Attention & Memory Deficits in TBI Patients

An Overview
References


References


Traumatic Brain Injury (TBI) is becoming a common occurrence, with nearly 400,000 new injuries per year.

TBI is known to affect cognitive functioning including attention.

The majority of persons with minor head injuries have difficulty with attention, concentration, memory and judgement.

Attention is critical to all areas of cognitive functioning including language.
The impact of head injuries on cognitive and neuropsychological functioning can be extensive and wide-ranging.

Attention and Memory deficits are one of the most striking cognitive difficulties commonly reported by patients and their relatives following head injuries.

50% of patients suffering from mild to moderate closed head injuries will develop a group of clinical symptoms known as post-concussion symptoms (PCS).
PCS

- Characterized by a range of subjectively experienced symptoms including:
  - headaches
  - dizziness
  - fatigue
  - irritability
  - slowed thinking
  - memory dysfunction
Patients who report a greater number of symptoms at 1, 6 or 12 months after suffering from mild head injury may have more attentional deficits than patients reporting few or no symptoms.

It also appears there are large variations within these patients in terms of both presented symptoms and neuropsychological performance.
Attention

- A vague and often used word in describing human behavior
- May be quantified by intensity and qualified by selectivity. That is how a person consciously makes an effort on one task, and how he can selectively withdraw from it, in order to deal effectively with the second task.
Theories of Attention

- Dual process theory of attention
- Resources allocation theory of attention
- Cognitive neuropsychological and neuro-anatomical theories of attention
Dual process theory of attention

- Shiffrin and Schneider focused on two qualitatively different types of processes involved in attention
  - Automatic processing
  - Controlled processing
Automatic Processing

- A fast, parallel, and effortless process that is not limited by short term memory capacity
- Not dependent on conscious choice
- Not impaired by the concurrent execution of another task
- Responsible for well developed skilled behavior
Controlled Processing

- Slow, generally serial, and effortful process that is limited by capacity
- Responsible for the self-regulated processing that must be dealt with for the novel or inconsistent information
Shiffrin and Schneider also distinguished 2 types of attentional problems...

- Focused attention deficits
- Divided attention
Focused attention deficits

- This occurs when a response produced by automatic processing interferes with a response produced by controlled processing.
Divided attention deficits

- Results from the limited capacity of the system for controlled processing

- However, Hirst, et al. showed that complex tasks requiring controlled processing can be performed simultaneously with very little or no interference
  - Still somewhat controversial
Resources allocation theory of attention

- Noted as a power supply that can be flexibly allocated in many different ways to response to task demands
- Kahneman proposed that all non-structural interference between tasks were explained by a central energy or mental effort limitation
- Wickens further proposed a multiple-resource model in interpreting any interference between two tasks tapping different resources
Cognitive neuropsychological and neuro-anatomical theories of attention

- Deals with the interrelationship between brain lesions and the manifested inattentive behavior
- Different theories explain attention deficits with location of lesions (Chan)
Despite the various views of attention, there is commonly acknowledged agreement among them: attention is subserved by different brain regions and may be described in terms of different components, including several basic elements of attention in sustaining, dividing, and selecting attention, and a higher mental function in regulating and over-running the strategy allocation of attention onto different tasks.
The term post-concussion derives from early conception of concussion as an entirely reversible syndrome without detectable neuropathology.
The Mild Traumatic Brain Injury Committee Special Interest Group of the American Congress of Rehabilitation Medicine developed a classification system to help define the characteristics of cerebral concussion.
It includes……

1) an actual or suspected loss of consciousness for less than 30 minutes
2) reversible loss of consciousness
3) Glasgow Coma Scale between 13 - 15, 30 minutes after the accident
4) post-traumatic amnesia not longer than 24 hours
5) altered mental status at time of accident, i.e. feeling dazed, disoriented, or confused
TBI can display a variety of memory impairments such as:

- Forgetting new information
- Impaired prospective memory
- Interference
Cont’d

- TBI also display executive function impairments such as:
  - Impaired self-monitoring
  - Strategy decision making
  - Planning
Memory complaints after TBI

- Retrieval deficits
- Acquisition of new information
- Working memory impairment; which is critical in the encoding of new information
- Impaired episodic memory
Remediation of “working attention”

- **N-back procedure**
  - Consists of the presentation of a sequence of stimuli with the requirements for the participant to continuously report the stimulus occurring n number of stimuli previously
  - Example: in the 1-back condition a set of digits are presented sequentially in random order and the participant is instructed to report the digit which occurred one prior to the current digit
  - (can use playing cards for stimuli)
In addition to previous n-back tasks, participants were required to make a self-generated response on each trial, prior to naming the relevant card in the n-back task.
N-back with continuous secondary task

- Participants were engaged in an ongoing secondary task while maintaining performance on the primary n-back task and actively allocating attentional resources between the various task demands.