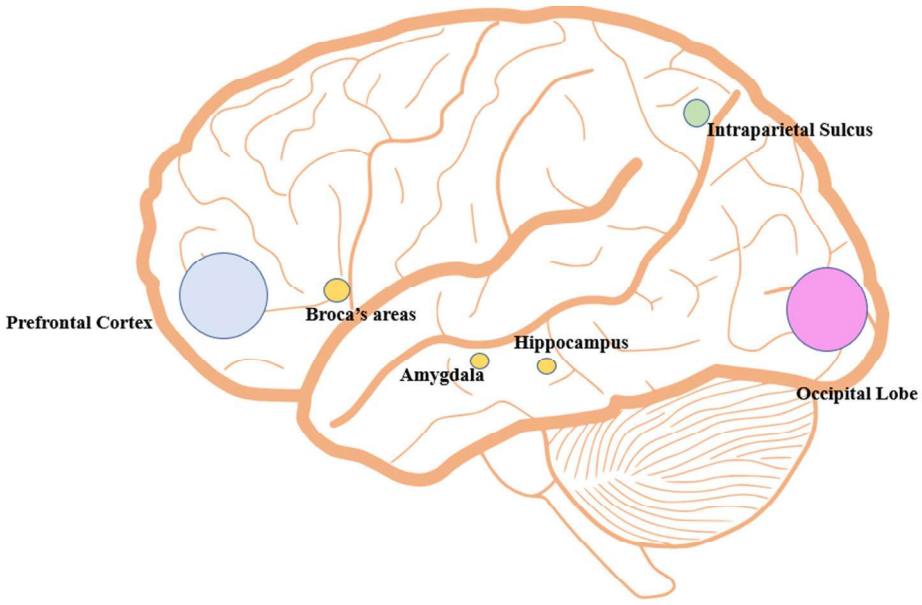

Fig. 1.4 : Main areas of brain contributing to working memory

These brain regions collaborate to support various aspects of working memory, including the storage, manipulation, and efficient use of information for cognitive tasks. It is essential to recognise that working memory is a complex cognitive function that entails dynamic interactions between various brain regions, and the cognitive neuroscience field is actively investigating their roles.

A number of other mental processes, including focus, language, and executive function, are connected to verbal working memory. For instance, as it enables people to remember the words they wish to use and keep track of the meaning of sentences, verbal working memory is essential for language comprehension and production.

According to research, **verbal working memory** is a sophisticated system that integrates a number of cognitive functions, including attention, encoding,

maintenance, and retrieval of data. Each person has a different verbal working memory capacity, with some being able to hold more knowledge than others.

1.6 Significance of Verbal Working Memory

Within the field of cognitive processes, working memory is an extremely important component that is essential to our day-to-day lives. As discussed, working memory is the part of our brain that temporarily stores and manipulates information, making it possible for us to engage in a wide variety of cognitive pursuits. Specifically, the verbal working memory concentrates on the analysis and storing of verbal or linguistic data.

The following are some of the most important factors that illustrate the significance of verbal working memory:

Language comprehension and communication: Comprehension of language and effective communication require a substantial amount of verbal recollection in order to comprehend and correctly interpret both spoken and written language. It makes it possible for humans to understand spoken communication such as talks, lectures, and instructions, as well as written information like books, articles, and documents. Verbal working memory is important because it enables us to remember and maintain grammatical rules, semantic knowledge, and vocabulary, which is necessary for efficient communication as well as language processing.

Learning and education: Verbal working memory is directly connected to both the process of learning and the achievement of success in academic settings. It permits the learning of new information, such as facts, ideas, tenets, and procedures, in addition to the ability to recall such information. Students rely on their verbal working memory to recall knowledge that is offered in lectures, textbooks, and other study materials. This information serves as the foundation for students' subsequent comprehension, problem-solving, and critical thinking abilities.

Reading and literacy skills: Developing reading and literacy abilities requires a strong verbal working memory first and foremost. Individuals are able to recall and recognise sight words, their phonetic patterns, and the rules of spelling as a result of this. Reading comprehension and the creation of meaning from written material are both aided by the development of verbal working memory, which makes it easier to hold on to the information presented in earlier sentences or paragraphs.

Recall and memory retrieval: Recalling and bringing information back from memory requires the use of verbal working memory, which plays a role in both recalling and bringing back information that was stored in the long-term memory. When it is necessary, we are able to remember from memory a variety of spoken content, including specific facts, events, and personal experiences. Verbal working memory makes it easier retrieving information from memory in various contexts, such as when one needs to remember crucial details during a conversation, recollect prior occurrences, or answer questions on an exam.

Problem-solving and reasoning: Verbal working memory is a key component in both the ability to solve problems and to think logically. It enables individuals to store pertinent information in their thoughts, alter that information, build mental connections between various bits of information, and form inferences based on those connections. Verbal working memory is especially crucial in activities that need the capacity of working memory, such as performing mental computations, following logical reasoning, and finding solutions to complex issues.

Planning and organization: Being able to recall information verbally is helpful when it comes to planning and organizing responsibilities and pursuits. It assists individuals in remembering the steps in a method and putting them in the correct order, as well as keeping track of their schedules, time frames, and appointments, and keeping an overall perspective on current projects. Verbal working memory facilitates efficient task performance by facilitating the ability to recall essential information and instructions verbally when required.

Verbal working memory is crucial for numerous cognitive processes, including language comprehension, learning, reading, recall, problem solving, and organisational processes. It is the foundation of a variety of cognitive processes that are essential to functioning academically, professionally, and in day-to-day life. Enhancing one's general cognitive performance as well as facilitating successful communication and information processing can be accomplished by working on one's verbal working memory skills and making sure to keep them in good shape.

1.7 Limitation of verbal working memory

The capacity of verbal working memory (VWM) has limitations. It is a fact that VWM is limited in a variety of ways and at times when we need it the most, it can fail us. The following factors contribute to the loss of VWM contents:

- disturbance or distraction
- attempting to remember too much information
- performing a difficult activities

One of the major limitations of VWM is that its capacity is limited. According to the findings of recent studies, the working memory of an individual is only capable of storing a certain amount of linguistic information at any given moment. The well-known "magical number seven" concept was devised by George Miller. According to this theory, the exact capacity can differ from person to person but is often limited to a very small number of items, typically somewhere around seven items (plus or minus two), in the majority of situations.

This method has a number of drawbacks, one of which is that it is susceptible to interference. When competing cognitive processes or other competing inputs occur simultaneously, this memory is swiftly disrupted or damaged. This is because the frontal lobe is the location of VWM in the brain. For instance, if you are attempting to remember a list of words at the same time that you are being presented with distracting audio or visual stimuli, this can interfere with your ability to maintain and accurately recall those words.

In addition, the knowledge that is stored in one's verbal working memory for a length of time is only kept there for a relatively short amount of time. It is possible that the verbal information that has been kept will soon be lost from working memory if there is no chance for active rehearsal or review. It is possible to forget things extremely fast, especially when one's concentration is focused on other activities or distractions. It is very easy to forget things when one's mind is preoccupied with something else.

The effect of phonological similarity can also have an impact on working memory, which is the part of the brain that stores verbal data. It is possible that it will be more challenging to remember exactly products or words that share phonetic properties despite the fact that they have a comparable sound to them. There are researches that indicate the vulnerability of verbal working memory to interference based on phonetic similarity and gives information on the relevance of phonological processes.

Different people may also have different capacities or strengths in their verbal working memories, which can contribute to differences in the levels of performance they exhibit. Some persons may have problems encoding, maintaining, and

manipulating linguistic information, while others may have a naturally higher capacity for their verbal working memory or better strategies for accomplishing these tasks.

It is of the utmost importance to keep in mind that these limitations fundamental to all of the different types of working memory. However, being aware of these limitations can help researchers and educators develop strategies and interventions that will enhance the performance of working memory and support individuals in overcoming any challenges they may have.

1.8 Working memory is NOT…

It is also pertinent to understand what working memory does not include. Working memory is a distinct cognitive function, but it is essential to distinguish what it is not to avoid confusion. Here are a few features that working memory does not possess:

Long-Term Memory: There is a clear distinction between long-term memory and working memory. Long-term memory entails the storage of information over protracted intervals, possibly for a lifetime. Working memory, on the other hand, temporarily stores information for active processing and manipulation.

Sensory memory: It is the temporary storage of sensory information, such as the after-image you see when closing your eyes after gazing at a bright light. It has an even shorter lifespan than working memory and relies on direct sensory input, while working memory involves the active manipulation and processing of information.

IQ or General Intelligence: Working memory is an element of cognitive functioning, however it is distinct from general intelligence. Intelligence encompasses a variety of cognitive skills, including logical thinking, problem-solving, and creativity, which extend beyond the bounds of working memory alone.

Attention: While working memory and attention are closely linked, they are not identical. Attention is the process of concentrating on particular details or stimuli, whereas working memory is the process of temporarily storing and manipulating this information. Attention guides what is stored in working memory, but the two cognitive functions are distinct.

Subconscious Processing: Working memory entails conscious as well as active manipulation of information whereas subconscious processing is neither unconscious nor automatic. It requires cognitive control and effortful engagement.

Permanent Storage: The information stored in working memory is not meant for permanent storage. It is employed for immediate cognitive duties and is typically discarded or replaced as new data becomes available.

In summary, working memory essentially functions as a workspace for cognitive tasks, allowing for the short-term retention and modification of data. It is distinct from other memory processes, intelligence as a whole, and subconscious mental functions.

1.9 Motivation

Motivation is defined as both internal and external factors that initiate, direct, and maintain behaviour towards particular objectives or outcomes. It includes the psychological processes that motivate and direct ideas, actions and behaviors of a person.

"Motivation refers to the initiation, direction, intensity, and persistence of behavior" - **Ryan, R. M., & Deci, E. L. (2000)**.

"Motivation is the psychological process that drives and sustains goal-directed behavior" **- Latham, G. P., & Pinder, C. C. (2005).**

"Motivation refers to the internal and external factors that stimulate desire and energy in people to be continually interested and committed to a job, role, or subject, or to make an effort to attain a goal" **- Judge, T. A., & Robbins, S. P. (2009).**

"Motivation refers to the processes that give behavior its energy and direction. It is the 'why' behind our actions" **- Reeve, J. (2018)**

Source of motivation

Motivation can originate from a variety of factors, such as intrinsic (internal) and extrinsic (external) elements. Intrinsic motivation originates within an individual and is fueled by individual interests, pleasure, curiosity, or a feeling of accomplishment. Extrinsic motivation, on the contrary, is influenced by external factors like rewards, perks, social expectations, and punishments.

Motivation plays an essential part in determining human behaviour and can influence the amount of effort expended, tenacity and engagement people devote to tasks or activities. It influences numerous spheres of existence, including education, sports, interactions, work, and personal objectives.

The following are key motivational concepts and theories:

Needs and drives: Motivation can be influenced by fundamental human requirements such as the need for food, safety, belonging, esteem, and self-actualization. Individuals are motivated to meet these requirements because they generate internal states or drives.

Goal-setting: It is a common component of motivation, as it provides direction and focus to an individual's behaviour. According to the theory of goal-setting, lucid objectives, coupled with input and a sense of advancement, can boost motivation and performance.

Incentives and rewards: External rewards or incentives, such as admiration, recognition, monetary compensation, or grades, can serve as motivators to engage in particular behaviours or accomplish desired outcomes.

Self-efficacy and beliefs: Motivation can be influenced by a person's confidence in his or her ability to perform (self-efficacy) and their expectations of whether they will succeed or fail in specific tasks (outcome expectations).

Social factors: Motivation can be influenced by social influences like social norms, expectations, social comparison, and the need for affiliation with or approbation from others.

Motivation has been the subject of numerous theories and models, such as Maslow's Hierarchy of Needs, Self-Determination Theory, Expectancy-Value Theory, and the Job Characteristics Model.

Motivation is a multifaceted and complicated construct that performs a crucial role in determining human behaviour, achieving objectives, and molding human well-being and performance.

1.10 Achievement Motivation

Before understanding the concept of achievement motivation, lets first briefly look into different terms like, achievement, motive and motivation.

Achievement refers to **successful accomplishment** of a goal, task, or objective. It is the act of accomplishing something meaningful or achieving a desired result. Academic achievements, professional milestones, personal objectives, athletic victories, and creative endeavours are all examples of different types of achievements.

Motive: A motive is an internal psychological factor that motivates, directs, and sustains behaviour. Motives can be thought of as the **requirements**, desires, or objectives that drive people to engage in particular actions or pursue specific results.

Motivation is essential for achievement. It is the **force** that motivates people to act, persevere in their efforts, and endeavour for success. Motivation provides the vitality, concentration, and resolve required to pursue and attain objectives.

Achievement motive: It refers to a **particular psychological need or desire for accomplishment**. Achievement motive is an inner drive that propels individuals to pursue success, achieve objectives, and seek out challenging tasks. Typically, the achievement motive entails a desire for competence, mastery, and the satisfaction derived from achieving significant goals.

Let's now discuss and understand what achievement motivation is.

Achievement motivation, refers to the psychological drive or desire to excel, complete difficult tasks, and surpass excellence standards. It is an essential component of motivation that motivates people to aspire for success and achieve significant achievements.

To summarise, achievement is the act of successfully completing a goal, motive is the internal force that drives behaviour, achievement motive is the particular psychological need or desire for achievement, and achievement motivation is the drive or inclination to partake activities that lead to success or accomplishment.

As such, testing achievement motivation is one method for gaining insight into students' achievement motive. Assessments and evaluations of achievement motivation can provide valuable information about an individual's motivation levels, goal orientations, and achievement attitudes. For this, self-report questionnaires or behavioural observations are used for these assessments. For this study, we have used Achievement Motivation Test by VP Bhargava (2009) to test the achievement motivation of the students.

Though motivation and achievement motivation are related but both are distinguishable concepts.

1.11 Difference between Motivation and Achievement Motivation

Definition: Motivation is the ***general*** psychological processes that initiate, direct, and maintain behaviour towards the accomplishment of an objective or the satisfaction of a need. It encompasses a wide variety of behaviourally influential drives, desires, and forces.

Achievement motivation, on the other hand, refers ***specifically*** to the psychological drive or drive to excel, complete difficult tasks, and exceed standards of excellence. It is a category of motivation that emphasises achievement-oriented behaviour in particular.

Focus: Motivation can encompass a ***vast array of objectives***, needs, and desires, such as social needs, expressing oneself, affiliation, pleasure, and curiosity. It pertains to various aspects of human behaviour and can be driven by both internal and external factors.

Achievement motivation is more ***narrowly concentrated*** on the drive for success, achievement, and excellence in particular fields or tasks, as its name suggests. It centres on the pursuit of competence, mastery, and exceeding performance standards.

Specificity: Motivation can be ***broad*** and diffuse, influencing a variety of aspects of behaviour and life objectives. It can be influenced by external as well as internal factors, and it can vary depending on the context and the circumstances.

Achievement-based motivation is a bit ***more specific*** and domain-focused. Usually, it pertains to specific areas, such as academics, sports, career, creative endeavours, or personal objectives. It frequently derives from intrinsic factors such as personal gratification, mastery, and the pursuit of excellence.

Measurement: Measuring motivation is a ***difficult*** endeavour because it requires evaluating multiple factors, including desires, needs, goals, values, and the degree of motivation across various domains. It can be measured via self-report questionnaires, behavioural observation, and psychological evaluations.

Achievement motivation can be assessed more ***precisely*** employing measures and scales that concentrate on indicators of achievement-oriented behaviour, such as goal setting,

persistence, a preference for difficult tasks, dread of failure, and the desire for competence.

Here the quick snapshots of the differences:

Table 1.3 : Difference between Motivation and Achievement Motivation

Aspect	Motivation	Achievement Motivation
Definition	Refers to psychological processes driving behavior	Specifically focuses on the drive for achievement and excellence
Focus	Encompasses various goals, needs, and desires	Concentrates on achievement, surpassing standards, and excellence
Specificity	Broad and applicable to multiple life domains	Narrower, domain-oriented, specific to achievement-related behavior
Measurement	Assessed through factors like needs, desires, goals	Evaluated through indicators such as goal setting, persistence, preference for challenges

1.12 Theories of Achievement Motivation

Achievement motivation is also referred as **need for achievement**. The need for achievement **(N-ach)** was recognized by American psychologist **Henry Murray in late 1930's**. A person's desire for significant fulfilment, control, or high standards is their need for achievement. N-ach brings in the desire to win and includes passionate, prolonged and constant efforts to accomplish the goals one has targeted for self. **David McClelland,** a psychologist, afterwards popularised the concept of N-Ach. Achievement for motivation can be defined as the attainment of excellence by meeting realistic goals. It can help individuals achieve their objectives, whether they are professional or personal.

Individuals' Need for Achievement is proportional to the complexity of their chosen endeavours. People with low N-Ach may choose straightforward tasks to reduce the possibility of failing, or exceedingly challenging assignments so that failure isn't humiliating. Individuals who have a high N-Ach prefer moderately challenging tasks, perceiving them as challenging but attainable.

Individuals with a high level of N-Ach tend to look out for difficulties and a great deal of autonomy. Their greatest gratifying return is acknowledgment of what they've accomplished. Sources of significant N-Ach concentrations include:

- Parents who fostered independence in their children
- Praise and incentives for achievement
- Association of success with positive emotions
- Attribution of success to one's own skill and endeavour, not to chance
- Desire to be productive or to be tested
- Intrapersonal Strength
- Desirability
- Possibility
- Capability to Set Objectives

Several hypotheses elucidate the requirement for achievement (nAch) and the drive to succeed. Following are the prominent work done in this field:

- McClelland's Needs Theory (McClelland)
- Achievement Motivation Theory (Atkinson)
- Lewin's Field Theory
- Achievement Goal Theory (Dweck)
- Expectancy-Value Theory (Eccles)
- Self-Determination Theory (Deci & Ryan)
- Social-Cognitive Theory (Bandura)

McClelland's Need Theory:

David McClelland, a psychologist, established the McClelland's Need Theory, a theory of motivation that contends that humans are governed by three fundamental desires: the need for authority, the need for belonging, and the need for achievement.

The need for achievement, according to the notion, is the drive to excel, to complete difficult tasks, and to be recognized for one's efforts. High achievers are often self-motivated and driven to be successful in their chosen fields. They frequently give themselves difficult targets, take calculated chances, and request performance feedback. On the other hand, those who have a low need for achievement might be fine with merely fulfilling the minimum needs and refrain from taking on difficult jobs.

Individuals who have a strong need for affiliation actively seek out new friends, relish teamwork, and place a high importance on interpersonal ties. They could value cooperation and societal harmony more than individual success. Those who don't need to belong to a group could be more independent and prefer to work alone.

According to McClelland's need theory, people may have various combinations of these three needs, and these needs can change over time as a result of environmental and personal circumstances. The theory has been applied to comprehend behaviour and motivation in a range of contexts, including leadership, employment, and education.

The urge to exert control, authority, and influence over others is the need for power. Individuals with strong needs for power like to be in charge, make decisions, and affect other people. They might prioritize personal success over communal harmony and be willing to take risks to get what they want. Those who don't need to be in charge may prefer to follow. This is strongly related to the theory of learning, as he believed that people learn or acquire their needs based on the types of events they encounter in their environment and culture. McClelland discovered that people with a particular need behave distinctly than those without it.

To summarise, his framework focused on three needs:

- Achievement,
- Power, and
- Affiliations

Need for Achievement:

The need for achievement is a specific motivational drive that motivates people to seek out and thrive in situations where they can undertake challenging tasks, set and achieve objectives, and get recognition for their achievements. In other terms, the need for achievement is a trait aimed at competing with a high standard of excellence. McClelland discovered that individuals with a great need for achievement succeed more than those with an average or low need for achievement, and he identified regional and national variations in achievement motivation. In the field of education,

if the educators can provide the students with challenging tasks and give credit to their accomplishment this can motivate them and give them a sense of achievement.

Need for Power:

The need for power revolves around having an effect on others, the desire to influence others, the impulse to alter people, and the yearning to make a difference in life. People with a high need for authority enjoy being in charge of other people and events. These lead to ultimate satisfaction to a person.

Need for Affiliation

The need for affiliation is described as the urge to develop and maintain cordial relationships with others. In many respects, the need for affiliation is comparable to Maslow's social requirements.

The Need Theory of McClelland has been widely implemented in numerous disciplines, including leadership development, organisational behaviour, and education. Understanding the dominant needs of individuals can assist organisations and leaders in designing motivating environments, assigning tasks that align with the motivations of individuals, and providing appropriate feedback and recognition. Teachers can use their pupil's achievement needs to foster intrinsic motivation and set objectives that are both challenging and attainable.

In addition, McClelland's Need Theory contributes to a thorough understanding of human motivation by emphasizing the significance of various needs and their influence on behaviour and performance. It acknowledges that individuals are not uniformly motivated by the same factors, emphasizing the need for individualized approaches to motivation and achievement.

Atkinson's Achievement Motivation Theory

John W. Atkinson developed the Achievement Motivation Theory, which concentrates on comprehending the motivation behind achievement-oriented behavior. Individuals are motivated to attain success while avoiding failure based on their individual orientation towards achievement, according to the theory.

Principal Concepts of Atkinson's Theory of Achievement Motivation:

Motivation to Achieve Success (Ms): It represents the intrinsic motivation and drive for success of an individual. Those with a high Ms are motivated by the satisfaction of accomplishing difficult objectives and performing well.

Motive to Avoid Failure (Maf): It reflects a person's motivation to avoid failure and the associated negative emotions. Those with a high Maf are concerned with avoiding error and failure.

Expectancy-Value Theory: Atkinson's theory contains elements of the expectancy-value theory, which suggests that people's motivation is affected by their expectations of success or failure and the importance that they place on attaining a particular outcome.

Goal Orientation: Atkinson's theory highlights the significance of goal orientation in motivation for achievement. Individuals may either have a mastery orientation, which focuses on acquiring competence and mastering tasks, or a performance orientation, which focuses on displaying their abilities and outperforming others.

Recognizing differences in achievement motivation and the effect motivation has on behavior and performance has been greatly influenced by Atkinson's Achievement Motivation Theory. Individuals' motivation to attain success and avoid failure tends to have a crucial part in their goal-setting, effort expenditure, and persistence, according to the theory.

It is essential to keep in mind that Atkinson's Achievement Motivation Theory is only one perspective within the larger field of achievement motivation, and that it has contributed to our understanding of motivation in educational, occupational, and other achievement-related contexts.

Lewin's Field Theory:

Lewin's Field Theory, which was conceived by Kurt Lewin, is a psychological framework that emphasizes the significance of the fluid relationship between a person and his or her surroundings when attempting to comprehend human behavior. It considers behavior to be the consequence of the interaction between personal traits and the external social and psychological "field."

Concepts central to Lewin's field theory:

Field: The field refers to a person's psychological environment, which includes all internal and external factors that influence their behaviour, which includes their emotions, thoughts, social relationships, and physical surroundings.

Life Space: Life Space is the sum of a person's experiences, perceptions, and beliefs at a particular juncture in time. It includes the individual's subjective reality and their interpretation and response to the field.

Forces: Forces are psychological forces within the field that have an impact on the individual and affect his or her behaviour. These forces may be both internal (such as requirements, desires, and values) and external (such as social norms and environmental cues).

Equilibrium and Disequilibrium: According to Lewin's theory, people have a natural inclination to pursue equilibrium, where all forces acting in the field are balanced. When there is a significant change or conflict in the field, however, people experience disequilibrium, which motivates them to alter their behaviour in order to restore equilibrium.

B = *f*(P, E): This equation, which is fundamental to Lewin's theory, represents behaviour as a function of an individual and his surroundings. It emphasises the interaction between personal characteristics and situational context in determining behaviour.

The Field Theory of Lewin has had an impact on numerous disciplines, including psychology, sociology, and organizational behaviour. It served as a foundation for subsequent research and theories on topics such as motivation, group dynamics, and social change by emphasizing the significance of considering both the individual and their environment to comprehend human behaviour.

Achievement Goal Theory

The Achievement Goal Theory (AGT) is very influential and a renowned theory of achievement motivation. The AGT, which was developed by **Elliot and Dweck**, has made an important impact on the subject of motivation and has been investigated and applied in a variety of contexts.

The Achievement Goal Theory postulates that person’s achievement motivation is driven by their objectives and perceptions of their own competence. It differentiates

between two primary categories of objectives: mastery objectives and performance objectives. Mastery objectives emphasise the attainment of new knowledge, developing new skills, as well as mastery of duties for one's own development and growth. In contrast, performance objectives focus on exhibiting competence and excelling others.

Individuals' objective orientations influence their motivation, effort, and behaviour, according to the theory. Those with a mastery goal orientation are typically more intrinsically motivated, desiring to develop competence and learn, whereas those with a performance objective orientation may be more extrinsically motivated, desiring to exhibit their abilities and outperform others.

This theory has been extensively studied and implemented in educational settings, athletics, and other contexts. It offers valuable insights into the various motivations individuals possess and how goal orientations influence their involvement, persistence, and performance.

Despite the fact that AGT is widely acknowledged as one of the most influential theories of achievement motivation, it is essential to note that other important theories, like Expectancy-Value Theory and Social-Cognitive Theory, have also contributed to the understanding of achievement motivation.

Expectancy-Value Theory of Achievement Motivation

It is a psychological framework that explains human motivation and behaviour by considering their perception of success or failure along with the subjective value they place on achieving a particular goal or outcome. It suggests that motivation is influenced by the association among an individual's expectations of success and their impression of the value of their goal.

Key concepts:

Expectation pertains to a person’s belief or subjective evaluation of their ability to accomplish a task or objective successfully. It is the perceived probability of attaining a desired outcome.

Value refers to the degree of importance or significance that an individual places on a particular objective or outcome. It can be intrinsic (associated with personal interest and pleasure) or extrinsic (associated with external rewards or social acknowledgment).

Expectancy-Value Motivation is the result of the interplay between expectation and value. High expectations and high value for an objective boost motivation, whereas low expectations or low value may decrease motivation.

Task-specific Expectancy and Value: Expectation and value may differ across tasks and objectives. Given the specific context or domain, individuals may have varying degrees of confidence and value diverse outcomes.

Various disciplines, which includes education, professional growth, and health psychology, have applied theory to comprehend and enhance engagement and drive. It has been applied to explain academic success, career decisions, decision-making, and behaviour modification.

It is crucial to note that the Expectancy-Value Theory has been expanded and improved over time by a variety of researchers, and that variations exist. Eccles and associates are a notable contributor to the development of Expectancy-Value Theory, as they have expanded the theory to include more variables such as task values and subjective task perceptions.

Social-cognitive theory

Albert Bandura's Social-Cognitive Theory is a psychological paradigm that emphasises the reciprocal interaction among individuals, their surroundings, and their cognitive processes in determining human behaviour. This theory emphasises the significance of learning through observation, self-efficacy beliefs, and social influences in assessing how individuals think, act, and regulate their emotions.

Principal Social-Cognitive Theory Concepts:

Observational Learning: Social-cognitive theory contends that individuals acquire knowledge by observing and imitating others. Observational learning is the process by which individuals acquire new behaviours, skills, as well as mindsets by observing the actions and outcomes of others.

Self-Efficacy: It pertains to a person's confidence in their capacity to execute a particular assignment or behaviour successfully. Bandura highlighted the importance of self-efficacy beliefs in motivating and controlling human behaviour. Higher self-efficacy correlates with increased motivation, tenacity, and performance.

Reciprocal Determinism: Social-Cognitive Theory acknowledges the interaction among individuals, their behaviour, and their environment. It suggests that individual

factors (e.g., thoughts, beliefs, emotions), the environment (e.g., social norms, tangible surroundings), and the behaviour itself all influence behaviour.

Triadic Reciprocal Causation: Bandura's triadic reciprocal causation theory stresses the fluid interaction between individual factors, behaviour, and the surroundings. It asserts that these three factors influence and shape one another continuously.

Self-Regulation: Social-Cognitive Theory highlights the significance of self-control in the way people act. Self-regulation entails monitoring and regulating one's own thoughts, emotions, and behaviours in order to attain desired outcomes.

Education, psychology, and organisational behaviour are among the many fields where the Social-Cognitive Theory has been extensively applied. It reveals how individuals learn, form self-beliefs, and deal with their social surroundings. Bandura's theory has had a substantial effect on our understanding of human behaviour and has shaped many research, interventions, and practical applications in numerous domains.

To summarise all the above theories, here is a quick snapshot:

Table 1.4 : Summary of various theories of Motivation

Theory	Key Concepts	Key Researchers
McClelland's Theory of Needs	- Need for Achievement (nAch)	David C. McClelland
	- Achievement-oriented behaviour	
Atkinson's Achievement Motivation Theory	- Motive to achieve success (Ms)	John W. Atkinson
	- Motive to avoid failure (Maf)	
	- Expectancy and value of success and failure outcomes	
Lewin's Field Theory	- Tension states and needs for goal achievement	Kurt Lewin
	- Goal-setting and performance	
Achievement Goal Theory (AGT)	- Mastery goals and performance goals	Carol S. Dweck
	- Task value	
	- Goal orientation	

Expectancy-Value Theory	- Expectancy for success and failure	Eccles, Wigfield, & Schiefele
	- Task value	
	- Achievement-related attributions	
Self-Determination Theory	- Intrinsic motivation	Edward L. Deci and Richard M. Ryan
	- Competence, autonomy, and relatedness needs	
	- Goal self-concordance	
Social-Cognitive Theory	- Self-efficacy beliefs	Albert Bandura
	- Outcome expectations	
	- Observational learning	

1.13 Relationship between verbal working memory and achievement motive

The association among adolescents' verbal working memory and achievement motivation is an interesting research field. Here are the key aspects of this connection:

Impact on Academic Performance: Verbal working memory positively influences academic performance in adolescents. Children with a stronger verbal working memory can process and retain verbal information more effectively, resulting in enhanced comprehension and learning outcomes.

Relationship with Achievement Motivation: Adolescent students' verbal working memory capacity can influence their achievement motivation. Individuals with a better verbal working memory are more inclined to engage in proactive study habits, set difficult objectives, and persevere in their pursuit of academic success.

Setting and Planning Objectives: Verbal working memory plays a role in setting and planning objectives, which are essential components of achievement motivation. Students with a stronger verbal working memory can formulate and organise plans to achieve their academic objectives more effectively.

Task Persistence: Verbal working memory capacity also has an effect on task persistence. Adolescents with a greater verbal working memory are better equipped to

maintain academic focus, sustain attention, and persevere when confronted with difficult assignments or obstacles.

To conclude, adolescents' verbal working memory and achievement motivation are interrelated. Academic performance, goal setting, planning, and task persistence are all affected by the ability to retain and manipulate verbal information. Enhancing adolescent achievement motivation and promoting academic success through the improvement of verbal working memory skills is possible.

1.14 Study Habits

It is very common in India, that we hear parents telling their children to focus on studies if they want to achieve something good or better in life, and as such there has been a lot of focus on how students' study and what they ultimately achieve in life. The children are cited examples of successful people around, in the family, in the society or even at the national and international level – who have achieved success due their sheer hard work and which is often equated with their academic achievements. And as such parents try to inculcate "good" study habits in their children so that they can be successful in their lives.

Study habits refers to dedicated time with no disruptions to enhance or improve the task of learning. Different individuals have different study habits which helps them in the learning process. Without it, an individual cannot develop and become self-limiting in life. A person's study patterns reveal how much he or she wants to acquire knowledge and how far he or she wants to go. It has been the most significant indicator of academic performance and plays a crucial role in students' academic success.

It is evident that those students who develop good study habits, fare better in exams compared to those who do not prepare well. Academic performance also is higher with children with regular study habits. To understand this concept this definition may be helpful.

Definitions:

Individuals' study habits are the methods and approaches they employ to effectively acquire and retain information. These habits are crucial to academic achievement because they increase concentration, comprehension, and memory recall. Here are some reliable definitions of study habits:

According to the **American Psychological Association** (APA): "Study habits are the behaviors employed by learners to manage and optimize the acquisition, retention, and retrieval of knowledge" (APA, 2021).

The **Merriam-Webster Dictionary** defines study habits as "the methods or skills used in studying, particularly if viewed as enhancing one's learning ability".

The **University of California, Berkeley** states, "Study habits are the specific routines, practises, and methods that students apply to enhance their learning outcomes. These practises include effective management of time, setting goals, active engagement with the material, and note-taking".

According to the **National Centre for Biotechnology Information (NCBI),** study habits are patterns of behaviour that improve academic performance and learning. They involve actions such as organisation, planning, managing time, and participating actively in learning tasks" **(Chowdhury, 2020)**.

These definitions present an overview of study habits as the intentional actions and techniques individuals employ to improve their learning, academic achievement, and comprehensive educational outcomes.

1.15 Verbal working memory and Study habits

The verbal working memory is crucial for the execution of effective study strategies. The strength of an individual's verbal working memory can affect his or her ability to process, retain, and alter verbal data, which is crucial for academic success. The following sources discuss the connection within verbal working memory and study habits:

A study conducted by **T. P. Alloway and R. G. Alloway (2010)** investigated the connection between working memory, intelligence, and academic achievement. It emphasized the importance of working memory to academic performance, which includes study practices, by showing its predictive function.

In another study by **N. Unsworth and R. W. Engle (2007)**, the implications of individual disparities in working memory capacity for cognitive tasks are examined. It lays emphasis on the impact of working memory on study habits and learning strategies, highlighting its function in the active maintenance of information during study tasks.

These sources indicate that verbal working memory capacity can affect study habits and academic performance. Those with a robust working memory are competent to efficiently organize and modify verbal information, facilitating them to engage in active learning, employ efficient methods of learning, and retrieve information quickly.

Study Habit and Achievement Motivation

The will to succeed may play an important role in the development of person's study routines and practices. Individuals who are intensely motivated to accomplish their goals are more inclined to exhibit goal-directed behaviors and have a greater propensity to pursue activities that are difficult but not insurmountable. These people also have a greater propensity to persevere in regardless of adversity and obstacles, and they have a tendency to regard failures as chances of their own development and advancement.

People who are highly motivated to succeed may engage in the following types of studying behaviours, depending on the habits they have developed:

Setting challenging goals: Individuals who have a strong drive to achieve are more likely to push themselves academically by setting difficult goals for themselves. This can encourage them to put in more effort and keep going even when things get tough.

Seeking feedback: Individuals who have a powerful achievement motivation are more inclined to seek out observations regarding their achievements in order to identify areas in which they can improve and to enhance their learning. This is intended to enhance the individual's learning.

Engaging in active learning strategies: Active learning methods, such as organization, and summarising, elaboration, may help individuals enhance their understanding and retention of the content they are studying. Individuals who have a high success motivation may be more inclined to participate in approaches to active learning.

Taking responsibility for learning: People who are driven to succeed in their endeavours are more inclined to accept ownership of their own education and to take the initiative to seek out resources and assistance in order to get where they want to go.

Managing time effectively: People with a strong ambition to succeed may be better able to manage their time to achieve a healthy balance between their academic pursuits and other obligations and responsibilities in their lives.

In general, those who have a strong drive to attain their goals are more inclined to adopt habits, like efficient study habits, that increase their chances of being successful in their academic endeavors.

1.16 Study Habit and achievement motive

In a study by **Dweck, C. S. (1986)**, he examined achievement motivation and its influence on learning. It underlined the significance of a mindset of growth, which is linked with an intense motivation to succeed, in developing effective study practises and promoting academic achievement.

Pintrich, P. R. (2000) examined the role of a goal-oriented mindset in self-regulated education in an article. It discussed how various goal orientations (such as mastery goals and performance goals) can impact study routines and academic achievement.

A study by **C. A. Wolters (2003)**, investigated the connection between motivation and putting off tasks, a common obstacle in pursuing higher education. Higher achievement motivation is associated with proactive study habits and fewer procrastination tendencies, according to this study.

These citations illustrate the influence of achievement motivation on study habits, emphasizing the significance of motivation in leading individuals to adopt effective study strategies, set objectives, maintain perseverance, and engage in self-regulated learning. Strong achievement motivation can result in the formation and continued execution of productive study routines, which ultimately contribute to academic success.

1.17 Academic Performance:

Academic performance pertains to a student's accomplishments, outcomes, and overall educational success. It includes grades, scores from tests, class ranking, fulfilment of assignments, involvement with class events, and overall subject mastery of a student. Academic performance is frequently used as a criterion for evaluating a student's curriculum-related knowledge, skills, and comprehension, and it is crucial for gauging their growth and their potential for upcoming educational possibilities. It

can affect college admissions, scholarship opportunities, and career prospects. Multiple factors, including mental capacities, study practises, motivation, quality of instructors, and external assistance systems, influence academic performance.

It can also be referred to as the quality of level of success or proficiency that students demonstrate in their educational endeavors. It can be defined differently depending on context and point of view. A few definitions of academic performance follow:

The attainment of knowledge and skills: Academic performance is an expression of gained knowledge, abilities, and competencies in particular areas of study or disciplines. It demonstrates students' capacity to comprehend and employ what they were taught in educational environments.

Grades and assessments: The evaluation of students' academic performance frequently include assessment, scores, test and ratings. It is an indicator of their progress, comprehension, and accomplishment relative to set guidelines or standards.

Mastery of curriculum objectives: Academic performance can be evaluated based on the degree to which students have attained the objectives for learning and goals specified in the curriculum. It demonstrates their capacity to comprehend and attain the desired educational outcomes.

Class participation and engagement: Performance in school/college can also include students' active participation, involvement, and involvement with classroom activities assignments and discussions. It takes into account how they contribute to the learning environment and their level of engagement with the material.

Academic performance can be viewed as the result of various educational results, including graduation rates, assignment and completion of projects, outcomes of research, and ultimate academic achievements. It includes the broader effects and results of the educational experiences of students.

Knowing that the definition and evaluation of academic performance might differ across systems of education, institutions, and contexts is essential. The particular standards and indicators used to evaluate academic performance can vary, but they typically focus on students' understanding acquisition, skill development, grades, tests, and overall educational outcomes.

1.18 Relationship between verbal working memory, study habits, achievement motivation, and academic performance

Here is a how the above factors influence each other:

Verbal Working Memory:

Strong verbal working memory capacity facilitates the processing and storage of verbal information. It facilitates comprehension, problem-solving, and language-related activities.

Study Habits:

The term "study habits" refers to the techniques and behaviours that students implement that promote academic achievement and learning.

Students with a robust verbal working memory might be more inclined to actively participate in engaged learning, take effective notes, and organise their study materials.

Better study practises, such as periodic review and practise, can facilitate the consolidation and recall of information.

Motivation for Achievement:

Achievement motivation demonstrates a person's academic drive and desire to succeed.

Students with a good verbal working memory might feel more motivated to succeed due to their ability to comprehend and process complex verbal information.

Academic tasks are performed with greater effort, persistence, and goal-directedness when achievement motivation is high.

Academic Performance:

Academic performance is the outcomes and accomplishments of a student's educational pursuits.

Verbal working memory impacts academic performance by improving understanding, solving problems, and recall of verbal information.

Strong study habits guided by efficient use of the verbal working memory contribute to enhanced academic performance.

Achievement motivation is a driving force that encourages students to set lofty objectives, implement productive study habits, and aspire for academic achievement, thereby improving their academic performance.

The relation between verbal working memory, study habits, achievement motivation, and academic performance is linked. Strong verbal working memory capacity may promote the growth of effective study practises, boost achievement motivation, and eventually lead to enhanced academic performance.

Here is a chart which summarises the above discussion:

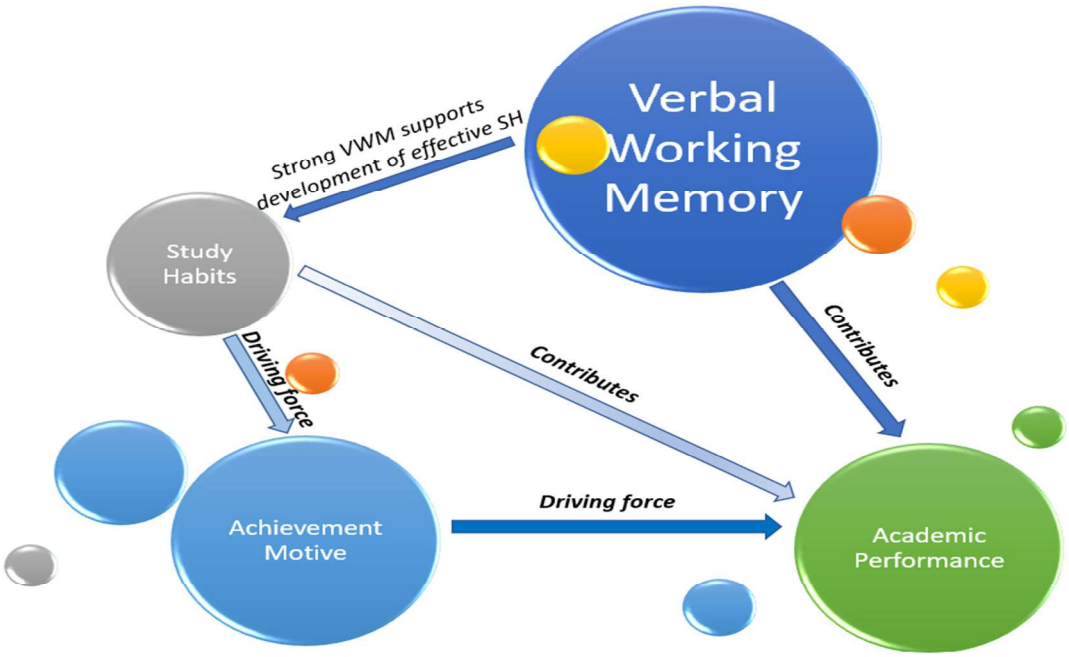

Fig. 1.5 : Relationship between Verbal Working Memory, Achievement Motive, Study Habits and Academic Performance

This chart places verbal working memory at the top to illustrate its influence over the other factors. The affiliation among study habits and verbal working memory highlights how a robust working memory capacity can facilitate the development of effective study habits. Academic performance, which is located in the centre, is affected by both study habits and verbal working memory. In addition, achievement motivation is associated with both study habits and academic performance, demonstrating that it functions as a driving force that affects both variables.

Please note that this chart is a simplified representation of the relationships and lacks specific details and dimensions. Its purpose is to depict the relationships between the variables.