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## Background

- Psychogenic non-epileptic events (PNEE) are episodes of altered motor, sensory, and mental function not associated with abnormal brain electrical discharges.
- Suggestion techniques can reliably reproduce habitual PNEE in the subgroup of patients who previously experienced events in medical settings, with a reported success rate of 77% to 84%.
- Some investigators categorize the patients to three major groups based on the ictal semiology:
  - Hypermotor: manifested by unresponsiveness associated with major motor accompaniments such as diffuse, violent, and highly disorganized activity.
  - Hypomotor: which includes unresponsiveness either in isolation or with minimal motor accompaniments.
  - Experiential: which includes paroxysms of purely sensory or subjective symptoms.
- There is limited literature on whether profiles on psychological instruments are able to distinguish patients who are either inducible or non-inducible via provocative suggestion. Likewise, there is no data on whether repeated provocative maneuvers affect the success rate of induction.
- We hypothesize that the success rate of placebo induction can be affected by previous induction exposure, as well as ictal semiology of the presenting event of interest. Secondly, we hypothesize that profiles of performance on self-report instruments may influence the success rate of placebo induction; and the ictal semiology of the induced PNEE.

## Methods

- Data was collected from patients admitted to the EMU at the Michael E. DeBakey VA Medical Center from December, 2008, until April, 2010.
- For patients who were suspected to have PNEE based on clinical grounds and remained event-free after 48 hours of video-EEG monitoring, the option of placebo induction was offered.
- Patients who consented to the induction procedure were considered for enrollment. We excluded patients with known EEG documentation of seizures or interictal epileptiform abnormalities.

- A provocative protocol was employed including the initial intravenous injection of 5 ml of normal saline, followed by hyperventilation and photic stimulation. If no sign or symptom characteristic of the habitual event was captured, a second induction was administered on the following day.
- Enrolled patients were given a battery of 4 instruments:
  - Dissociative Experience Scale (DES): a self-report questionnaire for measuring dissociative tendencies.
  - Structured Inventory of Malingered Symptomatology (SIMS): an instrument for screening of over-reporting or exaggeration of psychiatric symptoms and cognitive impairments. A cut-off score of 14 was used.
  - Test of Memory Malingering (TOMM): a 50-item recognition test that can assist in discriminating between true memory impairment and malingering. Score of 45 or less was interpreted as “below chance”.
  - Brief COPE: a multidimensional coping inventory that examines the different ways people respond to stress.

## Results

- 51 patients were enrolled in this study. Based on the pre-induction categorization methodology listed above:
  - 26 patients were classified in the hypermotor category,
  - 20 in the hypomotor category,
  - 5 in the subjective category
- With the first induction attempt, 76.5% (n= 39) of the enrolled patients successfully reproduced their respective events of interest.
- Out of the 12 remaining patients who had unsuccessful initial induction attempt, the second induction attempt led to a 25% (3/12) success rate.
- Among all successfully induced cases resulting in definitive diagnoses (n=42), 92.9% (n = 39) of these cases were successfully induced on the very first attempt (figure 2). Upon combining results from both induction attempts, 82.4% (n = 42) of suspected cases of PNEE successfully reproduced their habitual episodes with placebo induction.

- 24 out of 26 (92.3%) patients in the hypermotor category had successful induction, whereas only 13 out of 20 (65%) patients in the hypomotor category had successful induction (p=0.029) (figure 1)
- The percentage of patients who had an elevated total SIMS score was statistically higher in the successful induction group compared to the unsuccessful induction group (p=0.035) (table 1).
- Successful induction group reported higher usage of two of the coping strategies than the unsuccessful induction group: “Use of instrumental support” and “Active coping” subscales.
- We did not find any statistically significant difference among the demographic factors, the SIMS scores (including total scores and individual domain subscores), COPE inventories, total DES scores, or TOMM scores between the hypermotor and hypomotor semiologic categories.

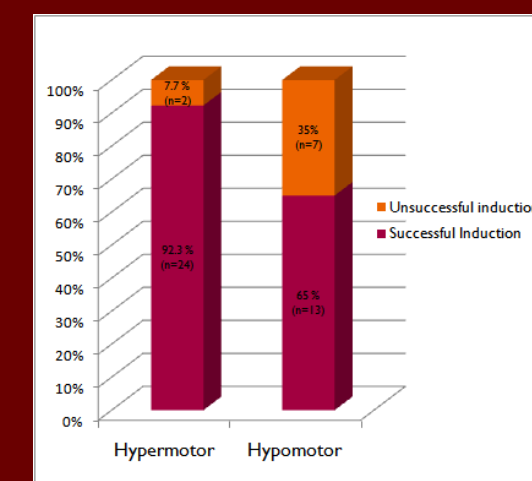


Figure 1- Success rate of induction in patients with hypermotor or hypomotor ictal semiology

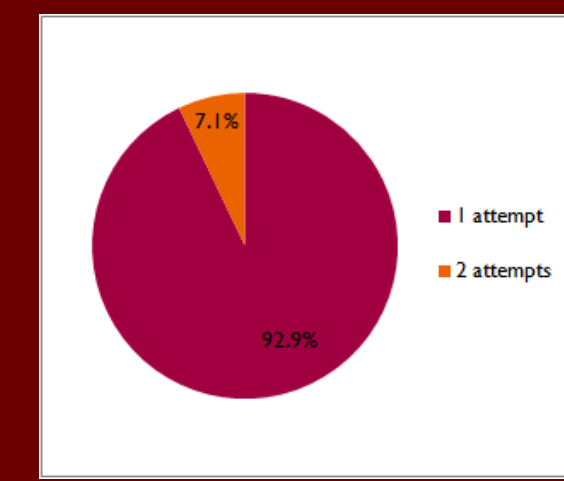


Figure 2- Number of attempts of induction in successfully induced patients

	Successful inductionn (%)	Unsuccessful inductionn (%)	p Value*
DES > 30 < 30	9 (27.3%)	2 (33.3%)	0.553
SIMS score > 14 < 14	24 (72.7%) n= 6 (19.4%)	4 (66.7%) n= 4 (66.7%)	0.035
TOMM score ≤ 45 > 45	n= 5 (20.83%) n= 29 (85.3%)	n= 0 n= 6 (100%)	0.738
COPE			
Active coping score, mean (SD)	4.19 (1.47), n=31	2.5 (1.38), n=6	0.013
Use of instrumental support score, mean (SD)	3.39 (1.87), n=31	1.5 (1.52), n=6	0.027

Table 1- Psychological instrument data comparison between successful and unsuccessful induction groups

## Discussion

- In this study, 82.4% (42/51) of suspected cases of PNEE reproduced their habitual episodes upon placebo induction, resulting in definitive diagnoses of PNEE.
- Among our 42 cases of successful induction, the majority of cases (92.9%, n = 39) were successfully induced on the 1<sup>st</sup> attempt. The 2<sup>nd</sup> induction attempt led to a smaller but not negligible 25% (3/12) success rate. However, due to the smaller size of this second induction group, the significance of this latter finding is less certain.
- We observed that placebo induction was statistically more likely to provoke hypermotor events as compared to hypomotor events (p = 0.029).
- Suspected cases of hypermotor PNEE typically reported overtly florid ictal manifestations that bolster the initial clinical suspicion for PNEE. On the other hand, suspicion in most hypomotor cases were primarily built upon psycho-social risk factors, unremarkable seizure work-ups, pharmaco-resistance to multiple anti-epileptic drugs, or other available histories. It is possible that the hypomotor cases represent a wider spectrum of etiologies, including epileptic, physiologic non-epileptic, feigned, or other events not typically known to demonstrate suggestibility. Such etiologic diversity may in part explain the diminished induction success rate for hypomotor events.
- We observed a significant association of total SIMS score exceeding recommended cut scores (> 14) among our successfully induced cases (p = 0.034), supporting tendency toward over-reporting of uncommon cognitive and affective symptoms among our inducible patients
- From the Brief COPE inventory, we further uncovered 2 coping approaches that showed significantly elevated subscales among our successfully induced patients. Both of these subscales reflect action-oriented approaches to an individual's illness.
- Pre-selection of patients (who meet the above profiles) for placebo induction may reduce costs by shortening V-EEG monitoring sessions for these patients. Such selective approach may also improve the diagnostic yield of V-EEG even for patients with very infrequent events for whom V-EEG monitoring had been typically considered as impractical.