

## EFFECTS OF HEAD INJURY ON MEMORY

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### ABSTRACT

*The present study folds two objectives; such as, first objective was to investigate the effects of head injury on memory between the participants with head and without head injury and, second objective was to investigate the effect of head injury on immediate memory and delayed memory among participants with head injury. Total sample of the present study was comprised of fifty participants (Male=25 & Female=25). Participants with head injury were 25 and 25 were the participants without head injury. The age range of participants was between 20-40 years. The participants only with frontal head injury were included. The whole sample was collected from the different hospitals of the Faisalabad and Lahore, Pakistan. After taking brief demographics information of participants the selective scales of Repeatable Battery for the Assessment of Neurological State (RBANS; Randolph, 1998) was administered on the respective sample. Data was scored and statistically analyzed by using SPSS, 12. Findings indicate there was significant difference between participants with head injury and participants without head injury on the scales of immediate memory and delayed memory ( $t=9.62$ ,  $p < 0.05$ ;  $t=11.90$ ,  $p < 0.05$  respectively). Further findings reported that participants with head injury perceived significant difference on the scales of immediate memory and delayed memory ( $t= 2.37$ ,  $p < 0.05$ ). Further implications and limitations were discussed.*

**Keywords:** Memory Impairment, Immediate Memory, Delayed Memory, Head Injury

### INTRODUCTION

Road accidents are the major causes of deaths and disabilities in developing countries like Pakistan (Razzak&Luby, 1998). The present study was conducted to investigate the effects of head injury on the memory and researches confirmed head injury is the common cause of memory impairment (Tateno et al., 2000; Goldstein, 2007). It is observed that road accidents are common in Pakistan and head injuries are commonly associated with road accidents, sometime it cause deaths and sometime it cause brain damage. Brain damage or head injuries are defined in the term of memory impairment or loss of memory for some time and sometime it can be permanently impaired or loss. Common causes of road accidents are ignorance of traffic rules, poor quality of roads, heavy traffic, careless driving and use of mobile phones during driving. Researchers have found the effects of head injury on memory are very common (; Carol, 2001; Testa, 2007; Levitin, 2002).

Hirsch (2007) proposed that brain injuries typically are the result of accidents in which the head strikes against an object. Common causes of brain injury are physical trauma, such as traumatic brain injury, neurological illness and stroke (Small & Gary, 2002). The head injury can be mild as bump, bruise (contusion) or cut on the head. And it can be moderate to severe in nature due to the concussion, deep cut or internal bleeding and damage to the brain (Hirsch, 2007). Transportation accidents (cars, bikes, horses) account for nearly half of all head trauma, followed by falls (25%). Firearms (assaults and suicide) represent about 10%.

Falls are the most common cause of playground injuries and result in a higher proportion of severe injuries than either bicycle or motor vehicle crashes. Brain injuries account for 75% of children's deaths from falling of playground equipments (Haburchak, 2002).

Head injury is a broad term that describes the problem occurs in the scalp, skull, brain and underlying tissues or blood vessels in head (Killam, Robin, Cautin, Anthony, & Santucci, 2005). It is commonly referred to brain injury or traumatic brain injury. Head injury is of two types, a closed head injury that occurs when there is a blow to the head as in a motor vehicle accident or a fall and an "open head injury" is a visible assault to the head and may result from a gunshot wound, an accident or an object going through the skull into the brain (Kalat, 2001). Injury to the brain may also occur as the result of near drowning, heart attack, stroke and infections. This type of injury usually results from lack of oxygen or blood supply to the brain. It is difficult to predict the outcome of a head injury in the first hour or day after the accident (Haburchak, 2002).

According to Kolab and Wishaw (2003) human beings are developed accordingly with their environment having a superior sense of understanding and manipulating the environment by using higher mental processes or cognition. The brain hypothesis is that "the brain is source of behavior and our brain commands our body". Healthy brain is very much important for proper functioning because higher order animals depend upon the brain for locomotion, cognition, eating and talking etc but head injury leads to many physiological, as well as psychological problems that affect a person's social, normal and occupational life.

Rao and Lyketsos (1999) suggested that head injury is damage to the brain caused by a blow to the head. It is observed that the insufficient oxygen, poisoning, or infections are the common type of brain damage and can cause similar deficits in memory. Brain injury is characterized by one or more of the following symptoms such as a brief loss of consciousness, and loss of memory immediately before or after the injury. Any alteration in mental state at the time of the accidents or focal neurological deficits can cause death as well. It can also result in a variety of neuropsychiatric disturbances ranging from subtle deficits to severe intellectual and emotional disturbance. The neuropsychiatric disturbances associated with head injury include the cognitive impairment, mood disorder, psychosis and behavioral problems.

According to the Tateno, Murata and Robinson (2002) that cognitive impairment has been found to be involved a wide range of intellectual functions such as orientation, memory, visual constriction, executive functioning and frontal lobe functioning. Many patients with mild to moderate head injuries who experience cognitive deficits become easily confused or distracted and have problems with concentration and attention. They also have problems with higher level, so-called executive functions, such as planning, organizing, and abstract reasoning, problem solving, and making judgments, which may make it difficult to resume pre-injury work-related activities. Recovery from cognitive deficits is greatest within the first six months after the injury and more gradual (Testa, 2007).

Patients with head injury also experience some type of amnesia, or memory loss. Indeed, memory loss is the most common cognitive side effect of a severe brain injury. In patients with a milder head injury, memory loss is still one of the most common symptoms (Eric, 2007). Any brain function can be disrupted by brain trauma resulting in inattention, difficulty concentrating, excessive sleepiness, faulty judgment, depression, irritability, emotional outbursts, and slowed thinking. However, memory loss is one of the most common cognitive side effects of traumatic brain injury. Even in mild injury memory loss is still very common (Goldstein, 2007).

Head injury also called brain damage. It influences individual's brain functioning such as memory impairment, memory loss, language problems, executive functioning, attention Span, or any others area of brain can be impaired (Matlin, 1999; Kolab & Wishaw, 2003). Further, head injury can be divided into close/open head injury (Small & Gary, 2002). According to Carol (2001), head injury cause various problems such as, Concussion a temporary loss of function due to trauma (Mccaffrey, 1999), Epidural Hematoma refers to loss of consciousness and it remains over minutes to hours (Small & Gary, 2002), Subdural Hematoma cause tearing of the bridging vein between the cerebral cortex and a draining venous sinus (Anderson, Heitger & Macleod, 2006) and Cerebral contusion refers bruising of the brain tissue. According to Eric (2007), injury of diffuse axonal creates confessional state of uncertainty about day, time and location.

According to the Rao and Lyketos (1999) more common problems associated with head injury may include cognitive (thinking, memory, and reasoning), sensory processing (sight, hearing, touch, taste, and smell), communication (expression and understanding), and behavior or mental health (depression, anxiety, personality changes, aggression, acting out, and social inappropriateness). Alexander (1997) has reported that sometimes head injury patients suffer from developmental stagnation, meaning that they fail to mature emotionally, socially, or psychologically after the trauma. Language and communication problems are common disabilities in head injury patients. Some may experience aphasia, defined as difficulty with understanding and producing spoken and written language; others may have difficulty with the more subtle aspects of communication, such as body language and emotional, non-verbal signals (David, 2004).

Colman (2003) defined memory as psychological functioning of preserving, storage, and utilization of information. It can be classified into immediate memory and delayed memory. Colman (2003) explained that immediate memory refers to loss of memory with short duration typically few seconds and is of limited capacity 5-9 items. Similarly, Chaplin (1999) described in the term of recalling the past experiences, totality of past experiences or remembered specific past experience. Immediate memory is also called as short term memory. On the other hand, delayed memory is defined as a recall of information after a delay, often with other information presented to prevent active rehearsal. There is no particular specification of the required time interval typically it is ten minutes or more, with the rehearsal the information is stored into the long term memory (Matlin, 1999). Chaplin (1999) further defines that long-term memory is intended for storage of information over a long time.

It is observed that through head injury sometimes loss memories retrieved easily or sometime not because it depends upon the severity of impairment. The common problems happened with memory loss are difficult to remember what was happened in days, weeks, months, or even years ago, and it can be difficult to learn and remember new things, the impairment or the problem in memory process resulting from head trauma is called the amnesia (Levitin, 2002).some of them experience partial memory loss or amnesia (Stoller& Diane, 1998).amnesia is classified into retrograde amnesia means hard to retrieve memories prior to an incident (Johnson, 1999), anterograde amnesia refers to loss of memory that often happened after the head injury (Colman, 2003) and third form is traumatic amnesia it refers to loss of consciousness for a few seconds to coma (Kalat, 2006).Brain injury cause significantly cognitive deficits such as language, communication, information processing, memory, and perceptual skills are common (Sigelman& Rider, 2003).

## METHOD

### Participants

Total sample of the present study was comprised of 50 participants. Further, sample was distributed into participants with head injury (N=25) and participants without head injury (N=25). Sample comprised of equal numbers of males (N=25) and females (N=25) participants. Furthermore, the participants with head injury were included on the bases of three major inclusion criteria; such as, 1) At least one week hospitalization after head injury, 2) Absence of any other neurological illness except head injury, 3) Front area of the head should be affected in head injury accompanied by skull fracture, while the normal participants were selected on the bases of having never history of head injury or neurological illness and were general community members. All the patients were selected from different neurological wards of various government and private hospitals such as, Allied Hospital Faisalabad, Lahore General Hospital Lahore, Sheikh Zaid Hospital Lahore and Civil Hospital Gujranwala. The age range of the participants was from 20-40 years.

### Instruments

#### *Demographic Form*

Demographic form was used to get personal information of the participants such as, age, education, socioeconomic status, marital status, duration of hospitalization, nature of head injury, and type of accidents.

#### *Repeatable Battery for the Assessment of Neurological State (RBANS; Randolph, 1998)*

RBANS is a test to assess cognitive decline in person due to neurological illness, brain damage or head injury. RBANS is a brief, individual administered test that helps to determine the neuro-cognitive status of individual between ages 20-89 years. This measure is suitable to assess neurological injury, head injury, as well as neurological disease like dementia and stroke etc. The whole battery is consisted of 5 cognitive domains and 12 sub-scales. Each domain is consisted of following sub-scales such as, immediate memory domain (List learning & Story memory), Delayed memory domain (List recall, List recognition, Story memory & Figure recall), Attention (Digit span & Coding), Language (Picture naming & Semantic fluency), Visual-spatial/Constructional (Figure copy & Line orientation) sub-scales respectively (Randolph, 1998). In this regards, by keeping in view the objectives of the present study only two domains of RBANS were selected that were more suitable to assess the particular sample such as Immediate Memory domain consisted of List Learning and Story Memory sub-scales and domain of Delayed Memory comprised of List Recall, List Recognition, Story Memory, and Figure Recall sub-scales.

### Procedure

This study was the desertion to fulfill the requirement of degree of M. Sc Applied Psychology, from Department of Applied Psychology, Government College University Faisalabad. Initially, the permission letter was taken from the department in order to seek permission from the authorities of the hospitals to collect data. Researcher briefly explained the purpose of research and confidentiality was assured to participants. Brief demographic information was taken and then tow domains such as Immediate Memory domain and Delayed Memory domain of Repeatable Battery for the Assessment of Neuropsychological State (RBANS) by Randolph, (1998) were administered on the participants.

## Statistical Analysis

Data was scored according to manual and prepared for statistical analysis. SPSS, 12 was used to investigate descriptive statistics such as, mean and standard deviation. Further, t-test statistics was done to investigate the difference between participants with head injury and without head injury as well as to find the difference between immediate and delayed memory among the participants with head injury.

## RESULTS

Results indicate that there was found significant difference between participants with head injury and participants without head injury on the variables of immediate memory and delayed memory ( $t= 9.62, p < 0.05$ ;  $t= 11.90, p < 0.05$  respectively). Further, results indicate that participants with head injury perceived significant difference between immediate memory and delayed memory ( $t= 2.37, p < 0.05$ ).

**Table 1. Difference in Memory Impairment (Immediate and Delayed) Between Participants with Head Injury and Without Head Injury**

Memory Status	With Head Injury (n=25)		Without Head Injury (n=25)		t	p
	M	SD	M	SD		
Immediate Memory	74.96	9.78	113.70	17.60	9.62	.001
Delayed Memory	65.80	12.1	100.16	7.78	11.96	.001

df = 48, P<0.05

Table-1 shows there is significant difference in scores between participants with head injury and participants without head injury on the variables of immediate memory and delayed memory.

**Table 2. Difference in Memory Status among the Participants with Head Injury**

Memory Status	With Head Injury (n=25)			
	M	SD	t	p
Immediate Memory	75.6	10.3	2.37	.002
Delayed Memory	68.3	11.4	2.30	.002

df = 48, P<0.05

Table-2 shows there is significant difference on the variables of immediate memory and delayed memory among the participants with head injury.

## DISCUSSION

The focus of the present study was to find out the effects of head injury on memory processes. Findings reported that memory (immediate and delayed) of participants with head injury was more impairment as compared to participants without head injury. Furthermore findings indicate the impairment in immediate memory was found high as compared to delayed memory among participants with head injury.

It was hypothesized that “the scores of participants with head injury would be less on the scale of immediate memory as compared to participants without head injury”. The findings show that the immediate memory of participants with head injury was more impaired as compared to the participants without head injury (Table-1). Immediate memory is defined as the storage of the information immediately it does not last very long perhaps minutes. Findings highlight immediate memory consistent with head injury directly which marked that memory status of participants with head injury is less than participants without head injury. The present study findings consistent with findings of study of Johnson (1999), that problem of immediate memory were more common and high among participants with head injury.

It is concluded that immediate memory of participants with head injury was found more impaired because they have difficulty to retrieve information after head injury due to damage of part of brain which process the function of list learning while it also damage the area of memory storage. Due to which participants with head injury feel difficulty to retrieve previous information. In fact, this mechanism takes into action when the middle sections of the brain are also resting on the bone of the skull and forward and backward movement of the brain in an accident, they get sheered or torn. A problem develops when there is a large flow of information coming in which the brain can't process, or when information is not being sent to the right place than a problem exists in memory after the head injury.

Further, it was hypothesized the “scores of participants with head injury would be less on the scale of delayed memory as compared to participants without head injury”. The findings show that the delayed memory of participants with head injury was more impaired as compared to the participants without head injury (Table-1). Delayed memory is defined as a recall of information after a delay, often with other information presented to prevent active rehearsal, it is obvious that memory effects after head injury has long term consequences. In this type of the memory loss people forget their names, relatives and even home address. The study findings consistent with study of Colman (2003) and Carol (2006), their studies findings reported the individuals with head injury face trouble to retrieve past memory.

It is observed that individuals after head injury face difficulty to list recall or recognize of memory of events because sometime the functioning of the particular area of brain is completely damaged and person did not able to retrieve previous information while sometime individual retrieve information gradually improved but in some cases impairment till one week after head injury remained high and impairment gradually decreased with the period of recovery. Moreover, through head injury individual's store memory can impaired and person also difficulty to maintain memory of recalling figures. The present study findings are consistent with studies of Sigelman and Rider (2003) and Testa (2007). According to, Johnson (1999) common reasons of impairment of the memory are swelling of the brain and sometime hematomas may be the cause of the memory loss and individual may reach at stage that cannot remind his/her name, place, address etc after the head injury. Sometimes memory problems may prolong from weeks, months, or years. The memory of these patients comes back in long run.

Moreover, it was formulated “the immediate memory would be more impaired as compared to delayed memory among participants with head injury”. The findings suggested that immediate memory was more impaired as compared to delayed memory among participants with head injury (Table-2). Generally it is observed that most of the patients with head injury are not able to describe the events of accidents immediately after the head injury because they feel difficulty to retrieve information. Present study findings consistent with previous studies (Matlin, 1999; Chaplin, 1999). Similarly, Mckinley et al (1981) conducted study in 1981; findings proposed that the problems most frequently reported in participants with head injury

were memory loss, impairment, emotional disturbances, poor memory, and subjective symptom. The amount of stress experienced by relatives did not diminish between 3 and 12 months, and was related to the incidence of mental and behavioral changes in the patient.

According to Goldstein (2007) some brain injury related amnesia such as patients unable to recall what happened just before; during and after the head injury is temporary. Temporary memory loss is often caused by swelling of the brain in response to the damage it sustained. But because the brain is pressed against the skull, even parts that were not injured are still not able to work. The patient's memory typically returns as the swelling goes down over a period of weeks or even months. Temporary memory loss may also be an emotional response to the stressful events surrounding a brain injury.

## CONCLUSION

It is concluded that the head injury is a high risk factor of memory impairment. Participants with head injuries are more prone toward impairment of high executive functions of cognition such as memory. Similarly, loss/impairment in memory creates a lot of problems in person such as cognitive, emotional, and behavioral. Moreover, the psychiatric problems like depression, apathy, anxiety, irritability, anger, paranoia, confusion, frustration, agitation, and insomnia are found very common. These problems are associated with behavior problems such as, aggression, violence, impulsivity, acting out behavior, noncompliance, social inappropriateness, emotional outbursts, childish behavior, impaired self-control, impaired self-awareness, inability to take responsibility, egocentrism, and inappropriate sexual behaviors (Carol, 2006; Eastwood & Crowther, 1998).

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