**Studies for Consciousness and Memory Test:**

1.**Case study of HM showing brain localization by B Milner**

**MRI study of HM by Corkin**

Background: HM is perhaps the most famous participant in a psychological study ever. It is a longitudinal case study and many different data collections methods have been used over the years.

HM was born in Manchester, Connecticut in 1926. HM was hit by a cyclist while crossing the street when he was 7-years-old and sustained a serious head injury. Epileptic attacks began when he was 10; they were assumed to be connected to the accident. At the age of 27 he had become so incapacitated by his seizures that he could not lead a normal life and medication did not help him. With the approval of the patient and his family, the neurosurgeon William Scoville performed an experimental surgery where he removed tissue from the medial temporal lobe (including the hippocampus) on both sides of HM’s brain.

Brenda Milner is a neuropsychologist who studied HM until he died in 2008. The first time Brenda Miller visited HM after the operation she observed that he forgot daily events nearly as fast as they occurred, for example, he forgot names of persons to whom he had just been introduced. He described his own state “like waking from a dream; every day is alone in itself.” (Milner et al. 1968).

After the operation HM remembered his childhood very well. His personality appeared largely unchanged. There was no general intellectual impairment but he could recall little of the 12 years before the operation. When some time had passed after the operation, HM’s retrograde amnesia (i.e. memory for events before the operation) diminished and by 1966 he only had problems remembering the period of about one year before the operation.

HM primarily suffered from anterograde amnesia. For example, he was unable to remember the faces of people he met after the operation. A psychologist could spend the morning testing him but in the afternoon HM would act as if the psychologist were somebody he had never seen before. He could not recognize people who came to see him regularly for several years.

Procedure: The aim of this case study was to better understand the effects that the surgery had had on patient HM.

In order to carry out her research, Milner used many different strategies. This is an example of how method triangulation may be used in a case study:

Psychometric testing: IQ testing was given to HM. His results were above average.

Direct observation of his behaviour;

Interviews with both HM and with family members.

Cognitive testing: memory recall tests as well as learning tasks - such as reverse mirror drawing.

Corkin later did an MRI to determine the extent of the damage done to HM's brain.

Findings: HM could not acquire new episodic knowledge (memory for events) and he could not acquire new semantic knowledge (general knowledge about the world). This suggests that the brain structures that were removed from his brain are important for the transfer of information from short-term to long-term memory.

The researchers also found that he was able to remember his house and could draw a picture of the floor plan of his new home. This indicates that he was able to form a cognitive map of the spatial layout of his house. This may mean that this type of memory is not encoded in the same way as semantic or episodic memories.

HM had a capacity for working memory, since he was able to carry on a normal conversation. This requires a minimal level of retention of what has just been heard and said. On being asked to recall the number 584, HM was able to do so even 15 minutes later, apparently by means of constant rehearsal. However, after the task was over, HM would not be able to recall the number.

Memories in the form of motor skills, i.e. procedural memories, were well maintained; for example, he knew how to mow a lawn. He also showed improvements on the performance of new skills such as reverse mirror-drawing in which he had to acquire new eye-hand coordination (Milner, 1966). Although he showed improvement on the skill over time, he never rememberd learning the skill. Every time Milner asked him to do it, he would say that he had never tried it before.

In 1992 and then 2003, Corkin carried out an MRI scan of HM’s brain to see the extent of the damage. It was possible to see that parts of HM’s temporal lobe including the hippocampus had the most damage. However, the damage was less extensive than originally estimated by Scoville. Damage to the hippocampus explains the problem of transferring short-term memory to long-term memory as this is the area where the neurotransmitter acetylcholine is believed to play an important role in learning and formation of memories.

The following is a summary of the key findings:

The memory systems in the brain constitute a highly specialized and complex system.

The hippocampus plays a critical role in converting memories of experiences from short-term memory to long-term memory.

However, researchers found that short-term memory is not stored in the hippocampus as HM was able to retain information for a while if he rehearsed it.

Since HM was able to retain some memories for events that happened long before his surgery it indicates that the medial temporal region is not the site of permanent storage but rather plays a role in the organization and permanent storage of memories elsewhere in the brain.

Implicit memory contains several stores - for example, procedural memory, emotional memory and skills and habits. Each of these areas is related to different brain areas.

Evaluation

The study was a case study. The strength of this study is that it was longitudinal - over 50 years! This means that change could be observed over time. In addition, case studies use method triangulation.

The limitation of case studies is that they cannot be easily replicated. However, there are several other case studies of patients like HM - for example, Clive Wearing - which confirm the findings.

Some of the study was retrospective in nature. This means that we do not have a lot of data on HM's actual cognitive abilities before the accident.

The medication taken to treat epilepsy may have resulted in some of the damage, but this is not highly relevant as it is the damage to specific parts of the brain that is important.

High ecological validity, no variables were manipulated and HM was observed in his natural environment.

Milner's research met high ethical standards of consent, confidentiality and protection from harm.

**2. Pheromones and attraction by Zhou et al**

Carried out a study to see if these substances influenced human sexual behaviour. The sample was made up of 96 participants – 24 heterosexual men, 24 heterosexual women, 24 gay men and 24 lesbian women.

In the experiment, participants were asked to watch stick figures walking on a screen and to determine their gender. While carrying out the task, the participants were exposed to the smell of cloves. In the first condition, the cloves were mixed with androstadienone; in the second condition, the cloves were mixed with estratetraenol; and in the control condition, only cloves were used. The findings showed that smelling androstadienone biased heterosexual females and gay males, but not heterosexual males, toward perceiving the walkers as more masculine. By contrast, smelling estratetraenol systematically biases heterosexual males and lesbian women toward perceiving the walkers as more feminine. The researchers concluded that pheromones influence communication of gender information in a sex-specific manner.

Although the study showed a significant difference in behaviour, there are some concerns with the study. First, the participants were exposed to very high levels of the pheromones; it is unclear that this response would happen in a naturalistic setting. Secondly, although they identified the figure as masculine or feminine, this is not a clear study of sexual odour but rather if participants perceived a person's walk as feminine or masculine. It can be debated whether this is a reliable measure of sexual behaviour. Finally, the study is done on a relatively small sample. The study would need to be replicated on a much larger sample in order to determine whether the results are reliable.

**3. Evolution/ Culture on Mating by D. Buss**

Buss posits that men and women have faced different adaptive challenges throughout human history, which shape behavioral difference in males and females today. Women have faced the challenges of surviving through pregnancy and lactation and then rearing children. Men, by contrast, have faced the challenges of paternity uncertainty, with its related risk of misallocating parental resources, and of maximizing the offspring onto which they pass their genes. Because insemination and pregnancy occurs inside of the female, males cannot be certain that the child in which they are investing is genetically their offspring. To solve the female adaptation dilemma, females select mates who are loyal and are willing and able to invest in her and her offspring by providing resources and protection. Historically, women who were less selective of mates suffered lower reproductive success and survival.Males solve the adaptation challenge of paternity uncertainty and resources misallocation by selecting sexually faithful mates. To maximize their offspring, men have adopted a short-term mating strategy of attracting and impregnating many fertile mates rather than one long-term mate.

David Buss supported this evolutionary reasoning with research focused on sex differences in mating strategies. In a large cross-cultural study that included 10,047 individuals across 37 cultures, Buss sought first to determine the different characteristics each sex looks for in a mate. From these findings, Buss was able to hypothesize the evolutionary causes for these preference differences. Buss found that men place very high importance on youth. Because youthful appearances signal fertility and men seek to maximize their number of mates capable of passing on their genes, men place high value on fertility cues. Buss also found that women desire older mates. He later hypothesized that this is because older males tend to have a greater chance of higher social status; this social status could lead to more resources for a woman and her offspring, and could therefore increase a woman's likelihood of sexual success and reproduction.

Another area in which the two sexes seem to differ greatly is in their reactions to sexual and emotional infidelity. Buss found that women were more jealous of emotional infidelity while men were more jealous of sexual infidelity.[18] This has been supported as universal norm by Buss' cross-cultural study.[19] Buss hypothesized that women find emotional infidelity more threatening because it could lead to the woman losing the resources she had gained from that mate and having to raise children on her own. He then hypothesized that men found sexual infidelity more threatening because they could risk spending resources on a child that may not be their own

Discuss ethical considerations in research into genetic influences of behavior