**Introduction**
- Temporal lobe epilepsy is associated with specific pathology of the hippocampus, and the hippocampus may be removed to reduce the seizures if it is determined that removal will not cause significant memory disorder
- fMRI has largely replaced the WADA exam as the gold standard for localization of function and presurgical evaluation of eloquent cortex
- Though mapping of motor sensory and even association cortices can be easily done with straightforward paradigms, because of its location and tonic activity, the hippocampus has been difficult to consistently activate, particularly in the context of depressed cognitive function
- To establish a valid clinical examination, the set of stimuli that consistently activates the hippocampus must be discovered
- Hippocampus involved in encoding and consolidation of memories
- Interconnection of hippocampus and amygdala
- Amygdala plays an important role in the mediation of aggression, fear, and other emotions
- Unpleasant emotional pictures activate parahippocampal gyrus and hippocampus; pleasant emotional pictures activate other brain regions but not hippocampus

**Objective**
- Mission of finding a general clinical method to examine the integrity and function of the hippocampus in order to aid in the surgical treatment of seizure disorders
- Theory: the hippocampus represents an interface between sensory systems in the cortex and limbic systems
- Hypothesis: We expect to find greater hippocampal activation during the encoding of emotionally arousing stimuli than during the encoding of emotionally neutral stimuli
- Secondary Hypothesis: Since we hypothesize the hippocampus serves as an interface to cortical association areas, this activation difference will be evident regardless of stimulus modality (i.e., words, sounds, or pictures)

**Participants**
- 21 healthy, normal adults (10 males)
- Age: 25 years ($SD=4$)
- Education: 17 years ($SD=2$)
- 90.5% right handed

**Data Acquisition**
- Participants were scanned using a 3.0 T scanner
- All participants were screened for Neurological, Psychiatric, or Psychological Disorders and for Contraindications to MRI
- Data preprocessing: slice time correction, realignment, coregistration (MNI), normalization (MNI), smoothing (5mm)

**fMRI Paradigm**
- Patterns of hippocampal activations were examined over the course of six runs using a conventional on-off boxcar design, with a passive control block (21 sec) leading to an experimental block (21 sec)
- Emotional and neutral pictures, words (e.g., “Kill” vs. “Flower”), and environmental sounds (e.g., glass breaking vs. baby laughing) were alternated during a single session
- Each run lasted 4.2 minutes for a total of 84 volumes each run
- Participants were asked to encode all stimuli
- Memory for the stimuli was assessed following the scanning

**Results**
- All results reported at a FWE corrected $p<.05$, with a cluster extent consistent with image smoothness
- Participants had the best recall for pictures
- Emotional stimuli were better remembered than neutral stimuli
- The right hippocampus was more active than the left for encoding of images
- Stimuli with emotional tone produce subtle patterns of hippocampal activation. This was observed by combining all emotional stimuli as one condition.

**Neutral and Emotional Words and Sounds:**
- Sounds
- Words
- Sounds & Words

**Discussion**
- Results suggest that fMRI methods detect the dominant influence of the visual system on hippocampal activation
- A picture encoding task is useful in activating the posterior hippocampus
- Results support the notion that the hippocampus plays a role in emotional memory processing
  - Evidence that successful emotional stimuli encoding more strongly associated with bilateral hippocampal activation
- Future validity studies should examine patients with hippocampal lesions using these methods