

Background

Background: A period known as post-traumatic amnesia (PTA) often follows a traumatic brain injury (TBI). PTA is characterized by anterograde and retrograde amnesia, confusion, disorientation, and agitation. The duration of PTA is a key indicator of the long-term prognosis after a TBI, so it is imperative to accurately determine the length of PTA. **Methods:** A systematic literature review was conducted to research PTA within a severe TBI and identify any gaps within the literature. **Results:** The Westmead Post-Traumatic Amnesia Scale (WPTAS) and the Galveston Orientation and Amnesia Test (GOAT) are the two most common tools used for assessing the length of PTA. Since they have differing strengths and weaknesses, a seven-item combined scale has been proposed. **Conclusions:** More research is needed to determine the efficacy of a seven-item combined WPTAS and GOAT scale for assessing the length of PTA.

Introduction

Traumatic brain injuries (TBI) are one of the most serious health complications, ranking as a leading cause of death, long-term cognitive disability, and financial difficulty (Promlek et al., 2020). Every year in the United States, approximately 2.8 million people are treated for a TBI (Keller, 2020). If the TBI requires hospitalization, 20% of TBI hospitalizations result in death. Following a severe TBI, patients often experience a period of confusion, disorientation, agitation, and amnesia, which is known as post-traumatic amnesia (PTA) (McDonald et al., 2019). The length of PTA indicates the severity of the injury (Spiteri et al., 2021).

Since PTA has been shown to be the best predictor of long-term clinical functioning, proper assessment of the duration and severity of PTA is crucial (Tenovuo et al., 2021). Other than the Glasgow Coma Scale (GCS), the Westmead Post-Traumatic Amnesia Scale (WPTAS) and the Galveston Orientation and Amnesia Test (GOAT) are the two most common assessment tools while in PTA (Roberts et al., 2019). Traditionally, researchers view the WPTAS as more accurate than the GOAT as that the WPTAS measures a longer duration of PTA when compared to the GOAT. In the WPTAS, the first seven questions assess the patient's orientation by asking his or her age, date of birth, month, time of day, day of the week, year, and location (Department of Psychology, n.d.). The final five questions assess the patient's memory by asking for the name and face of the examiner and then asking him or her to identify three different pictures. On the first day the patient receives a 12/12, the picture cards switch to new pictures. After a patient scores 12/12 on three consecutive days, he or she is considered to have emerged from PTA. The WPTAS, then, emphasizes orientation, anterograde memory, and the ability to learn new information (Hennessy et al., 2020; Spiteri et al., 2021). In the GOAT, the patient is asked a series of 15 questions, which is scored out of 100 points, assessing orientation, anterograde memory, and retrograde memory (Spiteri et al., 2021). As the WPTAS and the GOAT have differing strengths and weaknesses, therefore, one study found that combining elements of the WPTAS and the GOAT into a seven-item scale best maximized the specificity and the sensitivity of both tests (Hennessy et al., 2020). This study compared PTA patients on opioids, moderate-to-severe TBI patients not receiving opioids, and orthopedic patients on opioids. In distinguishing between the various groups, the WPTAS displayed sensitivity of 72%, but specificity of only 40%. In contrast, the GOAT sensitivity was only 0%, but its specificity was 100% (results shown in Table 1). If the GOAT sensitivity was only 0%, then the GOAT failed to correctly identify patients as being within PTA. Therefore, Hennessy et al. (2020) suggested combining four questions from the WPTAS and three questions from the the GOAT to best maximize the WPTAS' sensitivity and the GOAT's specificity. The proposed scale is in Table 2 and its results are shown in Table 3. More research is needed to determine the effectiveness and potential impacts of utilizing the combined seven-item scale rather than the traditional WPTAS or the GOAT testing.

Table 1

Sensitivity and specificity for the WPTAS and the GOAT

	Sensitivity	Specificity
WPTAS	72%	40%
GOAT	0%	100%

(Hennessy et al., 2020)

Table 2

Proposed 7-item scale for assessing patients within PTA, utilizing four items from the WPTAS and three items from the GOAT

WPTAS:	Assessing for:
What day of the week is it?	Orientation
Picture I	Ability to learn new information
Picture II	Ability to learn new information
Picture II	Ability to learn new information
GOAT	
How did you get to the hospital?	Anterograde memory
What is the first event you can remember after the injury?	Anterograde memory
Can you describe the last event you can recall before the accident?	Retrograde memory

(Hennessy et al., 2020)

Methods

A systematic literature review was conducted to glean information on PTA, particularly on the most evidenced-based method of determining the length of PTA. The literature review was conducted using the Jerry Falwell library database. All resources are peer-reviewed and published within the last five years.

Figure 1. Relationship between the hippocampus, parahippocampal gyrus, and cingulate gyrus
Adapted from "Neuroanatomy for Medical Students" (2nd Edition), by Wilkinson, J.L., 1992, pp. 197-205. Used with permission, copyright 1992 by Butterworth-Heinemann.

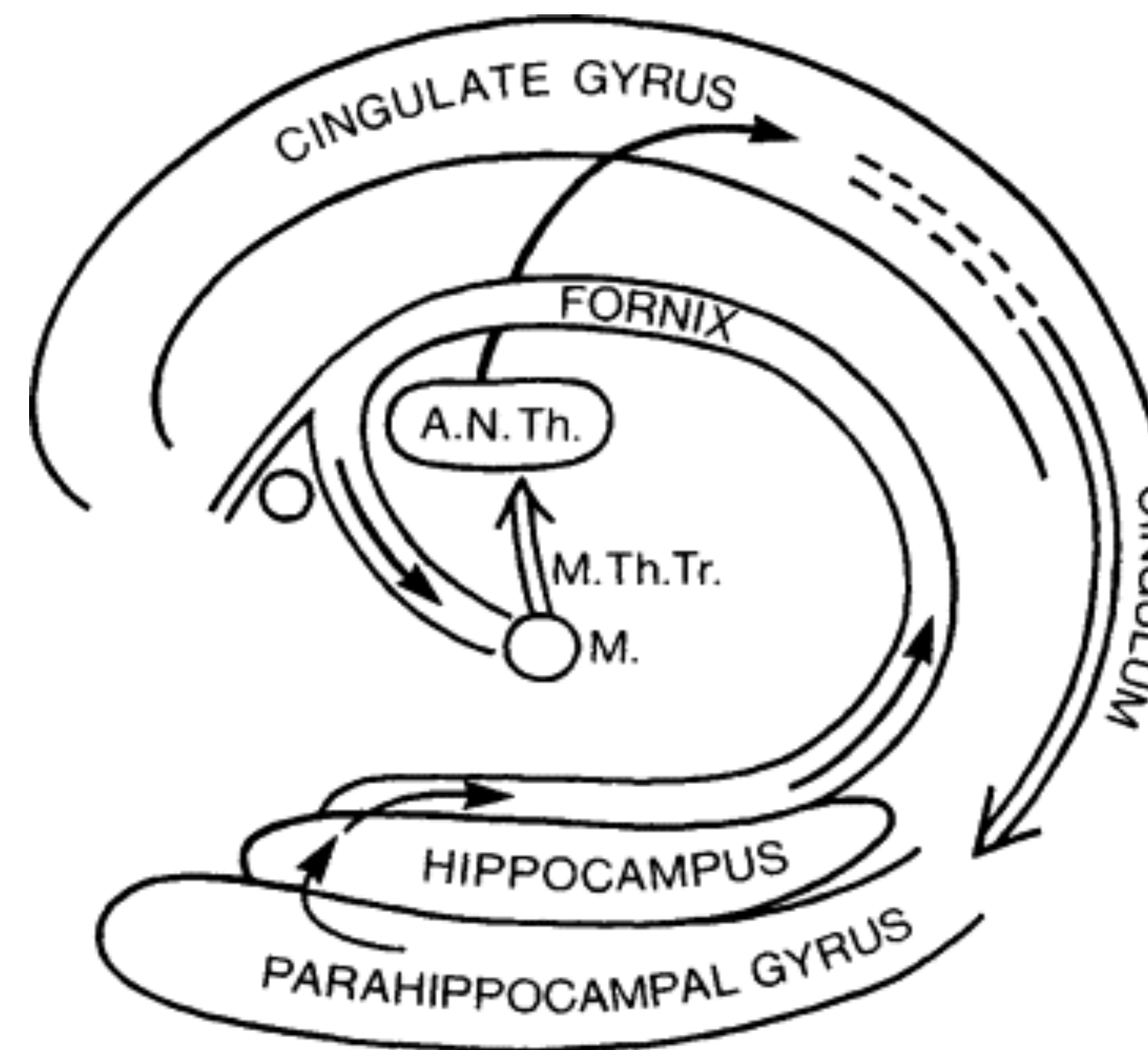


Table 3

Specifications on differentiating between PTA patients on opioids and moderate-to-severe TBI patients not receiving opioids using a 7-item combined WPTAS and GOAT scale

Sensitivity	Specificity	Positive predictive value	Negative predictive value
100%	85%	83%	100%

(Hennessy et al., 2020)

Future Work

- Further research is needed to pin down the best type of nutrition for PTA patients. Additionally, future research is needed to determine the potential impact of enteral nutrition on mortality, hospitalization time, and nosocomial infections.
- Further research is needed to investigate any impacts of a combined GOAT and WPTAS assessment scale. What would be the results of implementing this scale within the in-patient setting? How would a combined GOAT and WPTAS scale measure the duration of PTA, especially compared to pre-existing GOAT, WPTAS, Confusion Assessment Protocol (CAP), and Orientation Log results?

Conclusion

TBIs are a weighty diagnosis—to the individual, their family, and the health care team. The patient will most likely deal with the ramifications of a severe TBI for the rest of his or her life. In a severe TBI, the acceleration-deceleration force injures the frontal and temporal brain lobes, leading to executive functioning and memory impairments. Injury to the gray and white matter can lead to a diffuse axonal injury within the brain. In PTA, diffuse axonal injury to the posterior cingulate cortex injures the axons connecting the parahippocampus, hippocampus, and the cingulate cortex, all of which are within the medial temporal lobe. When this region is injured, the patient experiences the amnesia, disorientation, sleep disturbances, and agitation known as PTA. The GCS, WPTAS, and the GOAT are all common assessment tools for PTA, but recent research recommends combining components of the WPTAS and the GOAT to maximize their sensitivity and specificity. Due to the severity of a TBI, it is important to incorporate all members of the health care team to provide the best possible care for a patient with PTA.

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