IMPACT OF VERBAL WORKING MEMORY ON ACHIEVEMENT MOTIVE, ACADEMIC PERFORMANCE AND STUDY HABITS AMONG STUDENTS

वाचीक कार्यशील स्मृति का विद्यार्थियों की उपलब्धि अभिप्रेरणा, अकादमिक निष्पादन एवं अध्ययन आदतों पर प्रभाव

A

Thesis

Submitted for the Award of the Ph.D. degree of

PACIFIC ACADEMY OF HIGHER EDUCATION AND RESEARCH UNIVERSITY

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2023

DECLARATION

I, **BENAZIR SHAFAAT HUSSAIN W/O Mr. SHAFAAT HUSSAIN** resident of M-73, Forest County, Kharadi, Pune, Maharasthra – 411014, hereby declare that the research work incorporated in the present thesis entitled **"Impact of Verbal Working Memory on Achievement Motive, Academic Performance and Study Habits Among Students"** (वाचीक कार्यशील स्मृति का विद्यार्थियों की उपलब्धि अभिप्रेरणा, अकादमिक निष्पादन एवं अध्ययन आदतों पर प्रभाव) is my original work. This work (in part or in full) has not been submitted to any University for the award or a Degree or a Diploma. I have properly acknowledged the material collected from secondary sources wherever required.

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CERTIFICATE

It gives me immense pleasure in certifying that the thesis **"Impact of Verbal Working Memory on Achievement Motive, Academic Performance and Study Habits Among Students"** (वाचीक कार्यशील स्मृति का विद्यार्थियों की उपलब्धि अभिप्रेरणा, अकादमिक निष्पादन एवं अध्ययन आदतों पर प्रभाव) and submitted by **BENAZIR SHAFAAT HUSSAIN** is based on the research work carried out under my guidance. She has completed the following requirements as per Ph.D. regulations of the University;

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ACKNOWLEDGEMENT

I stand at the culmination of a long and enriching journey, and I am filled with gratitude for the invaluable support and guidance I have received along the way.

First and foremost, I extend my deepest appreciation to Professor **Dr. Hemant Kothari**, Dean PG Studies, Pacific University, for giving me this opportunity and timely guidance to undertake this research study.

I would like to express my gratitude towards my guide **Dr. Deepika Jain,** Assistant Professor, Department of Psychology, PAHER University, who rest assured that I was doing the right thing all through my journey in completing the thesis.

There are not enough words to convey my deep gratitude and respect for my research advisor, **Dr. Ajay Chaudhary,** Associate Professor, Department of Psychology, Government Meera Girls College, Udaipur. He has inspired me to become an independent researcher and helped me realize the power of believing in oneself.

Altogether, their mentorship, unwavering support, and insightful feedback have been instrumental in shaping this thesis. I am profoundly grateful for the countless hours they devoted to refining my research and nurturing my academic growth. I offer my sincere thanks for their time, expertise, and constructive critique. Their diverse perspectives enriched my work and contributed significantly to its depth and rigor.

My family has been the bedrock of my journey. To my mother, **Ms. Lubna Zahid** & father, **Mr. Oan Ali Zahid**, sister **Ms. Saba Zahid**, mother-in-law **Ms. Rashida Shahnaz** and husband **Mr. Shafaat Hussain**, I owe a debt of gratitude that words cannot fully express. I am profoundly grateful to my two sons, **Afraaz Hussain** and **Faizaan Hussain**, who have been unwavering pillars of support throughout my PhD journey. Afraaz and Faizaan, your belief in my abilities and your willingness to share in the sacrifices demanded by this pursuit have been my greatest motivation. Not to mention the kind of support and constant encouragement which I received from my brother-in-law and my sister-in-law, **Mr. Tasir Hussain** and **Ms. Fakhrunnissa Hussain**. My brother, **Mr. Adil Ali** and sister-in-law, **Ms. Nazima Ali**, never let me lose sight of my vision and helped me in each phase of this research work.

The one person who has been my source of inspiration throughout my life, my grandmother – **Ms. Rashida Kaab Hussain**, I wanted to tell her, that you never stop to amaze me and I want to dedicate this PhD to her. The unwavering belief of my family in me, their sacrifices, and their unconditional love sustained me through the challenges of this academic pursuit.

The overwhelming support from my extended family and my friends helped me in sailing through the trough and crest of this roller coaster. Without them I cannot imagine how this journey would have been possible. I would like to extend my thanks to **Ms Shamim Sheikh**, **Ms Zulfiya Sheikh**, **Mr. Jaswant Jain**, **Ms. Anju Jain**, **Mr. Asad Ali**, **Ms. Sugra Kathawala** and **Mr. Rishabh Verdia**, who provided a supportive network, offering encouragement and intellectual camaraderie. Your presence in my life has been a source of strength. I was equally supported by my school and my colleagues who not only guided me regarding some of the research related work, but also provided a strong support system at work, so that I could balance both the worlds without compromising on quality at either place.

I am deeply indebted to the **Pacific University** for providing access to all the resources and related facilities which were crucial to this research.

Lastly, this would not have been possible without the active participation of all the schools and colleges and the students and their parents, who willingly spared their valuable time and helped me with all the data collection.

As I conclude this chapter, I am filled with a profound sense of gratitude. Each individual and institution mentioned and those whom I would have missed mentioning here, has played a pivotal role in the realization of this thesis. I reckon this is **ALMIGHTY's** way to hold my hand in this immensely enriching journey. I offer my deepest thanks to the Almighty for the wisdom, strength, and grace that sustained me throughout this endeavour.

DATE: - **BENAZIR SHAFAAT HUSSAIN**

Dedicated to
My father in law
Late Mr. Arif Hussain
Rizvi who always prayed
for completion of my
Ph.D.

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PREFACE

The investigation of working memory and its profound implications for academic success has been an endeavor filled with intellectual and personal significance. This thesis is the result of years of dedicated research, reflection, and collaboration with mentors, colleagues, and students.

Working memory, the cognitive system responsible for temporarily retaining and manipulating information, is an integral component of learning and cognitive functioning. It has been a privilege and a challenge to comprehend its complex mechanisms and impact on educational outcomes. Through this work, I have endeavored to investigate not only the implications of verbal working memory but also the interplay of study habits as well as achievement motive of the students on their academic performance.

I have been working in the field of education all these years and hence I was keen to identify what could be those factors which can positively affect the learning outcomes of the students. This thesis aims to illuminate how educators, policymakers, and practitioners can employ the power of working memory to optimize educational experiences for the students.

In the initial days of exploring this field of working memory, I came across the rich body of work done by Tracy Alloway and Ross Alloway, and hence I also endeavored to explore this vast and intriguing field.

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:

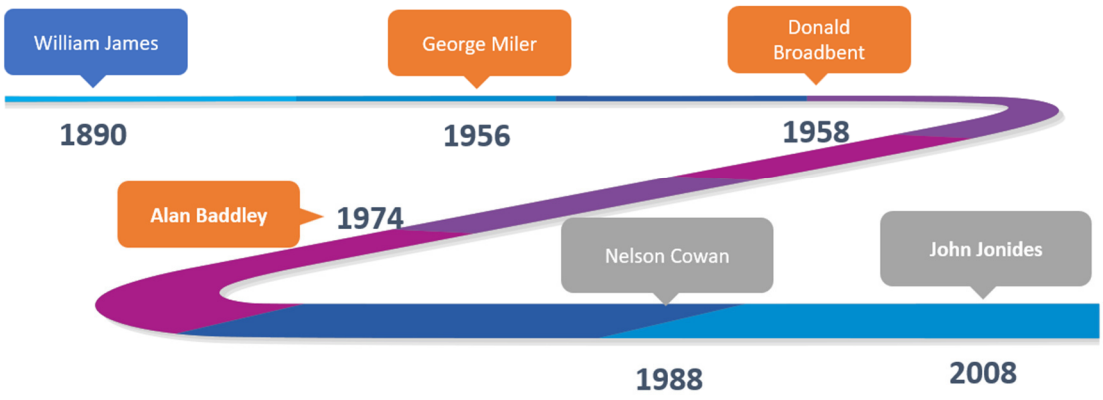


Fig. 1.1 : Timeline - Evolution of the concept of Working Memory

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.

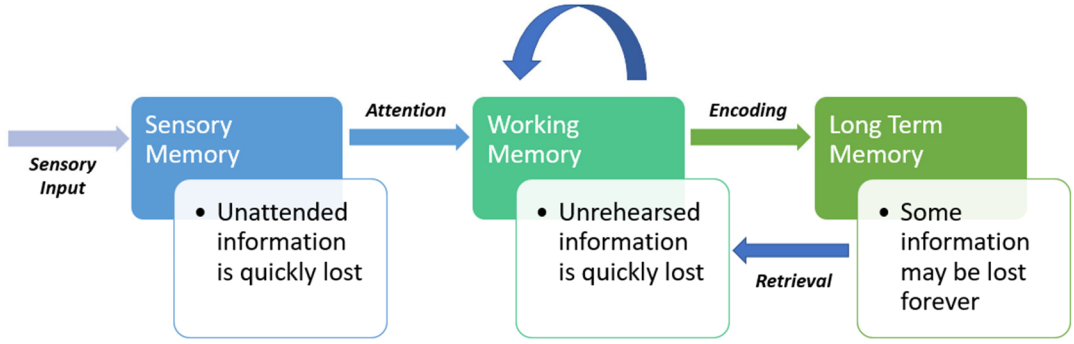


Fig. 1.2 : Modal model of Working Memory by Atkinson & Shiffrin (1968)

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.

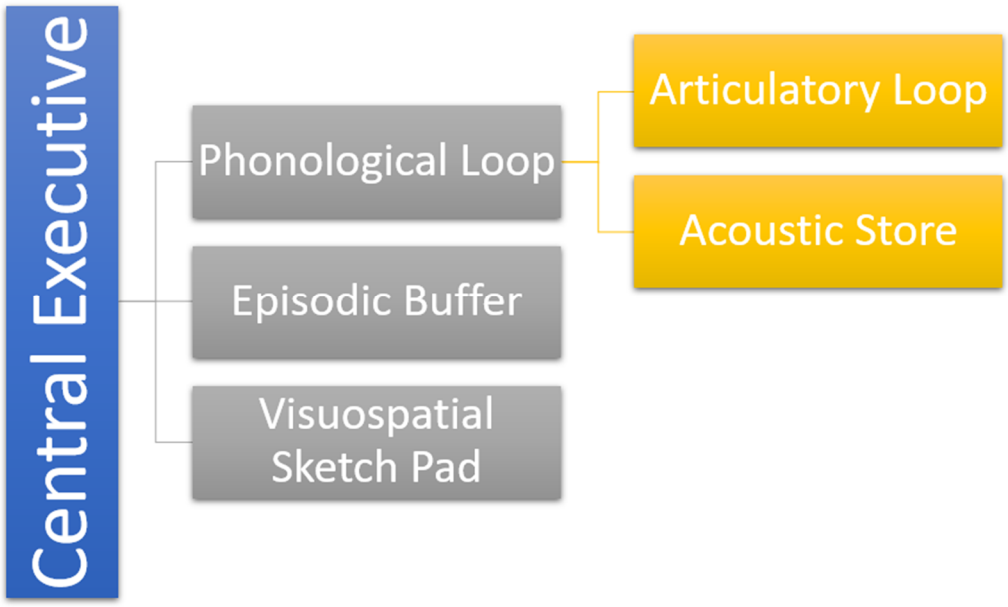


Fig. 1.3 : Latest Model of Working Memory

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.

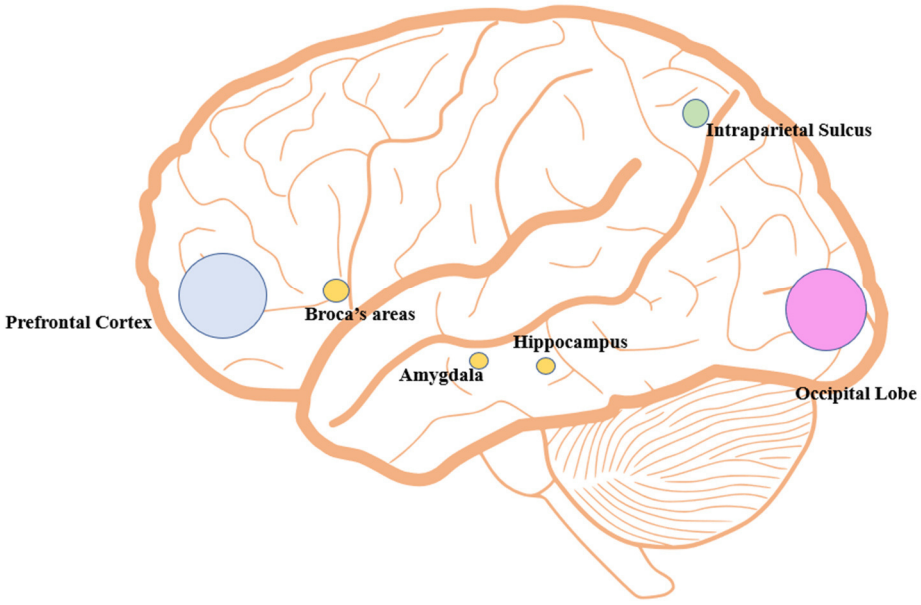


Fig. 1.4 : Main areas of brain contributing to working memory

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:

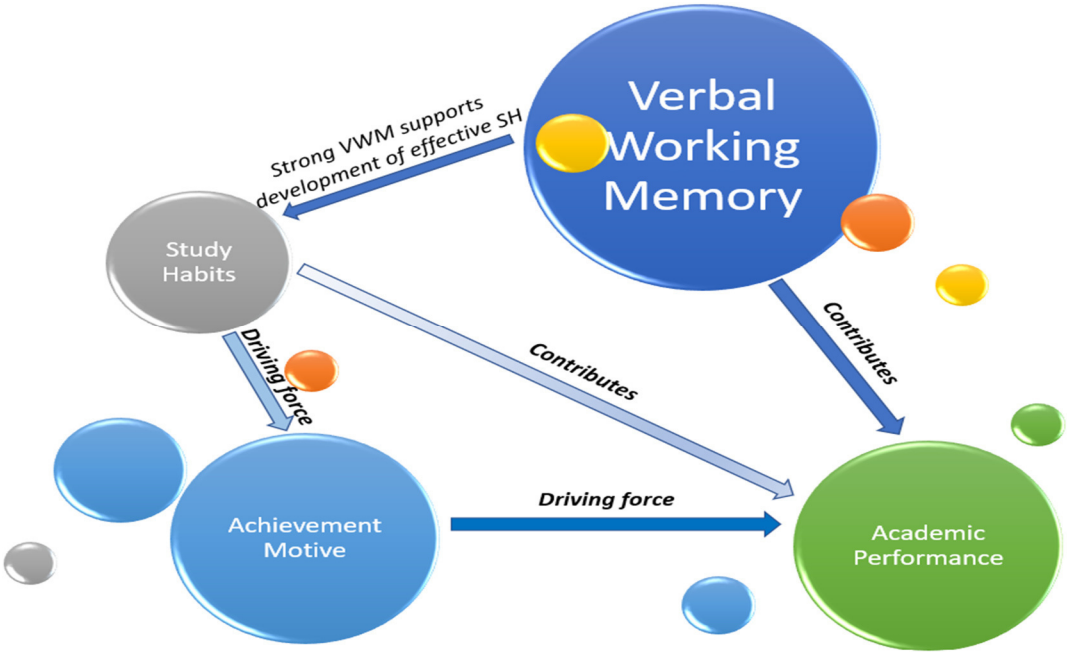


Fig. 1.5 : Relationship between Verbal Working Memory, Achievement Motive, Study Habits and Academic Performance

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.

CHAPTER – II

REVIEW OF LITERATURE

Review of literature is one of the most important part of any new research as it lays down a strong foundation. A thorough ground work in the topic which is being investigated, not only equips the researcher to gain an in-depth knowledge of the topic, but also helps him/her to identify what has not been explored before and thus paving the path for a new study, which can not only benefit the research community but helps him/her to contribute meaningfully to the whole ecosystem at large.

Literature review provides clarity and helps the researcher in choosing the best theoretical framework for the study. While the current literature provides the strong understanding of the history, the research gaps which are identified, helps the research community as a guiding light for the future work.

For this research, the aim was to identify and thoroughly understand what was already studied in the field of working memory and specifically, verbal working memory and its impact on the different aspects, like study habits, achievement motive and academic performance of students. There is a treasure of work being done in one or the other topics and it really helped in giving a structured approach for this current research.

2.1 Verbal working memory

In initial search on this vast topic of Verbal working memory and its impact on the student's achievement motive and study habits, we came across similar research being conducted by **Tracy Alloway and R. Alloway (2010**).

This study aimed at determining if working memory is merely a surrogate for intelligence or if it has a unique impact on learning outcomes. A sample of 98 children were evaluated at two distinct ages: first, when they were between 4.3 and 5.7 years old, and then again 6 years later, when they were between 10.0 and 11.3 years old. Based on poverty indices and nutrition eligibility, schools with low, moderate, and high poverty rates were chosen. Forward digit recall was utilised to

evaluate verbal short-term memory, whereas digit recall was utilised to evaluate verbal working memory.

Children's memory retention capabilities at age 5 were the most accurate predictors of their literacy and numeracy skills six years later, according to the significant findings. IQ contributed a lesser proportion of the unique variance in these learning outcomes. This emphasises the distinction between working memory and IQ and its independent relationship with academic achievement. Remarkably, the study demonstrates that working memory, particularly in the early phases of formal schooling, is a better indicator of future academic achievement than IQ. These results have significant ramifications for education, particularly for interventions that seek to improve working memory skills, thereby potentially enhancing academic performance overall.

The study's examination of the relationship between working memory and academic achievement demonstrates that working memory is more than an IQ proxy. Instead, it emerges as a distinct cognitive ability with unique ties to academic success. In the context of predicting academic success, working memory emerges as a more potent predictor than IQ, particularly at the beginning of formal education. This research has significant implications for educational strategies and interventions that seek to optimise students' academic outcomes by leveraging working memory skills.

In their study, **Alloway and Alloway (2020)** aimed to identify if the association between working memory and academic achievement differs depending on the specific academic domain. The researchers wanted to examine whether domain-specificity could provide an explanation for the inconsistent results observed in previous studies.

The research involved a comprehensive literature review on the relationship between working memory and academic achievement. The authors conducted a thorough analysis of studies that investigated the connection between diverse academic domains, such as mathematics, literacy, and overall academic performance.

According to their findings, the interplay among working memory and academic success is complex and multifaceted. Although there is evidence supporting a positive association, the intensity and consistency of this association varied by academic domain.

A recent study by **Studer-Luethi, B., Toermaenen, M., Margelisch, K (2022)** investigated the effect of working memory (WM) training on the educational success as well as educational development of children. The researchers concentrated on fundamental cognitive processes such as working memory, which plays a crucial role in learning. Although WM training has been deemed beneficial, school-based research is limited. The purpose of the study was to determine how the characteristics of training tasks and each child's individual characteristics shape the cognitive and academic outcomes of training.

The investigation included 86 children between the age of 8 to 12 years, who participated in a 6-week training programme. One group underwent WM training with tasks such as n-back and complex span, whereas another group underwent control training with perceptual matching tasks. The investigators also evaluated the children's personal characteristics, such as neuroticism, conscientiousness, enthusiasm for learning, and strength.

In comparison to the control group, the other group which was given the WM training, demonstrated advances in both working memory and math performance. Additionally, there were indications that vocabulary may have improved after WM training. Both training groups demonstrated improvements in literacy and fluid intelligence.

The study analysed distinct characteristics within the training group and discovered that training efficacy was related to psychological well-being, diligence, resilience, and factors including teachers' reports of learning enjoyment and social integration.

The study concluded that working memory training has the ability of boosting working memory capacity and mathematical abilities of the children. It also emphasised the impact of individual characteristics, motivation, and social factors on cognitive training outcomes.

Kulp, M. T., Edwards, K. E., & Mitchell, G. L. (2002) conducted a study to address the controversy surrounding the connection among visual memory and academic performance. 155 students in grades two through four (average age = 8.83 years) were involved in a masked investigation.

Using the visual memory subtest of the Test of Visual Perceptual Skills, visual memory was evaluated. The Otis-Lennon School Ability Test and the Stanford Achievement Test were utilised to evaluate academic performance. The analysis took age and verbal aptitude into account.

Visual memory scores substantially predict below-average performance in decoding words, and total scores of math, according to the study's findings. Predicting reading comprehension reveals a positive trend ($p = 0.093$).

In conclusion, the study establishes a significant correlation between poor visual retention and inferior academic performance in reading, math, and overall school performance among 2^{nd} to 4^{th} graders. Even when age and verbal aptitude are taken into account, the findings hold up.

An article by **Miller-Cotto & Byrnes (2020)** examined interaction of working memory on arithmetic and literary performance in an effort to comprehend the underlying mechanisms. This study contrasted three theories for this relationship:

i. the cognitive filter model,

ii. the transactional model, and

iii. the positive manifold model

By employing math and literacy data from the 2011 Early Childhood Longitudinal Study Kindergarten (ECLS-K), two distinct assessments were conducted.

Path analyses conducted within a structural equation modelling framework determined that the transactional model provided the greatest fit in both instances. This suggests that the interaction among achievement and working memory is reciprocal as well as recursive over time.

Recent research has established links between educational achievement measures and both the verbal and visuospatial components of working memory. In addition, particular executive functions, namely shifting, updating, and restraint, have been associated with academic performance. In a study by **St Clair-Thompson, & Gathercole (2006),** verbal and visuospatial working memory abilities of children of the age of 11 and 12 years, were assessed in addition to the ones mentioned above.

Two executive factors emerged through exploratory factor analysis - one related to updating functions and the other to inhibition. Strong correlations were found between updating skills and verbal and visuospatial working memory span performance. Working memory was strongly correlated with academic achievement in math and English, whereas inhibition was strongly correlated with academic performance in science, math and English.

In addition, the study revealed associations which were specific to the domain - verbal working memory directly affected performance in English, whereas visuo-spatial working memory affected English, mathematics, and science achievement. These findings have implications for the conceptual study of working memory as well as executive functioning, and how they contribute to the learning of children. This study brought out the significance of comprehending the complex relationships between cognitive processes and academic performance, providing insights that can inform educational strategies and interventions.

Recent developmental research has sought to comprehend the predictive effect of intelligence and working memory (WM) on student's academic achievement. While both variables are acknowledged to be significant, it remains unclear whether IQ or WM has a greater impact on academic achievement. Some studies indicate that IQ is the primary predictor, while others indicate that WM has a greater predictive capacity. A study by **Schneider & Niklas (2017)** utilised statistics from the Munich

Longitudinal Study on the Origins of Individual Competencies (LOGIC) to investigate this topic in greater depth. The study included approximately 200 participants whose IQ and WM were evaluated at age six, with follow-up evaluations through age 23. In addition to evaluating reading, penmanship, and math skills, the study assessed these skills across this time span.

To investigate the relative predictive power of IQ and WM across assessment time intervals (early versus late), the researchers employed regression analyses and structural equation modelling (SEM) with latent variables. Both IQ and Working memory consistently predicted academic success in both early and late developmental stages, particularly when domain knowledge was not considered as an additional factor. However, domain knowledge emerged as a significant contributor, explaining the majority of the variance in more in-depth regression models and reducing the influence of IQ and working memory. SEM analyses corroborated these findings, confirming that IQ has a significant influence on early educational achievement and highlighting the additional influence of domain knowledge during later developmental stages.

In essence, this study emphasised the importance of IQ and WM in predicting academic success, while emphasising the centrality of prior domain knowledge.

In a study similar to our current research was conducted by **Sadaf Tariq & Sarah Noor (2012)**. The objective of the investigation was to find out if working memory influences the academic performance of college-level science students. The primary goals of the research were to compare working memories and academic performance of male and female science students. This study included both male and female college science students as participants. Using multistage cluster sampling, 300 students were chosen - 150 males and 150 females, from the university clusters chosen as the research sample. 50 candidates were chosen from each institution. A questionnaire was chosen to assess the students' working memory. The academic performance parameter was evaluated using the students' grade based on their university performance. Study's nature was descriptive. Survey questionnaires were used to capture data from universities that had been visited in person. The standard deviation was calculated to analyse the data. The t-test with two tails was used for comparing men and women on the motivational variable and academic achievement.

The population's working memory scores followed a normal distribution. In addition, there was little disparity in working memory scores between either gender, and both genders demonstrated moderate working memory usage. The academic achievement results of male and female pupils were found to be comparable. Their academic achievement scores did not differ significantly. Science students at the university have been found to utilise working memory similarly when studying. Males and females had nearly identical means, with males having 51.31 and females 50.82. The average academic performance on university examinations was below fifty percent.

This study was done on university students. Since the secondary school is a crucial part of any student's career path, a study is needed to cover this age group and also to see if the Verbal WM has any direct relation to the need for achievement of the students. Also, research can be conducted to establish if need for achievement has any relation to the study habit pattern in India.

However, there was one research of working memory and academic achievement done on medical students which was conducted by **Ishak and other (2012).** It aimed to analyse the working memory of students at University Kebangsaan Malaysia (UKM) based on gender, program, year of study, study style, memorizing techniques, supplement intake, sleep hours and to appraise their relationship between working memory and grades obtained. It had a very different result with respect to effect of working memory on academic performance.

The methodology used in this analysis was a cross-sectional study which was done on second and third-year students of Environmental Health, Nutrition and Biomedical Science programs at Universiti Kebangsaan Malaysia (UKM).

157 participant students were selected through purposive random sampling for participation in the analysis, including 29 males and 128 females. All participants were divided in two sections. The data was collected through a structured questionnaire consisting of two sections. Section A contained demographic information, supplement intake, memorizing techniques, learning style as well as resting time. Section B consisted of Visual Working Memory Test and Arithmetic Test, which were altered from the Wechsler Adult Intelligence Scale IV (WAIS-IV) (Lichtenberger & Kaufman, 2009). The Statistical Package for Social Sciences for

Windows (version 17.0) was used to analyse the data and the techniques used were Independent-t test, Analysis of Variance (ANOVA), and Spearman correlation.

The majority of the students had average working memory scores (40% to 70%), according to the findings of the study. Approximately 24% of students performed well with a score exceeding 70%, while 17% scored poorly with a score less than 20%. No major variations were found between working memory scores and gender, program, or year of study ($p>0.05$). Likewise, memorization technique, study style and sleeping hours also showed insignificant association with working memory scores ($p>0.05$). The results also showed that there was no significant correlation between working memory scores and Cumulative Grade Point Assessment (CGPA) ($p>0.05$).

While exploring researches being done in the area of working memory (WM) and academic achievement, one research that stood out was one by **Tashauna L. et al (2016)**, where they examined different memory processes – working memory and recollection, and how they contributed towards academic achievement. Academic achievement differs from individual to individual. Of course, there are differences in academic achievement of children with learning difficulties and children without learning difficulties. However, even within typically developing children, there are variances in the academic achievement. There are several factors for this. The distal ones being parental interaction, socio-economic condition of the family, classroom techniques and proximal one being working memory.

The authors noted that though there were researches being done to learn how memory, working memory, or one of the components of working memory, affect or contribute to academic achievement, but there were very few or no research which studied multiple cognitive process and their contribution towards academic achievement. Theirs was the first study to be conducted on typically developing students where both, recollection and working memory, was studied.

For this research, the investigators examined both – working memory and episodic memory, as contributors to academic achievement. They used recollection as an aspect of working memory to understand its contribution to academic achievement. The sample for this study consisted of 81 kids mainly from Caucasian population and their parents were highly educated. For the recollection measurement the task from work by DeMaster and Ghetti (2013) was used. In this the children were exposed to stimuli consisting of black and white drawing having colored border. The children

were supposed to retain and recall the drawings related to the border colour at a later stage.

For assessing the working memory, the kids were administered backward digit span test. For evaluating the achievement of mathematics and reading, the Woodstock Johnson (WJ) III Tests of Achievement were utilised. Math assessment was based on calculation and math fluency while for reading, comprehension and reading fluency was used as the yardstick. Since verbal IQ was also used as a controlled variable for all the analysis.

The results were on expected lines on many counts. Using hierarchical regressions, the contribution of memory to maths and reading performance measures was analysed. Verbal IQ and age were used in the first stage while recollection and working memory was used in the second step.

The results were as follows:

Reading achievement:

Reading fluency

- Step 1 - Verbal IQ and age affected the reading fluency by 18% of variance
- Step 2 – Memory (WM and recollection) explained an additional 17% difference (contributed by verbal IQ and working memory but not recollection)

Passage comprehension

- Step 1 - Verbal IQ and age explained 20% variance in comprehension
- Step 2 – Memory (WM and recollection) explained an additional 23% of variance (Verbal IQ, WM and recollection all contributed to this variance)

Math achievement:

Math fluency

- Step 1 - Verbal IQ and age affected the math fluency by 10% of variance
- Step 2 – Memory (WM and recollection) explained an additional 12% of variance (all 3 variables contributed the additional variance)

Calculation

- Step 1 - Verbal IQ and age explained the variance of 32% in calculation
- Step 2 – Memory (WM and recollection) explained the variance of 7% (age, WM and verbal IQ contributed to the additional variance but not recollection)

As mentioned, the results demonstrated that both WM and recollection contributed to arithmetic and literacy performance when verbal IQ and age were used as controlled variables. These findings were not surprising but those related to recollection and academic achievement were bit variable. While recollection did contribute to achievement in passage comprehension but is did not however, did the same to reading fluency.

Since there is a strong relation between calculation and age, a more restrictive sample with respect to age would provide a greater comprehension of how memory plays a role in the achievement.

As discussed earlier, in one paper **George Miller (1956)**, discussed the limitations of working memory and proposed that the average person can hold seven items (plus or minus two) in their working memory simultaneously.

However, the paper by **Nelson Cowan (2001)** challenged the concept of the "magical number seven" and contended that the working memory capacity is actually limited to about four information chunks. It examined research on the limits of working memory capacity and offered a revised estimate.

Barrouillet, Bernardin, and Camos (2004) investigated the effect of time constraints and shared resources on the working memory spans of adults. The researchers sought to determine how the distribution of cognitive resources under varying time constraints influences working memory performance.

Participants in the study were adults who were given sequences of numerals to remember. Two variables were altered by the researchers: the extent of display time for each digit and the period between the display of the final digit and the recall phase. After the presentation, those who participated were instructed to remember the numbers in the exact sequence.

According to the findings of the study, the participants' working memory performance decreased significantly under time constraints. In particular, shortened display times and longer intervals between display and recall led to decreased memory spans. These results suggested that time restrictions had an adverse effect on the working memory capacity of the participants.

The researchers also investigated the function of sharing resources in working memory performance. They hypothesised that the cognitive resources available for

the storage and manipulation of information in working memory are restricted and may need to be shared among various memory system components. The research found proof backing the resource-sharing hypothesis, suggesting that when cognitive resources are constrained because of time constraints, individuals allocate fewer cognitive resources to encoding and maintaining information, resulting in a decrease in working memory capacity.

Adults' working memory capacities are negatively affected by time constraints, according to the research. It emphasised the significance of resource allocation and sharing for working memory performance. The findings contribute to the existing knowledge of the factors that influence working memory capacity as well as cast light on the importance of time constraints in cognitive processes.

In a cross-sectional study, **De Vita, Costa, Tomasetto, *et al*** studied the function of Working Memory (WM) in supporting early math learning and the contributions of different WM domains as well as processes to mathematical performance. The study analysed 66 second-year preschoolers and 110 first-graders. Multigroup path analysis was used to investigate the relationships between domains and processes of working memory and early math knowledge in each age category.

The analysis yielded intriguing insights regarding the contributions of various processes and domains of working memory to early mathematical knowledge. Visuo-spatial low-control WM forecasts initial understanding of math in infants, whereas verbal low-control WM predicts early understanding of math in first graders. On the other hand, visuo-spatial high-control WM and numerical–verbal WM emerge as significant predictors for both age groups, particularly among preschoolers. These results shed light on particular WM domains and processes that exert the greatest influence on the formation of early mathematical knowledge at various stages of development. Implications of the study include the potential design and implementation of training interventions that focus on specific WM skills and are tailored to the requirements of children before they begin formal education.

Peng and Kievit (2020) discussed the significance of academic and cognitive development in children's overall development in a very informative article wherein recent research findings on the two-way relationship between cognitive capacities and academic achievement were discussed.

The review's findings indicate several important points:

1. Academic achievement and mental abilities, such as working memory, reasoning, and executive function, influence each other's development, especially in reading and mathematics.
2. The development of reasoning skills is influenced positively by direct academic instruction.
3. The bidirectional relationship between cognitive skills and academic achievement appears to be weakened in children from disadvantaged backgrounds, such as individuals with special needs or socioeconomic disadvantage.

In accordance with the theory of mutualism and the transactional model, these findings suggest that superior quality education play a crucial role in nurturing children's academic and cognitive development. The article emphasised the significance of enduring and effective educational environments that can stimulate cognitive-academic bidirectionality and promote the holistic development of children.

Pascual, Muñoz, & Robres (2019) investigated the relationship between working memory (WM) and math and textual literacy. Multiple frameworks of WM were put forward including one that differentiates between verbal and visuospatial WM based on modality. The objective of the investigation was to establish a connection between these WM modalities and academic performance, focusing on the distinction between mathematical and literacy tasks. Middle school students were evaluated on a variety of WM, mathematical, and literacy tasks.

Verbal and visuospatial WM can be distinguished, as confirmed by confirmatory factor analyses. In addition, the predictive power of these distinct WM factors to explain discrete parts of variance in math and reading varied. Overall, the results, emphasise the significance of recognising and taking into account the various working memory modalities when examining the connection between mathematics and reading academic achievement.

This longitudinal study by **Wilde et al (2016)** examined the interaction between kindergarten and early elementary school children's working memory development and their relationships with teachers and peers. Over the course of two school years, kindergarten and first grade, the study followed 1,109 students, half of whom were boys. There were three assessment waves: in the fall and the spring of the first academic year, and in the springtime of the second academic year. A visuo-spatial

working memory assignment was used to evaluate the children's working memory abilities.

The results uncovered compelling developmental links among working memory and the calibre of relationships with instructors and peers. Particularly, lower working memory levels were linked with a subsequent rise in teacher-student conflict and drops in teacher affection after a complete school year. Similarly, low working memory values were associated with a decline in social likeability during the same educational year. Intriguingly, an inverse relationship also appeared, with teacher-child conflict displaying an adverse correlation with the growth of working memory throughout the entire observation period. The established connections among working memory and social-relational variables stayed consistent through genders.

This study highlights the complex connection between the improvement of working memory and relationships with others in the context of early elementary school. The research suggests that the development of children's working memory may be fostered by positive interactions and relationships with teachers during their early years.

Ashley Goodwin (2016) investigated the working memory deficits of children attending either Special Educational Needs (SEN) or regular primary institutions. The research consisted of 28 participants between the ages of 7 and 11 who attended either a Special school or a regular elementary school. To evaluate working memory, participants completed the Automated Working Memory Assessment (AWMA), while instructors provided input via the Working Memory Rating Scale (WMRS) and Strengths and Difficulties Questionnaire (SDQ) for all those who participated. SPSS was used for a t-test with independent variables and Pearson's correlation coefficient for statistical analysis.

A t-test conducted revealed no statistically significant distinction between the two categories of institutions in terms of working memory. In addition, Pearson's correlation coefficient revealed a significant adverse relationship between impulsivity and both verbal and visuospatial working memory ($r = -0.515$, $p = 0.005$ and $r = -0.458$, $p = 0.014$, respectively). Unsurprisingly, there was no correlation between AWMA and WMRS. The outcomes coincided with those of previous research, confirming the reliability of the results. The study provided additional evidence for the considerable connection between hyperactivity and working memory. In addition, it cast light on the identification of working memory deficits and highlighted the

challenge instructors may have in recognising these issues. The study also suggested avenues for future studies to attain a more comprehensive and detailed comprehension of working memory in elementary school children.

This study not only contributes to the current understanding of working memory deficits, but additionally highlights the significance of treating hyperactivity-related conditions that have an effect on working memory. In addition, it highlights the importance of enhanced identification and support strategies within the educational context.

Reading employs a variety of mental processes, which include elementary tasks such as alphabet and word recognition to far more intricate procedures such as using working memory and applying efficient methods of learning. For complicated cognitive duties such as text comprehension, the ability to store and analyse information, that is dependent on working memory, becomes critical. So a research was explored which involved special ability students and was related to their reading skills.

The goal of this research conducted by **Nicolielo-Carrilho, Crenitte, Lopes-Herrera, & Hage, (2018)** was to evaluate the implementation of metacognitive techniques in reading, focusing on the phonological working memory among learners with disabilities related to learning. Furthermore, the study sought to determine if there is a correlation between these abilities and reading comprehension.

A total of thirty students, of both genders, aged 8 to 12 and engaged in elementary school comprised the study's sample. These individuals were separated into an experimental group (EG) and a control group (CG). Each participant was evaluated on their reading comprehension, phonological working memory, and use of metacognitive reading techniques. Using the Mann-Whitney test, a comparison of the information gathered from the two groups was performed. In addition, prospective correlations between variables were analysed using the Spearman correlation coefficient.

Comparing the experimental group (EG) to the control group (CG) revealed statistically substantial variations in the information at hand. In particular, a significant positive association was found between comprehension of texts, phonological working memory, and metacognitive test scores.

Students with learning disabilities demonstrated deficiencies in both phonological working memory and the use of cognitive techniques, according to the study's findings. The strong and positive correlation between the assessed abilities supports the idea that deficiencies in phonological working memory and the implementation of metacognitive strategies can indeed hinder reading comprehension.

The link among working memory skills and performance on national curriculum tests in English, math, and science was investigated by **Gathercole, Pickering, Knight & Stegmann (2003)** in 7 to 14-year-old children. At age 7, proficiency across language and math were substantially correlated to mental capacity, especially execution of complicated span activities. At fourteen years of age, substantial correlations persisted within sophisticated cognitive test results as well as achievement levels in math and science subjects, but there were no significant correlations between English proficiency and working memory capability. The outcomes indicate that the mental operations required in math and science are limited by the average working memory capacity throughout infancy. While achievement in learning the basics of literacy (as measured by English examinations at the earliest age) correlated as well to cognitive capacity, accomplishment in the more advanced abilities of understanding and evaluating the content of literary works in English (measured at 14 years) was independent of working memory capability.

Allan Baddeley (2020) discusses the consensus among various theories regarding verbal short-term memory in his book. If verbal short-term memory were to be represented by a single task, it would be digit span, in which lengthier sequences of digits occupy a larger portion of the short-term storage system. This theory assumes that working memory is supervised by the central executive, a mechanism for attentional control, and is not merely a memory system. It adheres to the model proposed by D. A. Norman and T. Shallice, which proposes two modes of control: one based on established practises and the other on a limited attentional executive. In addition to directing attention to the current task, the central executive is also responsible for the ability to divide attention between multiple duties.

2.2 Study Habits

A study was undertaken in the southern state of India, to understand the study routines of the medical pupils of first year and to see if there was any relationship of the same to the way they perform in their exams. For this **Sreelekha V. et al (2016)** took a

sample of 80 first year MBBS students which included both the gender. The participants self-assessment test which has been developed by M Palsane and Sadhna Sharma, to assess their study habits. On the basis of these scores, the students were grouped into two categories. The first group consisted of students who had good study habits while the other group was of students who had poor study habits.

The Group I students were the ones who had a total PSSHI score of >210 while those with the total PSSHI score of <210, formed Group II.

Since the PSSHI consisted of 6 domains, in which the study habit scores were measured, any student with a domain score of >35 was also considered to be the one with good study habit skills. Anyone getting less than 35 in a domain, was earmarked as a student with poor study practices.

For measuring academic achievement, the researchers used the scores on the haematology test. The total marks obtained were out of a maximum of 25 and anyone with >50% marks (i.e., 12.5) was considered as a student with good academic performance.

For both the groups the scores of PSSHI were compared with the academic performance. It was found that the Group I which had a high study habits scores also had high academic performance in the test conducted on Hematology. The coefficient of correlation obtained for the first group was 0.87 for which the p-value was <0.0001, and it was statistically significant and meaning those having proper study routines and patterns fared better in the exam. For Group II, there was a similar observation. The coefficient of correlation (r) was 0.98 and the p-value was <0.0001, and it again was very substantially important. This meant that individuals with weak study habits had lower scores on the test of section completion.

Researchers concluded that good study habits result in better academic performance. However, they also noted and suggested that the surrounding factors of the students – the parents, the teachers and college administration– should concentrate on helping all students create healthy study habits rather than seeing how many hours did the student study or how many tests were conducted and their frequency or how many teaching hours were devoted to them. The emphasis should be on smart learning rather than just hard work.

Since this study was conducted only on first year medical students, there is a scope to extend this research to other faculties of learning and the same can also be done on school level to see what relationship exists among study habits and academic performance. Also, no other factor, like achievement motive, was considered and hence the need for the current study.

Continuing with the researches related to study practices as well as the academic achievement, one more research comes to light which was done by **A.S. Arul Lawrence in 2014**. A survey was used in this study, to acquire data from 300 high school students, i.e., students who have completed their 10th Standard and were either in 11th or 12th standard. Also, for the purpose of measuring their academic performance the researchers used the marks obtained in the quarterly exams conducted by the schools. For the measurement of study habits of the students, the Study Habits Inventory by V.G. Anantha (2004) was used. The statistical techniques used included percentile analysis, 't" test, ANOVA and Pearson's product moment correlation.

The data analysis revealed that majority of students in both Class 11th and 12th had moderate levels of study habits. The same inference could be made for academic achievement, wherein 698.9% of Class 11th students had moderate academic achievement while 57.7% of Class 12th students had moderate academic achievement.

A significant difference was found among the study practices of 11th Standard and 12th Standard school children, with Class 12 students having superior study habits. It was also noted, that the same could be because Class 12th was an important intersection in the life of students as the results determine what future professional course they can enroll into.

The data also revealed that the residential status of the students had a significant impact on the students' study behaviours. This meant that the study habits of hostellers were better than the day-scholars.

However, there was no correlation between secondary school students' study practices and their academic performance.

Quilez-Robres, A., González-Andrade, A., Ortega, Z., & Santiago-Ramajo, S. (2021) explored the relationship between study habits, general intelligence and short-term memory as well as to identify their capacity for predicting preschool students' academic performance.

According to the Programme for International Student Assessment (2015), low academic performance is a significant issue that is associated with difficulties in securing improved employment, which in turn leads to people taking jobs that are not stable and lower paid. This cycle can be prevented if early intervention programs could be designed and implemented during elementary schools which uncovers the factors related to academic performance. There are numerous studies which were conducted to identify the most influential factors for academic success. While there have been several researches which have pointed out that intelligence capacity is one of the most important factors for the academic achievement, however, with respect to other cognitive factors, short term memory has also been researched to in relation to this.

It is crucial to note that STM enables the retention of information for a limited amount of time and requires no executive control **(Swanson & Kim, 2007).** Also, intelligence quotient is highly correlated with working memory **(Conway et al, 1999).**

Among non-cognitive factors, study habit is one of the most important one. Few researchers have found that college students' study practises and motivation are significantly related to their academic performance **(Crede & Kuncel, 2008)**.

The non-cognitive factors are independent of the student's intelligence though they are directly related to acquiring new learning **(Crede & Kuncel, 2008)**. The researcher noted that there have been many studies which have tried to find a correlation of various factors and their effect on academic achievement, however, these were spread over several different age groups ranging from 11-15 years, or 13 - 15 years or 17-44 years. As such the researcher wanted to focus on elementary school students and find out the most important predictor of academic performance amongst study habits, short-term memory as well as IQ over two-year period. For this, a sample of 74 elementary students was selected from Aragon (Spain).

To measure the abovementioned factors the investigators employed tests developed by Yuste for testing intelligence and memory. To understand the study-habits a questionnaire developed by Alvarez et al (2015) was used while the school children's academic achievement was measured by their grades obtained in the last exam.

The collected data revealed a correlation between academic performance and the three variables of studying patterns, IQ, and short-term memory. The researcher also included age as a controlled variable and however, no significant correlation was found. According to the multiple regression analysis, the factors in question have a 59% prediction potential with $p<0.001$. Though the short-term memory, gender and age were not significant predictors but, study habits and IQ were significant predictors.

The findings suggest that the parameters can predict 12% of the difference between the third and fourth grades. IQ and study practises were significant factors once again. This meant that the study habits and IQ are associated with opposite effects on academic year-to-year change.

This study was focused on elementary school students to enable devising early intervention program to get the desired results which could have positive effect on students' academic achievement. However, this research was being done for the adolescent students to see how verbal working memory can predict the students' academic achievement.

Evans and Julius (2015), carried out a research on the association of students' academic performance and their study habits among Spicer Higher Secondary School students in India. In this particular research, the effect and influence of students' study practices on their performance in school were observed. A quantitative study was conducted on a randomly stratified sample of Indian respondents.

The 9th grade students of Spicer Higher Secondary School were chosen to establish a correlation between the study practises inventory by N.M. Palsane and school evaluation transcripts. Findings' interpretation and recommendations were computed and analysed using Pearson's product moment correlation coefficient. The research revealed a remarkable 0.66 correlation between study habits and academic performance. In order to improve academic performance, it is evidently necessary to cultivate effective study habits. Though the entire learning and teaching process in all institutions is geared towards the accomplishment of higher academic performance, little is done to improve students' study habits in order to achieve this goal. The result indicates that institutions do little to cultivate study habits. Students are expected to have excellent study habits, while teachers are expected to be knowledgeable about the application of study principles, in order to provide guidance on study techniques.

Study patterns differ from person to person, but certain habits that enhance academic performance can be inculcated. Habits including scheduling study time, regularly attending classes, concentrating on study, and managing the school and home environment. Instilling good study habits proactively at the elementary level will foster elevated values and stimulate the academic environment. To improve students' study habits, instructors should enforce interactive relationships with students that encourage intellectual reflection. The research findings suggest that parents, instructors and students should recognize positive study habits, discover methods to improve them, and implement them in educational institutions in order to increase student academic achievement.

Learners who invest greater time in class are more successful **(Battle and Lewis, 2002)**, and individuals working harder are more successful **(Carbonaro, 2005, cited by Barry, 2006),** according to previous research on study practises.

According to **Issa et al. (2012),** students' regular reading practises influence their study behaviours and future educational achievement. The correlation among students' reading habits and their academic performance is widely acknowledged.

He investigated the reading preferences as well as interests of majors in different branches at the Polytechnic institute in Offa. The study employed a survey research methodology to acquire information. To assure the reliability of the instrument, students of accountancy stream, from the same institute participated in a pilot test. The Reading Interests and Habits Questionnaire (RIHQ) had a reliability coefficient of 0.88. 246 of the 250 questionnaires administered were considered for analysis.

The findings indicated that the majority of students engage in utilitarian reading. Particularly during examination periods, they inclined to study their own notes and course books. Their main resource of their material to read was their instructors' educational materials and journals. The study identifies several factors that impede the development of their reading inclinations and practises, such as an unfavourable atmosphere at home, the a low socioeconomic standing of their parents, limited access to relevant reading materials, and a lackadaisical attitude. To address the above issues, the study suggests nurturing a conducive home environment, reorienting parenting strategies, and improving the operational efficiency of the school library system.

In a research done by **Bhan and Gupta (2010),** the academic performance and study practises of scheduled caste and non-scheduled caste students, were evaluated. The findings of the research indicated that there was no substantial impact of on the academic achievement and study habits of students in question.

Reading involves contemplating, evaluating, assessing, envisioning logical reasoning, and solving problems. It is an indispensable tool for knowledge transfer, and the reading habit is a learning process that enhances techniques for reading. By perusing papers, books, and different periodicals, a child facilitates himself in learning about the global community and its environment. Once a child has learned to read and cultivated a passion for literature, he can investigate a vast array of life experiences and information through reading. It is difficult for children to develop good reading habits later on if they are deprived of the opportunity to interact with books during their formative years.

Higginbotham (1999) investigated the reading habits of 6^{th}, 7^{th} and 8^{th} graders in a metropolitan, public school in Atlanta, Georgia. The purpose of the research was to identify significant patterns in reading preferences and to identify possible gender-related differences. It was hypothesised that the findings would indicate differences in gender as well as different categories of reading interest.

The analysis employed a chi-square technique to evaluate the reading preferences across the whole group as well as to assess reading preferences among boys and girls. The results of the investigation disclosed notable reading preferences among the students. Humour as well as horror appeared to be the most popular categories, with additional interest reported for books/literature which dealt with suspense, history, science and adventure, while literature related to animals were popular in the non-fiction piece.

The findings of the research revealed significant gender-based disparities. Female respondents favoured literature which dealt with Friendship, Animal, Romantic relations, Risks and Adventure, as well as history more than their male counterparts. On the contrary, male participants exhibited a greater preference for Sports and Science. Additionally, the findings revealed that male participants strongly preferred non-fiction more than their female counterparts.

Additionally, **Ward (1997) and Agbezree (2001)** undertook a study on the primary and secondary levels of education in Ghana.

In a horizontal descriptive-analytical research **Jafari, H., Aghaei, A., and Khatony, A. (2019),** investigated the association between medical sciences students' study practises and their educational achievement at the medical college.

380 students were randomly selected from different faculties using proportional sampling.

The study aimed to answer three questions:

1) the status of students' study habits,
2) the status of students' academic achievement, and
3) the connection between study-habits and academic success.

The results showed a significant correlation among students' study-habits and their academic achievement.

In this study, the size of the sample was determined by using a computer software. The goal was to have a minimum of 328 participants. To account for the potential of 15% non-response, 380 students were enrolled from several faculties at the university. The samples were randomly selected from each faculty in proportion to the number of students, using a random number table. The criteria for inclusion were the willingness to participate and being in their second term or higher. Participants who were absent on the sampling day or failed to complete the questionnaire in full were excluded from the study.

Personal information forms and study-habit test (PSSHI) comprised the research tools. The personal information form collected information regarding gender, marital status, age, medical branch, diploma, historical data related to educational probation, birthplace, and past term GPAs.

The PSSHI, developed in India in 1989, serves as a reliable tool for measuring students' study habits. The original questionnaire's validity and reliability has been established in previous research by Siahi and Maiyo and its Persian version has been reported to have a reliability coefficient of 0.88 by Rezaie Looyeh H. In this study, content validity was determined by having 12 panels of KUMS experts review and provide feedback on the questionnaire, which was then modified accordingly. The

reliability was tested using the test-retest method and was found to have a correlation coefficient of 0.87.

The PSSHI assesses various aspects of study patterns and routines of the learners, like how well they manage their time, how is their surrounding environment, how motivated they are towards their education, how they prepare and appear for their exams, what are their reading capabilities and how often do they take notes while in classroom or while studying. They have to respond how often they do or not do a particular thing for each question and they are given scores from 2 to 0. A score of 60 or above on the questionnaire is considered desirable, 31-59 is considered moderate, and 30 or lower is considered undesirable.

Academic achievement was determined by the student's past term GPA, with scores of 17 or higher being considered good, 14-16.99 being considered moderate, and below 13.99 being considered poor.

A review of the literature on the interaction between studying routines and academic success reveals that study habits perform a crucial part in determining the educational success of students. Many researches have shown that students with good study habits, such as studying in a quiet place, studying daily, taking notes, having regular rests and breaks, and prioritizing difficult content, outperform those who have poor study habits, such as procrastination, studying in inappropriate conditions, and exposure to distractions like loud music and television.

How study practices and academic achievement are related, this area has been studied in several settings, including medical schools, and the results have been consistent across different populations and geographies. A study conducted at 21 Iranian medical universities revealed that a third of students lacked significant study techniques and routines, and students with better study habits tended to have better academic performance. Other studies have discovered a strong and statistically significant connection between the way students study and their academic performance. According to Lawrence, however, there are studies that have discovered no correlation between study practises and academic performance. This variation in results demonstrates the complexity of the connection among study practises and academic performance, which is possibly impacted by a variety of factors including individual differences, the setting in which one studies, and other private and social variables.

In conclusion, the literature review leans towards the idea that study habits play a critical role in academic performance and that students who have better study habits tend to have better academic outcomes. However, further research is needed to fully understand the relationship between study habits and academic performance and to identify the best strategies for improving student study-habits and academic success.

To understand effects of different factors which could affect the performance of the learner community in school, a research was undertaken for understanding the adolescent students' study-habit patterns along with impact of their socio-economic status by **Prof. Shubha Vyas and Garima Choudhary in 2016**. The researchers used a study-habit test and Socio-economic standing Scale to measure adolescent students' study behavior as well as social and financial standing in India. The sample consisted of 450 students from the schools of Delhi, where each region was covered by 2 government schools and 1 private institution. The students were categorized into 3 socio-economic status (SES):

a) High
b) Middle, and
c) Low

The study habit scores for each category, further categorized by gender, was compared using one way ANOVA. Correlation technique was also employed in determining what relationship between did the socio-economic status had on study habits.

There were some interesting findings from this research. There was no significant variance in the study practices of teenagers across both the gender. Also, the same was true for the higher socio-economic status students, i.e., the gender had no influence over study patterns and routines of adolescent students among higher socio-economic status. Similar was the observation for the students among the middle socio-economic status.

A different observation was however made in the low SES adolescent students, where female scored higher on measures of study-habits compared to male students. This meant that the gender of adolescents with the same low socio-economic status affected their study patterns.

However, when it came to study habits pattern among the different categories of socio-economic status, there were significant differences which were observed. Similarly, average study habit scores of adolescents with higher socioeconomic status were higher than those of adolescents with intermediate socioeconomic status. Similar results were found between the average study habits scores of students with medium and low socioeconomic status; the average score of study-habit for students pertaining to the middle level of SES were higher than those of low SES students.

Evidently, a significant correlation amongst the social and financial condition as well as study habits among adolescent students was observed.

The relevance of this study is more due to the fact that looking at our current social fabric, there are vast differences in the availability of resources for students of different socio-economic status. Such studies help in laying down strong arguments for establishing a system where all students are given equal opportunities and those with less exposure to the learning resources, are given priority, so that as a nation, we can ensure that every student realizes his/her full potential.

While this study takes into account one important social factor of economic status and its impact on the study habits of adolescents, not much has been done to view other factors like effect of verbal working memory of students and its impact on their study habits. Also, the above research was done on school students, while the current research focusses its attention on both school as well as college students.

To understand the connection between the study habits and its influence on learning and the academic achievement, a research was done by **Rezaie Looyeh et al., in 2013-14** on the medical students of the Guilan University in Iran. It was descriptive and an analytical study which was conducted to learn more about the above objectives.

The sample selection was done using stratified sampling method. The data was collected through a study habit test, where questions regarding 8 areas were asked. According to data collected from 461 students, most of the students demonstrated academic performance which was average. The analysis established the correlation between various areas of study practices and academic achievement. The findings demonstrated high correlation with the area of “noting” and academic performance whereas the relation of “wellness” with the academic performance was the least. This

meant that students who had habit of taking notes, they remembered the concepts better and hence their academic performance was better than the ones who did not keep proper notes. Those students who did not take notes, often relied on the notes of their classmates and which often resulted in academic results which were less desirable. Similarly, the low correlation of academic performance with the wellness score was linked with the fact that even when students are not well before the exams, they dedicate their time studying for their exams and hence they are able to perform better.

Overall, the research discovered a significant relationship within students' study behaviours as well as academic success. In addition, they determined that the study habit scores were able to forecast 6.8% of academic performance shifts.

The aim of the study was to provide insights to the educators, planners and the students as to what they can do to enhance the overall learning experience and hence the academic performance. The identification of areas of improvements in the study habits and timely intervention can provide better results in terms of academic performance. Since one can teach study habit skills if proper strategies are included in the curriculum of the students and they are directed to follow those, this can show positive results in their performance not only in the field of education but also in future where one seeks to build a career.

The research does not include Indian students and also is limited to college students that too in the field of Medical science. Our research tries to study the effect of verbal working memory and its impact on study habit and the academic performance as well as achievement motive of students in India.

Kaur and Singh (2020) compared the connection within study habits and academic achievement. The intent of this research was to find out how various study practises affected students' performance in school.

The analysis was done by employing a method of quantitative analysis and gathered data from a representative sample of students. Participants filled out self-report questionnaires evaluating their habits related to their studies and their performance in the school.

The study uncovered a strong correlation among study practices and academic achievement. The students’ academic performance with effective study habits was

typically superior to that of students with weak study habits. Effective study habits included time management, organization, active learning strategies, and consistent review.

These findings demonstrate the significance of developing effective study habits for enhanced academic performance. The study indicates that promoting time management, organization, and active learning can have a positive effect on students' academic performance.

The association between mental health, achievement motivation, and academic performance of medical sciences students was the focus of the research. The researchers intended to investigate the interrelationships between these variables and the potential influences of background factors. The sample comprised of 430 Kurdistan University of Medical Sciences students chosen at random.

The researchers used the health questionnaire and a motivation test to assess mental health and achievement motivation, respectively. The correlation between mental health and achievement motivation was statistically significant (p .001), indicating that students with superior mental health tended to be more motivated (p .001). However, there was no correlation between mental well-being and academic achievement.

In addition, the investigation discovered a strong correlation between achievement motivation and academic performance (p =.025). This indicates students with higher motivation to attain their learning objectives performed better academically. No correlation was found between demographic factors and mental health; however, discipline of study and marriage status were correlated with academic success and motivation to succeed.

To conclude, the study emphasizes the significance of maintaining students' motivation, especially in the medical profession, as it is crucial to their academic success. In addition, students with improved mental health tended to demonstrate greater academic motivation. These findings highlight the importance of bolstering students' motivation and mental health to improve their academic performance in the medical sciences.

The objective of **Sherafat and Murthy's (2016)** study was to examine the study patterns and educational achievement of middle and high school pupils in Mysore.

The researchers wanted to investigate if any relation existed between these students' study behaviours and academic achievement.

Using a stratified random sampling technique, the research was carried out on a randomly selected group of 625 understudies from Mysore, India.

Secondary and senior secondary school students from multiple Mysore, India, institutions participated in the study. The researchers obtained data through self-report questionnaires that measured study habits of pupils and garnered information about the academic accomplishments as well.

The results of the study revealed a strong connection between study habits and academic performance. The academic performance of students with effective study habits was typically superior to that of students with weak study habits. Effective study habits included time management, organization, active learning strategies, and consistent review.

These findings lay importance on the significance of developing and promoting effective study habits among students of middle and high school for improving the students' performance in school. The investigation suggests that time management, organization, and active learning can have a positive effect on students' academic performance.

In the study conducted by **Verma (2016)**, the relationship between high school pupils' study habits and academic performance was analyzed. The investigation sought to establish significance of the correlation among learners' ways to study as well as their academic achievement.

The sample consisted of high school pupils, and self-report questionnaires were used to collect data. These questionnaires assessed various aspects of students' study routines, including their study schedules, time management skills, organizational techniques, and levels of concentration. In addition, the academic accomplishments of the students, such as their grades and test scores, were collected.

After analysing the data, this research showed a strong correlation among study practises and academic achievement. In particular, students with effective study habits tended to have higher academic performance than those with ineffective study habits. Effective study habits included maintaining a structured study schedule, managing

time efficiently, employing effective organization techniques, and maintaining concentration and focus during study sessions.

This study's findings emphasize the significance of fostering and promoting effective study habits among secondary school students. Implementing study techniques such as effective time management, organization, and concentration can have a positive effect on students' academic performance. Students are more likely to maximize their learning potential and attain superior academic outcomes if they cultivate these study habits.

Milton J. Dehn's 2008 book, "Working Memory and Academic Learning: Assessment and Intervention," focuses on the connection within working memory and success in the academia. The book discusses the difficulties that working memory deficits cause for students in the classroom, impairing their ability to acquire and retain information. Dehn provides thorough insights into working memory capacity evaluation and offers useful intervention options for parents and teachers to help students who struggle with working memory.

The importance of working memory in a variety of academic tasks, including reading comprehension, solving mathematical problems, and obeying directions, is emphasized throughout the book. It describes how working memory is involved in executive functions, attention regulation, and sophisticated cognitive processes that are essential for effective learning.

In order to help educators and psychologists discover areas that need attention, Dehn provides numerous evaluation techniques and approaches. Teachers can adapt interventions to address specific deficits and assist students in creating coping mechanisms to enhance academic achievement by assessing a student's working memory profile.

The book provides intervention tactics that are intended to improve working memory capacity and lessen its negative effects on learning. These methods include teaching methods, study tools, and flexible learning settings. The objective is to give students the tools they require to manage their working memory constraints and achieve academic success.

This book offers educators, psychologists, and parents a thorough resource for helping kids with working memory issues. It emphasizes the significance of early detection

and intervention in order to generate better learning outcomes and experiences for kids in academic contexts.

Alzahrani, Park, and Tekian (2015) aimed to analyse medicine students' association among the study patterns, gender, as well as variables which are not related to learning, and their academic achievement. Scholars at Taif University were surveyed regarding their study habits, like study time, study companions, study interruptions, attention difficulties, breaks, study materials, study exertion, and delayed study.

59% of the 257 pupils who responded had an excellent grade- point normal (GPA), while 41% had a low GPA. Half of the population was of men and half were women. Significant differences were observed with respect to time spent studying, study materials, study interruptions, and study enjoyment between scholars with high and low GPAs. Study time, study styles, breaks in study, exertion of the students, and delayed study time displayed gender differences.

The study concluded that gender differences in study routines have a substantial impact on the academic achievement of the participants. In light of significance of academic achievement in medical education, the findings emphasize the need for curricular variations and interventions to ameliorate literacy issues. These findings can be used to enhance educational strategies and grease the enhancement of medical pupil learning issues.

Hassanbeigi, Askari, Nakhjavani, M., et al., (2011) conducted a study to determine the connection among multiple study skills as well as the academic success of undergraduates. Here is a summary of the most important aspects study:

Subjects included a total of 179 boy and girls studying dentistry as well as medicine.

The "Study Skills Assessment Questionnaire" served as the researchers' tool. This survey came from Houston University's counselling services and was validated by ten psychologists and faculty members the university.

The statistics collected from those who participated were analysed with the Kruskal-Wallis test, a form of non-parametric statistical analysis utilised for comparing groups.

Individuals with a greater overall grade point average (15 or more out of 20) exhibited significant greater success in all seven examined skills, according to the study's

findings. These abilities included managing time and putting off tasks, memory and focus, study aides and taking notes, strategies for tests and test anxiety, organising and digesting data, motivation and attitude, as well as reading and identifying the main idea.

The research concluded, according to its findings, that instructing undergraduates on study skills could play a significant role in enhancing their academic achievement.

This study emphasises the significance of study skills to the educational achievement of students. It indicates that students with superior study abilities have higher GPAs on average. This knowledge may be useful for educational organisations and teachers who are thinking about integrating study skills enhancement into their educational programme in order to improve the academic performance of students.

2.3 Achievement Motive

The partnership between motivations for success and relational frameworks for goals in educational settings has been the subject of extensive research. The interaction between individual achievement incentives (such as competition, work competence, and loss aversion) and competitive or cooperative objectives in schools was the focus of a study by **Zhou and Wang (2021).** The relationships between these variables, as well as reading achievement and reading self-concept, were investigated using a supplementary multiple level assessment of data from China and America from the PISA 2018 study. Competitiveness as well as work expertise motives positively influenced reading self-concept, while competitive goal structure affected reading achievement. Notably, the competitive objective structure exhibited negative moderation effects in the Chinese sample, altering the relation between work mastery motivation and academic outcomes, and between competitiveness motivation and self-concept. The study illuminates the intricate relationships between achievement motives, goal structures, and academic outcomes, casting light on their implications for educational theory and practise.

Jowkar and associates (2014) investigated the connection between achievement objectives and resilience in academia, building on the well-established achievement goal theory. This theory has demonstrated how differences in engagement, task persistence, and academic resilience can be understood in the context of achievement objectives.

Senior secondary learners which included 297 boys and 307 girls participated in this investigation. A questionnaire to measure achievement and survey which measured various skills were completed by them. Analysis of this data included Pearson product-moment correlations to investigate the relationships between variables and simultaneous multiple regression to predict educational tenacity by means of approaches towards achievement objective.

The results demonstrated significant associations among the above mentioned factors. The "mastery-approach" orientation in particular emerged as a strong indicator of home and peer care segments for educational resilience. These analysis suggest that various achievement goal orientations have varying effects on particular aspects of academic resilience. Overall, the findings demonstrate the significance of achievement goal orientations in determining students' academic performance.

Bargamadi, Mahdian, and Yamini (2019) sought to evaluate the effects of teaching Mindfulness and Working Memory on educational well-being, scholastic self-control, and motivation for achieving academic success of students in secondary schools. A semi-experimental methodology with two stages of testing structure and a control group comprised the study. The sample consisted of 45 individuals with lesser scores on the three dependent variables, who were separated into one control group and two experimental groups.

Using the Educational Well-Being Questionnaire by Tuominen-Soini et al. (2012), the Self-Regulatory Questionnaire by Kanle and Royan (1987), and the Achievement Motivation Questionnaire by Abd Khodaie (2008), data were collected. The experimental groups received training in mindfulness and working memory, while the control group did not. Both intra-group (test) and intergroup (group membership) factors were considered in a variance analysis to determine the efficacy of the interventions.

According to the findings, both mindfulness education and working memory training improved academic well-being, academic self-control, and learning motivation among students. In addition, the results revealed a substantial distinction efficacy of working memory training and mindfulness education. The study concluded that mindfulness training is more effective than working memory training in enhancing academic well-being, academic self-regulation, and academic performance motivation.

In the study conducted by **Marion A. Eppler & Beverly L. Harju (1997)**, the researchers explored the applicability of Dweck's model to college going students. As per the Dweck's model of achievement, individuals can either of the two mindsets:

1. fixed mindset – where individuals are of the view that their abilities are fixed and hence, they focus more on demonstrating their abilities to avoid failure
2. growth mindset – where individuals believe that with additional effort abilities can be learnt or improved

Also, as per the model, there are two types of goal orientations:

1. performance goals – where the focus of the individual is to demonstrate competency and outperform others
2. orientation goals – where focus is on learning new skills and better learning

The researchers' objective was to examine association of goal orientations as well as educational achievement of college scholars. Within the college students, the two groups studied were – traditional and non-traditional. The traditional students were defined as the ones who were below the age of 25 years, not married and were not employed for more than 20 hours per week. Any other student, who did not meet any one of the above criteria, was classified as non-traditional student.

To measure the achievement motivation goals the Achievement Motivation Inventory was used. Educational achievement was measured by using the average of grade point, which was obtained from the University records.

The sample consisted of 262 undergraduate students. Statistical tools were employed to study the variance in the average of the two groups of students, and multiple regression analysis was employed to study the association between academic performance and goal orientations, while controlling other factors like age, marital status, work status and gender.

The results were on the lines of the Dweck's model, where both the group of students have higher preference for learning goals than performance goals. However, the non-traditional students' endorsement was more than the traditional ones.

The results also demonstrated that educational focus could be used as a more precise indicator of academic success than the status of the students. This meant that the motivational factors were more important than the demographic factors.

It also found that for traditional students who had irrational beliefs about their performance were less likely to do well in their studies. While for non-traditional students, work hours had an inverse relation with their academic performance.

In summary, the study highlighted that goal orientation was an important predictor of academic success of both traditional as well as non-traditional students. The findings can help the policymakers and learning community to develop interventions and programs that could address students' motivational factors to improve the academic results.

However, in India, the concept of traditional and non-traditional students is not much prevalent and also, the current literature does not take into account the cognitive factors like verbal working memory, to see how it can impact the academic results of the students. Also, this study only dealt with the college going students. But since the idea of how success looks like, starts taking shape during the school years, it is necessary to study that age group and see how motivation and academic performance can be liked to each other.

In a study conducted on outstanding students of Majmaah University by **Mai Fathi Al-Baghdadi et al., (2021)**, a highly significant positive connection was discovered across academic motivation and working memory. In fact, a positive correlation was found in both the audio number memory as well as the category classification memory with the achievement motivation. Additionally, it discovered a positive relationship among memory of maps and directions & achievement motivation. The study was conducted on 60 students of the university whose GPA scores were equal to or more than 4.5.

Executive functions and its various components, which include working memory as one of its components, have been studied together to find out how they affect the academic performance. In a research by **Court Pascual et al (2019)** on 133 children aged 6-9 years, an investigation was done to find how the relationship as well as the forecasting capability of the executive skills and its various components with the academic achievement – both general achievement and specific achievement in the subjects of Language Arts and Math. The relationship obtained between overall achievement and academic performance as well as specific achievement and academic performance, was not significantly different:

- Overall achievement and executive functions - r=0.392
- Specific achievement Language Arts and executive functions - r=0.361
- Specific achievement Mathematics and executive functions - r=0.361

However, working memory component of executive functions demonstrated a stronger relationship with overall as well as specific achievement.

- Overall achievement and executive functions - r=0.512
- Specific achievement Language Arts and executive functions - r=0.475
- Specific achievement Mathematics and executive functions - r=0.505

Another component of the executive functions – task monitoring showed a similar relation with the academic performance and so it was concluded that the study provided an insight into the components of executive functions which had greater impact on the academic performance, general as well as specific.

Villa and Sebastian (2021) investigated the impact of motivation to succeed, locus of control, and study practises on the math proficiency of 258 first-year undergraduates. Using self-report questionnaires, the researchers collected data from a sample of first-year college students and assessed their levels of motivation to succeed, locus of control, and study practices. Using academic performance indicators, mathematics achievement was evaluated.

The study found that, motivation to succeed, study patterns and locus of control were all significant indicators of mathematics achievement among first-year college students. Higher levels of achievement motivation and an internal locus of control, in which individuals perceive that they have control over their outcomes, were associated with improved mathematics performance. Furthermore, efficient study habits significantly predicted mathematics achievement.

These results highlight the significance of psychological factors and study habits in determining the mathematics performance of students. Fostering a strong drive for achievement, cultivating a personal sense of control, and promoting efficient habits of study may have a positive effect on students' mathematics achievement, according to the study.

ElAdl and Alkharusi (2020) examined the connections between methods of self-regulation in learning, motivation for learning, and math achievement. The focus of

the investigation was to assess how strategies for self-regulated learning as well as learning drive influenced students' mathematical performance.

238 ninth-grade pupils from the Sultanate of Oman participated.

Self-report questionnaires were used to capture data from a sample of students involved in the study. Students' self-regulated learning strategies, such as setting goals, managing time, and self-evaluation, were evaluated via these questionnaires. In addition, the study assessed the intrinsic and extrinsic learning motivation of students. The mathematical aptitude of students was also evaluated.

Significant a positive connection was discovered among self-regulated learning strategies, motivation to learn, and success in mathematics. Students who utilised efficient self-regulated learning strategies and exhibited high levels of learning motivation tended to perform better in mathematics. In particular, goal setting, time management, self-evaluation, and intrinsic motivation have been identified as key contributors to enhanced mathematics achievement.

In the context of mathematics education, the results emphasise the significance of promoting methods of self-regulation in learning and nurturing intrinsic motivation in students' learning processes. Mathematical performance can be improved by encouraging students to set objectives, manage their time well, and engage in self-evaluation. Moreover, fostering intrinsic motivation by emphasising the value and delight of mathematics learning can also contribute to enhanced performance in the subject.

Sharma and Sharma (2018) examined the relationship between motivation and academic achievement in their study. The purpose of the study was to determine how student motivation affects their academic performance.

Data was gathered through questionnaires and academic transcripts from a sample of participants in the study. The questionnaires evaluated several facets of motivation, including intrinsic drive, extrinsic drive, along with beliefs regarding self-efficacy. Individuals' educational records, such as ratings and test scores, were utilised to determine academic achievement.

The study found a strong positive relation among motivation and success in the field of education. Individuals with greater degree of intrinsic and extrinsic motivation tended to attain better academic results. Additionally, self-efficacy beliefs, which

reflect students' conviction in their academic success, were identified as an important factor influencing academic achievement.

These findings highlight the significance of student motivation to their academic success. Academic achievement can benefit from encouraging intrinsic motivation, such as by fostering a passion of learning and advocating autonomy in education. Providing external motivators, such as recognition or rewards, can also contribute to enhanced academic performance. Furthermore, fostering self-efficacy beliefs by imparting confidence and giving opportunities for success could enhance students' academic performance.

In a study conducted by **Ishihara, Morita, Nakajima, Okita, Sagawa, and Yamatsu (2021),** the connections between achievement motivation, physical heartiness, and academic performance in Japanese schoolchildren were delved. The goal of the study was to examine if any association was there among the drive to succeed, physical well-being, and achievement in school, with an emphasis on whether these connections vary between boys and girls.

12-13 year-old pupils (172 males and 153 females, totaling 325) were named by the experimenters to gather the information. Utilised measures included tone- reported questionnaires to examine achievement motivation, assessments of physical fitness to estimate colorful aspects of fitness, and academic performance data from academy records.

Both achievement motivation and physical fitness were having a positive correlation with academic achievement among pupils, according to the findings. When gender was considered, still, the association between achievement motivation and academic achievement was set up to be moderated. This suggests that the impact of drive to succeed on school achievement may differ depending on the gender of the pupil.

As a whole, the study demonstrates the significance of meaning achievement motivation and physical fitness as influential factors in schoolchildren's academic performance. It underlines the significance of taking into account prospective gender differences when analysing the complex commerce between these variables.

A stratified arbitrary sample of 400 undergraduate scholars was named for a correlation exploration by **Moghadari- Koosha, Moghadasi- Amiri, Cheraghi, Mozafari, Imani, and Zandieh.** The pupil's grade point normal was the criterion for

academic achievement. The data were analysed using multiple direct retrogression, analysis of friction, and independent t- tests.

Mean scores for were as under:

Self- efficacy – 62.18 ± 9.3,

Self- regulated literacy – 76.31 ± 11.3,

Motivation –81.83 ± 8.58.

Together, self-regulated studying, self-confidence, and motivation explain 19.6% of the variation in academic performance. Academic achievement had a strong correlation with self- regulated literacy, and self- regulated literacy was a more accurate indicator of academic performance. Scholars in the fields of nursing, from radiological department, anaesthesia, and lab sciences found a strong connection among self-controlled literacy and academic success.

Self- regulated literacy was concluded to be a more precise predictor of academic success. It appears that self- regulated literacy encourages scholars to have faith in their own capabilities and to be greater self- driven in both school as well as real-world.

A study by **Datu JA (2017)** was undertaken to study the connection between peace of mind (PoM) and academic motivation and achievement among high school pupils of the Philippines. The experimenters wished to probe the implicit educational benefits of low-arousal positive affect, particularly in societies with collectivist cultures.

525 students from the high schools participated in the study, and a variety of measures were used to assess academic achievement, academic motivation (including amotivation, controlled motivation, and independent motivation), and serenity of mind. The findings bared a number of significant findings.

First, there was a correlation between internal peace and achievement in academy, self- motivation, and controlled motivation. As it was expected, it was negatively associated with apathy. Also, a beneficial connection was set up among independent ambition and academic achievement.

In addition, the experimenters conducted bootstrap analyses, which indicated that internal peace laterally told academic achievement via its interceding goods on independent provocation.

Peace of mind accounted for around 1% to 18% of the variation in achievement in school and motivation in terms of effect.

These findings contribute to the appreciation of the function of low- arousal positive affect in academy settings, particularly in collectivist societies. They suggest that peace of mind can have positive goods on high school pupils' academic motivation and achievement.

The finding provides both theoretic and real- world counter accusations, emphasizing the significance of nurturing calmness and autonomy in educational surrounds in order to ameliorate scholars' academic performance.

2.4 Research Gap

Many studies have been undertaken which investigated the generally accepted thought process that study habits and academic achievement are connected. While doing researches it was also found that scholars tried to see what motivated the students and how it affected their overall performance. As mentioned earlier, the whole ecosystem comprising of the students, their parents, their teaching community as well as the whole society, is totally invested in how a student evolves and grows professionally and personally. Each component has their own understanding of what factors affect the student and how they can contribute to the growth of the student.

Here comes the study habits, which is the first target of all the parents and the teachers. And rightly so, it has been established in the above researches that good study habits have positive relation with educational achievement. Similarly, learning ecosystem encourages learners to feel motivated and future looking to ensure that they have all the right motivation to succeed in life; whether it is student life or a professional one.

Also, there have also been great work done where researchers studied the impact of memory with the academic performance of the students.

Memory has captivated scientists' imagination from ages. Ancient philosophers such as Plato and Aristotle discussed memory as a process of recall and a means of gaining access to inherent knowledge. **St. Augustine, Thomas Aquinas, and Giordano Bruno** investigated memory in relation to perception, knowledge, and mnemonic techniques during the Middle Ages and Renaissance. In the late 19th century and beginning of the 20th century, however, researchers such as Hermann Ebbinghaus,

William James, and Frederic Bartlett initiated the scientific study of memory as it is known today. Ebbinghaus studied forgetting curves and mnemonic techniques, James distinguished between primary and secondary memory, and Bartlett emphasised the reconstructive nature of memory. These pioneering researchers established the foundation for the current scientific understanding of memory, which continues to evolve.

Also, the idea of working memory has also become an integral part of our comprehension of cognitive processes over time. It arose from early theoretical models of mental processing with limited capacity. Working memory rose to importance with the work of **Baddeley and Hitch,** who provided a model that distinguished it as an active system engaged in the transient storing and analysing data.

Research as well as technological advancements, such as brain imaging techniques, have aided our comprehension of the neural correlates and functions of working memory. Working memory is now widely acknowledged to perform a crucial part in a variety of cognitive processes, which includes problem-solving, decision-making, language comprehension, and learning.

Though current research keeps improving our knowledge of particular processes and components that make up working memory, advancing our understanding of cognitive functioning as a whole, but specific work to understand the impact of verbal working memory (a working memory component), on the practices, patterns and routines of learning and subsequently on educational achievement coupled with the implication of how motivated the students are, was not found.

Also, the research in India has also been limited to few cities or states and there was no study being done in this regard in the southern part of Rajasthan, India.

To bridge this gap, it was decided to undertake a study which can find the impact of multiple factors: verbal working memory, achievement motive as well as the study habits on the academic performance of the students of Udaipur, Rajasthan.

CHAPTER – III

RESEARCH METHODOLOGY

The pursuit of knowledge is an exciting journey characterised by inquisitiveness, investigation, and methodical exploration. In this chapter, we embark on the methodological journey that forms the basis of our research endeavour. A well-structured methodology creates the framework for our research, thereby ensuring its rigour, validity, and reliability, in the same way that a compass guides an explorer through uncharted territory.

Hence, it is an important chapter which defines the research by providing all the required information, detailed description of the procedures, techniques, and methodologies used to collect and analyse data, ensuring that your research is reliable, valid, and reproducible. This section enables the reader to assess the validity of our research and comprehend how we reached our conclusions.

Research methodology, in simple words, means the way to methodically addressing the research subject.

In it, we examine the different stages that a researcher usually undergoes to logically examine his research problem. When discussing RM, we take into account the rationale behind the approaches we employ in connection with our research investigation and clarify why we are using or not using a specific approach or technique to ensure that the outcomes of research can be analysed by us or by other individuals.

For the current research in verbal component of working memory, all attempts are made to outline the methodology after due deliberations on various aspects of the research process. All care has been taken to select the most suitable and appropriate options where ever available to ensure that the methodology is more specific to the subject matter and provide a guiding direction to the researcher.

Consequently, the topic of the research has been arrived at by the researcher after a lot of in-depth analysis of the literature available on the topics related to Working Memory (verbal component only). During course of the initial investigation and knowledge acquiring spree, the idea of conducting the research and the logic behind doing so will become more and more clear.

With such clarity of thoughts, it will be easy for the next phase when the data is assimilated and analysis is done. The whole concept of giving back to the society starts making more and more sense.

Our study explores the various facets of the relationship between verbal working memory, achivement motivatoin, study habits and the academic performance among the students.

3.1 Scope of the study

The scope of the study establishes the limits and parameters within which the research was conducted. It describes the precise aspects of the topic that will be covered. For this research we have defined the scope as under:

a) Since verbal working memory is considered as main the criteria which influences the cognitive activities of any individual, hence emphasize was laid to assess and measure verbal working memory in students (age 15-20 years) using specific test of working memory.
b) The scope of study is also to assess the effects of verbal working memory in relation to achievement motivation, academic performance and study habits in students.
c) Also, the endeavour of the study was to see the effects of study habits in students and to understand how achievement motive plays an important role in escalating academic performance in students.

The research scope ensures that the research remains focused, manageable, and in line with the overall research objectives which are detailed in the next section.

3.2 Objectives of the study

This part clarifies the purpose and aims of our investigation and provides a roadmap for our research endeavour. They serve as guiding beacons that illuminate the path to a deeper comprehension of the topic. They define the specific outcomes and insights we hope to achieve with this research.

In this part, we outline both the research's overarching objective and the specific, measurable objectives that will contribute to its accomplishment. Each objective is designed to address a specific aspect of the research questions, ensuring a thorough examination of the investigated phenomenon.

We have outlined the following objectives for this research:

1. To study verbal working memory status of school /college students.
2. To study the achievement motive of school/college students.
3. To study the academic performance of school /college students.

4. To study the study habits of school /college students.
5. To study the effect of gender on achievement motive.
6. To study the effect of gender on academic performance.
7. To study the effect of gender on study habit.
8. To study the effect of verbal working memory on achievement motive.
9. To study the effect of verbal working memory on academic performance.
10. To study the effect of verbal working memory on study habit.

In addition, these objectives serve as a basis for evaluating the study's effectiveness and influence. At the conclusion of the journey, they will serve as benchmarks against which we measure our progress and evaluate the depth of our understanding.

3.3 Hypotheses to be tested

This section signals the beginning of our scientific inquiry, as we enter the domain of informed speculation. Hypotheses serve as the heart of empirical inquiry, providing testable propositions that steer our research towards significant conclusions.

In this section, we outline the hypotheses underlying our research. These assertions express our expectations regarding the relationships, effects, or consequences we anticipate observing, based on available knowledge and theories.

Each hypothesis is meticulously crafted with the goal of being specific, measurable, and verifiable. This allows them to be rigorously evaluated against empirical evidence. In the long run, the acceptance or rejection of these hypotheses will contribute to the corpus of knowledge surrounding our research questions.

It is essential to keep in mind that hypotheses are not eternal truths, rather they are provisional assertions subject to empirical scrutiny, as we proceed. They serve as a framework for research, inviting us to analyse, interpret, and infer meaningful conclusions from the collected data.

For our research, we have crafted the following hypotheses:

- There is no significant difference in achievement motive between boys and girls.
- There is no significant difference in academic performance between boys and girls.
- There is no significant difference in study habit between boys and girls.
- There is no significant effect of verbal working memory on achievement motive.

- There is no significant effect of verbal working memory on academic performance.
- There is no significant effect of verbal working memory on study habit.

3.4 Geographical coverage

This research was conducted on students from the city of Udaipur, Rajasthan. The data collection was done from schools and colleges in the urban area.

3.5 Sample

A total sample of 200 students between the age group of 15-20 years, from secondary, higher secondary school and degree students. The above sample will then be categorized into 3 groups of Verbal Working Memory (VWM) – high, medium and low and which will be taken for the study. The number of male and female students are equally divided into 100 each with each having equal numbers from schools and colleges i.e., 50 boys from schools and 50 from colleges, and the same for girls sample population.

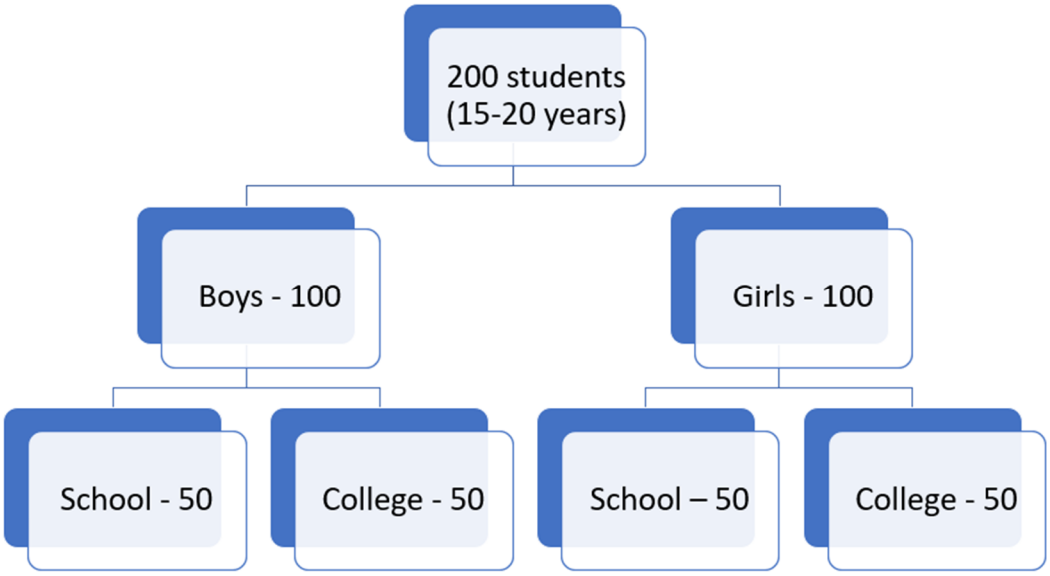


Fig. 3.1 : Sample size and its break up

Inclusion and Exclusion Criteria:

- Inclusion of secondary, higher secondary and degree students
- Inclusion of English medium school students
- Exclusion of rural students
- Exclusion of Hindi medium school students
- Exclusion of students with Learning disabilities

3.6 Research Design

2x3 Factorial design was chosen to accomplish the study's objectives. In this research, as we have 2 independent variables (Verbal Working Memory & Gender) and amongst which one (Gender) has two levels, i.e., male & female and the other one (Verbal Working Memory) has three levels of High, Medium and Low, we will use a 2X3 factorial design to understand the effect of them on each dependent variable, i.e., Achievement Motive, Academic Performance and Study Habits.

Table 3.1 : 2X3 Factorial design

		Gender	
		Male	Female
Verbal Working Memory	Low	Group 1 Low Verbal Working Memory / Males	Group 4 Low Verbal working memory / Females
	Medium	Group 2 Medium Verbal working memory / Males	Group 5 Medium Verbal working memory / Females
	High	Group 3 High Verbal working memory / Males	Group 6 High Verbal working memory / Females

3.7 Variables

The following variables have been identified for the study:

Independent Variable

Level of Verbal working memory

1. Low
2. Medium
3. High

Type of Gender

1. Boy
2. Girl

Dependent Variable:

1. Achievement Motivation
2. Academic performance
3. Study habits

Controlled variable:

1. Age of students – 15 years to 20 years
2. Area of institutions – Urban

Table 3.2 : Information of tests used for the research

Aspects of the study	Test	Developed by
Verbal Working Memory	Digit Span Subtest (WISC)	David Wechsler
Achievement Motive	Achievement Motivation Test	V.P. Bhargava (2009)
Study Habits	Palsane Sharma Study Habits Inventory (PSSHI)	M.N Palsane and Sadhna Sharma

3.8 Description of test and tools used

A bio data document was created for students to be filled up before taking any test. It included the personal details and the students were apprised that their personal details would only be utilised for the research purposes.

Standardized Psychological tests of Verbal working memory, achievement motive and study habit available in the field:

1. **Digit Span Subtest** – It is a subtest of the standard Wechsler Intelligence Scales for Children - (WISC). Digit Span (DGS) is a measure of **verbal short term and working memory** that can be used in two formats, Forward Digit Span and Reverse Digit Span.
2. Achievement Motivation Test (ACMT) by V.P. Bhargava (2009)
3. Study habit inventory PSSHI (Palsane & Sharma)

The data collected from the above tests were analysed using SPSS version 21.0 in addition to the Microsoft Excel and Microsoft power point applications. Few images from MS Power Point source were used to create figures to enhance the discussion at several places.

Let's take a detailed look with respect to the above tests and questionnaires which were used to collect the data for this research.

Wechsler Intelligence Scales for Children (WISC) -Digit Span (DGS)

The Digit Span test is a primary instrument created for evaluating **verbal working memory.** It is also used as a neuropsychological measure to test attention and working memory. It consists of forward recall part and backward recall part for digit sequences. The backward digit span gives more precise evaluation of overall working memory capacity than the forward digit span. This is because it requires not only storing the numerals but also cognitively reversing their order, which places a substantial strain on the cognitive aspect of working memory. A child with low scores (more than 1 SD below the mean, for example) on the backward digit recall test is likely to have a deficient verbal working memory.

The Digit Span test is a widely utilised instrument in psychology and neuropsychology for assessing the verbal working memory capacity of an individual. It assesses an individual's capacity to briefly retain as well as manipulate an exact series of numerals. Here is a description of the Digit Span test, as well as information regarding its validity and reliability:

Typically, the Digit Span test consists of 2 sections:

- forward digit span and
- backward digit span

In the forward digit span, the person taking the test reads a series of numerals audibly at a consistent speed, and the test taker must recall those digits sequentially. In the backward digit span, the examiner will call out a sequence of numerals, and the examinee is required to recite the digits in reverse order.

Reliability:

The reliability of test results refers to their consistency and stability. The Digit Span test has demonstrated excellent reliability across multiple studies. The Digit Span test has demonstrated moderate to high test-retest reliability. It signifies the consistency of results over a period of time.

Validity:

It is the degree to which a test measures what it is designed to measure. It has been determined that the Digit Span test has acceptable construct validity, meaning that it accurately measures verbal working memory capacity. It is supported by theoretical

models of working memory and has been utilised extensively in research and clinical settings to assess working memory abilities.

Additionally, the Digit Span test has demonstrated excellent criterion-related validity. It has been established that it correlates with other assessments of working memory, such as complex span activities and other tests assessing similar cognitive functions.

Notably, the reliability and validity of the Digit Span test can vary based on test administration procedures, demographics of the population, and scoring methods. When utilizing the Digit Span test in assessments, researchers and practitioners should use standardized administering procedures while considering any particular psychological characteristics reported in the literature.

Achievement Motive Test by V.P. Bhargava. (2009)

The Achievement Motivation Test was created in 1994 by V.P. Bhargava. It is a test of sentence completion with fifty incomplete sentences. Each item has three options, and respondents must select one by placing a checkmark next to it.

This test is designed to determine the individual's N Ach score. The test is founded on lines that follow the design created by Bishwanath Mukherji as well as the Sentence Completion Test technique. The evaluation consists of 50 partially completed sentences that must be finished by selecting any of the three alternatives that are supplied for each item. The children are given instructions on how to confirm the alternative by selecting one of the potential replies that most accurately reflects what he really feels in response to the query put forwarded by the item. It is anticipated and expected that, while scrutinising the object, the subject would consider all conceivable aspects that could be thought at that time. Therefore, his checkmarks on the other replies (which he chooses) would disclose his true emotions. By highlighting each item, his answers on the entire examination will be marked. For the purpose of determining the subject's accuracy in responding to the inquiries from the test, the exam comprises repetitive questions. Comparable responses to comparable test questions indicate consistency in test-taking. This was done to prevent the time interval gap effect that usually occurs when an experiment is carried out after an interval of time. Efforts have been made to encompass as many facets as are administratively practical and feasible. The average time required to administer a test is 30 minutes, including the time required to give students instructions. While administering the exam to the subjects, it is preferable for the person taking the test to

seat them in a manner that prevents them from communicating or consulting with one another about the responses they should evaluate. This is sufficient to detect the response feigning that typically occurs when a test is given in a group setting. The author believes that language variable effect and the social desirability or acceptance influences cannot possibly be reduced. It might always exist.

Following the procedure of collecting items from various sources (via experts), combining them, and then selecting them based on their individual merits, the test was constructed. The same procedure was used to determine potential alternative responses with similar competitive appeal value. When an initial design of the test (which comprised of 75 items) was completed, an initial assessment session was carried out on 35 subjects to assess the practical feasibility of the test and to identify which of the questions are 'not acceptable' and could be deleted without compromising the validity of the test.

As a consequence of the preliminary test, 25 items with low acceptability and feasibility were eliminated, and 50 items were kept for the final version.

Standardization of the achievement motive test

The final version of the 50-item Achievement Motive Test was administered to 600 college-bound students (300 of each gender and 300 female and 300 males) between the ages of 16 and 22.

Reliability

The Achievement Motive Test's reliability was determined using the test-retest method.

The reliability of the Hindi and English versions was determined independently by administering the AMT (Hindi version) to 100 college-aged male and female students and then to the same sample 30 days later. The correlation coefficient found was 0.87, which is statistically significant at the 1% level of significance.

The English version of the Achievement Motive Test was given to a sample of 100 female college students who spoke English as their primary language. The Achievement Motive Test was administered to this sample again 30 days later. The correlation coefficient was 0.91, which was significant at the.01 level of significance.

Palsane and Sharma Study Habits and Inventory (PSSHI)

To measure the study habits among students the **Palsane and Sharma Study Habits and Inventory (PSSHI),** standardized by M N Palsane (Pune) & Sadhana Sharma (Agra) was administered.

The PSSHI is founded on the premise that effective study practises and abilities are essential for academic success. The inventory seeks to assess different aspects of study habits, including time management, focus, taking notes, literature comprehension, test preparation, and self-evaluation.

Typically, the PSSHI consists of a succession of statements regarding various study habits and abilities. Respondents indicate the extent to which they engage in each behaviour or possess each characteristic using a Likert scale. The inventory captures positive study habits (e.g., "I allocate specific time for studying each subject") as well as negative study habits (e.g., "I waste time during study hours"). The results of the inventory may give information about a person's study habits and potential improvement areas.

In research and educational settings, the PSSHI has been used to evaluate the study habits and abilities of students across different ages and academic levels. It can aid educators and researchers in identifying areas in which students may require assistance in developing effective study techniques.

Notably, although the PSSHI can provide insightful information, it is a self-assessment which depends on individuals' perceptions and reports of their study patterns. In conjunction with other tests and observations, it may be beneficial for gaining an in-depth knowledge of students' study habits and abilities.

It is made up of 45 items which assess various aspects of study habits. It measures students' study habits in eight domains, including:

1. Budgeting time (5)
2. Learning motivation (6)
3. Memory (4)
4. Note-taking (3)
5. Physical conditions (6)
6. Reading ability (8)
7. Taking exams (10)

8. Health (3)

Answers rely on a three-option Likert scale comprising "always or most of the time," "sometimes," and "rarely or never," and they are respectively scored as 2,1 and zero.

Inverse scoring is applied to 11 of these items. The total marks which can be obtained lie in the 0 to 90 range, with scores of 60 or more demonstrating an appropriate level of study habits, scores between 31 and 60 suggesting reasonable or moderate study habits levels, while 30 or lower scores signaling an undesirable study habit levels. Possible score range for each subcategory is as follows:

- Time management: 0 to 10;
- Physical conditions: 0 to 12;
- Learning motivation: 0 to 12;
- Reading ability: 0 to 16;
- Note-taking: 0 to 6;
- Memory: 0 to 8;
- Taking tests: 0 to 20; and
- Health of study: 0 to 6

Utilising the 3-part continuum technique, a rating was determined for each subcategory. This was accomplished by subtracting the lowest score from the top score and dividing it by 3. The resultant value represents the gap in the 3 grades representing the desirable, relatively desirable, and undesirable levels within all the subcategories.

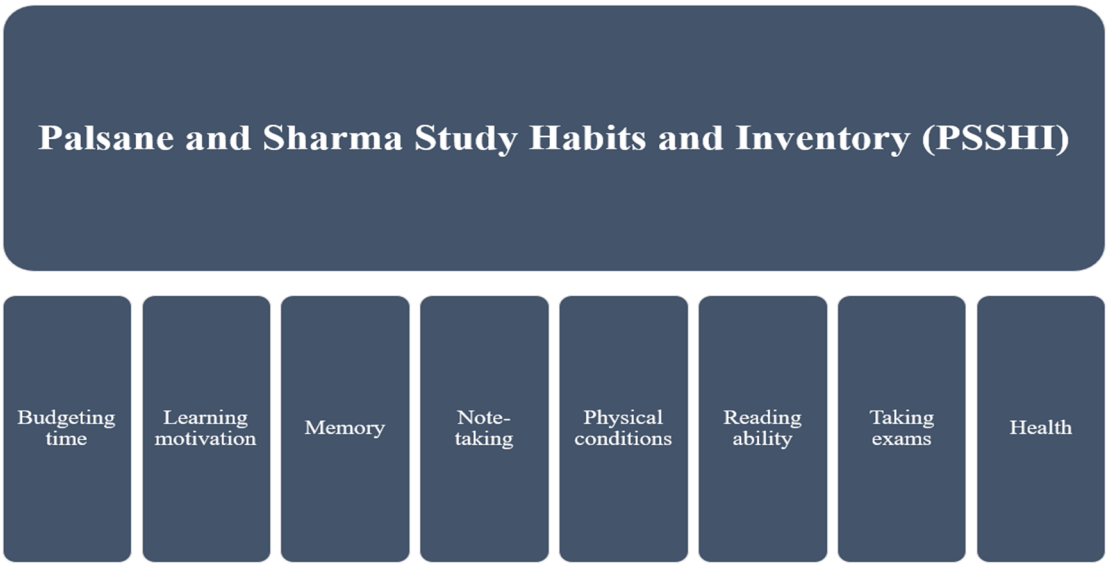


Fig. 3.2 : Domains of Study habit test

Reliability: The PSSHI is more reliable than other study habits assessments hence it has been used in numerous researches to determine the connection between study habits and academic performance. The test-retest (with a gap of four weeks) reliability co-efficient is 0.88.

Validity: This inventory of study habits is an itemised list with only face validity. Face validity is the degree to which a measurement or assessment purports, on the surface, to gauge what it is intended to measure.

ACADEMIC PERFORMANCE

Academic achievement was measured using the percentage/grade from the prior term/class. To categorize, a score of 82% or greater was deemed "good academic achievement," 68%-81% was deemed "moderate academic achievement," and a percentage below 68% was deemed "poor academic achievement" or high, average and low, respectively.

3.9 Procedure and administration of test

A total sample of 200 students between the age group of 15-20 years, from secondary; higher secondary school and degree students. The sample was taken from Udaipur, Rajasthan. The data was collected through Convenient Sampling. The study was conducted on 200 students administering verbal WM tool. Basis which the students will be categorized into 3 groups – High, Medium and Low. Each group were then administered the achievement motive tool and study habit tests and the results will be collated to test the hypotheses.

Administration of the Digit Span Test

Once the student is seated comfortably in a well-lit room with no distractions, and rapport was built to make him/her feel safe and secure. The goal and directions of the digit span test were explained to the student who was instructed to attention to the numbers which were read out. Once this is done, they had to repeat the same.

Procedure:

The student is expected to remember a series of digits (numbers) in the right sequence right after the person taking the test has spoken out each number or sequence in a monotone manner. The total number of the series is gradually increased by one digit till the participant can no longer recall it accurately. The above continues till the test

participant fails. When an individual misses two numbers in a row, the examination is terminated.

Scoring:

The score of an individual is the cumulative number of items reiterated forwards appropriately.

Example:

Table 3.3 : Example of scoring for Digit Span test

ITEM	FIRST TRIAL	TICK MARK OR CROSS	SECOND TRIAL	TICK MARK OR CROSS
A	43	√	16	√
B	792	√	847	√
C	5941	X	7253	√
D	93872	X	75396	X

The total correct answers are 5 in the above instance.

The exam is also administered in reverse order, using the identical procedure as for the forward sequence.

Backward series:

Similar instructions are given for the backwards series but this time the student has to remember and repeat the numbers in the exact opposite sequence. The student is given two trials of 2-digits and if he/she recalls the numbers in the forward manner, he/she is then reminded to give the numbers in the reverse order.

Procedure: In reverse series, the person taking the exam speaks the numbers out loud in a monotone tone. The individual who participates is required to recite each number or series in reverse order after hearing them. To aid the participant's comprehension of the examination, an example is provided.

Scoring: Same as digit forwards.

Final Score: All the correct answers (both backwards and forwards) are added together. Table 3.3 is referred for scoring. The same can be calculated as percentile equivalent by referring to table 3.4.

FINAL SCORE:

Table 3.4 : Example of final scoring for Digit Span test

Total forwards and backwards:	
Standard score:	
Percentile equivalent:	

Norms for catergorization of verbal working memory levels were as follows:

- Students with score of 124 or above were considered to possess high verbal working memory
- Students who scored between 106 till 123 were considered as students with average verbal working memory
- Students with a score of 105 or less were considered to possess low verbal working memory

The above norms were arrived at by calculating the mean score of all the students and standard deviation (SD). The lower range value was calculated by subtracting 1SD from the mean, while the higher range value was calculated by adding 1SD to the mean. The middle range was categorized as average score. The same method was used for the remaining three variables as well.

Administration of the Achievement Motive test

This was the second test conducted on same sample of students who had completed attempting Digit span test. The students were asked to fill the socio demographic details on the first page of the test booklet. It was ensured that no personal details would be disclosed and all personal details of the students would be kept confidential.

This was done in small batches where students were given instructions to listen carefully and an example was explained to ensure that they have understood the right way of completing the test.

Instructions:

On the following pages 50 incomplete sentences have been given. For each incomplete sentence three alternative answers which may complete the sentence have been given. Select the most appropriate alternative answer sentence and put a tick mark√ in its box. Please do complete all the 50 incomplete sentences. Remember to give honest feedback and complete the booklet. You will be given 30 minutes to complete the whole test.

Procedure:

Once the students are seated comfortably and ready to listen to instructions, the subjects are given 30 minutes to complete the test without leaving any question unanswered. Subjects are then explained how to start the test. They are asked to read the statements carefully which has three options a, b, c and select the alternative response that best reflects their true emotions. It is anticipated and presumed that the subject, while involved with the process of examining the item, would take into account all conceivable elements of the item that could be considered at that moment.

Scoring:

The scoring procedure is straightforward and can be accomplished using an evaluation key. One mark for every correct answer.

Each of the items demonstrating Achievement motivation (N-Ach) is assigned a score of 1 for every correct answer, and the sum of all scores is the N-Ach score. The range of score is 00 to 50.

Norms for catergorization of achievement motivation levels were as follows:

- Students with score of 24 or above were considered to possess high achievement motivation
- Students who scored between 17 till 23 were considered as students with average achievement motivation
- Students with a score of 16 or less were considered to possess low achievement motivation

Administration of the Palsane and Sharma Study Habit Inventory (PSSHI)

After completing the two tests on verbal working memory and Achievement motive, the third test was conducted to determine the study patterns and routines.

After a short break same set of students were handed over the PSSHI test sheet which contains 45 statements. Each statement has 3 alternatives and the students is asked to read the statement carefully and then place a tick on the correct statement which suits them as the best option or which they practice in their studies. Again, they are asked to respond honestly and complete all the question without leaving any of them.

Following instructions were given to the students - the manner in which you prepare for tests in school and college can have a significant impact on how well you do on those tests. The statements that follow describe the ways in which you typically

engage in academic pursuits. We are interested in learning about your study habits so that we may better assist you in achieving the desired results on your upcoming test.

Therefore, the active participation of yourself and others is vitally necessary.

Once the students are seated comfortably and ready to listen to instructions, the subjects are given 30 minutes to complete the test without leaving any question unanswered. Subjects are then explained how to start the test. They are asked to read the statements carefully which has three alternatives (a) Always or Mostly, (b) Sometimes and (c) rarely or Never and choose one of the alternative responses which holds good for them and is true to their way of studying. It is expected that students will give fair responses and do justice to the test by attempting all the questions with honesty.

An example was given which was also present in the questionnaire as part of the instructions and the students were asked to follow the same way of completing the test. They were also informed that in case they had any doubts in any of the questions/statements. Though this test is not restricted by time limit, but still it is expected that the students would respond to all the statements with complete honesty within 20 minutes.

Scoring:

The simple statement and dotted statement table are used for scoring.

Simple statement table

Table 3.5 : Simple statement table scoring for Study Habits

Response	Score
Always/ mostly	2
Sometimes	1
Rarely or never	0

Dotted statement table

Table 3.6 : Dotted statement table scoring for Study Habits

Response	Score
Always/ mostly	0
Sometimes	1
Rarely or never	2

The minimum possible score was 0 and the highest was 90.

- Total scores of 81 and above were considered High study habits score.
- Total scores between 66 and 80 were considered average study habits.
- Total scores 65 and below were considered as low study habits score.

In this chapter, we have methodically defined the research methodology that will serve as the backbone of our research and also have established a robust framework for inquiry by employing a well-thought-out research design, exhaustive data collection methods, and stringent ethical considerations. The stated scope, objectives, and hypotheses provide distinct direction for our investigation. It is essential to acknowledge and rigorously address the inherent limitations and constraints. As we progress into the empirical phase, this methodological foundation will serve as our compass, guiding us to valuable insights and a deeper understanding of the topic.

CHAPTER – IV

ANALYSIS OF RESULTS

The focus of this chapter is to analyze the results of the data obtained by employing all the three tests mentioned in the last chapter.

The chapter titled "Analysis of Results" is the crucible where raw information is transformed into valuable insights. This crucial stage of our research entails a thorough examination of gathered data, which allows us to identify patterns, establish correlations, and derive narratives that hold the key to addressing our research questions.

This chapter is crucial because it bridges the gap between data collection and deriving meaningful conclusions. We intend to discover the underlying meaning and significance of the numbers, words, or observations through a methodical examination. We endeavour to acquire knowledge that will contribute to the corpus of research in this field by employing the appropriate analytic techniques and frameworks.

This phase's significance cannot be exaggerated. It enables us to confirm or disprove our hypotheses, thereby determining the trajectory of our discoveries. In addition, it permits the discovery of unanticipated insights and the development of nuanced interpretations. Our research's credibility and validity will ultimately depend on the calibre and rigour of our analysis.

As we embark on this journey of analysis, we do so with a sense of purpose and a dedication to objective inquiry. Through this rigorous procedure, we are able to unearth the true essence of our research, as well as the stories contained within the data.

This chapter is distributed into five sections for ease of comprehension.

1. The first part deals with normality testing of the data.
2. The second part deals with the verbal working memory.
3. The third, fourth and fifth part is related with variables - Achievement Motivation, Academic Performance and Study Habits.

Furthermore, the third fourth and fifth part is further divided into ten parts in which first three parts are related with mean, standard deviation and category. The fourth sub part is related with 2-way ANOVA in which effects of independent variables [Gender (Boys/Girls)] and Levels of Verbal working memory (Low/Average/High)] on dependent variables is examined.

The fifth part is related with determining the differences of boys and girls on dependent variables. The sixth part is related with determining the effect of verbal working memory on dependent variables. The seventh part is related with comparing study groups on dependent variables. The eighth sub part is related with association of gender and dependent variables. The ninth sub-part is related with association of levels of verbal working memory and dependent variables. The tenth part is related with correlation of verbal working memory scores and dependent variables.

4.1 Normality Testing of Data

For this we will calculate the test statistic (D), which measures the deviation of the sample distribution compared to the normal distribution. The greater the magnitude of D, the more unlikely it will be for data to be normally distributed. The value of "p" measures this likelihood, with a low likelihood suggesting that a sample deviates from a distribution that is normal to an extent that is improbable to have occurred by by chance. Higher D while low p indicate that the data does not have a normal distribution.

Table 4.1.1 shows basic indicators for normality testing with reference to verbal working memory data.

Table 4.1.1 : Basic indicators For Normality Testing with reference to Verbal working memory data

	Verbal working memory
Sample Size (N)	200
Mean	114.49
Median	116
Standard Deviation	9.726403
Skewness	-0.15854
Kurtosis	-0.599604
K-S Test Statistic (D)	0.07986
p value	0.14774

The value of the K-S test statistic (D) is 0.07986 and the p-value is 0.1474. It implies that verbal working memory data is not substantially different from the normally distributed data.

Table 4.1.2 shows basic indicators for normality testing with reference to achievement motivation data.

Table 4.1.2 : Basic indicators For Normality Testing with reference to Achievement Motivation data

	Achievement Motivation
Sample Size (N)	200
Mean	20.04
Median	20
Standard Deviation	4.361596
Skewness	0.098596
Kurtosis	-0.22187
K-S Test Statistic (D)	0.09133
p value	0.06674

The value of D obtained by applying the K-S test statistic came to be 0.09133 and the p-value is 0.06674. It suggests that achievement motivation data does not differ significantly from those with a normal distribution.

Table 4.1.3 shows basic indicators for normality testing with reference to academic performance data.

Table 4.1.3 : Basic indicators For Normality Testing with reference to Academic Performance data

	Academic Performance
Sample Size (N)	200
Mean	75.025
Median	75.5
Standard Deviation	7.246859
Skewness	-0.109535
Kurtosis	-0.81364
K-S Test Statistic (D)	0.08266
p value	0.12293

K-S test statistic (D) has a value of 0.08266, and the p-value is 0.12293. Again, it infers that data on academic performance do not substantially differ from normally distributed data.

Table 4.1.4 shows basic indicators for normality testing with reference to study habit data.

Table 4.1.4 : Basic indicators For Normality Testing with reference to Study Habit data

	Study Habit
Sample Size (N)	200
Mean	72.9
Median	74
Standard Deviation	8.204056
Skewness	-0.045976
Kurtosis	-1.002539
K-S Test Statistic (D)	0.08033
p value	0.14326

K-S test statistic (D) has a value of 0.08033, and the p-value is 0.14326. It implies that study habit data is not substantially different from those with a normal distribution.

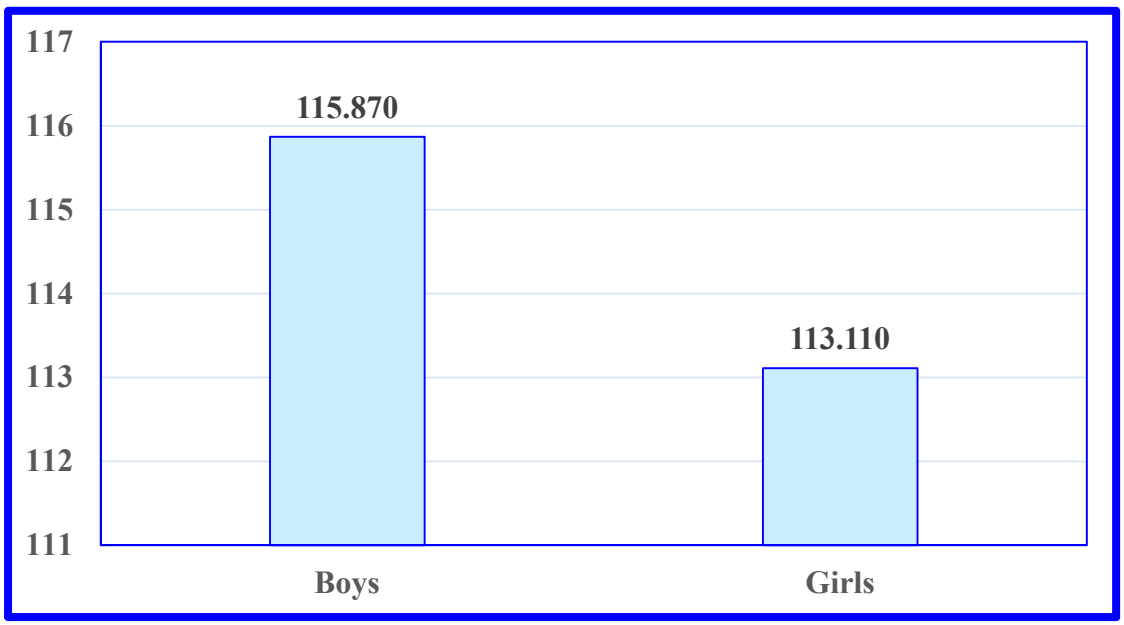
4.2 Verbal working memory

Table 4.2.1 showing mean, standard deviation of selected sample for verbal working memory.

Table 4.2.1: Mean S.D. and Category of Verbal working memory for Boys and Girls

Verbal working memory	N	Mean	S.D.	Category
Total Sample of Boys	100	115.87	9.66	Average
Total Sample of Girls	100	113.11	9.64	Average

Table 4.2.1 shows that mean scores of verbal working memory for boys are 115.87 showing average category of selected sample. Similarly, the girls have a mean verbal working memory score of 113.11 which lies in the average category of selected sample.

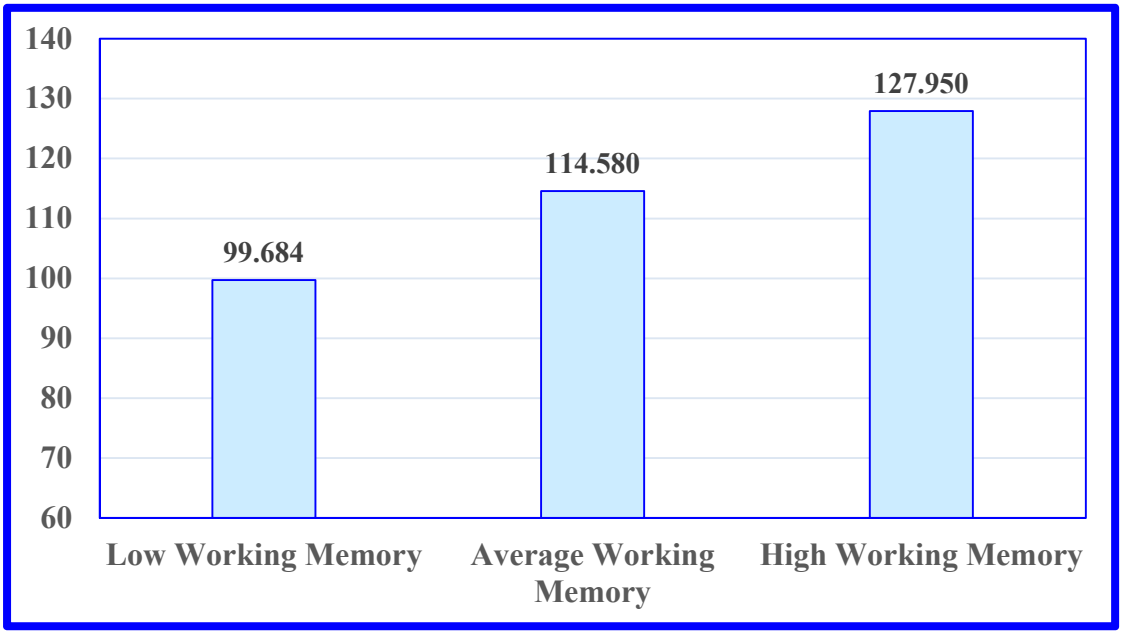


Graph 4A 1 : Mean verbal working memory scores of boys and girls.

Table 4.2.2 : Mean S.D. and Category for different levels of Verbal working memory

Verbal working memory	N	Mean	S.D.	Category
Total Sample with Low Verbal working memory	38	99.68	3.39	Below
Total Sample with Average Verbal working memory	121	114.58	4.36	Average
Total Sample with High Verbal working memory	41	127.95	3.02	High

Table 4.2.2 shows that mean scores of verbal working memory for the sample which is categorized into "low verbal working memory group" is 99.68. Similarly, the sample from "average verbal working memory group" have a mean verbal working memory score of 114.58 which lies in average category of selected sample. In addition, the cohort of people with a "high verbal working memory" has a mean score of 127.95 on the verbal working memory test.



Graph 4A 2 : Mean verbal working memory scores for different levels of verbal working memory

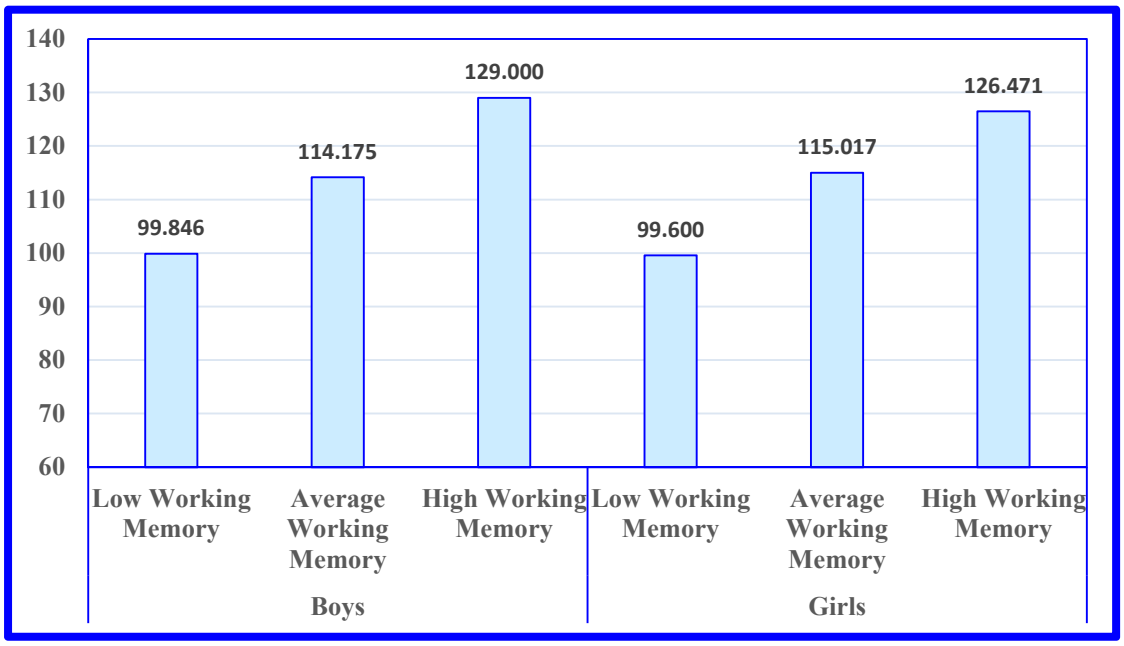
Table 4.2.3: showing mean, S.D. and category of verbal working memory for different study groups.

Table 4.2.3: Mean S.D. and Category of Verbal working memory for Study Groups

Verbal working memory	N	Mean	S.D.	Category
Boys with Low Verbal working memory	13	99.85	2.97	Low
Boys with Average Verbal working memory	63	114.17	4.56	Average
Boys with High Verbal working memory	24	129.00	2.89	High
Girls with Low Verbal working memory	25	99.60	3.65	Low
Girls with Average Verbal working memory	58	115.02	4.11	Average
Girls with High Verbal working memory	17	126.47	2.60	High

Table 4.2.3 tells that the average verbal working memory scores of boys with low verbal working memory category group is 99.85 while the mean verbal working memory scores of boys with average verbal working memory category group is 114.17 and the mean verbal working memory scores of boys with high verbal working memory category group is 129.

Table 4.2.3 also depicts that the mean score of verbal working memory of girls in the low verbal working memory category group is 99.60 while the mean score of verbal working memory of girls in the average category group is 115.02 and the mean score of verbal working memory of girls in the high category group is 126.47.



Graph 4A 3 : Mean verbal working memory scores for study groups

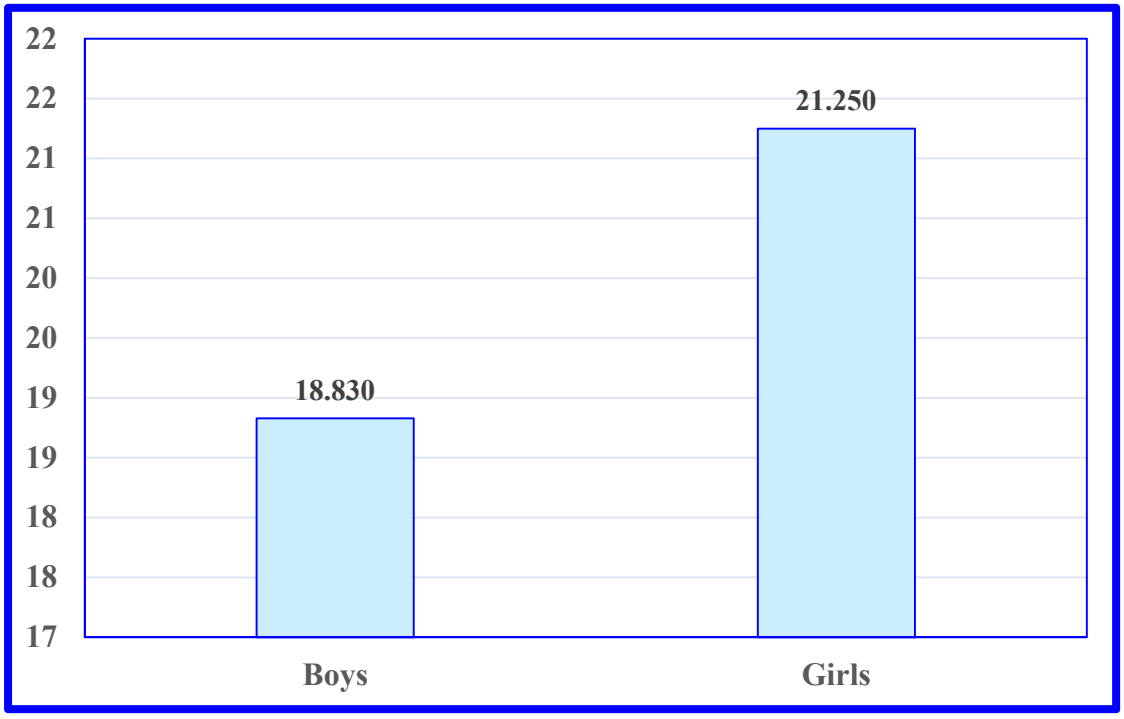
4.3 Achievement Motivation

Table 4.3.1 displays the mean, standard deviation, and achievement motivation category values for both the gender.

Table 4.3.1 : Mean, S.D. and Category of Achievement Motivation for Boys and Girls

Achievement Motivation	N	Mean	S.D.	Category
Total Sample of Boys	100	18.83	4.87	Average
Total Sample of Girls	100	21.25	3.39	Average

Table 4.3.1 shows that mean score of achievement motivation for boys is 18.83 which can be categorized as average level. Similarly, the girls have a mean achievement motivation score of 21.25 which is average level of achievement motivation.

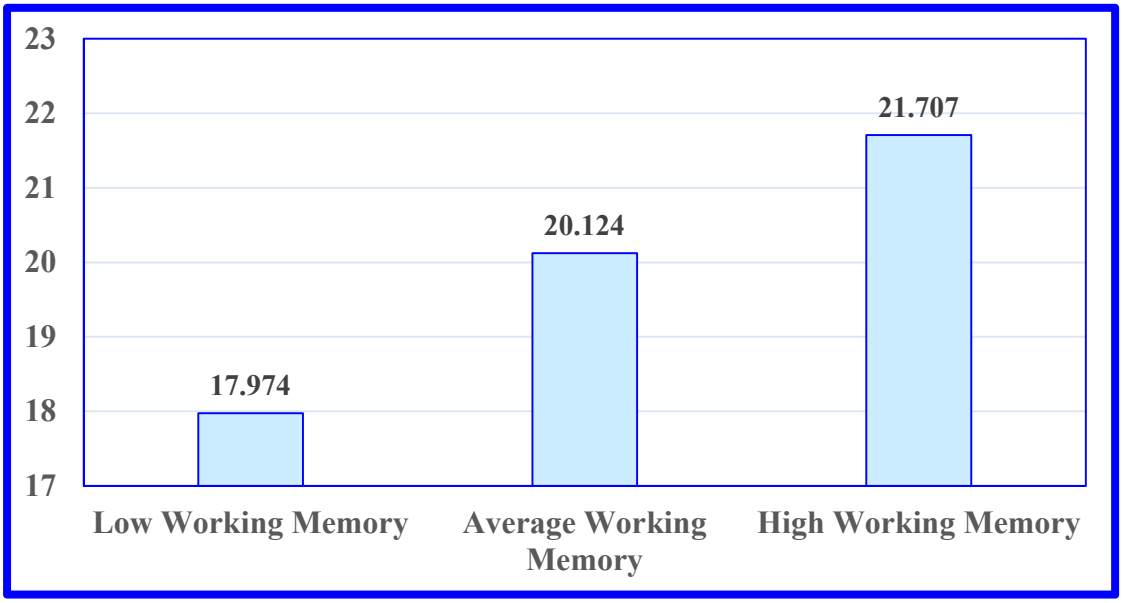


Graph 4B 1 : Mean achievement motivation scores for boys and girls

Table 4.3.2 : Mean, S.D. and Category of Achievement Motivation Scores of students with different levels of Verbal working memory

Achievement Motivation	N	Mean	S.D.	Category
Total Sample with Low Verbal working memory	38	17.97	5.01	Average
Total Sample with Average Verbal working memory	121	20.12	2.79	Average
Total Sample with High Verbal working memory	41	21.71	6.42	Average

Table 4.3.2 shows that mean score of achievement motivation for students from "low verbal working memory group" is 17.97 and which means they are having average level of achievement motivation. Similarly, the average scores of achievement motivation for students from average level verbal working memory group is 20.12 which means that they are having average level of achievement motivation. Furthermore, mean scores of achievement motivation for students from high level verbal working memory group is 21.71, which means that they are having average level of achievement motivation.



Graph 4B 2 : Mean achievement motivation scores for different levels of verbal working memory

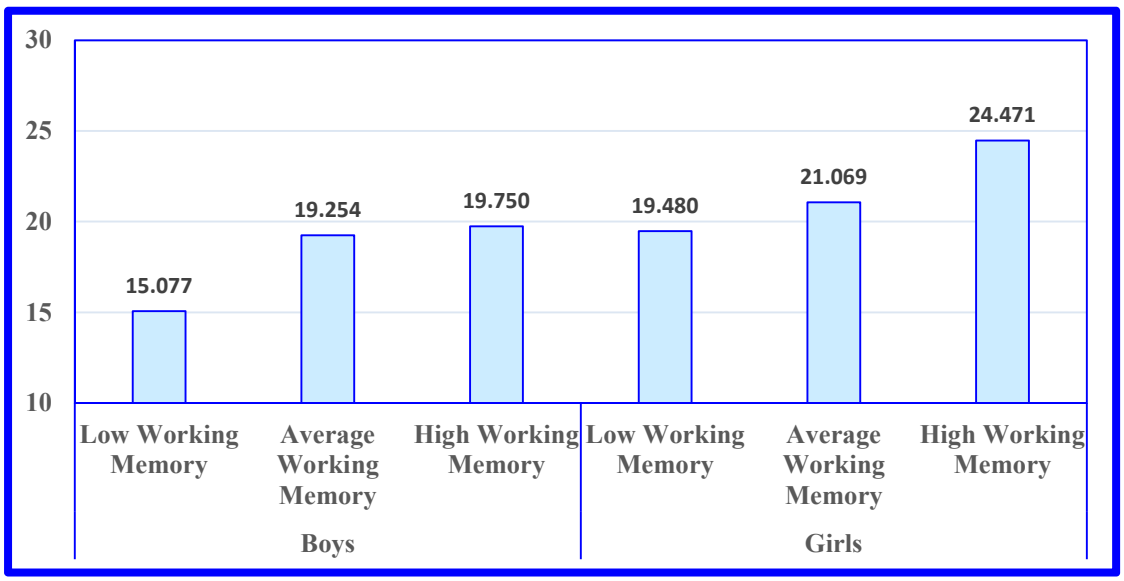
Table 4.3.3 : Mean S.D. and Category of Achievement Motivation Scores for Study Groups

Achievement Motivation	N	Mean	S.D.	Category
Boys with Low Verbal working memory	13	15.08	5.11	Low
Boys with Average Verbal working memory	63	19.25	3.37	Average
Boys with High Verbal working memory	24	19.75	6.99	Average
Girls with Low Verbal working memory	25	19.48	4.33	Average
Girls with Average Verbal working memory	58	21.07	1.50	Average
Girls with High Verbal working memory	17	24.47	4.35	High

Table 4.3.3 shows the mean achievement motivation score of boys with low verbal working memory category group is 15.08 which is categorized as low according to the categorization level of achievement motivation whereas the mean achievement motivation scores of boys with average verbal working memory group is 19.25 and so it is categorized average level of achievement motivation and the mean achievement motivation scores of boys with high verbal working memory category group is 19.75 which is categorized average level of achievement motivation.

Table 4.3.3 also depicts that the mean achievement motivation score of girls with low verbal working memory category group is 19.48 and it is categorized as average level

of achievement motivation while average achievement motivation score of girls with average verbal working memory category group is 21.07 which is categorized as having average level of achievement motivation and average achievement motivation scores of girls with high verbal working memory category group is 24.47 which is categorized as having high level of achievement motivation.



Graph 4.B 3 : Mean achievement motivation scores for study groups

Table 4.3.4 : shows two-way ANOVA for achievement motivation

Table 4.3.4 : Two-way ANOVA for Achievement Motivation

Source	Sum of Squares	df	Mean Square	F-Ratio	Sig.
Type of Gender (A)	477.609	1	477.609	30.665	0.000
Levels of Verbal working memory (B)	433.248	2	216.624	13.908	0.000
A X B	87.791	2	43.895	2.818	0.062
Error	3021.559	194	15.575		
Total	3785.680	199			

Table 4.3.4 reveals that the F-ratio for Gender (Boys/Girls) for achievement motivation is 30.665, which is substantially significant at the 0.01 level ($p=0.000$; $p<0.01$), which infers that boys and girls have significantly different levels of achievement motivation. This may be due to how the society thinks and creates stereotypes. For example, there is always a pressure on the male members of the family to earn and hence their motivation to achieve success in life can be impacted.

Similarly, cultural pressures or thought processes also influence the achievement motivation of boys and girls.

Table 4.3.4 displays that F-ratio for Levels of Verbal working memory (Low/Average/High) for achievement motivation is 13.908 and it is statistically significant at 1% level ($p=0.000$; $p<0.01$), which infers that there are significant differences in achievement motivation levels of students with different levels of verbal working memory. However, **Hyde and Lamon (1990)** discovered no gender differences in achievement motivation or interest in mathematics.

Tables 4.3.4 also reflects that F-ratio for interaction of independent variables (Type of Gender & Levels of verbal working memory) for achievement motivation is 2.818 and it is statistically not significant at 5% level ($p=0.062$; $p>0.05$).

Table 4.3.5 : Comparison of Achievement Motivation of Boys and Girls

	Achievement Motivation	
	Boys	Girls
N	100	100
Mean	18.830	21.250
Std. Deviation	4.878	3.389
Mean Difference	2.420	
't' score	4.074	
p value	0.000	

According to Table 4.3.5, the mean achievement motivation value for boys is 18.830, while the mean achievement motivation value for girls is 21.250. The difference in mean was 2.420, while the 't' score was 4.074, and it is statistically significant at the 1% level ($p=0.000$; $p<0.01$), which suggests that there are significant differences among boys' and girls' achievement motivation. Furthermore, the mean score reflects that girls have higher achievement motivation in comparison to boys. Socially, since girls are confined to restricted environment, it at times naturally comes to them to have higher need to succeed and hence higher motivation to achieve success. Also, learning environment and teaching practices can also affect the achievement motivation among boys and girls. A study by **Bouchey & Harter (2005)**, found that girls had higher academic self-perceptions and showed higher positive reflected

appraisals from teachers and parents when compared to boys. Additionally, girls demonstrated higher achievement motivation specifically in science and math.

Table 4.3.6 : Comparison of Achievement Motivation of students with different levels of Verbal working memory

Achievement Motivation	N	Mean	S.D	Mean Difference	't' score	p value
Low Verbal working memory	38	17.974	5.011	2.150	3.358	0.001
Average Verbal working memory	121	20.124	2.789			
Low Verbal working memory	38	17.974	5.011	3.734	2.867	0.005
High Verbal working memory	41	21.707	6.416			
Average Verbal working memory	121	20.124	2.789	1.583	2.182	0.031
High Verbal working memory	41	21.707	6.416			

Table 4.3.6 shows that average achievement motivation scores for students with low verbal working memory are 17.974 and average achievement motivation scores for students with average verbal working memory are 20.124. The difference in means was 2.150 while 't' score was 3.358 and it is statistically significant at 0.01 level ($p=0.001$; $p<0.01$), which suggests that there are significant differences in achievement motivation of students with low verbal working memory and students with average verbal working memory. Furthermore, mean score reflects that students with average verbal working memory are more motivated to succeed than those with low verbal working memory.

Table 4.3.6 illustrates that average achievement motivation score for students with low verbal working memory is 17.974, while the mean achievement motivation score for students with high verbal working memory is 21.707. The difference in the means was 3.734 and 't' score was 2.867 and it is statistically significant at 1% level

($p=0.005$; $p<0.01$). This means there are substantial differences in achievement motivation between students with low and high verbal working memory. In addition, the mean score indicates that students with high verbal working memory are more motivated to succeed than those with low verbal working memory.

Table 4.3.6 exhibits that the mean achievement motivation scores for students with average verbal working memory are 20.124 and the mean achievement motivation scores for students with high verbal working memory are 21.707. The mean variance was determined as 1.583 while the 't' score was reported as 2.182, which at 5% level of significance is statistically significant ($p=0.031$; $p<0.05$). It suggests that students with ordinary verbal working memory and students with high verbal working memory differ significantly in their motivation to achieve. In addition, the average score indicates that students with high verbal working memory are more motivated to succeed than students with average verbal working memory.

The above results may be because the ability to solve problems, make decisions, and act in a way that is aimed towards achieving goals are all examples of cognitive functions that rely heavily on verbal working memory. Students with a higher verbal working memory capabilities might have access to a larger pool of cognitive resources at their disposal, which may be used for activities associated to accomplishment. This expanded ability might lead to greater motivation by making it easier to process and organise the information that is essential for the pursuit of goals.

Also, the capacity of an individual's verbal working memory has an impact on their ability to concentrate, maintain attention, and avoid distractions. Those with larger verbal working memory capacity may be more engaged in their tasks and persistent in their efforts because they are better able to keep their focus and resist interruptions or setbacks. Motivation to attain a goal requires consistent, prolonged work in addition to a determined will to succeed.

A similar result was found by **Alloway et al., (2009)** where they found that children with lower verbal working memory capacity had lower achievement motivation as compared to children with higher verbal working memory capacity.

Table 4.3.7: Comparison of Achievement Motivation of Study Groups

Achievement Motivation	N	Mean	S.D.	Mean Difference	't' score	p value
Boys with Low Verbal working memory	13	15.077	5.107	4.177	3.695	0.000
Boys with Average Verbal working memory	63	19.254	3.374			
Boys with Low Verbal working memory	13	15.077	5.107	4.673	2.119	0.041
Boys with High Verbal working memory	24	19.750	6.986			
Boys with Average Verbal working memory	63	19.254	3.374	0.496	0.446	0.657
Boys with High Verbal working memory	24	19.750	6.986			
Girls with Low Verbal working memory	25	19.480	4.331	1.589	2.486	0.015
Girls with Average Verbal working memory	58	21.069	1.497			
Girls with Low Verbal working memory	25	19.480	4.331	4.991	3.660	0.001
Girls with High Verbal working memory	17	24.471	4.346			
Girls with Average Verbal working memory	58	21.069	1.497	3.402	5.082	0.000
Girls with High Verbal working memory	17	24.471	4.346			
Boys with Low Verbal working memory	13	15.077	5.107	4.403	2.797	0.008
Girls with Low Verbal working memory	25	19.480	4.331			
Boys with Average Verbal working memory	63	19.254	3.374	1.815	3.768	0.000

Achievement Motivation	N	Mean	S.D.	Mean Difference	't' score	p value
Girls with Average Verbal working memory	58	21.069	1.497			
Boys with High Verbal working memory	24	19.750	6.986	4.721	2.464	0.018
Girls with High Verbal working memory	17	24.471	4.346			

Table 4.3.7 shows that the mean achievement motivation scores for boys with low verbal working memory are 15.077 and the mean achievement motivation scores for boys with average verbal working memory are 19.254. The difference in mean was 4.177 and 't' score was 3.695 and which at 1% level of significance was significant ($p=0.001$; $p<0.01$), which suggests that achievement motivation differs significantly between boys who have poor verbal working memory and boys with ordinary verbal working memory. In addition, the mean score indicates that boys with average verbal working memory are more motivated to achieve than boys with limited verbal working memory.

Table 4.3.7 illustrates that the average score of achievement motivation for boys with low verbal working memory is 15.077 and the mean score achievement motivation for boys with high verbal working memory is 19.750. The mean difference was 4.673, and the 't' score was 2.119, indicating that it is significant at the 5% level ($p=0.041$; $p<0.05$), which means that boys with a low verbal working memory and those with a high verbal working memory differ significantly in their motivation to achieve. In addition, the mean score indicates that boys with high verbal working memory are more motivated to achieve than boys with low verbal working memory.

Table 4.3.7 exhibits that the mean achievement motivation scores for boys with average verbal working memory are 19.254 and the mean achievement motivation scores for boys with high verbal working memory are 19.750. The mean difference was 0.496 and the t-score was 0.446, which is statistically insignificant at the 5% significance level ($p=0.657$; $p>0.05$), which implies that there is no significant difference between boys with average verbal working memory and boys with high verbal working memory with regard to achievement motivation. In addition, the mean

score indicates that males with high verbal working memory are equally motivated to achieve as those with ordinary verbal working memory.

Table 4.3.7 shows that the average achievement motivation scores for girls with low verbal working memory are 19.480 and average achievement motivation scores for girls with average verbal working memory are 21.069. The mean variance was determined as 1.589, while the 't' score was 2.486, and this is statistically significant at the 5% level of significance ($p = 0.015$; $p<0.05$), which implies that girls with low verbal working memory are significantly less motivated to achieve than those with average verbal working memory. In addition, the mean score indicates that girls with ordinary verbal working memory are more motivated to achieve than girls with limited verbal working memory.

Table 4.3.7 shows average achievement motivation scores for girls with low verbal working memory is 19.480, while those for girls with high verbal working memory is 24.471. The mean variance was 4.991, and the 't' score was 3.660, which is statistically significant at the 1% level of significance ($p=0.001$; $p<0.01$), which means that girls with low verbal working memory are significantly less motivated to achieve than those with high verbal working memory. In addition, the mean score indicates that girls with high verbal working memory are more motivated to achieve than girls with low verbal working memory.

Table 4.3.7 exhibits that the mean achievement motivation scores for girls with average verbal working memory are 21.069 and the mean achievement motivation scores for girls with high verbal working memory are 24.471. The difference in mean was 3.402 and ‘t’ score was 5.082 and it is significant at 0.01 level ($p=0.000$; $p<0.01$), which deduces that there is a significant difference between girls with average verbal working memory and girls with high verbal working memory in terms of their motivation to achieve. In addition, the mean score indicates that girls with high verbal working memory are more motivated to achieve than girls with average verbal working memory.

Table 4.3.7 shows that the mean score of achievement motivation for boys with low verbal working memory is 15.077 and the mean score of achievement motivation for girls with low verbal working memory is 19.480. The difference in mean was 4.403 and ‘t’ score was 2.797 and it is statistically significant at 1% level ($p=0.008$; $p<0.01$) which suggests that boys with low verbal working memory are significantly less

motivated to achieve than girls with low verbal working memory. In addition, the mean score indicates that girls with low verbal working memory have higher achievement motivation than boys with low verbal working memory.

Table 4.3.7 shows that average achievement motivation scores for boys with average verbal working memory are 19.254 and average achievement motivation scores for girls with average verbal working memory are 21.069. The difference in mean was 1.815 and 't' score was 3.768 and it is found to be significant at 1% level ($p=0.000$; $p<0.01$) and which implies that boys with average verbal working memory are significantly less motivated to achieve than girls with average verbal working memory. In addition, the mean score indicates that girls with average verbal working memory are more motivated to achieve than boys with average verbal working memory.

Table 4.3.7 reveals that average achievement motivation score for boys with a strong verbal working memory is 19.750, while average achievement motivation score for girls with a strong verbal working memory is 24.471. The difference in mean was 4.721 and 't' score was 2.464 and it is significant at 5 % level of significance ($p=0.018$; $p<0.05$), which implies that boys with high verbal working memory and girls with high verbal working memory differ significantly in their achievement motivation. In addition, the mean score indicates that girls with high verbal working memory are more motivated to achieve than boys with high verbal working memory.

Table 4.3.8 : Association between Gender and Achievement Motivation

		Achievement Motivation		Total	Chi Square
		Below Average	Above Average		(p value)
Boys	F	48	52	100	20.353
	%	48.0%	52.0%	100.0%	0.000
Girls	F	18	82	100	
	%	18.0%	82.0%	100.0%	
Total	F	66	134	200	
	%	33.0%	67.0%	100.0%	

Table 4.3.8 shows that out of total boys, 48 % boys are having achievement motivation below average while rest of 52 % boys are having above average achievement motivation. While out of total girls, 18 % girls are having achievement motivation below average while rest of 82 % girls are having above average achievement motivation. The value of chi-square is 20.353 and it is significant at the 1% level ($p=0.000$; $p<0.01$), which suggests that there are significant differences among boys' and girls' achievement motivation.

The formation of a drive to excel in one's chosen field can be affected by the norms and expectations of society. It's possible that girls receive greater praise, support, and encouragement for their academic accomplishments, all of which might lead to higher levels of motivation. Additionally, during the past several years, societal transformations have taken place that have promoted gender equality and empowered girls, which may have had a favourable influence on the levels of motivation that girls exhibit.

The motivation of students may be significantly influenced by both their teachers and their parents. According to the findings of several studies, educators have a tendency to offer more positive comments and encouragement to female students, which might help boost their motivation. In a similar vein, the expectations of parents for their daughters and their engagement in their daughters' education can have a good impact on the girls' desire to learn.

According to the results of the investigation by **Jacobs et al 2002**, females often have greater levels of self-competence and values in areas that are usually connected with academic achievement, such as language arts and social studies. It was shown that girls' motivation and self-perceptions in these areas were impacted by variables such as supportive parental and teacher feedback, personal interest, and the internalisation of society's expectations for academic accomplishment.

Table 4.3.9 : Association between Levels of Verbal working memory and Achievement Motivation

		Achievement Motivation		Total	Chi Square
		Below Average	Above Average		(p value)
Low Verbal working memory	F	26	12	38	27.142
	%	68.4%	31.6%	100.0%	0.000
Average Verbal working memory	F	28	93	121	
	%	23.1%	76.9%	100.0%	
High Verbal working memory	F	12	29	41	
	%	29.3%	70.7%	100.0%	
Total	F	66	134	200	
	%	33.0%	67.0%	100.0%	

Table 4.3.9 shows that out of total students having low verbal working memory, 68.4 % students are having achievement motivation below average while rest of 31.6 % students are having achievement motivation above average.

Table 4.3.9 reflects that out of total students with average verbal working memory, 23.1 % students with average verbal working memory are having achievement motivation below average while rest of 76.9 % students with average verbal working memory are having achievement motivation above average.

Table 4.3.9 demonstrates that out of total students with high verbal working memory, 29.3 % students with high verbal working memory are having achievement motivation below average while rest of 70.7 % students with high verbal working memory are having achievement motivation above average.

The chi-square value is calculated to be 27.142 and it is significant at 1% level ($p=0.000$; $p<0.01$) which suggests that there is significant variance in achievement motivation of students with different levels (low/average/high) of verbal working memory.

Students with a greater ability for verbal working memory may have had greater academic achievement in the past as a result of their superior cognitive talents. This

positive reinforcement and history of achievement can further build their conviction in their own skills and increase their drive to continue obtaining successful outcomes.

Alloway & Alloway (2010) found that students who had a greater capacity for verbal working memory also exhibited higher levels of achievement motivation, which in turn, favourably improved their academic success.

Table 4.3.10 : Correlation between Verbal working memory and Achievement Motivation

	Coefficient of Correlation	p value
Boys (N = 100)	0.297	0.003
Girls (N = 100)	0.575	0.000
Total Sample (N = 200)	0.345	0.000

Table 4.3.10 reveals that the correlation coefficient among verbal working memory and achievement motivation is 0.297, which is statistically significant at the 0.01 level for boys ($p=0.003$; $p<0.01$) which infers that a significant positive correlation exists between verbal working memory of boys and their achievement motivation. It infers that achievement motivation increases with increase in verbal working memory and vice versa.

Table 4.3.10 displays that the coefficient of correlation between verbal working memory and achievement motivation is 0.575 and it is statistically significant at 1% for girls ($p=0.000$; $p<0.01$) which infers that a significant positive correlation exists among verbal working memory and achievement motivation for girls. It infers that achievement motivation increases with increase in verbal working memory and vice versa for girls.

Table 4.3.10 exhibits that the correlation coefficient among verbal working memory and achievement motivation is calculated as 0.345 which is significant at 1% level for total sample ($p=0.000$; $p<0.01$), which deduces that a significant positive correlation exists among verbal working memory and achievement motivation for total sample. It infers that achievement motivation increases with increase in verbal working memory and vice versa for total sample.

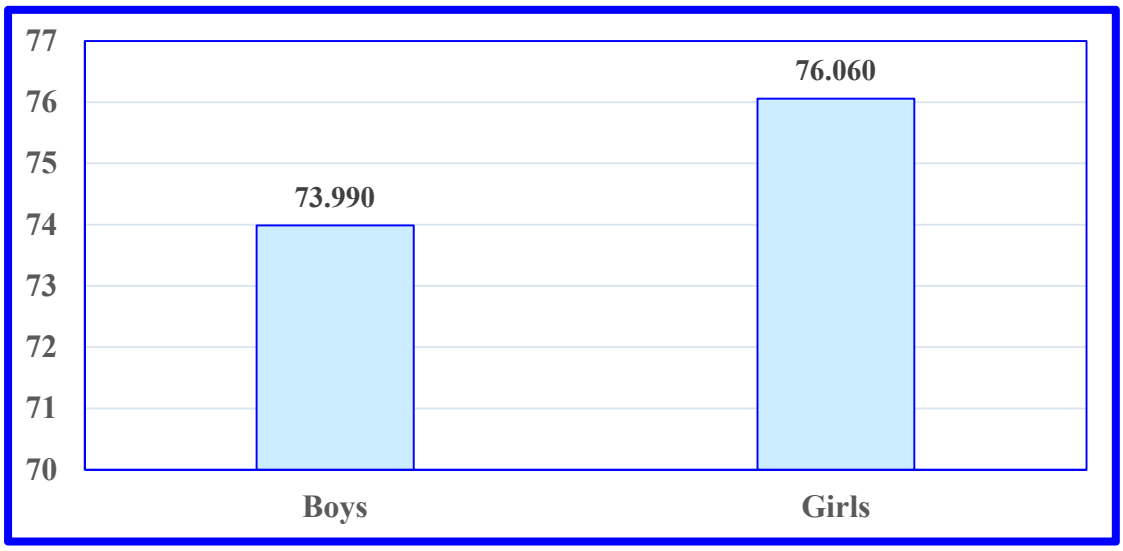
4.4 Academic Performance

Table 4.4.1 displays mean, standard deviation and different categories of academic performance scores of boys and girls.

Table 4.4.1 : Mean, S.D. and Category of Academic performance for Boys and Girls

Academic performance	N	Mean	S.D.	Category
Total Sample of Boys	100	73.99	7.75	Average
Total Sample of Girls	100	76.06	6.59	Average

The table shows that mean score of academic performance for boys is 73.99 which shows that they are having an average level of academic performance. Similarly, the girls have a mean academic performance score of 76.06 which is categorized as average level of academic performance.

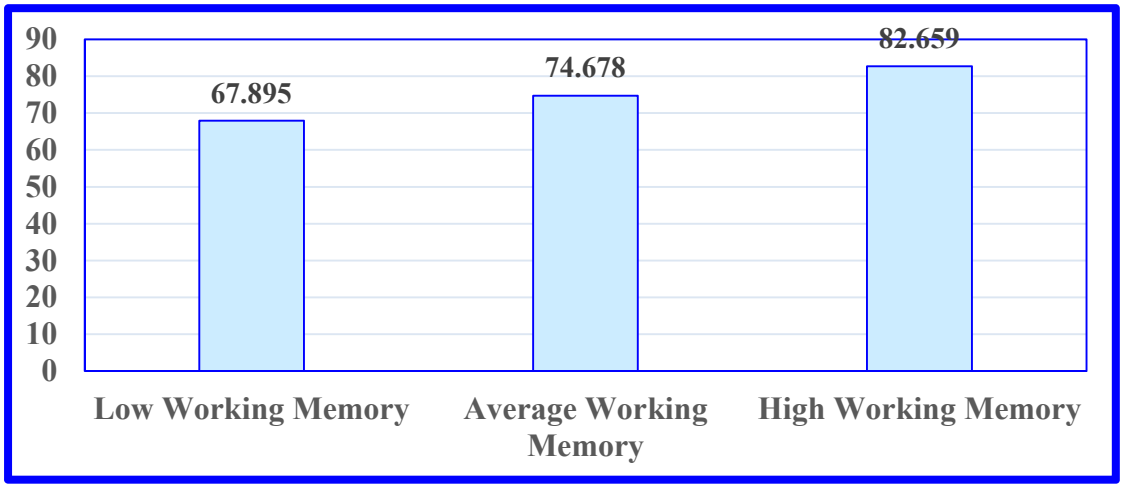


Graph 4C 1 : Mean academic performance scores for boys and girls

Table 4.4.2 : Mean, S.D. and Category of Academic performance Scores of students with different levels of Verbal working memory

Academic performance	N	Mean	S.D.	Category
Total Sample with Low Verbal working memory	38	67.90	7.29	Low
Total Sample with Average Verbal working memory	121	74.68	5.19	Average
Total Sample with High Verbal working memory	41	82.66	4.79	High

Table 4.4.2 shows that mean score of academic performance for students from low verbal working memory group is 67.90, which means that they have a low academic performance. Similarly, the average score of academic performance for students from average level verbal working memory group is 74.68, and this shows that they have an average academic performance. Furthermore, the mean scores of academic performance for students from high level verbal working memory group is 82.66, and which means that they are having average level of academic performance.



Graph 4C2 : Mean academic performance scores for different levels of verbal working memory

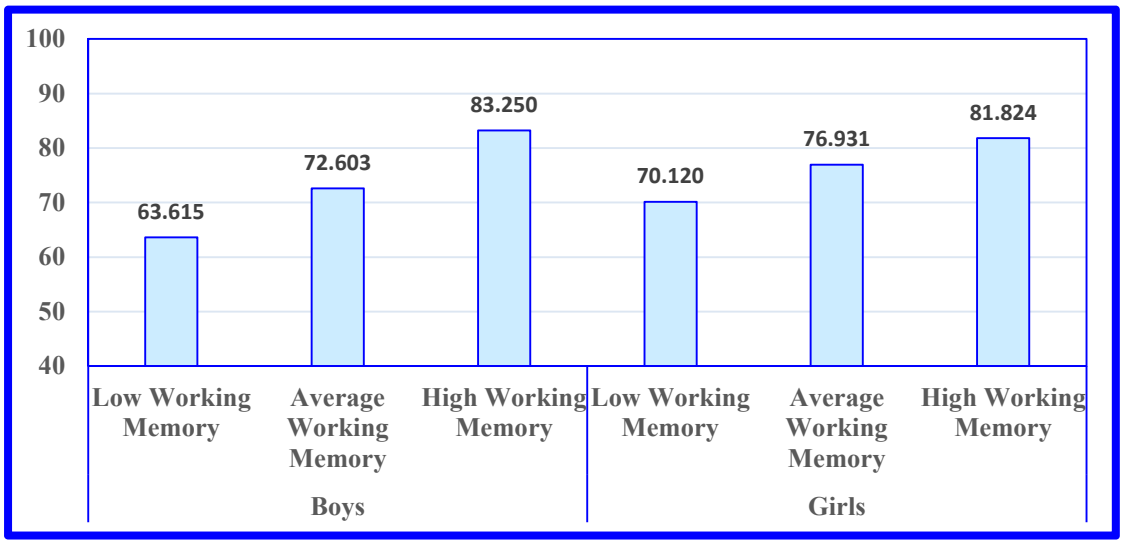
Table 4.4.3 : Mean S.D. and Category of Academic performance Scores for Study Groups

Academic performance	N	Mean	S.D.	Category
Boys with Low Verbal working memory	13	63.62	3.01	Low
Boys with Average Verbal working memory	63	72.60	5.73	Average
Boys with High Verbal working memory	24	83.25	3.07	High
Girls with Low Verbal working memory	25	70.12	7.89	Average
Girls with Average Verbal working memory	58	76.93	3.33	Average
Girls With High Verbal working memory	17	81.82	6.52	High

Table 4.4.3 shows the mean academic performance scores of boys with low verbal working memory category group is 63.62 which is categorized as low level of academic performance while the mean academic performance scores of boys with average verbal working memory category group is 72.60 which is categorized as average academic performance and the average academic performance of boys with

high verbal working memory category group is 83.25 which is categorized as high level of academic performance.

Table 4.4.3 also depicts that the mean academic performance scores of girls with low verbal working memory category group is 70.12 and it is categorized as average academic performance while the average score for academic performance of girls with average verbal working memory category group is 76.93 and it is categorized as average academic performance and the mean score for academic performance of girls with high verbal working memory category group is 81.82 which is categorized as high level of academic performance.



Graph 4C 3: Mean academic performance scores for study groups

Table 4.4.4 shows two-way anova for academic performance.

Table 4.4.4 : Two-way ANOVA for Academic Performance

Source	Sum of Squares	df	Mean Square	F-Ratio	Sig.
Type of Gender (A)	353.146	1	353.146	13.258	0.000
Levels of Verbal working memory(B)	4529.868	2	2264.934	85.031	0.000
A X B	339.367	2	169.683	6.370	0.002
Error	5167.491	194	26.637		
Total	10450.875	199			

Table 4.4.4 shows that F-ratio for Type of Gender (Boys/Girls) for academic performance is calculated to be 13.258 and it is significant at 1% level ($p=0.000$; $p<0.01$) which suggests that a significant difference exists in the level of academic

achievement of boys and girls. It's possible because boys and girls have distinct interests and approaches to learning. Girls, for instance, are more likely to pay attention and concentrate on specifics, whereas boys may be more inclined to learn via physical activity and hands-on experience. The various approaches to instruction utilised in various educational environments can have a direct impact on how well students are able to achieve academically.

Table 4.4.4 displays that F-ratio for Levels of Verbal working memory (Low/Average/High) for academic performance is calculated to be 85.031 and it is significant at 1% level ($p=0.000$; $p<0.01$) which means that a significant difference exists in the level of achievement of students with different levels of verbal working memory. It may be because planning and organisation of activities use verbal working memory. Students with higher capacity for verbal working memory are better prepared to handle many tasks, set objectives, and devise successful methods for the completion of task assignments. Their capacity for organisation can result in more productive study habits and an overall improvement in their academic achievement.

Tables 4.4.4 also reflects that F-ratio for interaction of independent variables (Type of Gender & Levels of verbal working memory) for academic performance is 6.370 and it is significant at 1% level ($p=0.002$; $p<0.01$). **Alloway et al (2009)** confirmed that children who had a limited capacity for verbal working memory had challenges with task planning, organisation, and goal setting. They were unable to effectively manage many activities at once, prioritise information, or devise efficient ways for completing tasks. These challenges in managing one's workload were linked to lower academic achievement in a variety of courses.

Table 4.4.5 : Comparison of Academic Performance of Boys and Girls

	Academic Performance	
	Boys	Girls
N	100	100
Mean	73.990	76.060
Std. Deviation	7.745	6.589
Mean Difference	2.070	
't' score	2.036	
p value	0.043	

Table 4.4.5 shows that the mean academic performance scores for boys are 73.990 and the mean academic performance scores for girls are 76.060. The difference in mean was 2.070 and 't' score was 2.036 and it is significant at 5% level ($p=0.043$; $p<0.05$) which deduces that a significant difference exists in the academic performance between boys and girls. Furthermore, the mean score reflects that girls have higher academic performance in comparison to boys. This may be because girls may have higher levels of intrinsic drive and greater conviction in their academic ability, both of which can favourably impact their performance, especially in countries like India where for ages girls were not provided enough opportunities to study and excel, more so in the case of academic achievement. On the other hand, boys may experience difficulties connected to the expectations of society or may display different motives, both of which might have an effect on the academic results they achieve.

Table 4.4.6 shows comparison of academic performance of students with different levels of verbal working memory.

Table 4.4.6 : Comparison of Academic Performance of students with different levels of Verbal working memory

Academic Performance	N	Mean	Std. Deviation	Mean Difference	't' score	p value
Low Verbal working memory	38	67.895	7.289	6.783	6.339	0.000
Average Verbal working memory	121	74.678	5.190			
Low Verbal working memory	38	67.895	7.289	14.764	10.715	0.000
High Verbal working memory	41	82.659	4.789			
Average Verbal working memory	121	74.678	5.190	7.981	8.672	0.000
High Verbal working memory	41	82.659	4.789			

Table 4.4.6 shows that the mean academic performance scores for students with low verbal working memory are 67.895 and the mean academic performance scores for students with average verbal working memory are 74.678. The difference in mean was 6.783 and 't' score was 6.339 and it is significant at 1% level ($p=0.000$; $p<0.01$), which deduces that a significant difference is there in academic performance between students with low and average verbal working memory. Furthermore, mean score reflects that students with average verbal working memory have higher academic performance in comparison to students with low verbal working memory.

Table 4.4.6 illustrates that the mean academic performance scores for students with low verbal working memory are 67.895 and the mean academic performance scores for students with high verbal working memory are 82.659. The difference in mean was 14.764 and 't' score was 10.715 and it is significant at 1% level ($p=0.000$; $p<0.01$), which deduces that a significant difference exists in academic performance between students with low and high verbal working memory. Furthermore, mean score reflects that students with high verbal working memory have higher academic performance in comparison to students with low verbal working memory.

Table 4.4.6 exhibits that the mean academic performance scores for students with average verbal working memory are 74.678 and the mean academic performance scores for students with high verbal working memory are 82.659. The difference in mean was calculated to be 7.981 and 't' score was 8.672 and it is significant at 0.01 level ($p=0.000$; $p<0.01$), which infers that there is a significant difference between the academic performance of students with average and high verbal working memory. In addition, the mean score indicates that students with superior verbal working memory perform better academically than those with ordinary verbal working memory.

Verbal working memory is linked to one's ability to learn and remember verbal information and as such students who have a greater verbal working memory capacity are able to encode, retain, and recall knowledge relevant to language-based courses such as reading, writing, and foreign languages more effectively. This has the potential to lead to increased performance on assessments as well as enhanced recall of previously taught content.

Similarly, the ability to digest language and comprehend it is inextricably linked to one's verbal working memory and so, students with higher verbal working memory capacity have an edge when it comes to the processing and comprehension of verbal

information. This can lead to increased comprehension of academic materials, instructions, and lectures, which in turn can contribute to enhanced academic achievement.

A research was conducted by **Gathercole et al (2004)** on children from the ages of 4 to 15 years old to see how their working memory capacity changes over time. It investigated the connection between working memory and a variety of academic talents, including language-based topics like reading and writing, as well as other academic abilities. According to the findings of the study, one's capacity to hold verbal information in their working memory was a major predictor of language-related skills such as reading comprehension and vocabulary. Children who had a greater ability for retaining and manipulating linguistic information in their working memory performed better on activities that required them to do so. In addition to this, the children's performance in activities requiring written language, such as spelling and the building of sentences, was significantly improved.

Table 4.4.7 showing comparison of academic performance of study groups

Table 4.4.7 : Comparison of Academic Performance of Study Groups

Academic Performance	N	Mean	S.D.	Mean Difference	't' score	p value
Boys with Low Verbal working memory	13	63.615	3.015	8.988	5.481	0.000
Boys with Average Verbal working memory	63	72.603	5.729			
Boys with Low Verbal working memory	13	63.615	3.015	19.635	18.694	0.000
Boys with High Verbal working memory	24	83.250	3.068			
Boys with Average Verbal working memory	63	72.603	5.729	10.647	8.624	0.000
Boys with High Verbal working memory	24	83.250	3.068			
Girls with Low Verbal working memory	25	70.120	7.892	6.811	5.556	0.000

Academic Performance	N	Mean	S.D.	Mean Difference	't' score	p value
Girls with Average Verbal working memory	58	76.931	3.329			
Girls with Low Verbal working memory	25	70.120	7.892	11.704	5.049	0.000
Girls with High Verbal working memory	17	81.824	6.521			
Girls with Average Verbal working memory	58	76.931	3.329	4.892	4.184	0.000
Girls with High Verbal working memory	17	81.824	6.521			
Boys with Low Verbal working memory	13	63.615	3.015	6.505	2.850	0.007
Girls with Low Verbal working memory	25	70.120	7.892			
Boys with Average Verbal working memory	63	72.603	5.729	4.328	5.024	0.000
Girls with Average Verbal working memory	58	76.931	3.329			
Boys with High Verbal working memory	24	83.250	3.068	1.426	0.938	0.354
Girls with High Verbal working memory	17	81.824	6.521			

Table 4.4.7 shows that the mean academic performance scores for boys with low verbal working memory are 63.615 and the mean academic performance scores for boys with average verbal working memory are 72.603. The difference in mean was 8.988 and 't' score was 5.481 and it is significant at 0.01 level ($p=0.000$; $p<0.01$). It deduces that a significant difference exists in academic performance between boys with low and average verbal working memory. Furthermore, the mean score reflects that boys with average verbal working memory have higher academic performance in comparison to boys with low verbal working memory.

Table 4.4.7 illustrates that the mean academic performance scores for boys with low verbal working memory are 63.615 and the mean academic performance scores for boys with high verbal working memory are 83.250. The average difference was 19.635 and 't' score was 18.694 and it is significant at 0.01 level ($p=0.000$; $p<0.01$), which infers that a significant difference is there the in academic performance between boys with low and boys with high verbal working memory. Also, the mean score reflects that boys with high verbal working memory have higher academic performance in comparison to boys with low verbal working memory.

Table 4.4.7 exhibits that the mean academic performance scores for boys with average verbal working memory are 72.603 and the mean academic performance scores for boys with high verbal working memory are 83.250. The average difference was 10.647 and 't' score was 8.624 and it is significant at 0.01 level ($p=0.000$; $p<0.01$). It tells that there exists a significant difference in the academic performance among boys with average and high verbal working memory. Furthermore, mean score reflects that boys with high verbal working memory have higher academic performance in comparison to boys with average verbal working memory.

Table 4.4.7 shows that the mean academic performance scores for girls with low verbal working memory are 70.120 and the mean academic performance scores for girls with average verbal working memory are 76.931. The difference in mean was 6.811 and 't' score was 5.556 and it is significant at 0.01 level ($p=0.000$; $p<0.01$). It tells that there exists a significant difference in the academic performance among girls with low and average verbal working memory. Moreover, mean score reflects that girls with average verbal working memory have higher academic performance in comparison to girls with low verbal working memory.

Table 4.4.7 illustrates that the mean academic performance scores for girls with low verbal working memory are 70.120 and the mean academic performance scores for girls with high verbal working memory are 81.824. The difference in mean was 11.704 and 't' score was 5.049 and it is significant at 0.01 level ($p=0.000$; $p<0.01$), which infers that a significant difference exists in the academic performance among girls with low and high verbal working memory. Furthermore, mean score reflects that girls with high verbal working memory have higher academic performance in comparison to girls with low verbal working memory.

Table 4.4.7 exhibits that the mean academic performance scores for girls with average verbal working memory are 76.931 and the mean academic performance scores for girls with high verbal working memory are 81.824. The difference in mean was 4.892 and 't' score was 4.184 and it is significant at 0.01 level ($p=0.000$; $p<0.01$). It deduces that a significant difference exists in the academic performance among girls with average and high verbal working memory. In addition to the above, mean score reflects that girls with high verbal working memory have higher academic performance in comparison to girls with average verbal working memory.

Table 4.4.7 shows that the mean academic performance scores for boys with low verbal working memory are 63.615 and the mean academic performance scores for girls with low verbal working memory are 70.120. The average difference was 6.505 and 't' score was 2.850 and it is significant at 0.01 level ($p=0.007$; $p<0.01$), which infers that a significant difference exists in the academic performance among boys with low and girls with low verbal working memory. Furthermore, mean score reflects that girls with low verbal working memory have higher academic performance in comparison to boys with low verbal working memory.

Table 4.4.7 shows that the mean academic performance scores for boys with average verbal working memory are 72.603 and the mean academic performance scores for girls with average verbal working memory are 76.931. The average difference was 4.328 and 't' score was 5.024 and it is significant at 0.01 level ($p=0.000$; $p<0.01$), which means that a significant difference exists in the academic performance among boys and girls with average verbal working memory. Furthermore, mean score reflects that girls with average verbal working memory have higher academic performance in comparison to boys with average verbal working memory.

Table 4.4.7 shows that the mean academic performance scores for boys with high verbal working memory are 83.250 and the mean academic performance scores for girls with high verbal working memory are 81.824. The difference in mean was 1.426 and 't' score was 0.938 and it is insignificant at 5% level ($p=0.354$; $p>0.05$). It means that there exists no significant difference in the academic performance between boys and girls with high verbal working memory. Additionally, mean score reflects that girls with high verbal working memory and boys with high verbal working memory have similar academic performance.

Table 4.4.8 : Association between Gender and Academic Performance

		Academic Performance		Total	Chi Square
		Below Average	Above Average		(p value)
Boys	F	60	40	100	8.000
	%	60.0%	40.0%	100.0%	0.000
Girls	F	40	60	100	
	%	40.0%	60.0%	100.0%	
Total	F	100	100	200	
	%	50.0%	50.0%	100.0%	

Table 4.4.8 shows that out of total boys, 60 % boys are having academic performance below average while rest of 40 % boys are having academic performance above average. While out of total girls, 40 % girls are having academic performance below average while rest of 60 % girls are having academic performance above average. The chi-square value is calculate to be 8.000 and it is significant at 0.01 level ($p=0.000$; $p<0.01$), which means that a significant difference is there in the academic performance of boys and girls. It's possible that boys and girls go through distinct emotional experiences and have varying levels of socio-emotional development, both of which can have an effect on their academic achievement. Girls, on average, tend to demonstrate higher levels of emotional awareness and self-regulation abilities, both of which might lead to stronger coping strategies and resilience in academic contexts. Girls also tend to be more resilient. When confronted with academic obstacles, boys, on the other hand, may have difficulty expressing their feelings and looking for support from others.

According to the findings of the study conducted by **Zeman, J., Cassano, M., Perry-Parrish, C., & Stegall, S. (2006)**, girls, on an average, display greater levels of emotional awareness and self-regulation than boys do. This is in comparison to their male counterparts. Girls were more likely to participate in adaptive techniques for emotion regulation, such as talking about their feelings, seeking assistance, and using coping skills. This was especially true in situations when they felt overwhelmed by their emotions. These abilities were linked to improved academic achievements as well as greater resiliency in academic settings.

Table 4.4.9 showing association between levels of verbal working memory and academic performance.

Table 4.4.9 : Association between Levels of Verbal working memory and Academic Performance

		Academic Performance		Total	Chi Square
		Below Average	Above Average		(p value)
Low Verbal working memory	F	33	5	38	44.145
	%	86.8%	13.2%	100.0%	0.000
Average Verbal working memory	f	62	59	121	
	%	51.2%	48.8%	100.0%	
High Verbal working memory	F	5	36	41	
	%	12.2%	87.8%	100.0%	
Total	F	100	100	200	
	%	50.0%	50.0%	100.0%	

Table 4.4.9 shows that out of total students with low level of verbal working memory, 86.8 % students are having academic performance below average while rest of 13.2 % students are having academic performance which is above average.

Table 4.4.9 reflects that out of total students with average verbal working memory, 51.2 % students with average verbal working memory are having academic performance below average while rest of 48.8 % students with average verbal working memory are having academic performance above average.

Table 4.4.9 demonstrates that out of total students with high verbal working memory, 12.2 % students with high verbal working memory are having academic performance below average while rest of 87.8 % students with high verbal working memory are having academic performance above average.

The chi-square value is 44.145 and it is significant at 0.01 level ($p=0.000$; $p<0.01$). It means that there exists a significant difference in the academic performance of students with different levels (low/average/high) of verbal working memory. This may be because verbal working memory is closely tied with language processing abilities, effective written expression as well as problem-solving tasks that require

mental manipulation of information, which not only helps students to articulate their thoughts, organize their thoughts, generate coherent and well-structured essays, and utilize a wider range of vocabulary and sentence structures and facilitates more efficient problem-solving and which contributes to better academic performance in subjects that require these skills.

The above results were also similar to findings of the study by **Alloway, T. P., Gathercole, S. E., & Pickering, S. J. (2006)** which investigated the influence that one's verbal and visuospatial working memories have on one's academic performance and the link between the two. The findings indicate that verbal as well as visuospatial working memory are vital determinants of academic success. This conclusion highlights the relevance of verbal working memory in a variety of academic activities.

Table 4.4.10 : Correlation between Verbal working memory and Academic Performance

	Coefficient of Correlation	p value
Boys (N = 100)	0.930	0.000
Girls (N = 100)	0.694	0.000
Total Sample (N = 200)	0.782	0.000

Table 4.4.10 shows that the coefficient of correlation among verbal working memory and academic performance is 0.930 and it is significant at 0.01 level for boys ($p=0.000$; $p<0.01$). It tells that there a significant positive correlation is there among verbal working memory and academic performance for boys. It infers that verbal working memory increases with increase in academic performance and vice versa for boys.

Table 4.4.10 displays that the coefficient of correlation among verbal working memory and academic performance is 0.694 and it is significant at 0.01 level for girls ($p=0.000$; $p<0.01$), which suggests that there exists a significant positive correlation between verbal working memory and academic performance for girls. It also implies that verbal working memory increases with increase in academic performance and vice versa for girls.

Table 4.4.10 exhibits that the coefficient of correlation among verbal working memory and academic performance is 0.782 and it is significant at 0.01 level for total sample ($p=0.000$; $p<0.01$), which suggests that a significant positive correlation exists

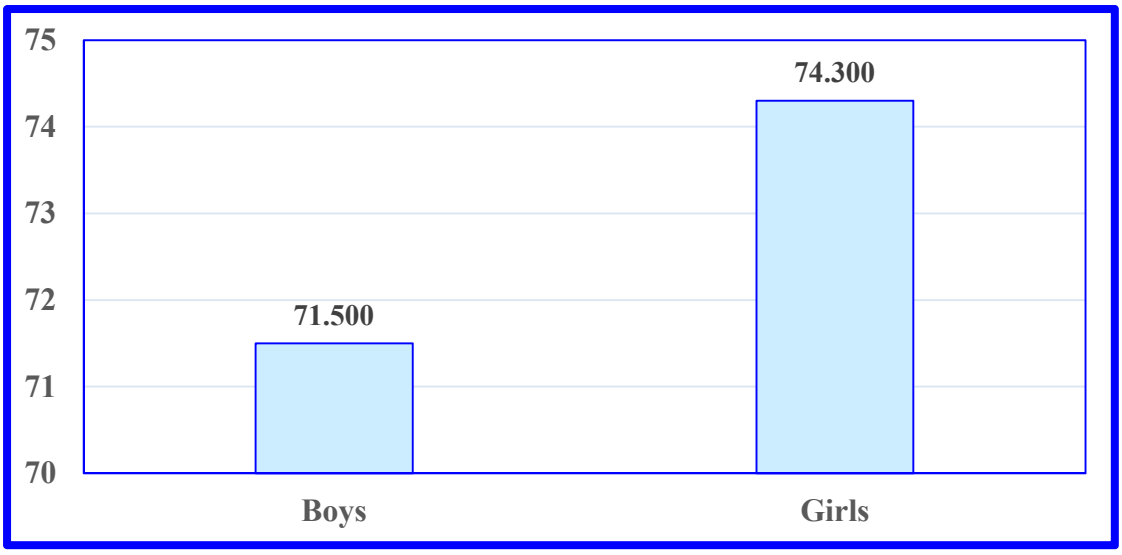
among verbal working memory and academic performance for total sample. It infers that verbal working memory increases with increase in academic performance and vice versa for total sample.

4.5 Study Habit

Table 4.5.1 : Mean, S.D. and Category of Study Habit Scores for Boys and Girls

Study habit	N	Mean	S.D.	Category
Total Sample of Boys	100	71.50	7.32	Average
Total Sample of Girls	100	74.30	8.82	Average

Table 4.5.1 shows that mean score of study habit for boys is 71.50 showing average level of study habit. Similarly, the girls have a mean study habit score of 74.30 which is average level of study habit.

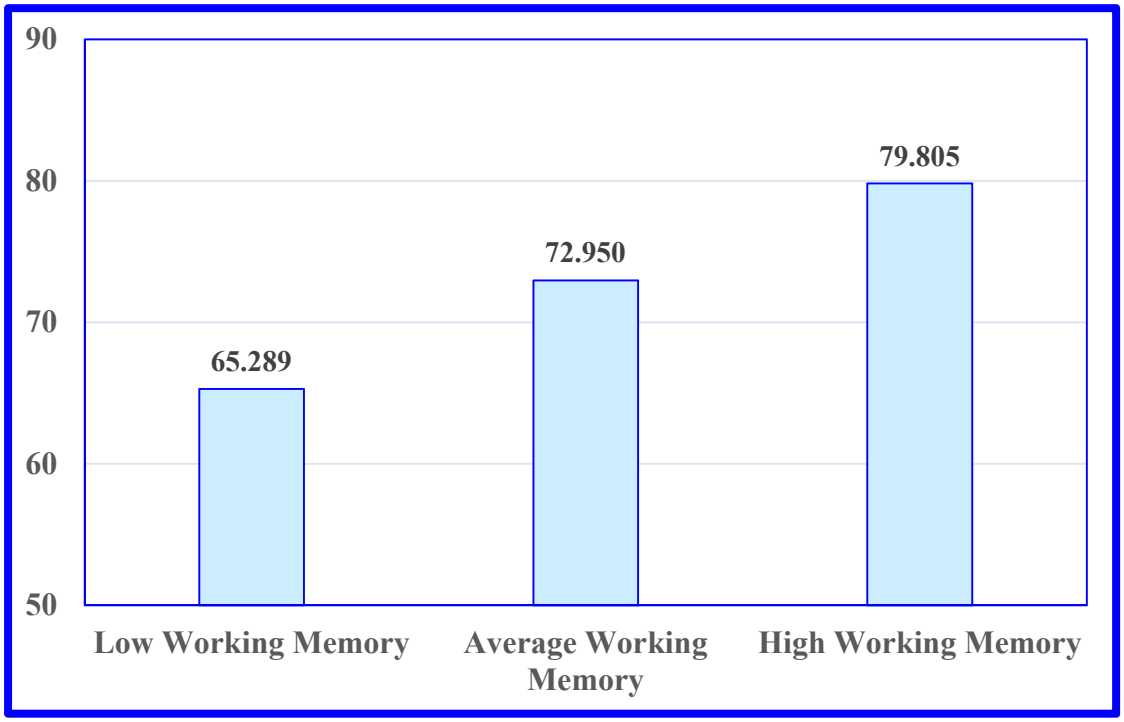


Graph 4D 1 : Mean study habit scores for boys and girls

Table 4.5.2 : Mean, S.D. and Category of Study Habit Scores of students with different levels of Verbal working memory

Study habit	N	Mean	S.D.	Category
Total Sample with Low Verbal working memory	38	65.29	8.67	Low
Total Sample with Average Verbal working memory	121	72.95	6.06	Average
Total Sample with High Verbal working memory	41	79.81	7.15	Average

Table 4.5.2 shows that average study habit score for students from low verbal working memory group is 65.29 indicating that they are having low level of study habit. Similarly, the mean scores of study habit for students from average level verbal working memory group is 72.95 and which indicates that they are having average level of study habit. Furthermore, the mean scores of study habit for students from high level verbal working memory group is 79.81 indicating that they are having average level of study habit.



Graph 4D 211 : Mean study habit scores for different levels of verbal working memory

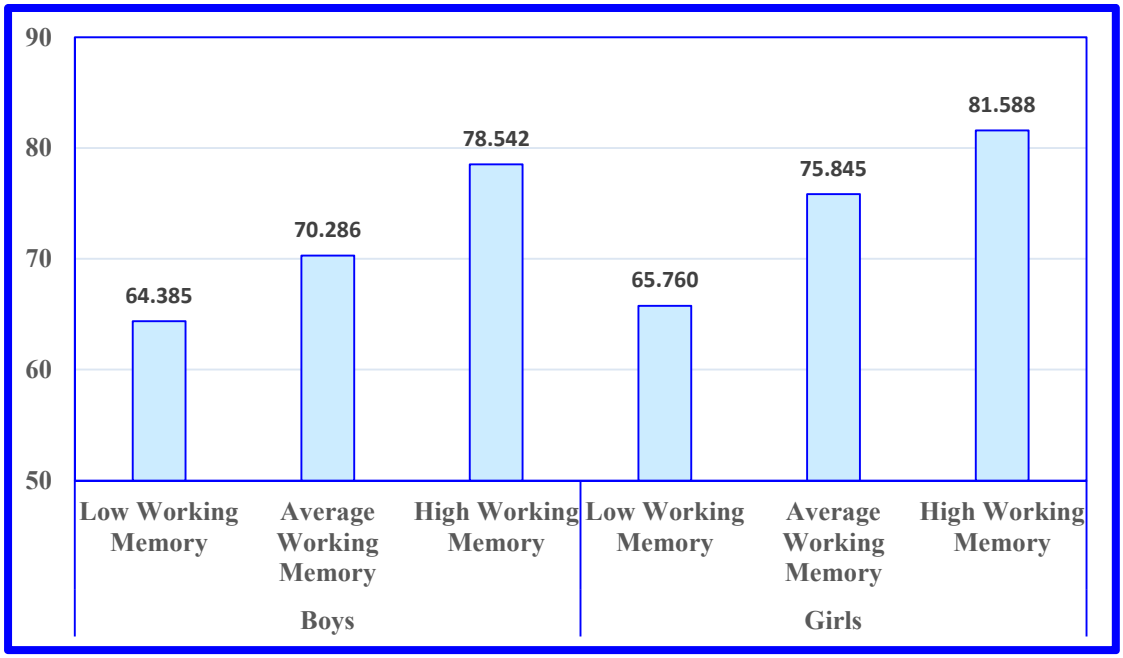
Table 4.5.3 : Mean S.D. and Category of Study Habit Scores for Study Groups

Study habit	N	Mean	S.D.	Category
Boys with Low Verbal working memory	13	64.38	7.75	Low
Boys with Average Verbal working memory	63	70.29	5.19	Average
Boys with High Verbal working memory	24	78.54	6.51	Average
Girls with Low Verbal working memory	25	65.76	9.23	Average
Girls with Average Verbal working memory	58	75.84	5.63	Average
Girls with High Verbal working memory	17	81.59	7.82	High

Table 4.5.3 displays the mean score of study habit of boys with low verbal working memory category group is 64.38 which is categorized as low level of study habit

while the mean study habit scores of boys with average verbal working memory category group is 70.29 and it is categorized as average study habit and the mean score of study habit of boys with high verbal working memory category group is 78.54 and it is categorized as average study habit.

Table 4.5.3 also depicts that the mean study habit scores of girls with low verbal working memory category group is 65.76 and it is categorized as average study habit while the mean score of study habit of girls with average verbal working memory category group is 75.84 and it is categorized as average study habit and the mean score of study habit of girls with high verbal working memory category group is 81.59 and it is categorized as high study habit.



Graph 4D 3 : Mean study habit scores for study groups

Table 4.5.4 : Two-way ANOVA for Study Habit

Source	Sum of Squares	df	Mean Square	F-Ratio	Sig.
Type of Gender (A)	397.647	1	397.647	9.412	0.002
Levels of Verbal working memory (B)	4135.747	2	2067.873	48.946	0.000
A X B	136.658	2	68.329	1.617	0.201
Error	8196.173	194	42.248		
Total	13394.000	199			

Table 4.5.4 shows that F-ratio for Type of Gender (Boys/Girls) for study habit is 9.412 and it is significant at 0.01 level ($p=0.002$; $p<0.01$), which suggests that there exists a significant difference in the study patterns of boys and girls. There can be several reasons which are responsible for this, including social expectations where girls are generally encouraged to be more diligent, organised, and focused on academic accomplishment, which can translate into more structured and disciplined study habits. Girls who are encouraged to be more hardworking, organised, and focused on academic achievement typically get better grades. On the other hand, the expectations placed on boys may be different and place a higher priority on other activities or may not place as much of an emphasis on good study habits.

Also, according to the findings of certain studies, girls often have more ambitious academic goals than boys do. The pursuit of higher academic goals can result in increased desire and investment in one's studies, which in turn can lead to the development of study habits that are more consistent and productive. This was corroborated in a study by **Simpkins, S. D., Davis-Kean, P. E., & Eccles, J. S. (2006)**. The objective of this assessment was to find out, in a longitudinal fashion, the link between adolescents' academic aspirations and their academic accomplishment in math and science. According to the data, it was found that females were more likely than boys to set greater academic objectives in the field of science and numeracy. The pursuit of these lofty objectives was connected with increased motivation and involvement in their studies, including the establishment of habitual approaches to learning that were both consistent and productive.

Table 4.5.4 displays that F-ratio for Levels of Verbal working memory (Low/Average/High) for study habit is 48.946 and it is significant at 0.01 level ($p=0.000$; $p<0.01$). It deduces that there exists a significant difference in the study habits of students with different levels of verbal working memory. It can be because students that have a greater ability for holding verbal information in their verbal working memory may have an edge when it comes to organising and integrating verbal content. They are able to cognitively organise information and make connections between disparate pieces of data, making it simpler for them to generate associations with significant and comprehend complicated concepts. Their capacity to efficiently establish structured study plans, find connections between various concepts, and synthesise material is improved as a result of this skill.

However, Table 4.5.4 also shows that F-ratio for interaction of independent variables (Type of Gender & Levels of verbal working memory) for study habit is 1.617 and it is insignificant at 5% level (p=0.201; p>0.05).

Table 4.5.5 : Comparison of Study Habits of Boys and Girls

	Study Habit	
	Boys	Girls
N	100	100
Mean	71.500	74.300
Std. Deviation	7.323	8.815
Mean Difference	2.800	
't' score	2.443	
p value	0.015	

Table 4.5.5 shows that the mean study habit scores for boys are 71.500 and the mean study habit scores for girls are 74.300. The difference in mean was 2.800 and 't' score was 2.443 and it is significant at 5% level (p=0.015; p<0.05). It suggests that a significant difference exists in the study habits between boys and girls. Furthermore, mean score reflects that girls have more study habits in comparison to boys. A number of factors, including socialisation and cultural standards, motivation and goal orientation, emotional control and self-discipline, influence from peers, and social comparison, contribute to the large gap in the study habits among the two gender. Girls typically have better study habits than boys, which may be the result of a greater societal emphasis on the academic success of girls, higher levels of motivation and setting objectives, greater emotional regulation and self-control skills, and influences from peers such as cooperative learning and social comparison. However, it is essential to keep in mind that individuals of the same gender might display a wide range of characteristics, and that scholastic practises can fluctuate significantly depending on the setting and the community.

Table 4.5.6 : Comparison of Study Habits of students with different levels of Verbal working memory

Study Habit	N	Mean	S.D.	Mean Difference	't' score	p value
Low Verbal working memory	38	65.289	8.671	7.661	6.087	0.000
Average Verbal working memory	121	72.950	6.062			
Low Verbal working memory	38	65.289	8.671	14.515	8.140	0.000
High Verbal working memory	41	79.805	7.153			
Average Verbal working memory	121	72.950	6.062	6.854	5.971	0.000
High Verbal working memory	41	79.805	7.153			

Table 4.5.6 shows that the mean study habit scores for students with low verbal working memory are 65.289 and the mean study habit scores for students with average verbal working memory are 72.950. The difference in mean was 7.661 and 't' score was 6.087 and it is significant at 0.01 level ($p=0.000$; $p<0.01$). It suggests that a significant difference exists in the study habits between students with low and average verbal working memory. Furthermore, mean score reflects that students with average verbal working memory have better level of study habits in comparison to students with low verbal working memory.

Table 4.5.6 illustrates that the mean study habit scores for students with low verbal working memory are 65.289 and the mean study habit scores for students with high verbal working memory are 79.805. The average difference was 14.515 and 't' score was 8.140 and it is significant at 0.01 level ($p=0.001$; $p<0.01$). It indicates that there exists a significant difference in the study habits between students with low and high verbal working memory. Furthermore, mean score reflects that students with high verbal working memory have better study habits in comparison to students with low verbal working memory.

Table 4.5.6 exhibits that the mean study habit scores for students with average verbal working memory are 72.950 and the mean study habit scores for students with high verbal working memory are 79.805. The average difference was 6.854 and 't' score was 5.971 and it is significant at 0.01 level ($p=0.000$; $p<0.01$). It deduces that a significant difference is present in the study habits between students with average and high verbal working memory. In addition, mean score reflects that students with high verbal working memory have better study habits in comparison to students with average verbal working memory.

The cognitive benefits that are linked with having a larger verbal working memory capacity can be related to the considerable variation in studying habits that exists between students who have varying degrees of verbal working memory capacity. These benefits include greater processing and retention of verbal knowledge, increased cognitive capacities, heightened understanding and analysis, higher planning and organisational skills, and more effective information retrieval. Conversely, lower verbal working memory will have an adverse impact on the effectiveness of study habits.

According to **Engle et al. (1999)**, students who had a higher capacity for verbal working memory were able to integrate and link knowledge in a more effective manner, which led to a deeper grasp of difficult concepts and improved recall of previously taught content.

Students having greater verbal working memory capacity may also have stronger metacognitive abilities, such as the ability to self-monitor and self-regulate. They are more aware of their progress in learning, are able to recognise areas in which they are having trouble, and are able to adapt their study tactics accordingly **(Alloway et al., 2010).**

Table 4.5.7 showing comparison of study habit of study groups.

Table 4.5.7 : Comparison of Study Habit of Study Groups

Study Habit	N	Mean	Std. Deviation	Mean Difference	't' score	p value
Boys with Low Verbal working memory	13	64.385	7.752	5.901	3.407	0.001
Boys with Average	63	70.286	5.191			

Study Habit	N	Mean	Std. Deviation	Mean Difference	't' score	p value
Verbal working memory						
Boys with Low Verbal working memory	13	64.385	7.752	14.157	5.904	0.000
Boys with High Verbal working memory	24	78.542	6.514			
Boys with Average Verbal working memory	63	70.286	5.191	8.256	6.168	0.000
Boys with High Verbal working memory	24	78.542	6.514			
Girls with Low Verbal working memory	25	65.760	9.230	10.085	6.114	0.000
Girls with Average Verbal working memory	58	75.845	5.628			
Girls with Low Verbal working memory	25	65.760	9.230	15.828	5.792	0.000
Girls with High Verbal working memory	17	81.588	7.819			
Girls with Average Verbal working memory	58	75.845	5.628	5.743	3.372	0.001
Girls with High Verbal working memory	17	81.588	7.819			
Boys with Low Verbal working memory	13	64.385	7.752	1.375	0.459	0.649
Girls with Low Verbal working memory	25	65.760	9.230			
Boys with Average Verbal working memory	63	70.286	5.191	5.559	5.652	0.000
Girls with Average Verbal working memory	58	75.845	5.628			
Boys with High Verbal working memory	24	78.542	6.514	3.047	1.358	0.182

Study Habit	N	Mean	Std. Deviation	Mean Difference	't' score	p value
Girls with High Verbal working memory	17	81.588	7.819			

Table 4.5.7 shows that the mean study habit scores for boys with low verbal working memory are 64.385 and the mean study habit scores for boys with average verbal working memory are 70.286. The difference in mean was 5.901 and 't' score was 3.407 and it is significant at 0.01 level ($p=0.001$; $p<0.01$). It indicates that a significant difference is present in the study habits among boys with low and average verbal working memory. Furthermore, mean score reflects that boys with average verbal working memory have better study habits in comparison to boys with low verbal working memory.

Table 4.5.7 illustrates that the mean study habit scores for boys with low verbal working memory are 64.385 and the mean study habit scores for boys with high verbal working memory are 78.542. The average difference was 14.157 and 't' score was 5.904 and it is significant at 1% level ($p=0.000$; $p<0.01$), which infers a significant difference is there in the study habits between boys with low and high verbal working memory. Furthermore, mean score reflects that boys with high verbal working memory have better study habits in comparison to boys with low verbal working memory.

Table 4.5.7 exhibits that the mean study habit scores for boys with average verbal working memory are 70.286 and the mean study habit scores for boys with high verbal working memory are 78.542. The average difference was 8.256 and 't' score was 6.168 and it is significant at 1% level ($p=0.000$; $p<0.01$). It indicates that there exists a significant difference in study habits among boys with average and high verbal working memory. Additionally, mean score reflects that boys with high verbal working memory have better study habits to boys with average verbal working memory.

Table 4.5.7 shows that the mean study habit scores for girls with low verbal working memory are 65.760 and the mean study habit scores for girls with average verbal working memory are 75.845 The difference in mean was 10.085 and 't' score was 6.114 and it is significant at 1% level ($p=0.000$; $p<0.01$). It infers that a significant difference is present in study habits among girls with low and average verbal working memory. Furthermore, mean score reflects that girls with average verbal working memory have better study habits in comparison to girls with low verbal working memory.

Table 4.5.7 illustrates that the mean study habit scores for girls with low verbal working memory are 65.760 and the mean study habit scores for girls with high verbal working memory are 81.588. The difference in mean was 15.828 and 't' score was 5.792 and it is significant at 1% level ($p=0.000$; $p<0.01$), which infers that there exists a significant difference in study habits amongst girls with low and high verbal working memory. Additionally, mean score reflects that girls with high verbal working memory have better study habits in comparison to girls with low verbal working memory.

Table 4.5.7 exhibits that the mean study habit scores for girls with average verbal working memory are 75.845 and the mean study habit scores for girls with high verbal working memory are 81.588. The average difference was 5.743 and 't' score was 3.372 and it is significant at 1% level ($p=0.001$; $p<0.01$). It infers that a significant difference is present in the study habits among girls with average and high verbal working memory. In addition to above, mean score reflects that girls with high verbal working memory have better study habits in comparison to girls with average verbal working memory.

Table 4.5.7 shows that the mean study habit scores for boys with low verbal working memory are 64.385 and the mean study habit scores for girls with low verbal working memory are 65.760. The difference in mean was 1.375 and 't' score was 0.459 and it is not significant at 0.05 level ($p=0.649$; $p>0.05$), which infers that no significant difference exists in the study habits among boys and girls with low verbal working

memory. Moreover, mean score reflects that girls with low verbal working memory and boys with low verbal working memory have similar study habits.

Table 4.5.7 shows that the mean study habit scores for boys with average verbal working memory are 70.286 and the mean study habit scores for girls with average verbal working memory are 75.845. The difference in mean was 5.559 and 't' score was 5.652 and it is significant at 1% level ($p=0.000$; $p<0.01$). It infers that a significant difference exists in the study habits among boys and girls with average verbal working memory. Furthermore, mean score reflects that girls with average verbal working memory have better study habits in comparison to boys with average verbal working memory.

Table 4.5.7 shows that the mean study habit scores for boys with high verbal working memory are 78.542 and the mean study habit scores for girls with high verbal working memory are 81.588. The difference in mean was 3.047 and 't' score was 1.358 and it is insignificant at 0.05 level ($p=0.182$; $p>0.05$). It infers no significant difference is there in the study habits among boys and girls with high verbal working memory. Additionally, mean score reflects that girls with high verbal working memory and boys with high verbal working memory have similar study habits.

Table 4.5.8 : Association between Gender and Study Habits

		Study Habit		Total	Chi Square
		Below Average	Above Average		(p value)
Boys	f	55	45	100	5.123
	%	55.0%	45.0%	100.0%	0.023
Girls	f	39	61	100	
	%	39.0%	61.0%	100.0%	
Total	f	94	106	200	
	%	47.0%	53.0%	100.0%	

Table 4.5.8 shows that out of total boys, 55 % boys are having study habits below average while rest of 45 % boys are having study habits above average. While out of total girls, 39 % girls are having study habits below average while rest of 61 % girls are having study habits above average. The chi-square value is 5.123 and it is

significant at 0.05 level ($p=0.023$; $p<0.05$). It indicates that a significant difference exists in the study patterns and routines of boys and girls.

This may be because learning styles and preferences vary between males and females, which can have an effect on the way in which they choose to study. For instance, females may lean more towards collaborative learning or prefer calm and concentrated study situations, whereas boys may participate in more active or hands-on learning ways **(Gurian, 2011)**. Moreover, girls may prefer to learn in environments that are less distracting than those in which boys learn.

Girls often exhibit greater self-regulation abilities than boys, including the ability to create and achieve objectives, successfully manage time, and consistently practise strict study habits. According to **Zimmerman (2002)**, these abilities contribute to more organised and more effective study habits.

Table 4.5.9 showing association between levels of verbal working memory and study habits.

Table 4.5.9 : Association between Levels of Verbal working memory and Study Habits

		Study Habit		Total	Chi Square
		Below Average	Above Average		(p value)
Low Verbal working memory	F	31	7	38	35.483
	%	81.6%	18.4%	100.0%	0.000
Average Verbal working memory	F	57	64	121	
	%	47.1%	52.9%	100.0%	
High Verbal working memory	F	6	35	41	
	%	14.6%	85.4%	100.0%	
Total	F	94	106	200	
	%	47.0%	53.0%	100.0%	

Table 4.5.9 shows that out of total students with low verbal working memory, 81.6 % students are having below average study habits while the rest of 18.4 % students are having study habits which can be categorized as above average.

Table 4.5.9 reflects that out of total students with average verbal working memory, 47.1 % students with average verbal working memory are having study habits below average while rest of 52.9 % students with average verbal working memory are having study habits above average.

Table 4.5.9 demonstrates that out of total students with high verbal working memory, 14.6 % students with high verbal working memory are having study habits below average while rest of 85.4 % students with high verbal working memory are having study habits above average.

The chi-square value is 35.483 and it is is significant at 1% level ($p=0.000$; $p<0.01$). It deduces that there exist significant differences in the study habits of students with different levels (low/average/high) of verbal working memory. This has also been the findings in several studies according to which, children who have varying degrees of verbal working memory may demonstrate a variety of alternative approaches to learning. Students with higher verbal working memory capacity may have better study habits overall, as opposed to those students who have a lower capacity overall. This can be because students with larger verbal working memory capacity are better equipped to organise and integrate verbal knowledge, which makes it simpler for them to recognise links between concepts and effectively synthesise material. According to **Alloway et al. (2010)**, having this capacity enables students to easily build structured study schedules and make connections between various kinds of knowledge. Also, students that have a larger capacity for keeping verbal knowledge in their working memory may have superior encoding and retention skills for verbal information. According to **Alloway et al. (2010)**, this indicates that they are better able to remember and retrieve knowledge that is pertinent to language-based subjects such as reading, writing, and foreign languages.

Table 4.5.10 : Correlation between Verbal working memory and Study Habit

	Coefficient of Correlation	p value
Boys (N = 100)	0.722	0.000
Girls (N = 100)	0.735	0.000
Total Sample (N = 200)	0.684	0.000

Table 4.5.10 displays that coefficient of correlation among verbal working memory and study habit is 0.722 and it is significant at 1% level for boys ($p=0.000$; $p<0.01$). It suggests that there exists a significant positive correlation between verbal working memory and study habits for boys. It infers that study habit improves with increase in verbal working memory and vice versa for boys.

Table 4.5.10 displays that the coefficient of correlation among verbal working memory and study habit is 0.735 and it is significant at 1% level for girls ($p=0.000$; $p<0.01$). It indicates that a significant positive correlation exists between verbal working memory and study habit for girls. It infers that study habits increases with increase in verbal working memory and vice versa for girls.

Table 4.5.10 exhibits that the coefficient of correlation among verbal working memory and study habit is 0.684 and it is significant at 1% level for total sample ($p=0.000$; $p<0.01$). It suggests that a significant positive correlation is there between verbal working memory and study habit for total sample. It infers that study habits increases with increase in verbal working memory and vice versa for total sample.

4.6 Hypothesis testing

On the basis of the above analysis:

The hypothesis ***"There is no significant difference in achievement motive between boys and girls"*** has **failed to be accepted** as the difference was found between achievement motivation of boys and girls (Table 4.3.4, Table 4.3.5 & Table 4.3.8).

The hypothesis ***"There is no significant difference in academic performance between boys and girls"*** has **failed to be accepted** as the difference was found between academic performance of boys and girls (Table 4.4.4, Table 4.4.5 & Table 4.4.8).

The hypothesis ***"There is no significant difference in study habit between boys and girls"*** has **failed to be accepted** as the difference was found between study habit of boys and girls (Table 4.5.4, Table 4.5.5 & Table 4.5.8).

The hypothesis ***"There is no significant effect of verbal working memory on achievement motive"*** has **failed to be accepted** as the difference was found between achievement motivation of boys and girls (Table 4.3.4, Table 4.3.6 & Table 4.3.9).

The hypothesis ***"There is no significant effect of verbal working memory on academic performance"*** has **failed to be accepted** as the difference was found between academic performance of boys and girls (Table 4.4.4, Table 4.4.6 & Table 4.4.9).

The hypothesis ***"There is no significant effect of verbal working memory on study habit"*** is **rejected** as the difference was found between study habit of boys and girls (Table 4.5.4, Table 4.5.6 & Table 4.5.9).

The next chapter is related with conclusion and suggestions.

CHAPTER – V

CONCLUSION AND SUGGESTIONS

The present chapter is related with conclusion and suggestions. The conclusions are systematically segmented into five sections. The first section is related with the conclusions related with verbal working memory. The second section deals with conclusions related with achievement motivation. The third section deals with conclusions related with academic performance. The fourth section deals with conclusion related with study habits and the fifth section is related with hypotheses testing.

Furthermore, the suggestions are also segmented into five parts. The first four parts are related with improvement/ enhancement of verbal working memory, achievement motivation, academic performance and study habits. The fifth part is related with the suggestions for further research. At last, the practical implications of the research are written.

5.1 Conclusion related with Verbal working memory

- Verbal working memory for boys and girls is average.

5.2 Conclusions related with Achievement Motivation

- Boys and Girls possess average level of Achievement motivation.
- Students having low level of verbal working memory have average Achievement Motivation.
- Students having average level of verbal working memory have average Achievement Motivation.
- Students having high level of verbal working memory have average Achievement Motivation.
- Boys with low verbal working memory have low Achievement Motivation.
- Boys with average verbal working memory have average Achievement Motivation.
- Boys with high verbal working memory have average Achievement Motivation.
- Girls with low verbal working memory have average Achievement Motivation.
- Girls with average verbal working memory have average Achievement Motivation.
- Girls with high verbal working memory have high Achievement Motivation.
- There is a significant difference in level of achievement motivation of boys and girls.

- There is a significant difference in level of achievement motivation of students with different levels of verbal working memory.
- The girls have significantly higher achievement motivation in comparison to boys.
- Students with average verbal working memory have significantly higher achievement motivation in comparison to students with low verbal working memory.
- Students with high verbal working memory have significantly higher achievement motivation in comparison to students with low verbal working memory.
- Students with high verbal working memory have significantly higher achievement motivation in comparison to students with average verbal working memory.
- Boys with average verbal working memory have significantly higher achievement motivation in comparison to boys with low verbal working memory.
- Boys with high verbal working memory have significantly higher achievement motivation in comparison to boys with low verbal working memory.
- Boys with high verbal working memory have similar achievement motivation to boys with average verbal working memory.
- Girls with average verbal working memory have significantly higher achievement motivation in comparison to girls with low verbal working memory.
- Girls with high verbal working memory have significantly higher achievement motivation in comparison to girls with low verbal working memory.
- Girls with high verbal working memory have significantly higher achievement motivation in comparison to girls with average verbal working memory.
- Girls with low verbal working memory have significantly higher achievement motivation in comparison to boys with low verbal working memory.
- Girls with average verbal working memory have significantly higher achievement motivation in comparison to boys with average verbal working memory.
- Girls with high verbal working memory have significantly higher achievement motivation in comparison to boys with high verbal working memory.
- There is a significant association between gender and achievement motivation.
- There is a significant association between verbal working memory levels and achievement motivation.
- There is a significant positive correlation between verbal working memory and achievement motivation for boys.

- There is a significant positive correlation between verbal working memory and achievement motivation for girls.
- There is a significant positive correlation between verbal working memory and achievement motivation for total sample.

5.3 Conclusions Related with Academic Performance

- Boys and Girls possess average level of Academic performance.
- Students having low level of verbal working memory have low level of Academic performance.
- Students having average level of verbal working memory have average level of Academic performance.
- Students having high level of verbal working memory have high level of Academic performance.
- Boys with low verbal working memory have low level of Academic performance.
- Boys with average verbal working memory have average level of Academic performance.
- Boys with high verbal working memory have high level of Academic performance.
- Girls with low verbal working memory have average level of Academic performance.
- Girls with average verbal working memory have average level of Academic performance.
- Girls with high verbal working memory have high level of Academic performance.
- There is a significant difference in level of academic performance of boys and girls.
- There is a significant difference in level of academic performance of students with different levels of verbal working memory.
- The girls have significantly higher academic performance in comparison to boys.
- Students with average verbal working memory have significantly higher academic performance in comparison to students with low verbal working memory.
- Students with high verbal working memory have significantly higher academic performance in comparison to students with low verbal working memory.

- Students with high verbal working memory have significantly higher academic performance in comparison to students with average verbal working memory.
- Boys with average verbal working memory have significantly higher academic performance in comparison to boys with low verbal working memory.
- Boys with high verbal working memory have significantly higher academic performance in comparison to boys with low verbal working memory.
- Boys with high verbal working memory have significantly higher academic performance in comparison to boys with average verbal working memory.
- Girls with average verbal working memory have significantly higher academic performance in comparison to girls with low verbal working memory.
- Girls with high verbal working memory have significantly higher academic performance in comparison to girls with low verbal working memory.
- Girls with high verbal working memory have significantly higher academic performance in comparison to girls with average verbal working memory.
- Girls with low verbal working memory have significantly higher academic performance in comparison to boys with low verbal working memory.
- Girls with average verbal working memory have significantly higher academic performance in comparison to boys with average verbal working memory.
- Girls and Boys with high verbal working memory have similar level of academic performance.
- There is a significant association between gender and academic performance.
- There is a significant association between verbal working memory levels and academic performance.
- There is a significant positive correlation between verbal working memory and academic performance for boys.
- There is a significant positive correlation between verbal working memory and academic performance for girls.
- There is a significant positive correlation between verbal working memory and academic performance for total sample.

5.4 Conclusions Related with Study Habits

- Boys and Girls possess average level of Study habits.
- Students having low level of verbal working memory have low level of Study habits.

- Students having average level of verbal working memory have average level of Study habits.
- Students having high level of verbal working memory have average level of Study habits.
- Boys with low verbal working memory have low level of Study habits.
- Boys with average verbal working memory have average level of Study habits.
- Boys with high verbal working memory have average level of Study habits.
- Girls with low verbal working memory have average level of Study habits.
- Girls with average verbal working memory have average level of Study habits.
- Girls with high verbal working memory have high level of Study habits.
- There is a significant difference in level of study habits of boys and girls.
- There is a significant difference in level of study habits of students with different levels of verbal working memory.
- The girls have significantly higher study habits in comparison to boys.
- Students with average verbal working memory have significantly higher level of study habits in comparison to students with low verbal working memory.
- Students with high verbal working memory have significantly higher level of study habits in comparison to students with low verbal working memory.
- Students with high verbal working memory have significantly higher level of study habits in comparison to students with average verbal working memory.
- Boys with average verbal working memory have significantly higher level of study habits in comparison to boys with low verbal working memory.
- Boys with high verbal working memory have significantly higher level of study habits in comparison to boys with low verbal working memory.
- Boys with high verbal working memory have significantly higher level of study habits in comparison to boys with average verbal working memory.
- Girls with average verbal working memory have significantly higher level of study habits in comparison to girls with low verbal working memory.
- Girls with high verbal working memory have significantly higher level of study habits in comparison to girls with low verbal working memory.
- Girls with high verbal working memory have significantly higher level of study habits in comparison to girls with average verbal working memory.

- Boys and Girls with low verbal working memory have similar level of study habits.
- Girls with average verbal working memory have significantly higher level of study habits in comparison to boys with average verbal working memory.
- Girls and Boys with high verbal working memory have similar level of study habits.
- There is a significant association between gender and study habits.
- There is a significant association between verbal working memory levels and study habits.
- There is a significant positive correlation between verbal working memory and study habits for boys.
- There is a significant positive correlation between verbal working memory and study habits for girls.
- There is a significant positive correlation between verbal working memory and study habits for total sample.

5.5 Hypotheses Testing

1. ***"There is no significant difference in achievement motive between boys and girls"*** **– failed to be accepted**

   The analysis reveals a significant difference between boys and girls regarding achievement motive, refuting the initial hypothesis and prompting a reconsideration of gender-related dynamics in this context.

2. ***"There is no significant difference in academic performance between boys and girls"*** **- failed to be accepted**

   The study reveals a significant difference between boys and girls regarding academic performance, rejecting the initial hypothesis.

3. ***"There is no significant difference in study habit between boys and girls"*** **– failed to be accepted.**

   The analysis reveals a significant difference between boys and girls regarding study habit, refuting the initial hypothesis.

4. ***"There is no significant effect of verbal working memory on achievement motive"*** **– failed to be accepted.**

The research findings demonstrate a noteworthy effect of verbal working memory on achievement motive, refuting the initial hypothesis and emphasizing the importance of verbal working memory in shaping achievement motive.

5. ***"There is no significant effect of verbal working memory on academic performance"*** **– failed to be accepted.**

The study findings demonstrate a significant effect of verbal working memory on academic performance, rejecting the initial hypothesis.

6. ***"There is no significant effect of verbal working memory on study habit"*** **– failed to be accepted.**

The research findings demonstrate a significant effect of verbal working memory on study habits, rejecting the initial hypothesis.

CHAPTER – VI

INTERVENTIONS, SUGGESTIONS & PRACTICAL IMPLICATIONS

6.1 Interventions & strategies to improve working memory & verbal working memory

The cognitive function known as working memory is the part of our minds that is responsible for briefly storing and manipulating the information we encounter. It is an essential component in a wide range of activities, including as learning, problem-solving, decision-making, and concentration, among others. Listed below are some ideas that can help boost your working memory and verbal working memory:

Chunking: The process of chunking involves breaking down more complicated information into more manageable and useful pieces. It is possible to make knowledge easier to recall as well as modify if you divide it up into smaller groups and organize it. As an illustration, rather than attempting to recall a big list of numbers, try organizing the numbers into meaningful sets.

Visualization: involves forming mental images for the purpose of improving memory and recall. Imagine the information that you need to remember, connect it to clear images, and work on making connections between the images in a way that will stick in your mind. The performance of one's working memory can be improved with the use of visual clues.

Mnemonic devices: Encode information using mnemonic techniques so that it is more easily retained in your memory. Mnemonics are any device, such as an acronym, rhyme, or visualization approach, that establishes an easily recallable connection between a piece of new information and prior information.

Memory exercises: Participate in tasks that have been created exclusively for the purpose of testing and exercising your working memory. Memory exercises, brain games, and puzzles such as memorizing lists, playing memory card games, or completing Sudoku might help you boost the quantum of information which can be stored in your working memory.

Mindfulness: The practice of mindfulness can help improve focus and attention, which are essential for working memory. Mindfulness meditation and other approaches can be found online. Your ability to concentrate, the number of distractions you can tolerate, and your level of cognitive control can all increase with regular practice of mindfulness.

Getting enough sleep: A sufficient amount of sleep is essential for the consolidation of memories and the enhancement of cognitive function, particularly working memory. Sleep plays a critical role in these processes. Make getting enough sleep as a top priority so that your brain can process and remember knowledge as efficiently as possible.

Staying Active: Maintaining an active lifestyle is important since research has shown that regular exercise has a beneficial effect on cognitive performance, particularly working memory. Take part in physical activities that will raise your heart rate; research has shown that aerobic exercise in particular is associated with positive effects on cognition.

Multitasking: Reduce your use of numerous tasks because doing so can put a burden on your working memory because it forces you to frequently switch your attention and keep track of multiple pieces of information at the same time. Make an effort to concentrate solely on one undertaking at a time to lighten your mental load and boost the capacity of your working memory.

Use external memory aids: Engage other resources to offload some of the demands placed on your working memory, and make use of external memory aides. Make use of tools such as timetables, to-do lists, alerts, and digital note-taking applications to assist you in remembering crucial information and activities. This will enable your working memory to concentrate on more pressing concerns.

Stay organized: By keeping both your digital and physical areas neat and tidy and by maintaining an environment that is organized. Your working memory will be able to function at a higher capacity if you keep your workspace organized, which will limit distractions and make it easier for you to concentrate.

Activities to improve Verbal working memory

Activities such as listening comprehension, following instructions, reading comprehension, and verbal problem-solving all require it to a significant degree. The following is an expanded list of methods that will help you increase your verbal working memory:

Active listening is the technique of actively focusing one's attention on the information that is being communicated, whether one is participating in a conversation or listening to a lecture. Pay attentive attention to the language, tone, and

main points that the speaker is making. You can improve your ability to remember information by avoiding distractions and making an effort to mentally summarise or repeat the information you need to remember.

Reading out loud can aid strengthen verbal working memory since it engages both the acoustic and verbal channels of processing information. While you are reading, make sure that the words and sentences are pronounced correctly. Your capacity for holding information in your working memory while also being able to manipulate it in real time will increase as you engage in this activity.

Repeat and summarise: Whenever you come across new material, such as directions, instructions, or reasons, you should read it aloud to yourself and then repeat it. Express in your individual thoughts the primary arguments or significant particulars. A better grasp and longer-lasting retention of the knowledge can be achieved through the practise of summarizing it.

Engage in Discussions: Taking part in conversations on a consistent basis will help strengthen your verbal working memory. Participate actively in discussions, listen intently, and reply meaningfully to other people's points of view. When you are having a conversation, you are required to process the information that is being provided to you, formulate responses, and maintain relevant information in the working memory.

Story-telling: it is a great skill to hone since it requires you to remember information and arrange it in a logical order. Practise telling stories. Try describing a narrative in one's own words or summing the plot of a book or movie that you've read or seen. By giving you practise in recalling and organising previously learned information, this exercise strengthens your verbal working memory.

Participate in word and **language-based games** such as crossword puzzles, word search puzzles, word association games, and other similar activities. These exercises put a strain on your verbal working memory by challenging you to recall, manipulate, and establish connections between a wide variety of words and linguistic components.

Apply spaced repetition: Spreading out your study and review sessions over an extended time period will assist in enhancing your verbal working memory and increase the amount of information you retain. Spread up your practise sessions over a longer period of time rather than trying to cram everything into one sitting. It is

important to go back over previously taught information regularly and review it so that the information is ingrained into your working memory.

Develop your vocabulary: Developing your vocabulary will give you with additional brain connections and associations, which will make it simpler for you to retain and manipulate information that is spoken. Acquire new vocabulary, become familiar with its meanings, and then train yourself to use the words in appropriate situations. Your verbal working memory will be put to the test with the use of a variety of novel language components in this exercise.

It's important to take pauses and **learn stress management** techniques because mental tiredness and stress might have an impact on working memory. During mentally taxing linguistic duties, it is important to allow your mind the opportunity to relax and recharge by taking frequent breaks. Because stress can decrease working memory performance, it is important to manage levels of stress with relaxation techniques, physical activity, or mindfulness practices.

Keep in mind that the only way to improve your verbal working memory is to consistently practice and put in the effort. Incorporate these tactics into your daily routine, concentrate on improving your verbal processing skills, and remember to be patient with your development as you work towards your goals. Your capacity to retain and efficiently manage the knowledge that other people verbally provide you with should, with practice and experience, grow with time.

6.2 Interventions & strategies to improve achievement motivation

The term "achievement motive" refers to the drive that people have to excel in their endeavors, achieve their objectives, and be successful. The academic achievement of adolescents and their overall success are both significantly impacted by its presence. The following is a list of more in-depth methods to boost students' accomplishment motivation:

Set realistic and challenging goals: Encourage children to develop objectives that are both practical and demanding. Children should not only be encouraged to set specific and attainable objectives., but also those goals that involve effort and provide a sense of success when they are completed. Assisting them in breaking down larger goals into smaller, more achievable activities will enable them to experience success on a more gradual basis, which will help them create motivation.

Provide feedback and recognition: Provide students with feedback that is both encouraging and instructive, focusing on the areas in which they can develop. It is important to acknowledge and applaud all of their accomplishments, no matter how great or how tiny, in order to strengthen their sense of self-worth and their desire to do well.

Encourage adolescents to have a growth mindset: It is the belief that intelligence and abilities can be increased through hard work and practice. This mindset is essential to the success of this strategy. Instill in them a love of a good challenge, the mindset that viewing setbacks as learning opportunities, and the determination to keep going even when things don't go their way. By putting an emphasis on the significance of hard work and perseverance, this mentality makes it easier to establish a robust accomplishment motive.

Nurture an Intrinsic Motivation: One way to cultivate an intrinsic motivation in students is to relate their learning to their interests, passions, and the relevance it has to the real world. You can assist kids in locating significance and worth in their academic activities by putting an emphasis on the joy of learning rather than merely concentrating on the benefits or grades they receive from outside sources.

Encourage autonomy and choice, by giving students opportunities to make decisions and feel like they have some degree of influence over their educational experience. Provide them with a variety of tasks or assignments from which they can choose topics or approaches that are in line with their interests and the areas in which they excel. Students' feelings of ownership and motivation are increased when they are given more autonomy and choice.

Encourage introspection and self-evaluation, by saying things like, assist students in the development of their self-awareness by having them reflect on their progress, as well as their strengths and limitations. Instruct students to establish their own personal learning goals, monitor and assess their own progress, and evaluate the results of their efforts. Motivation can be increased when one engages in self-reflection since it fosters a sense of responsibility and personal development.

Foster a supportive learning environment: Create a culture in the classroom that rewards effort, collaboration, and support, and you will be fostering an environment

that is conducive to learning. Encourage relationships between students of the same age, as well as cooperative learning and cooperation, so that kids can learn from and be inspired by one another. Students are more likely to be motivated and encouraged to strive for excellence when they are in an environment that is pleasant and encouraging.

Provide challenging and engaging tasks: Tasks that are intellectually exciting and challenging should be provided to pupils, and they should be at a level that is appropriate for their skills. Make space for creative expression, problem-solving, and critical thinking by providing those possibilities. Students' interests and curiosities are piqued when they participate in engaging activities, which in turn fuels the students' motivation to achieve and thrive.

Cultivate self-efficacy beliefs: To assist student in developing a sense of self-efficacy, or the conviction that they are capable of attaining their objectives on their own, it is necessary to cultivate self-efficacy beliefs. Offer support in the form of scaffolding, increase the difficulty gradually, and create opportunities for students to gain mastery experiences. In order to boost both their self-assurance and their drive to succeed, you should acknowledge their achievements and push them to take on increasingly difficult challenges.

Encourage a mindset and a language that is growth-oriented: Make use of language that is upbeat and encouraging, as this will encourage growth, effort, and improvement. Drive home the point that one's skills can be improved via consistent practise, and that even one's failures may serve as instructive learning experiences. Establish a culture in the classroom that places a higher importance on progress and development than on competition and preconceived conceptions about students' levels of intelligence.

Enhancing achievement motivation is a process that occurs over time and is continual; this must be kept in mind. You may assist kids in developing a robust accomplishment motive that contributes to their academic success as well as their personal growth if you continuously put these tactics into practise and modify them to meet the specific requirements of individual students.

6.3 Interventions & strategies to enhance study habit and academic performance

The adolescent years are a critical time for growth and development, and they are also a time when important academic shifts take place. Students will confront a variety of obstacles throughout this time, any one of which may have an effect on their study routines or academic success. For adolescents to attain their academic goals, excel in their assignments, and acquire learning abilities that can be used throughout their lives, developing productive study habits is absolutely necessary. The necessity of good study habits in adolescents and the impact those habits have on overall academic achievement is the focus of this essay.

Time management: It is one of the most influential factors in determining a student's academic performance. Good study habits are developed when adolescent students learn to prioritize their assignments, set aside enough time for studying, and refrain from procrastinating on their schoolwork. If students are able to successfully organize their schedules, they will be able to devote sufficient time to each topic, finish their assignments on time, and adequately prepare for their examinations.

Learning through engagement and activity: Active learning strategies are utilized by students who maintain productive study habits. They go beyond simple reading and memorization by adopting active learning tactics such as knowledge summarization, the creation of concept maps, and participation in conversations. These practises develop skills in comprehension, critical thinking, and problem-solving, which ultimately leads to better academic success.

Taking notes and being organized: Having the capacity to take notes that are clear and well organized. The academic demands that teenagers face can have a substantial influence on their study habits and performance. Adolescents are provided with the tools necessary to properly cope with stress when they are taught stress management strategies such as deep breathing exercises, mindfulness practises, physical activity, and appropriate sleep. They are able to keep attention, enhance learning, and do better academically if they learn how to manage their stress levels.

Reviewing material on a consistent basis and putting what you've learned into practise are two essential study habits for teens. Students' knowledge is strengthened and they are better able to retain information for the long term if they regularly review stuff they have already studied. Teenagers achieve topic mastery via consistent

practise, which also helps them to cement their learning, recognise gaps in their knowledge, and focus their attention on those areas.

An atmosphere that is suitable for learning: It is essential for the academic performance of teenagers to have an atmosphere that is suitable for learning. A study area that is uncluttered, calm, and well-organized makes it easier to concentrate on one's studies and reduces the number of potential distractions. In addition, cutting down on digital distractions by doing things like turning off cellphones or disabling notifications from social media might make it easier to concentrate and increase productivity.

Stress Management: The academic demands that teenagers face can have a substantial influence on their study habits and performance. Teenagers are provided with the tools necessary to properly cope with stress when they are taught stress management strategies such as deep breathing exercises, mindfulness practises, physical activity, and appropriate sleep. They are able to keep attention, enhance learning, and do better academically if they learn how to manage their stress levels.

Seeking Out Support and Working Together: It is essential for the academic performance of teenagers to encourage them to seek out support when it is required. They will be able to raise questions, seek explanation, and quickly resolve challenges if they establish open communication channels with their instructors, parents, and peers. Knowledge-sharing, critical thinking, and the ability to solve problems are all qualities that benefit from collaborative learning environments, which in turn contribute to increased academic success.

The formation of productive study habits is absolutely necessary for teenage students who wish to achieve academic success. Teenagers have the ability to improve their study habits and their academic performance by adopting tactics such as effective time management, active learning, regular review, and stress management. It is crucial for educators, parents, and students to recognize the relevance of these study habits and work cooperatively to establish a supportive learning environment that encourages growth, accomplishment, and a passion for learning that lasts a lifetime among teenagers.

6.4 Suggestions for further research

Reviewing the above research studies it is observed that no study is seen in which impact of working memory and gender on achievement motivation, academic performance and study habits altogehter. The following research gaps are identified:

a) Exclusion of Hindi speaking and rural students
b) Exclusion of government schools
c) Exclusion of primary age group of students
d) Exclusion of Pan-India coverage
e) Exclusion of children with special needs.
f) No Mental disorder as per DSM-5
g) No physical impairment that could impede the evaluation's execution.

Any research can serve its purpose if it can open up areas for future research. The key is to make sure that it not only contributes to the society in its current form with all the findings, but it also lays down the foundation for improvement which can further enhance overall value of the research.

While conducting this research there were many instances where it was felt that, this could be an area for future research. Not only, can this study be extended to cover more cities, it can also be extended to include rural schools as well to start with. Further, one can conduct longitudinal investigations that follow adolescents over an extended period of time. This would allow researchers to examine the longitudinal association among working memory and academic performance, achievement motivation, and study habits. Longitudinal research offers a deeper comprehension of the developmental trajectory and possible causal relationships.

Since this research focused on verbal working memory and its impact, the future studies can either look to find the impact of other aspects of working memory or take different aspects of working memory together to investigate their influence on study habits, academic performance and related aspects.

Future studies can implement experimental designs to investigate the association among working memory and academic outcomes. For instance, researchers can conduct interventions that seek to enhance working memory through targeted training programmes and then evaluate the effects on academic performance, motivation, and study habits.

Another aspect that can be explored is related to working memory. It should be evaluated using a combination of objective and subjective measures. The researchers can incorporate both laboratory-based and ecologically valid objectives that reflect actual academic requirements. We can consider using self-report measures to collect data on students' perceived working memory abilities, academic motivation, and study routines.

Moreover, if the future research can include diverse samples of adolescents from a variety of backgrounds, socioeconomic conditions, and educational contexts as aforementioned then it can contribute more to the education ecosystem. This would aid in the identification of potential individual differences and contextual factors influencing the relationship between working memory and academic outcomes. It is crucial to ensure that research findings can be applied to a diverse population of adolescents.

If, in future studies, we can account for potential confounding variables that may influence the relationship between working memory or its different components, study habits, achievement motivation and academic performance, such as intelligence, attention, and socioemotional variables, then by controlling these variables, researchers can more precisely isolate the contribution of working memory to academic outcomes and motivational factors. For instance, variables such as motivation, attention, executive functioning, and socioeconomic factors may moderate or mediate these relationships.

The success of this or any deep dive in this topic can be increased by transforming the research findings into interventions that can be implemented in educational settings. Not only the endeavor is to create interventions that target adolescents' working memory, academic motivation, and study habits but to enable the educational institutes to implement them effectively, so that the next studies can evaluate the efficacy of these interventions in enhancing academic performance and achievement motivation of the students.

Another effective way to promote and further improve this research is to increase and promote collaboration between researchers from various fields, including psychology, neuroscience, education, and cognitive science. Collaboration can result in a more thorough comprehension of the topic. Encouraging the replication studies will

validate findings of the current research and will also guarantee the dependability of research results.

With the non-stop advancement in technology, if we can examine the use of all upcoming technology in evaluating and enhancing working memory, academic motivation, and study practices then we will be able to do achieve the true objective with which we had set out for while starting this research. Developing digital tools and applications that can objectively measure working memory, provide individualised feedback, and provide strategies for improving study practices is another way to do one up to this study. This integration can facilitate the collection of data and the delivery of interventions.

The future work can utilize qualitative research methods, such as interviews or focus groups, to obtain a more in-depth understanding of adolescents' experiences, perceptions, and strategies in relation to working memory, academic motivation, and study habits. In addition to complementing quantitative findings, qualitative data can provide abundant insights.

A very important aspect of any learning in every field is how can we make use of it for the benefit of not only the immediate community in which it was conducted, but also how can the results can be extended to the whole society – without geographical borders. Conducting cross-cultural studies to assess the generalizability of research results across diverse cultural contexts can be the step in this direction. By doing this we can examine the influence of cultural factors, educational practises, and societal expectations on the relationship between working memory, academic performance, achievement motivation, and study habits.

Researchers can improve the quality and applicability of their studies on working memory and its effects on adolescents' academic performance, achievement motivation, and study routines by implementing the aforementioned recommendations. In turn, this can contribute to the development of interventions and strategies founded on evidence to support student learning and success.

Also, the further research can include Hindi speaking as well as rural students so that it will give a complete picture of how all these factors play across the national level. This will mean that the study should include government schools in the sample selection.

Another dimension which can be added to the study is the inclusion of primary age group of students for a similar study so that a comprehensive view about the impact of working memory on the different factors can be understood and related intervention across different age groups can be identified and implemented.

While there has been much talk of inclusion in the education ecosystem, we still see that there are few studies which cover. In fact the initial idea of this study was to study the impact of verbal working memory on students with special needs, but because of practical difficulties regarding sample collection the special needs students were excluded in this study. However, an organisation with enough sample size and resources can enhance the overall value of this research topic by inlcuding the students with special needs in such a study. This will definitely a much needed research and will also help us to be more inclusive in the real sense.

Also, if we compare the research landscape across India and the rest of the world, it is found that in India, research investigates effects of working memory on learning outcomes and proposes active learning interventions within the context of diverse educational practises. In the meantime, worldwide research investigates the relationship between study practises and working memory, with an emphasis on the role of neuroscience in education. It is essential to overcome obstacles such as cultural adaptation and implementation gaps to translate research into effective classroom practises.

For this first, we need to take into consideration cultural diversity in educational practises and societal norms is emphasised to ensure that interventions are suitable for particular contexts. Second, a divide between research insights and classroom application should be identified, necessitating collaborative efforts between researchers, educators, and policymakers to effectively translate theory into practise. Lastly, the recognition of individual variations in the working memory capacities of students highlights the significance of adapting instructional strategies while maintaining academic standards.

Researchers, educators, and policymakers must work together to bridge the gap between theory and practise in order to enhance student learning outcomes by incorporating research-based strategies into educational systems.

6.5 Practical implications of the research

While there are more layers to this current study and which as mentioned above can lead to further researches in the times to come, but the current study and the outcomes will not only help the students but the larger ecosystem involving teachers as well as parents and the society at large. The results of this study can be applied to the real-life situations which can enhance the overall learning experience.

Here are some ways where results of research can help:

1. **Educational Interventions:** Educators, using the findings of the research as a foundation, can construct educational interventions and instructional methodologies that are centered on the goal of increasing students' capacities of working memory. This may comprise training programmes, strategies that enhance memory, or particular teaching approaches that assist pupils' better control and utilise the resources of their working memory.
2. **Curriculum design:** The findings of this research can help the developers of curriculum to appreciate the cognitive burden that is imposed on students' working memory while designing the curriculum. Working memory can get overwhelmed when complex activities or an excessive amount of knowledge are performed, which can result in decreased motivation and performance. Educators can boost students' success motivation and academic performance by organising the curriculum in a way that reduces the cognitive load on pupils and facilitates the processes that take place in their working memory.
3. **Individualized Support**: It is helpful for educators to identify kids who have a lower working memory capacity so that they may give tailored support to such individuals. Teachers will be able to better personalize their instruction for these kids if they are aware of the unique obstacles they confront and are able to apply tactics such as scaffolding, repetition, and breaking the assignments into more manageable chunks. The assistance of this personalized support can help students to overcome their working memory impairments and increase their motivation and academic performance.
4. **Methods of Evaluation:** The use of standardised exams and other types of evaluations frequently places a major strain on the working memory. Students will be able to exhibit their genuine talents if alternative assessment techniques are developed as a result of this research by looking into the connection between

working memory and academic achievement. These methods will impose less burden on students' working memory than traditional testing procedures. This can be achieved by implementing more project-based assessments providing more time for activities that are more complicated.

5. **Study Skills training:** The development of efficient study skills is an essential component in maximising the use of one's working memory resources. The findings of this research may be utilised to construct study skills training programmes that teach students how to efficiently manage their working memory, organise material, employ mnemonic methods, engage in active learning tactics, and so on. Students' achievement motivation and academic performance can be improved if they are given the opportunity to develop these abilities.
6. **Support from Parents and Teachers:** Sharing the findings of this study with parents and teachers will assist these individuals in better comprehending the significance of working memory in relation to the motivation and performance of students. This understanding may enable parents and teachers to offer the right support and establish a conducive atmosphere that encourages the development and utilisation of working memory abilities. Working memory refers to the part of a person's memory that is actively used for processing information. For instance, they might suggest taking breaks while the student is studying, give assistance in the form of organisational tools, and provide compliments and positive reinforcement for the student's efforts rather than merely their grades.

In broad terms, research on working memory and its influence on achievement motivation and academic performance may guide a variety of practical interventions in educational contexts. These interventions can empower students, parents, and educators to optimise learning experiences and results. Any incremental improvement in the ways the knowledge is imparted and the manner which it is absorbed by the learning community and more importantly the students, which are the future of any nation, bodes well for the future of the country. It was the underlying reason for this research and any positive contribution which these suggestions can make, will be a sign that this research has served its true purpose.

APPENDIX- I TO VI

Appendix-I

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Appendix-II

Bio data sheet of the respondents

Name	:
Father's name	:
Date of birth	:
Gender	:
Age	:
Class/Year	:
School/College	:

Appendix-III

Achievement Motive test questionnaire

1. What I want most in my life is.....
   (a) To get an ideal home life.
   (b) To be a popular man in the society.
   (c) To do something requiring efforts.
2. I would like to solve.....
   (a) Those problems which will give new experiences.
   (b) The socio-economic problems of my country.
   (c) Very difficult puzzles and quizzes.
3. I am happiest when.....
   (a) Making others happy.
   (b) I become the centre of other's attention.
   (c) Successful in my work.
4. I often strongly think of.....
   (a) Being one respected political leader.
   (b) Being a famous social leader.
   (c) Accomplishing something great.
5. My aim of life is.....
   (a) To make a long record of successful achievements.
   (b) To attain high status in society.
   (c) To serve the nation.
6. I like to praise those who.....
   (a) Have earned a name of repute in their own field.
   (b) Have some principles in life.
   (c) Have devoted themselves in the service of mankind.
7. I want to know.....
   (a) How I can be successful to whatever I undertake.
   (b) The honest means of accumulating wealth.
   (c) The easiest way of achieving the World Peace.
8. Before starting a difficult task.....
   (a) I would plan to work out its details.
   (b) I would think about the difficulties that may come in the way.

(c) I would invite suggestions from others.

9. It is my nature to.....

(a) Do things for my friends.

(b) Undertake tasks which require great skills.

(c) Keep things neat and clean.

10. I wish I could always be.....

(a) Eager in successfully doing difficult jobs.

(b} Eager to be sympathetic to sick and poor people.

(c) Eager to visit new places, see new persons and get new things.

11. I feel upset when.....

(a) I am blamed by my own people.

(b) I am neglected.

(c) I fail to reach my desired goal.

12. I want to accomplish the task.....

(a) In a neat and clean fashion.

(b} To do it more better than others.

(c) To finish it before the time fixed.

13. I like to.....

(a) Read fictions and do courageous works.

(b} Think of my future.

(c) Visit different places of the world.

14. I usually think.....

(a) That I should get honour and respect like a leader.

(b) That I should perform something great and unique.

(c) That I should help and look after the sick and injured.

15. I like to be.....

(a) Very systematic and orderly in the work I undertake.

(b) Very faithful and sincere to my friends and colleagues.

(c) Best in my performances and assignments.

16. I like that.....

(a) I may earn money.

(b) I may do most important work.

(c) I may become the master of myself.

17. I am always.....
    (a) Ready to fight for the noble and reasonable cause.
    (b) Ready to enhance and develop my ability.
    (c) Prepared to remove casteism and other social evils.
18. I am sure that during next five years.....
    (a) I will be earning lot of monies.
    (b) I will be an expert in my field.
    (c) I will be independent.
19. I want that.....
    (a) My institution may be more democratic.
    (b) The environment of my town be more peaceful and healthy.
    (c) The environment of my house may allow me to study more and more.
20. I like things which.....
    (a) May make me rich and more possessing. □
    (b) May make me to get respect that of a leader.
    (c) May be achieved by others with great difficulty.
21. I get satisfaction most in.....
    (a) Remaining in the company of famous and popular persons.
    (b) Doing the most difficult tasks.
    (c) Testing others and to give guidance to them.
22. I give preference to.....
    (a) Difficult tasks over simple and easy task.
    (b) Remain in the company of elderly and experienced persons.
    (c) Get encouragement from my friends and others.
23. I genuinely believe that for me.....
    (a) It is possible to attain high social status.
    (b) It is possible to get enough power.
    (c) It is possible to get desired maximum achievements.
24. I wish that I may be.....
    (a) Liberal and kind to my friends at all times.
    (b) Sympathetic to sick and poor people.
    (c) Successful in doing difficult works.

25. I am most happy when .....
    (a) Get a chance to enjoy with others by wits and humour.
    (b) Get honour & respect after performing difficult tasks successfully.
    (c) Get the chance to get a high position.
26. I feel.....
    (a) Upset when I am not getting success in the examination despite of hard work.
    (b) Sad at the death of somebody near and dear to me.
    (c) Enraged when some of my friends do not get justice.
27. In general, I may be described as a.....
    (a) Tolerable person.
    (b) Humble and polite person.
    (c) Optimistic person.
28. I sincerely wish.....
    (a) To be a most wealthy person.
    (b) To be a happy and most fortunate person.
    (c) That I may attain the high achievements in a surprising manner.
29. While working in group I wish that.....
    (a) I may perform the best work than others.
    (b) I may be the leader of the group.
    (c) I may do the work in the most systematic way.
30. I consider myself better than others who.....
    (a) Are unsocial by nature.
    (b) Do not feel the responsibility.
    (c) Do not fix any aim of life and do not work to get it.
31. I get pleasure in.....
    (a) The company of children.
    (b) Solving difficult problems.
    (c) Living with jovial people.
32. I believe.....
    (a) Love is more better than justice.
    (b) My future depends on some special achievements.
    (c) It is better to be sincere and faithful than to be popular.

33. Generally, I.....

(a) Critically analyse other's decisions.

(b) Am polite in behavior.

(c) Do the work till it is completed successfully.

34. In most of the social situation.....

(a) Try to be traditional.

(b) Try to become a bit able to do work in accordance with the social traditions.

(c) Try to attract and get other's attention by my work.

35. I like to.....

(a) Become a big authority in some business or work.

(b) Do my activities in a systematic way.

(c) Make friendly sympathetic behavior with sad people.

36. My real wish.....

(a) Is to get the highly paid work.

(b) s to enjoy the bliss of happy marred life.

(c) Is to attain reputable attainments.

37. I want that I should become so able that.....

(a) I may use such words the meaning of which nobody should be able to understand.

(b) I may be able to do better work than others.

(c) I may forgive him who wants to harm me.

38. I.....

(a) May try my level best to become a big person in my field

(b) May try to remain firm in following the truth.

(c) May try to help the helpless people to the best of my capacity.

39. Generally, I wish that.....

(a) I may be a worshipper of God.

(b) I may serve the poor without caring for any return.

(c) I may get additional success in some work.

40. I avoid.....

(a) Such persons who are pleasure-seekers only and are without responsibility.

(b) Those situations which are not competitive.

(c) Those persons who are mentally illumined and unsystematic.

41. I want that others may think about me as.....

(a) Laborious person.

(b) Very good natured person.

(c) Very intelligent and capable person.

42. I feel very good when.....

(a) I relate my personal experiences to others.

(b) I am told to make others to understand something.

(c) I have to do my difficult work.

43. I always.....

(a) Do the activities in my own systematic way.

(b) Try to please everybody with my behaivour.

(c) Try to do my work in the best possible way.

44. I evaluate my ability by saying.....

(a) My teachers are partial and side others.

(b) Whatever the grade has been given to me is related with labour I have put in.

(c) The grade given to me is less than the labour I have put in.

45. I am.....

(a) Morally a correct person.

(b) Determined to get my high goal in life.

(c) Tolerable to those persons who try to hit me.

46. I am full of anxiety for.....

(a) Knowing my deficiencies so that I may remove them.

(b) Doing more important work.

(c) Becoming the centre of attraction in the group.

47. I bear out the pain because.....

(a) Nobody should feel painful feelings given by me.

(b) I may escape from other's allegations.

(c) I may remove difficulties and get first class success.

48. I am.....

(a) Courageous, but would avoid unnecessary dangers and risks.

(b) Quite punctual and never late for work, school & appointments.

(c) Quite neat and organized in what I do.

49. I am of the opinion that for pleasure and happiness one must…

(a) Get the basic amenities of life.

(b) Enrich the records one's achievements.

(c) Support charities.

50. In whatever work I undertake.....

(a) I like to do very best.

(b) I like to assume full responsibility for it.

(c) I like to make advance plans.

Appendix-IV

Study Habit Inventory

There are 45 questions in the study habit inventory and three alternatives are given for each question: (a) Always or mostly, (b) Sometimes and (c) Rarely or never.

The respondent has to select only one alternative for each question. As per the instructions, there is no time limit for this test, but all the answers must be given honestly and carefully. The questions are as under:

1. I study every day.
2. I study at a particular time of the day.
3. I do my homework daily.
4. If I have to study for a longer time, I take rest in between.
5. I have all the required books and other relevant materials of study with me.
6. For the time of study, I get disturbed by the surroundings at the time of the study.
7. I develop automatic interest in the subject as soon I start studying it.
8. I realise the importance of the subjects for my future career.
9. Other stray thoughts gradually flow in, as soon as I settle down for the study.
10. I read the main points before I read the chapter.
11. I take down notes while reading.
12. I try to recall the matter after reading it.
13. I continue my reading despite the difficulties in understanding meaning of some of the words.
14. I read very carefully in order to understand every point.
15. I never read silently.
16. According to the importance and difficulty of the subject matter, I change and adjust speed of my reading.
17. I study figures and graphs very carefully while reading.
18. During the classroom teaching, I take down notes very sincerely.
19. At home, I compare my class notes with the notes from the textbooks.
20. I take help of anybody if I do not follow anything.
21. I study the subject matter at home thoroughly before it is taught in the

classroom.

22. I read books whenever, I get free time whether at home or in the school/College.
23. I attend my classes regularly in time.
24. I frequently remain absent from class.
25. If a matter is to be learnt by heart, I read and memorize it part by part.
26. I cram certain things without understanding.
27. I revise the subject matter from time to time.
28. I study in the library regularly.
29. During examination days also, I sleep as: usual in the night.
30. Before writing the answers to the questions in the examination. I read very carefully the entire question papers.
31. In the examination, I answer the question in their serial order.
32. I divide the time according to the matter to be answered in respect of the number of questions.
33. Before examination. I read my own notes carefully.
34. I prepare for the examinations from the guides/notes available in the market.
35. I draw an outline of answers of each question before writing answers to the questions in the examination.
36. I feel tense at the beginning of the examination.
37. After the examination, I realise that I have made some mistakes in the answers I have written or I have forgotten some important points.
38. I carefully record my examination results.
39. I single out my weak subjects on the strength of my examination results.
40. I try to make up my deficiency in the weak subjects to my best.
41. I get disappointed, if the examination result is not favourable.
42. I have a tendency to compare my marks with others after the results are declared.
43. I think that I can improve fairly my study habits.
44. I get guidance about proper study habit from my teachers.
45. I will take advantage if a guidance programme in study habits is arranged.

Appendix V

DIGIT SPAN TEST

An assessment procedure for specialist teachers to investigate verbal memory difficulties in children's learning. Both parts are administered.

Digits forwards

Start Item A

Finish Failure on both trials of a pair**.**

Directions "Listen carefully as I say some numbers. When I finish, you say them."

Delivery Digits should be given at the rate of one per second. Administer both trials of each item. Recite digits in an even monotone without any variation in pitch of voice.

Scoring The individual's score is the total number of items correctly repeated forwards.

WORKED EXAMPLE

Item	First Trial	√ or X	Second Trial	√ or X
A	**43**	√	**16**	√
B	**792**	√	**847**	√
C	**5941**	X	**7253**	√
D	**93872**	X	**75396**	X

In this example, the total correct is 5.

Digits Backwards

Directions Administer as above but say, "Repeat these numbers after me but this time I want you to say them backwards." Give two practice trials of two digits first – any two numbers. If the child gets them wrong - correct her or him**.** If the child repeats the digits *forwards*, give a reminder that they should be reversed.

Score As for digits forwards.

Final score Total number managed (ticks) backwards and forwards *added together*. Consult Table 1 for standard score. This can also be expressed as a percentile equivalent: consult Table 2.

Comparison Most people can remember two more digits forwards than they can

backwards. If the gap is larger than three, or smaller than one, this may be worthy of note.

DIGITS FORWARDS

Item	First Trial	√ or X	Second Trial	√ or X
A	43		16	
B	792		847	
C	5941		7253	
D	93872		75396	
E	152649		216748	
F	3745261		4925316	
G	82973546		69174253	
H	246937185		371625948	
			Forwards score	

DIGITS BACKWARDS

Item	First Trial	√ or X	Second Trial	√ or X
A	83		29	
B	475		615	
C	2619		3852	
D	28736		59413	
E	624719		276391	
F	4183627		1586937	
G	52624197		94617385	
			Backwards score	

FINAL SCORE:

Total forwards and backwards:
Standard score:
Percentile equivalent:

Martin Turner

Jacky Ridsdale

revised 6th October 2004

Appendix VI

Paper 1: A STUDY OF RELATIONSHIP BETWEEN WORKING MEMORY AND ACADEMIC PERFORMANCE AMONG ADOLESCENTS

ABSTRACT

Memory and academic results are often used in the same breadth when talking about a student's performance. As teachers and as parents, the emphasis is always is to ensure that the students utilize their maximum abilities in their studies as this will lead to future success. ***Objective -*** The aim of this study is to discover the relationship between working memory and academic performance among adolescent students. ***Research Methodology -*** The study sample consists of 200 adolescents. Working memory is measured using a standardized working memory sub-test, while academic performance is assessed based on students' grades in their respective classes/courses. ***Analysis and conclusion –*** The results indicate a positive association between working memory and academic performance. These findings suggests that academic performance can be improved by using interventions/practices which can enhance the working memory.

KEYWORDS: Working Memory, academic performance, adolescent girls and boys, education

INTRODUCTION:

Working memory is an important cognitive function that plays a crucial role in academic performance. It refers to the ability to temporarily store and manipulate information in the mind. Students with strong working memory are more likely to be successful in their academic endeavours, as they are better equipped to process and retain information.

The ability to retain information in one's working memory is a dynamic cognitive ability that is necessary for academic achievement. It is the ability of the mind to temporarily retain information and exercise control over that information. Students that have strong working memory tend to have greater academic performance because they are better able to absorb and recall the information they learn. The aim of this study is to investigate the relationship between working memory and academic performance among adolescent students.

Working memory is a cognitive mechanism that facilitates the retention and manipulation of information during the execution of a task or the resolution of a problem. Alternative terms for it include the "cognitive workspace" or the "working memory." Working memory is a crucial component for numerous routine activities such as reading, listening, critical thinking, and decision-making. It is crucial for academic achievement and knowledge acquisition, particularly in fields such as mathematics and science that require data manipulation. In fact, working memory is a complex cognitive process that encompasses the active maintenance of information in short-term memory, as well as its modification and integration with long-term memory and prior knowledge.

***Working Memory and Academic performance*:** Working memory is an essential element of academic performance because it enables students to retain and manipulate information, such as recalling instructions, recalling key details, and solving problems. Alloway, Gathercole, and Pickering (2006) discovered that WM was an essential indicator of academic performance in multiple subject areas, including reading, mathematics, and writing. In addition, the study discovered that students with superior WM tended to perform better in school, indicating that WM plays a crucial role in academic achievement.

***Working Memory and learning*:** Working memory is also essential for learning, especially in subjects that involve the recall and implementation of intricate information, such as math and science. According to the research conducted by Kyttala and Lehto (2008), WM is substantially associated with math and science academic achievement. The research indicated that the capacity to store and manipulate information in working memory is crucial for success in these subjects. In addition, studies have shown that students with deficient WM are at a disadvantage when acquiring new information because they struggle to retain it in their minds, making it more difficult to adapt it to new contexts.

REVIEW OF LITERATURE

A synopsis of the research that has been done on the topic of the connection between working memory and academic performance:

Research has demonstrated time and time again that working memory, often known as WM, is an important factor in determining academic achievement in a variety of subject areas, including reading, mathematics, and writing. For instance, Kyttala and

Lehto (2008) discovered that working memory capacity was strongly connected to academic accomplishment in both mathematics and science, with greater WM capacity being associated with better performance in both of these fields of study.

In addition, studies have demonstrated that working memory is essential for the process of learning and remembering new knowledge. Studies have shown that students with low WM have trouble acquiring new knowledge. This is because they struggle to maintain the information in their thoughts, which makes it more difficult for them to apply it in new circumstances. Students with strong WM have an easier time learning new material. Students with a greater WM capacity, on the other hand, have a stronger ability to remember and modify knowledge, which in turn gives them a better ability to apply it to new circumstances.

Last but not least, WM is connected to other cognitive abilities such as concentration, processing speed, and reasoning, which makes it an essential component of total cognitive functioning. People who have a larger capacity for working memory often have stronger attentional control, which enables them to better concentrate on activities and disregard distractions. Additionally, those who have a greater capacity for working memory also tend to have quicker processing rates, which enables them to process information in a more expedient and effective manner. In conclusion but not least, working memory is connected to reasoning ability, with a larger working memory capacity being related to improved problem-solving abilities.

The amount of research available implies, on the whole, that working memory (WM) is an important cognitive ability that plays an important part in both academic success and cognitive functioning. It is possible that interventions designed to improve working memory capacity will have major positive effects on academic achievement as well as overall cognitive functioning.

Research has also been conducted on college students to investigate the connection that exists between working memory and academic achievement. A quick summary of some of the most important discoveries is as follows:

There is a correlation between college students' levels of working memory and their academic performance: The amount of information that can be held in an individual's working memory is positively correlated with their academic achievement, according to a number of studies conducted on college students. For instance, Cowan et al. (2005)

conducted a research in which they discovered that the capacity of a person's working memory was a predictor of academic achievement among college students.

When it comes to academic activities that need higher cognitive functions, working memory is very important. Working memory is especially necessary for academic tasks that demand higher cognitive processes, such as critical thinking, problem-solving, and understanding, since these activities all need the student to be actively engaged in the subject at hand. Working memory capacity was shown to be a predictor of academic achievement on tasks that required complicated reading, according to research carried out by Hannon and Daneman (2001).

Shipstead et al. (2012), from their research showed training for the working memory may increase the overall academic performance of attention deficit hyperactivity disorder (ADHD) and dyslexia kids.

Working memory seems to be a predictor of academic achievement among college students as a whole, especially for activities that demand higher cognitive functions. This is shown by the research that has been done on the topic. Working memory deficiencies are correlated with scholastic problems; nonetheless, these deficiencies are trainable and may be overcome with practise. However, the academic achievement of college students is also affected by other aspects, such as their level of motivation and the study habits they develop.

OBJECTIVE

The objective of this study is to find the relationship between level of working memory and academic performance of students in the age group of 15-20 years.

HYPOTHESIS

There is no significance relationship between working memory and academic performance.

RESEARCH METHODOLOGY

The study sample consisted of 200 participants, which included both boys and girls in the age group of 15-20 years from schools and colleges of Udaipur, Rajasthan. For this the participants were engaged through convenience sampling. Working memory was measured using a standardized working memory test called Digit Span test (subtest of WISC) The distribution of the data was analysed using Pearson coefficient of correlation.

SAMPLE

The research study was carried out by collecting information from a representative sample of two hundred students (male and female) between the ages of 15-20 years old who were enrolled in various educational institutions (schools and colleges). The universities and schools of Udaipur (Rajasthan) were used to compile the sample, and it was selected using a random sampling method.

VARIABLE

Independent variable: School students & College students

Dependent Variable: Working Memory & Academic performance

TOOLS UTILIZED

To measure the working memory among students the **Digit Span test,** a subtest of WISC was administered.

The digit span test is a cognitive evaluation tool that measures an individual's ability to retain and recall a sequence of digits that is given to them either orally or visually. The test may be administered either orally or visually. It is a straightforward and common method for evaluating one's working memory, which is defined as the capacity to temporarily store and manipulate information in one's mind.

PROCEDURE

Firstly, the participant was asked to comfortably sit in a quiet room with distractions and was explained the process of conducting the test. In forward series, the participant was asked to remember a sequence of digits (numbers) in the proper order immediately after the examiner has read out the numbers or series in a monotone voice. The length of the sequence is raised progressively (1 digit at a time) until the subject can no longer remember the sequence correctly. This continues until the individual fails the test. Once the participant fails to answer two consecutive numbers, the test is stopped.

The test is also given in reverse order following same protocol as done for forward sequence.

In backward series, the examiner reads out the digits aloud clearly in a monotone voice. After listening to the numbers, the participant is asked to repeat the numbers or series in reverse order. An example is illustrated to the participant for better understanding of the test.

In contrast, students' Academic performance in school and college was evaluated according to the grades which are converted into marks they earned in the last exam of the classes/courses for which they registered.

RELIABILITY AND VALIDITY OF THE TEST

It has been shown that the digit span test has a high test-retest reliability and strong construct validity. The digit span test, in its entirety, is a reliable and valid measurement of working memory capacity that has been frequently used in a variety of clinical and research situations.

STATISTICAL TECHNIQUES

The coefficient of correlation using SPSS version 21.0 was calculated.

DATA ANALYSIS & INTERPRETATION

In this study, we wanted to find out the relationship between the working memory and academic performance of students from school and college.

Normality Testing for Academic Performance & Digit Span (Working Memory) through Kolmogorov-Smirnov Test

Results of the Lilliefors test indicated that for Academic Performance there is a significant difference from the normal distribution, (D(200) = .082, p = .00215).

Results of the Lilliefors test indicated that for Working Memory (Digit Span) there is a significant difference from the normal distribution, (D(200) = .08, p = .00342).

Parameter	Academic Performance	Working Memory (Digit Span)
p – value	0.002145	0.003422
D	0.08239	0.07991
Sample size (n)	200	200
Average ($\bar{x}$)	75.025	114.49
Median	75.5	116
Sample Standard Deviation (S)	7.2469	9.7264
Sum of Squares	10450.875	18825.98
K	1.1652	1.1301

Parameter	Academic Performance	Working Memory (Digit Span)
Skewness	-0.1095	-0.1585
Skewness Shape	Potentially Symmetrical (p val=0.524)	Potentially Symmetrical (p val=0.356)
Excess kurtosis	-0.8136	-0.5996
Kurtosis Shape	Platykurtic, negative kurtosis, short thin tails (p val=0.017)	Potentially Mesokurtic, normal like tails (p val=0.08)

Even though result is statistically significant, since the effects level is very small i.e., the difference between the sample distribution and the normal distribution is very small, we may practically assume that the distribution is normal.

Correlations			
		Academic Performance	Digit Span
Academic Performance	Pearson Correlation	1	0.199**
	Sig. (2-tailed)		0.005
	N	200	200
Digit Span	Pearson Correlation	0.199**	1
	Sig. (2-tailed)	0.005	
	N	200	200
** Correlation is significant at the 0.01 level (2-tailed).			

The above table indicates that there is significant Pearson coefficient of correlation between academic performance and working memory is found to be 0.199 which is significant at 1% level ($p=0.005$, $p < 0.01$). It infers that that there is significant positive correlation between academic performance and working memory. Furthermore, it can be depicted that by increasing working memory, academic performance can be enhanced and vice-versa also. It is mainly because with good working memory students develop better cognitive skills (for example – critical thinking, analytical thinking and reasoning) and hence can retain information for a longer time leading to better performance in the academic activities. These results are well supported by Holmes, J., & Gathercole, S. E. (2014) and Alloway, T. P.,

Gathercole, S. E., & Kirkwood, H. (2020). The results of these studies suggested that working memory played a crucial role in the academic achievement in adolescents.

DISCUSSION

The findings of this study indicate that working memory is a significant predictor of academic performance among adolescent students. Students with a robust working memory are better able to comprehend and retain information, which is crucial for academic success. It is possible that the stronger relationship between working memory and academic performance among adolescents is a result of the increased demands imposed on working memory in higher education. The findings of this study have significant implications for educators and policymakers, as interventions aimed at enhancing working memory have the potential to improve students' academic performance.

CONCLUSION

This study provides evidence of a positive relationship between adolescent students' working memory and academic performance. The findings emphasise the significance of working memory to academic achievement and imply that interventions aimed at enhancing working memory could have significant positive effects on students' academic performance. Further research is required to investigate the underlying mechanisms of this relationship and to devise effective interventions for enhancing students' working memory.

Paper 2: PREDICTION OF ACADEMIC SUCCESS ON THE BASIS OF STUDY HABIT OF ADOLESCENTS

ABSTRACT

In our society, we lay emphasis on how students perform in academics and often extend the academic performance to the future success of the student. ***Objective-*** The aim of the paper is to find relationship between study habit and academic performance and to predict academic performance on the basis of study habit of school and college students of Udaipur, in the age range of 15-20 years, because as far as we know, there is a dearth of similar research being done on students of South Rajasthan.

Research Methodology - With this intention, a study was conducted on 150 students from schools and colleges, of Udaipur which included both boys and girls. The analysis was done using quantitative research and data was collected through a standardized test on study habits (i.e., PSSSHI by M.N Palsane and Sadhna Sharma) and their academic performance was measured using their percentages achieved in last exams. **Analysis and conclusion –** Descriptive statistics and inferential statistics, such as correlation analysis and independent t test will be used to examine the data. Linear Regression was applied to generate regression equation for prediction of academic performance on the basis of study habit.

Results indicate that there is no significant difference in study habits and academic performances between college and school students. The high positive correlation is obtained between study habit and academic performance.

KEYWORDS: Academic performance, study habits, education, students, school, college

Introduction

Academic performance and study habits are always connected to each other in a student's life. The grades students obtain in tests, coursework, and other types of evaluation are frequently used in India to judge students' academic success and hence the emphasis we lay on studies.

The actions and routines that students follow to finish their homework and study for tests and exams are referred to as study habits. According to one description of study habits, they are "repeated behaviours that have evolved over time and have become

instinctive reactions to specific situations" (Pintrich, 2002). The recurrence and automaticity of study habits, as well as their influence on the formation of academic behaviour, are stressed in this definition [1].

Importance of Study habits and how they are formed in Indian Scenario:

Students who develop good study habits are more prepared to participate in and learn from their classes because they are well prepared and hence often demonstrate higher level of confidence. Of course, there are many factors, including internal drive, parental influence, peer pressure, and the school setting, might shape them. In India, parental and family plays a major role in shaping of a student's study habit because the propensity of study habits to affect academic success, particularly in a highly competitive educational system, makes them important in India.

According to research, students who establish productive study habits are more likely to succeed academically. For instance, a study by Raut and Kamble (2019) revealed that students using effective study techniques—such as employing study aids, establishing goals, and taking notes—had higher academic accomplishment than those who did not. Similar to this, a study conducted by Roy and Das (2018) discovered that students who used time management techniques and had a good attitude about studying had superior academic achievement.

In India, where the educational system is extremely competitive and academic success is highly valued, effective study habits are especially crucial. In order for students to thrive in their academic endeavours, it is also increasingly critical that they establish effective study habits, such as time management and self-regulation. This is because modern education increasingly relies on technology and online instruction.

How academic performance is linked to Study habits and its importance:

Academic performance and study habits are closely related because good study habits help students absorb and retain material, which enhances their performance on tests and assignments. On the other hand, unproductive study methods can harm academic success. This is more so because as mentioned, in India (and probably majority of other countries), academic results define the future trajectory of a person.

Several researches have looked into the connection between study techniques and academic success. For instance, a study by Saad and Alhashemi (2020) discovered that students with strong study habits, such as employing efficient time management

techniques, setting study goals, and periodically checking their notes, outperformed those who did not. In a similar manner, a study by Velasco and Velasco (2016) discovered that students who maintained good study habits, such as setting up a comfortable study space and employing active learning strategies, outperformed those who did not in terms of their academic achievement.

Study practises can operate as a mediator in the interaction between elements like self-regulated learning and academic achievement, according to another research. For instance, a study by Adu et al. (2019) discovered that effective study habits largely moderated the association between self-regulated learning and academic achievement.

The importance of study habits in predicting and enhancing academic achievement is generally highlighted by these researches. Students can thrive in their academic endeavours and improve their academic performance by developing efficient study habits.

Review supporting the research:

The routines and actions people take to enhance their learning and academic achievement are known as study habits. Academic achievement depends greatly on how pupils' put in their effort to study what has been taught and learnt. This overview of the literature tries to emphasise how study habits affect academic achievement and offers some practical advice for improving these habits.

Academic performance and study habits are significantly correlated, according to research. For instance, a study by Singh and Gupta (2017) discovered that students who prioritised their study habits and spent more time studying were more successful academically than those who did not. Parallel to this, a 2016 study by Akram and Akhtar discovered that good study practises, like making a timetable, setting study goals, and using learning aids, positively impacted academic performance among undergraduate students.

Yet, studies have also shown that a variety of factors, such as socioeconomic situation, parental engagement, and educational background, have an impact on study habits and academic achievement. In contrast to students from higher socioeconomic origins, students from lower socioeconomic backgrounds exhibited worse study habits and lower academic achievement, according to a 2019 study by Kishore and Kaur.

Another study by McCann and Roy (2013) looked into how Saudi Arabian medical college students' study behaviours affected their academic achievement. The study discovered a negative correlation between bad study habits like cramming and poor

planning and academic success. The study also discovered that self-control and time management were crucial for encouraging successful study habits and academic achievement

Several researches have looked into the connection between study techniques and academic success. One study found that students who develop productive study techniques like time management, taking notes, and active listening typically succeed academically better (Crédé & Kuncel, 2016). Demir and Sahin (2017) discovered in another study that effective note-taking, self-testing, and regular study routines all showed a substantial positive link with academic achievement.

Also, according to a study by Pande and Jadhav (2020), students who develop successful study habits—like goal-setting, utilising a variety of learning tools, and self-evaluation—are more likely to succeed academically.

The significance of time management abilities in academic success has been highlighted by several scholars. For instance, Bajwa and Saeed's (2018) research revealed that students who successfully manage their time score more academically. Also, a study by Mutsotso et al. (2019) found that students who create objectives and effectively manage their time typically perform better academically.

Motivation is a key element that influences study habits and academic achievement. A study by Kusurkar et al. (2011) found that motivated learners are more inclined to develop productive study habits and perform better academically.

Considering all the above researches it is also evident that in many cases time management has been most effective facet of study habit which is closely linked with good academic performance. On the other hand, few researches also show different factors contribute for each individual to perform academically better. For some it is time management whereas for others it is goal setting which can lead to academic performance.

In conclusion, academic achievement and study routines are crucial aspects of Indian education. While having good study habits can help students perform better academically, other factors can also have an impact on both study habits and academic achievement. Thus, it is crucial for educators, parents, and legislators to be aware of these variables and to create plans to help pupils form good study habits and succeed academically.

There are several studies which establish a strong relation between study habits and academic performance. Following are the key findings from those literature:

Adeyemo and Adeyinka (2015) discovered a positive correlation between undergraduates' study practises and academic performance. Students with excellent study habits were more likely to receive better grades, according to the findings of the study.

Kukulu and Kocakaya (2016) found a correlation between high school pupils' study habits and their academic performance in a separate study. Effective study habits, such as time management and note-taking, were associated with higher GPAs, according to the study.

Credé and Kuncel (2016) discovered through a meta-analysis that study habits emerged as one of the strongest indicators of academic achievement, with an effect size of 0.44. The study analysed data from more than 300 investigations involving over 200,000 students.

A study conducted by Grewal and Salovey (2005) found that graduate students with excellent study habits were more likely to be successful. Effective study habits, such as self-monitoring and time management, were associated with a greater likelihood of degree completion and higher GPAs.

A study by Wubbena et al. (2019) discovered a significant positive correlation between nursing students' study habits and academic performance. Students with excellent study habits, such as time management and note-taking, had higher GPAs and were more likely to pass their licensure exams, according to the study.

Overall, the research indicates that study habits have a substantial effect on academic performance. Students who cultivate effective study habits, such as time management, note-taking, and self-monitoring, are more likely to attain their educational objectives and perform well academically.

Research Methodology:

The study was done using quantitative approach. In this, we obtained the data, classified them under the relevant categories, and measured it against the parameters we had set out to It is a descriptive research study, where the parameters are measured, analysed, compared and interpreted based on the data obtained. For this research, on the study habits and academic performance of students from Udaipur, we had used a descriptive design. Samples from 2 groups -school and college, in the age group of 15-20 years were taken. Both the groups were administered the PSSHI study habit inventory developed by M N Palsane (Pune) & Sadhana Sharma (Agra) which

measures the study habits of the person taking the test. The academic performance was measured by obtaining the results of the students' last exam which they appeared for in their school or college respectively.

Sample:

The research was done by obtaining data from a sample of 150 students (both boys and girls) in the age-group of 15-20 years, from schools and colleges. The sample was chosen using random sampling from the schools and colleges of Udaipur (Rajasthan).

Inclusion and Exclusion Criteria:

The age group defined for this study was between 15 years to 20 years. The students, outside of this range, were not included in the current research. Also, the both English and Hindi medium students were made part of this study. However, only the schools and colleges of urban Udaipur were part of the sample collection and as such the rural students were excluded from the current study.

Variable:

Independent variable:

School students & College students

Dependent Variable:

Study Habits

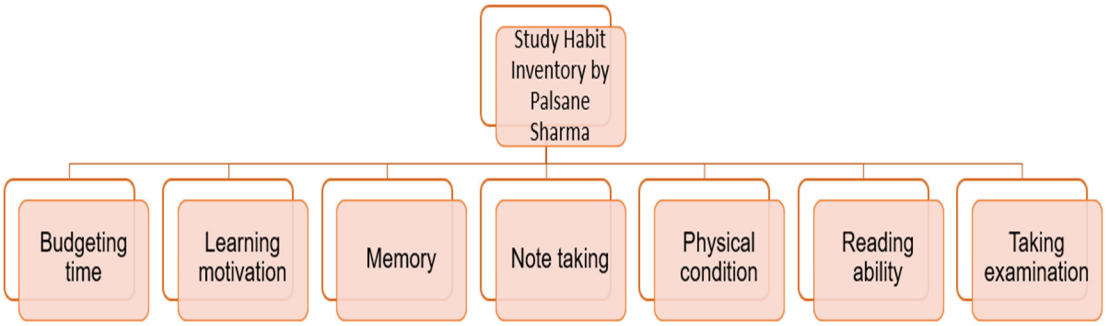
Academic performance

Tools utilized:

To measure the study habits among students the **Study Habit Inventory** (PSSHI) standardized by M N Palsane (Pune) & Sadhana Sharma (Agra) was administered.

It is a self-answering questionnaire which is used to measure the study habit of the person undertaking the test. This test is one of the most used tests in the academic studies since it was first developed in 1985 by Palsane and Sharma.

It is made up of 45 items which assess various aspects of study habits.



The validity and reliability of the PSSHI is good and hence it has been used in numerous researches to find the link between study habits and academic success. It is also used to then assess how efficient are the interventions which are used to improve the study habits.

For academic performance we have used the results of the last exam conducted by the respective institute, which the student had appeared for.

Statistical Techniques:

Descriptive and inferential statistics i.e., mean, SDs, correlation coefficient and two sample t-test were used for to study the nature of the results obtained from the sample collection. The data points were calculated using SPSS version 21.0

Data Analysis & Interpretation:

In this study, we wanted to find out the relationship between the study habits and academic performance of students.

Basic Statistics

		College Students (N=39)	School Students (N=111)	Total Sample (N=150)
	Mean	55.59	52.91	53.607
	Median	57	53	54
Study Habit	Std. Deviation	8.22	9.146	8.965
	Skewness	-0.184	0.185	0.075
	Kurtosis	-1.013	-0.762	-0.855
	Mean	76.974	74.324	75.013

		College Students (N=39)	School Students (N=111)	Total Sample (N=150)
	Median	77	74	75
Academic Performance	Std. Deviation	6.426	8.1	7.767
	Skewness	-0.177	0.205	0.068
	Kurtosis	-0.564	-0.83	-0.814

The skewness and kurotsis values are less than 1 in all study groups therefore it may be considered that data is normalized.

Normality Testing		Kolmogorov-Smirnov		
		Statistic	df	Sig.
Study Habit	College	0.103	39	0.200
	School	0.083	111	0.056
Academic Performance	College	0.097	39	0.200
	School	0.076	111	0.128

The Kolmogorov-Smirnov test is applied for normalization testing. The p value is insignificant (p>0.05) it infers that data is normalized for all the study groups and study variables.

		N	Mean	Std. Deviation	Std. Error Mean	Mean Difference	't'	p value
Study Habit	College Students	39	55.59	8.220	1.316	2.68	1.614	0.11
	School Students	111	52.91	9.146	0.868			
Academic Performance	College Students	39	76.97	6.426	1.029	2.65	1.848	0.07
	School Students	111	74.32	8.100	0.769			

Comparison of School Students Vs College Students

The mean scores for study habit for college students is 55.590 and for school students it is 52.910 and the 't' score is found to be 1.614 which is insignificant at 0.05 level. (p=0.109, p > 0.05). It shows that there is no significant difference between study habit

of college and school students. It may be due to similar way of time management, memory capacity, learning motivation, note taking tendencies, physical condition and reading and taking examination of both college and school students.

The mean scores for academic performance for college students is 76.974 and for school students it is 74.324 and the 't' score is found to be 1.848 which is insignificant at 0.05 level. (p=0.067, p > 0.05). It shows that there is no significant difference between academic performance of college and school students. It may be due to the reason that the academic performance largely depends on the time spent on studies and the way of studying and it almost remains same at school and both college level.

Correlation Table

Correlation between Study Habit and Academic Performance

	r (Coefficient of correlation)	Significance
College Students (n = 39)	0.769	0.000
School Students (n = 111)	0.920	0.000
Total Sample (n = 150)	0.891	0.000

The correlation between study habit scores and academic performance is found high (above 0.75) for all study groups. It infers that academic performance can be boosted through increasing study habits.

Prediction of Academic Performance on the basis of Study Habit

Model		Unstandardized Coefficients		Standardized Coefficients
		B	Std. Error	Beta
1	(Constant)	33.636	1.757	
	Study Habit	0.772	0.032	0.891

And thus, the regression equation is as follows

Academic Performance = 0.772 x Study Habit Scores + 33.636

It infers that by obtaining Study habit scores through Palsane Study habit inventory academic performance can be predicted.

Implications of the study:

The results of this study will aid in identifying the variables that affects or shows a relationship between school students and college students study habits and academic achievement. The research will also aid in the creation of interventions meant to enhance students' study practises and academic achievement. Descriptive statistics and inferential statistics, such as correlation analysis and independent t test will be used to examine the data.

This research will be important because it will provide information on the elements that influence school students and college students' academic progress. Teachers, parents, and legislators can use the findings to create policies that will improve pupils' academic achievement. Overall, this study will significantly advance the field of education and aid in raising high school students' academic performance.

There is a direct correlation between the amount of time spent studying and the grade point average. The formation of productive habits for studying is one of the most significant components in obtaining success in academic pursuits. Students are more likely to achieve higher levels of success in their academic work if they cultivate healthy study habits.

Here are a few ways that study practises can influence academic performance:

Time management: Effective study practises require time management skills. Students who effectively manage their time are more likely to finish their assignments on time and to be better prepared for exams.

Focus and concentration: Effective study practises necessitate the creation of a conducive environment for learning, which promotes focus and concentration. Information is more likely to be absorbed and retained by students who can focus and concentrate effectively.

Memorization and retention: Effective study practises include methods for memorization and retention, such as revising notes and employing mnemonic devices. Important information is more likely to be retained by students who employ these techniques.

Exam Preparation: One of the most important components of effective study habits is to start studying for examinations as early as possible. Students have a better chance of doing well on tests if they study on a consistent basis and put in sufficient effort.

Critical thinking and analysis: The development of effective study habits requires both the ability to critically think and analyse information. Pupils who regularly practise these abilities are better able to comprehend difficult concepts and apply their comprehension to novel scenarios.

Overall, students who cultivate healthy study habits have a greater chance of accomplishing their academic goals. Students have the ability to enhance their grades, expand their knowledge, and acquire the skills they will need to be successful in both their professional and academic lives if they create productive study habits.

PUBLICATIONS

The International Journal of Indian Psychology
ISSN 2348-5396 (Online) | ISSN: 2349-3429 (Print)
Volume 11, Issue 2, April- June, 2023
DIP: 18.01.203.20231102, DOI: 10.25215/1102.203
https://www.ijip.in

Research Paper

A Study of Relationship Between Working Memory and Academic Performance Among Adolescents

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ABSTRACT

Memory and academic results are often used in the same breadth when talking about a student's performance. As teachers and as parents, the emphasis is always to ensure that the students utilize their maximum abilities in their studies, as this will lead to future success. ***Objective -*** The aim of this study is to discover the relationship between working memory and academic performance among adolescent students. ***Research Methodology -*** The study sample consists of 200 adolescents. Working memory is measured using a standardized working memory sub-test, while academic performance is assessed based on students' grades in their respective previous classes/courses. ***Analysis and conclusion*** – The results indicate a positive association between working memory and academic performance. These findings suggests that academic performance can be improved by using interventions/practices which can enhance the working memory.

Keywords: *Working Memory, Academic Performance, Adolescent Girls and Boys, Education*

Working memory (WM) is an important cognitive function that plays a crucial role in academic performance. It refers to the ability to temporarily store and manipulate information in the mind. Students with strong working memory are more likely to be successful in their academic endeavours, as they are better equipped to process and retain information.

The ability to retain information in one's working memory is a dynamic cognitive ability that is necessary for academic achievement. It is the ability of the mind to temporarily retain information and exercise control over that information. Students that have strong working memory tend to have greater academic performance because they are better able to absorb and recall the information they learn. The aim of this study is to investigate the relationship between working memory and academic performance among adolescent students.

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Received: June 01, 2023; Revision Received: June 09, 2023; Accepted: June 11, 2023

Working memory is a cognitive mechanism that facilitates the retention and manipulation of information during the execution of a task or the resolution of a problem. Alternative terms for it include the "cognitive workspace" or the "working memory." Working memory is a crucial component for numerous routine activities such as reading, listening, critical thinking, and decision-making. It is crucial for academic achievement and knowledge acquisition, particularly in fields such as mathematics and science that require data manipulation. In fact, working memory is a complex cognitive process that encompasses the active maintenance of information in short-term memory, as well as its modification and integration with long-term memory and prior knowledge.

***Working Memory and Academic performance*:**
Working memory is an essential element of academic performance because it enables students to retain and manipulate information, such as recalling instructions, recalling key details, and solving problems. Alloway, Gathercole, and Pickering (2006) discovered that WM was an essential indicator of academic performance in multiple subject areas, including reading, mathematics, and writing. In addition, the study discovered that students with superior WM tended to perform better in school, indicating that WM plays a crucial role in academic achievement.

***Working Memory and learning*:**
Working memory is also essential for learning, especially in subjects that involve the recall and implementation of intricate information, such as math and science. According to the research conducted by Kyttala and Lehto (2008), WM is substantially associated with math and science academic achievement. The research indicated that the capacity to store and manipulate information in working memory is crucial for success in these subjects. In addition, studies have shown that students with deficient WM are at a disadvantage when acquiring new information because they struggle to retain it in their minds, making it more difficult to adapt it to new contexts.

REVIEW OF LITERATURE

A synopsis of the research that has been done on the topic of the connection between working memory and academic performance:
Research has demonstrated time and time again that working memory, often known as WM, is an important factor in determining academic achievement in a variety of subject areas, including reading, mathematics, and writing. For instance, Kyttala and Lehto (2008) discovered that working memory capacity was strongly connected to academic accomplishment in both mathematics and science, with greater WM capacity being associated with better performance in both of these fields of study.

In addition, studies have demonstrated that working memory is essential for the process of learning and remembering new knowledge. Studies have shown that students with low WM have trouble acquiring new knowledge. This is because they struggle to maintain the information in their thoughts, which makes it more difficult for them to apply it in new circumstances. Students with strong WM have an easier time learning new material. Students with a greater WM capacity, on the other hand, have a stronger ability to remember and modify knowledge, which in turn gives them a better ability to apply it to new circumstances.

Last but not least, WM is connected to other cognitive abilities such as concentration, processing speed, and reasoning, which makes it an essential component of total cognitive

functioning. People who have a larger capacity for working memory often have stronger attentional control, which enables them to better concentrate on activities and disregard distractions. Additionally, those who have a greater capacity for working memory also tend to have quicker processing rates, which enables them to process information in a more expedient and effective manner. In conclusion but not least, working memory is connected to reasoning ability, with a larger working memory capacity being related to improved problem-solving abilities.

The amount of research available implies, on the whole, that working memory (WM) is an important cognitive ability that plays an important part in both academic success and cognitive functioning. It is possible that interventions designed to improve working memory capacity will have major positive effects on academic achievement as well as overall cognitive functioning.

Research has also been conducted on college students to investigate the connection that exists between working memory and academic achievement. A quick summary of some of the most important discoveries is as follows:
There is a correlation between college students' levels of working memory and their academic performance: The amount of information that can be held in an individual's working memory is positively correlated with their academic achievement, according to a number of studies conducted on college students. For instance, Cowan et al. (2005) conducted a research in which they discovered that the capacity of a person's working memory was a predictor of academic achievement among college students.

When it comes to academic activities that need higher cognitive functions, working memory is very important. Working memory is especially necessary for academic tasks that demand higher cognitive processes, such as critical thinking, problem-solving, and understanding, since these activities all need the student to be actively engaged in the subject at hand. Working memory capacity was shown to be a predictor of academic achievement on tasks that required complicated reading, according to research carried out by Hannon and Daneman (2001).

Shipstead et al. (2012), from their research showed training for the working memory may increase the overall academic performance of attention deficit hyperactivity disorder (ADHD) and dyslexia kids.

Working memory seems to be a predictor of academic achievement among college students as a whole, especially for activities that demand higher cognitive functions. This is shown by the research that has been done on the topic. Working memory deficiencies are correlated with scholastic problems; nonetheless, these deficiencies are trainable and may be overcome with practise. However, the academic achievement of college students is also affected by other aspects, such as their level of motivation and the study habits they develop.

Objective

The objective of this study is to find the relationship between level of working memory and academic performance of students in the age group of 15-20 years.

Hypothesis

There is no significance relationship between working memory and academic performance.

RESEARCH METHODOLOGY

The study sample consisted of 200 participants, which included both boys and girls in the age group of 15-20 years from schools and colleges of Udaipur, Rajasthan. For this the participants were engaged through convenience sampling. Working memory was measured using a standardized working memory test called Digit Span test (subtest of WISC) The distribution of the data was analysed using Pearson coefficient of correlation.

Sample

The research study was carried out by collecting information from a representative sample of two hundred students (male and female) between the ages of 15-20 years old who were enrolled in various educational institutions (schools and colleges). The universities and schools of Udaipur (Rajasthan) were used to compile the sample, and it was selected using a random sampling method.

Variable

- **Independent variable:** School students & College students
- **Dependent Variable:** Working Memory & Academic performance

Tools Utilized

To measure the working memory among students the **Digit Span test,** a subtest of WISC was administered.

The digit span test is a cognitive evaluation tool that measures an individual's ability to retain and recall a sequence of digits that is given to them either orally or visually. The test may be administered either orally or visually. It is a straightforward and common method for evaluating one's working memory, which is defined as the capacity to temporarily store and manipulate information in one's mind.

Procedure

Firstly, the participant was asked to comfortably sit in a quiet room without distractions and was explained the process of conducting the test. In forward series, the participant was asked to remember a sequence of digits (numbers) in the proper order immediately after the examiner has read out the numbers or series in a monotone voice. The length of the sequence is raised progressively (1 digit at a time) until the subject can no longer remember the sequence correctly. This continues until the individual fails the test. Once the participant fails to answer two consecutive numbers, the test is stopped.

The test is also given in reverse order following same protocol as done for forward sequence.

In backward series, the examiner reads out the digits aloud clearly in a monotone voice. After listening to the numbers, the participant is asked to repeat the numbers or series in reverse order. An example is illustrated to the participant for better understanding of the test.

In contrast, students' Academic performance in school and college was evaluated according to the grades which are converted into marks they earned in the last exam of the classes/courses for which they registered.

Reliability and Validity of The Test*:* It has been shown that the digit span test has a high test-retest reliability and strong construct validity. The digit span test, in its entirety, is a reliable

and valid measurement of working memory capacity that has been frequently used in a variety of clinical and research situations.

Statistical Techniques

The coefficient of correlation using SPSS version 21.0 was calculated.

DATA ANALYSIS & INTERPRETATION

In this study, we wanted to find out the relationship between the working memory and academic performance of students from school and college.

Normality Testing for Academic Performance & Digit Span (Working Memory) through Kolmogorov-Smirnov Test

Results of the Lilliefors test indicated that for Academic Performance there is a significant difference from the normal distribution, (D(200) = .082, p = .00215).

Results of the Lilliefors test indicated that for Working Memory (Digit Span) there is a significant difference from the normal distribution, (D(200) = .08, p = .00342).

Parameter	**Academic Performance**	**Working Memory (Digit Span)**
p – value	0.002145	0.003422
D	0.08239	0.07991
Sample size (n)	200	200
Average ($\bar{x}$)	75.025	114.49
Median	75.5	116
Sample Standard Deviation (S)	7.2469	9.7264
Sum of Squares	10450.875	18825.98
K	1.1652	1.1301
Skewness	-0.1095	-0.1585
Skewness Shape	Potentially Symmetrical (p val=0.524)	Potentially Symmetrical (p val=0.356)
Excess kurtosis	-0.8136	-0.5996
Kurtosis Shape	Platykurtic, negative kurtosis, short thin tails (p val=0.017)	Potentially Mesokurtic, normal like tails (p val=0.08)

Even though result is statistically significant, since the effects level is very small i.e. the difference between the sample distribution and the normal distribution is very small, we may practically assume that the distribution is normal.

Correlations			
		Academic Performance	**Digit Span**
Academic Performance	Pearson Correlation	1	0.199**
	Sig. (2-tailed)		0.005
	N	200	200
Digit Span	Pearson Correlation	0.199**	1
	Sig. (2-tailed)	0.005	
	N	200	200
** Correlation is significant at the 0.01 level (2-tailed).			

The above table indicates that there is significant Pearson coefficient of correlation between academic performance and working memory is found to be 0.199 which is significant at 0.01

level ($p=0.005$, $p < 0.01$). It infers that that there is significant positive correlation between academic performance and working memory. Furthermore, it can be depicted that by increasing working memory, academic performance can be enhanced and vice-versa also. It is mainly because with good working memory students develop better cognitive skills (for example – critical thinking, analytical thinking and reasoning) and hence can retain information for a longer time leading to better performance in the academic activities. These results are well supported by Holmes, J., & Gathercole, S. E. (2014) and Alloway, T. P., Gathercole, S. E., & Kirkwood, H. (2020). The results of these studies suggested that working memory played a crucial role in the academic achievement in adolescents.

DISCUSSION

The findings of this study indicate that working memory is a significant predictor of academic performance among adolescent students. Students with a robust working memory are better able to comprehend and retain information, which is crucial for academic success. It is possible that the stronger relationship between working memory and academic performance among adolescents is a result of the increased demands imposed on working memory in higher education. The findings of this study have significant implications for educators and policymakers, as interventions aimed at enhancing working memory have the potential to improve students' academic performance.

CONCLUSION

This study provides evidence of a positive relationship between adolescent students' working memory and academic performance. The findings emphasise the significance of working memory to academic achievement and imply that interventions aimed at enhancing working memory could have significant positive effects on students' academic performance. Further research is required to investigate the underlying mechanisms of this relationship and to devise effective interventions for enhancing students' working memory.

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Acknowledgement
The author(s) appreciates all those who participated in the study and helped to facilitate the research process.

Conflict of Interest
The author(s) declared no conflict of interest.

How to cite this article: Hussain, B.S., Jain, D. & Chaudhary, A.K. (2023). A Study of Relationship Between Working Memory and Academic Performance Among Adolescents. *International Journal of Indian Psychology*, *11(2),* 2011-2018. DIP:18.01.203.20231102, DOI:10.25215/1102.203

The Board of

The International Journal of
INDIAN PSYCHOLOGY

Is hereby awarding this certificate to

Benazir Shafaat Hussain

In recognition of the publication of the paper entitled

"A Study of Relationship Between Working Memory and Academic Performance Among Adolescents"

Published in ISSN 2348-5396 (e), ISSN 2349-3429 (P)

Volume 11, Issue 2, April-June, 2023

DIP: 18.01.203.20231102, DOI: 10.25215/1102.203, Certificate No.: 40624-1

an international, peer-reviewed, refereed, academic, scientific, psychological journal

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Education and Society
(शिक्षण आणि समाज)

UGC CARE Listed Journal
ISSN 2278-6864

Education and Society

Since 1977

The Quarterly dedicated to Education through Social Development And Social Development through Education

April-June 2023
Year: 46, Issue-3/ Volume-II

Indian Institute of Education
J. P. Naik Path, Kothrud, Pune- 38

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Publisher:
Indian Institute of Education
J. P. Naik Path, Kothrud, Pune- 38

Contact Numbers: 8805159904, 9834109804
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Education and Society, the educational quarterly is owned, printed and published by the Indian Institute of Education, Pune. It is printed at Pratima Mudran, 1-B, Devgiri Istate, Survey No. 17/1-B, Plot no. 14, Kothrud Industrial Area, Kothrud, Pune 38. It is published by the Editor Dr. Jaysing Kalake at Indian Institute of Education J. P. Naik Path, Kothrud, Pune- 38. Opinions or views or statements and conclusions expressed in the articles that are published in this issue are personal of respective authors. The editor, editorial board and the institution will not be responsible for the same in any way.

Editorial

We are very happy to release here our Issue of the month of April-June 2023. We have included the different social and educational issues in contemporary Indian context. We have got lots of articles first time in the history of our mouthpiece. Therefore, we have decided and releasing the three volumes of our journal.

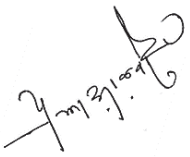
The academicians and professionals all over India contributed in these volumes with their different topics with their contemplation and the implacable field work and experimental ideas of education.

We included the topics in this issue i.e., professionals' development of human, ICT, NEP 2020, Corporate Governance, Grammer Skills, Impact of Social-media, High order thinking skills, NAAC Parameters, Cybercrimes, Spiritual Intelligence, Digital Learning, MOOCs Learning, ChatGPT, Digital Marketing, Women Empowerment, Learning Difficulties, DIKSHA Course Module etc.

We are thankful to all the authors who contributed their innovative ideas that will help us to simplify the new concepts of education that arrival in the context of modern education with reference to NEP.

We invite the papers on the implementation of NEP 2020 for our next issues from all the intelligence and research scholars and please be connect with our Education and Society.

Thank you!



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Indian Institute of Education, Pune

Education and Society

Year: 46, Issue No.: 3, Volume: II /April-June 2023, ISSN: 2278-6864

Content…

Prediction of Academic Success on the Basis of Study Habit of Adolescents

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Abstract:

In our society, we lay emphasis on how students perform in academics and often extend the academic performance to the future success of the student.

Objective: The aim of the paper is to find relationship between study habit and academic performance and to predict academic performance on the basis of study habit of school and college students of Udaipur, in the age range of 15-20 years, because as far as we know, there is a dearth of similar research being done on students of South Rajasthan.

Research Methodology: With this intention, a study was conducted on 150 students from schools and colleges, of Udaipur which included both boys and girls. The analysis was done using quantitative research and data was collected through a standardized test on study habits (i.e., PSSSHI by M. N Palsane and Sadhna Sharma) and their academic performance was measured using their percentages achieved in last exams.

Analysis and conclusion: Descriptive statistics and inferential statistics, such as correlation analysis and independent t test will be used to examine the data. Linear Regression was applied to generate regression equation for prediction of academic performance on the basis of study habit.

Results indicate that there is no significant difference in study habits and academic performances between college and school students. The high positive correlation is obtained between study habit and academic performance.

Keywords: Academic performance, study habits, education, students, school, college

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Introduction:

Academic performance and study habits are always connected to each other in a student's life. The grades students obtain in tests, coursework, and other types of evaluation are frequently used in India to judge students' academic success and hence the emphasis we lay on studies.

The actions and routines that students follow to finish their homework and study for tests and exams are referred to as study habits. According to one description of study habits, they are "repeated behaviours that have evolved over time and have become instinctive reactions to specific situations" (Pintrich, 2002). The recurrence and automaticity of study habits, as well as their influence on the formation of academic behaviour, are stressed in this definition [1].

Importance of Study habits and how they are formed in Indian Scenario:

Students who develop good study habits are more prepared to participate in and learn from their classes because they are well prepared and hence often demonstrate higher level of confidence. Of course, there are many factors, including internal drive, parental influence, peer pressure, and the school setting, might shape them. In India, parental and family plays a major role in shaping of a student's study habit because the propensity of study habits to affect academic success, particularly in a highly competitive educational system, makes them important in India.

According to research, students who establish productive study habits are more likely to succeed academically. For instance, a study by Raut and Kamble (2019) revealed that students using effective study techniques—such as employing study aids, establishing goals, and taking notes—had higher academic accomplishment than those who did not. Similar to this, a study conducted by Roy and Das (2018) discovered that students who used time management techniques and had a good attitude about studying had superior academic achievement.

In India, where the educational system is extremely competitive and academic success is highly valued, effective study habits are especially crucial. In order for students to thrive in their academic endeavours, it is also increasingly critical that they establish effective study habits, such as time management and self-regulation. This is because modern education increasingly relies on technology and online instruction.

How academic performance is linked to Study habits and its importance:

Academic performance and study habits are closely related because good study habits help students absorb and retain material, which enhances their performance on tests and assignments. On the other hand, unproductive study methods can harm academic success. This is more so because as mentioned, in India (and probably majority of other countries), academic results define the future trajectory of a person.

Several researches have looked into the connection between study techniques and academic success. For instance, a study by Saad and Alhashemi (2020) discovered that students with strong study habits, such as employing efficient time management techniques, setting study goals, and periodically checking their notes, outperformed those who did not. In a similar manner, a study by Velasco and Velasco (2016) discovered that students who maintained good study habits, such as setting up a comfortable study space and employing active learning strategies, outperformed those who did not in terms of their academic achievement.

Study practises can operate as a mediator in the interaction between elements like self-regulated learning and academic achievement, according to another research. For instance, a study by Adu et al. (2019) discovered that effective study habits largely moderated the association between self-regulated learning and academic achievement.

The importance of study habits in predicting and enhancing academic achievement is generally highlighted by these researches. Students can thrive in their academic endeavours and improve their academic performance by developing efficient study habits.

Review supporting the research:

The routines and actions people take to enhance their learning and academic achievements are known as study habits. Academic achievement depends greatly on how pupils' put in their effort to study what has been taught and learnt. This overview of the literature tries to emphasise how study habits affect academic achievement and offers some practical advice for improving these habits.

Academic performance and study habits are significantly correlated, according to research. For instance, a study by Singh and Gupta (2017) discovered that students who prioritised their study habits and spent more time studying were more successful academically than those who did not. Parallel to this, a 2016 study by Akram and Akhtar discovered that good study practises, like making a timetable, setting study goals, and using learning aids, positively impacted academic performance among undergraduate students.

Yet, studies have also shown that a variety of factors, such as socioeconomic situation, parental engagement, and educational background, have an impact on study habits and academic achievement. In contrast to students from higher socioeconomic origins, students from lower socioeconomic backgrounds exhibited worse study habits and lower academic achievement, according to a 2019 study by Kishore and Kaur.

Another study by McCann and Roy (2013) looked into how Saudi Arabian medical college students' study behaviours affected their academic

achievement. The study discovered a negative correlation between bad study habits like cramming and poor planning and academic success. The study also discovered that self-control and time management were crucial for encouraging successful study habits and academic achievement

Several researches have looked into the connection between study techniques and academic success. One study found that students who develop productive study techniques like time management, taking notes, and active listening typically succeed academically better (Crédé & Kuncel, 2016). Demir and Sahin (2017) discovered in another study that effective note-taking, self-testing, and regular study routines all showed a substantial positive link with academic achievement.

Also, according to a study by Pande and Jadhav (2020), students who develop successful study habits—like goal-setting, utilising a variety of learning tools, and self-evaluation—are more likely to succeed academically.

The significance of time management abilities in academic success has been highlighted by several scholars. For instance, Bajwa and Saeed's (2018) research revealed that students who successfully manage their time score more academically. Also, a study by Mutsotso et al. (2019) found that students who create objectives and effectively manage their time typically perform better academically.

Motivation is a key element that influences study habits and academic achievement. A study by Kusurkar et al. (2011) found that motivated learners are more inclined to develop productive study habits and perform better academically.

Considering all the above researches it is also evident that in many cases time management has been most effective facet of study habit which is closely linked with good academic performance. On the other hand, few researches also show different factors contribute for each individual to perform academically better. For some it is time management whereas for others it goal setting which can lead to academic performance.

In conclusion, academic achievement and study routines are crucial aspects of Indian education. While having good study habits can help students perform better academically, other factors can also have an impact on both study habits and academic achievement. Thus, it is crucial for educators, parents, and legislators to be aware of these variables and to create plans to help pupils form good study habits and succeed academically.

There are several studies which establish a strong relation between study habits and academic performance.

Following are the key findings from the literature:

Adeyemo and Adeyinka (2015) discovered a positive correlation between undergraduates' study practises and academic performance. Students with

excellent study habits were more likely to receive better grades, according to the findings of the study.

Kukulu and Kocakaya (2016) found a correlation between high school pupils' study habits and their academic performance in a separate study. Effective study habits, such as time management and note-taking, were associated with higher GPAs, according to the study.

Credé and Kuncel (2016) discovered through a meta-analysis that study habits emerged as one of the strongest indicators of academic achievement, with an effect size of 0.44. The study analysed data from more than 300 investigations involving over 200,000 students.

A study conducted by Grewal and Salovey (2005) found that graduate students with excellent study habits were more likely to be successful. Effective study habits, such as self-monitoring and time management, were associated with a greater likelihood of degree completion and higher GPAs.

A study by Wubbena et al. (2019) discovered a significant positive correlation between nursing students' study habits and academic performance. Students with excellent study habits, such as time management and note-taking, had higher GPAs and were more likely to pass their licensure exams, according to the study.

Overall, the research indicates that study habits have a substantial effect on academic performance. Students who cultivate effective study habits, such as time management, note-taking, and self-monitoring, are more likely to attain their educational objectives and perform well academically.

Research Methodology:

The study was done using quantitative approach. In this, we obtained the data, classified them under the relevant categories, and measured it against the parameters we had set out to It is a descriptive research study, where the parameters are measured, analyzed, compared and interpreted based on the data obtained. For this research, on the study habits and academic performance of students from Udaipur, we had used a descriptive design. Samples from 2 groups -school and college, in the age group of 15-20 years were taken. Both the groups were administered the PSSHI study habit inventory developed by M N Palsane (Pune) & Sadhana Sharma (Agra) which measures the study habits of the person taking the test. The academic performance was measured by obtaining the results of the students' last exam which they appeared for in their school or college respectively.

Sample:

The research was done by obtaining data from a sample of 150 students (both boys and girls) in the age-group of 15-20 years, from schools and colleges. The sample was chosen using random sampling from the schools and colleges of

Udaipur (Rajasthan).

Inclusion and Exclusion Criteria:

The age group defined for this study was between 15 years to 20 years. The students, outside of this range, were not included in the current research. Also, the both English and English medium students were made part of this study. However, only the schools and colleges of urban Udaipur were part of the sample collection and as such the rural students were excluded from the current study.

Variable:

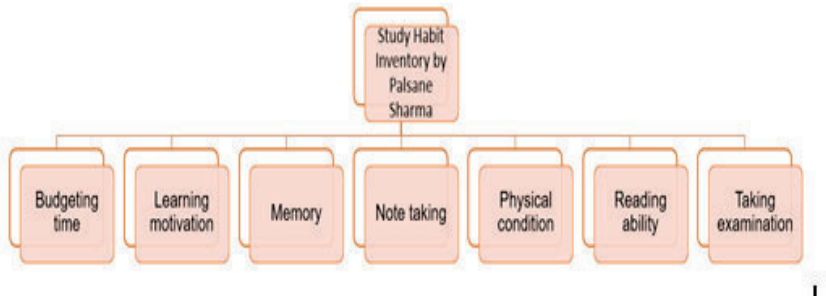
Independent Variable: School students & College students

Dependent Variable: Study Habits, Academic performance

Tools utilized:

To measure the study habits among students the **Study Habit Inventory** (PSSHI) standardized by M N Palsane (Pune) & Sadhana Sharma (Agra) was administered. It is a self-answering questionnaire which is used to measure the study habit of the person undertaking the test. This test is one of the most used tests in the academic studies since it was first developed in 1985 by Palsane and Sharma.

It is made up of 45 items which assess various aspects of study habits.



The validity and reliability of the PSSHI is good and hence it has been used in numerous researches to find the link between study habits and academic success. It is also used to then assess how efficient are the interventions which are used to improve the study habits.

For academic performance we have used the results of the last exam conducted by the respective institute, which the student had appeared for.

Statistical Techniques:

Descriptive and inferential statistics i.e., mean, SDs, correlation coefficient and two sample t-test were used for to study the nature of the results obtained from the sample collection. The data points were calculated using SPSS version 21.0

Data Analysis & Interpretation:

In this study, we wanted to find out the relationship between the study habits and academic performance of students.

Basic Statistics:

		College Students (N=39)	School Students (N=111)	Total Sample (N=150)
Study Habit	Mean	55.59	52.91	53.607
	Median	57	53	54
	Std. Deviation	8.22	9.146	8.965
	Skewness	-0.184	0.185	0.075
	Kurtosis	-1.013	-0.762	-0.855
Academic Performance	Mean	76.974	74.324	75.013
	Median	77	74	75
	Std. Deviation	6.426	8.1	7.767
	Skewness	-0.177	0.205	0.068
	Kurtosis	-0.564	-0.83	-0.814

The skewness and kurotsis values are less than 1 in all study groups therefore it may be considered that data is normalized.

Normality Testing			Kolmogorov-Smirnov	
		Statistic	df	Sig.
Study Habit	College	0.103	39	0.200
	School	0.083	111	0.056
Academic Performance	College	0.097	39	0.200
	School	0.076	111	0.128

The Kolmogorov-Smirnov test is applied for normalization testing. The p value is insignificant ($p>0.05$) it infers that data is normalized for all the study groups and study variables.

Comparison of School Students Vs College Students:

		N	Mean	Std. Deviation	Std. Error Mean	Mean Difference	't'	p Value
Study Habit	College Students	39	55.59	8.220	1.316	2.68	1.614	0.11
	School Students	111	52.91	9.146	0.868			
Academic Performance	College Students	39	76.97	6.426	1.029	2.65	1.848	0.07
	School Students	111	74.32	8.100	0.769			

The mean scores for study habit for college students is 55.590 and for school students it is 52.910 and the 't' score is found to be 1.614 which is

insignificant at 0.05 level. (p=0.109, p > 0.05). It shows that there is no significant difference between study habit of college and school students. It may be due to similar way of time management, memory capacity, learning motivation, note taking tendencies, physical condition and reading and taking examination of both college and school students.

The mean scores for academic performance for college students is 76.974 and for school students it is 74.324 and the 't' score is found to be 1.848 which is insignificant at 0.05 level. (p=0.067, p > 0.05). It shows that there is no significant difference between academic performance of college and school students. It may be due to the reason that the academic performance largely depends on the time spent on studies and the way of studying and it almost remains same at school and both college level.

Correlation Table: Correlation between Study Habit and Academic Performance

	R (Coefficient of correlation)	Significance
College Students (n = 39)	0.769	0.000
School Students (n = 111)	0.920	0.000
Total Sample (n = 150)	0.891	0.000

The correlation between study habit scores and academic performance is found high (above 0.75) for all study groups. It infers that academic performance can be boosted through increasing study habits.

Prediction of Academic Performance on the basis of Study Habit:

Model		Unstandardized Coefficients		Standardized Coefficients
		B	Std. Error	Beta
1	(Constant)	33.636	1.757	
	Study Habit	0.772	0.032	0.891

And thus, the regression equation is as follows

Academic Performance = 0.772 x Study Habit Scores + 33.636

It infers that by obtaining Study habit scores through Palsane Study habit inventory academic performance can be predicted.

Implications of the Study:

The results of this study will aid in identifying the variables that affects or shows a relationship between school students and college students study habits

and academic achievement. The research will also aid in the creation of interventions meant to enhance students' study practises and academic achievement. Descriptive statistics and inferential statistics, such as correlation analysis and independent t test will be used to examine the data.

This research will be important because it will provide information on the elements that influence school students and college students' academic progress. Teachers, parents, and legislators can use the findings to create policies that will improve pupils' academic achievement. Overall, this study will significantly advance the field of education and aid in raising high school students' academic performance.

There is a direct correlation between the amount of time spent studying and the grade point average. The formation of productive habits for studying is one of the most significant components in obtaining success in academic pursuits. Students are more likely to achieve higher levels of success in their academic work if they cultivate healthy study habits.

Here are a few ways that study practices can influence academic performance:

Time management: Effective study practices require time management skills. Students who effectively manage their time are more likely to finish their assignments on time and to be better prepared for exams.

Focus and concentration: Effective study practices necessitate the creation of a conducive environment for learning, which promotes focus and concentration. Information is more likely to be absorbed and retained by students who can focus and concentrate effectively.

Memorization and retention: Effective study practices include methods for memorization and retention, such as revising notes and employing mnemonic devices. Important information is more likely to be retained by students who employ these techniques.

Exam Preparation: One of the most important components of effective study habits is to start studying for examinations as early as possible. Students have a better chance of doing well on tests if they study on a consistent basis and put in sufficient effort.

Critical thinking and analysis: The development of effective study habits requires both the ability to critically think and analyse information. Pupils who regularly practice these abilities are better able to comprehend difficult concepts and apply their comprehension to novel scenarios.

Overall, students who cultivate healthy study habits have a greater chance of accomplishing their academic goals. Students have the ability to enhance their grades, expand their knowledge, and acquire the skills they will need to be successful in both their professional and academic lives if they create productive

study habits.

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