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Confrontation Naming Skills in Persons with Medically Intractable Temporal and Extratemporal Epilepsy

*[1]ManjuMohan P, [2]Goswami S. P&[3] RamshekharN Menon

[1]Speech Therapist, Department of Neurology, Sree Chitra Tirunal Institute for Medical Sciences and Technology, Trivandrum, Kerala (India)
[2]Professor, Department of Speech Language Pathology,All India Institute of Speech and Hearing, Mysore, Karnataka (India)
[3]Additional Professor, Department of Neurology, Sree Chitra Tirunal Institute for Medical Sciences and Technology, Trivandrum, Kerala (India)

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***Corresponding Author**
Email:manju.pranavam[at]gmail.com

ABSTRACT
Confrontation naming in persons with epilepsies (PWE) shows contraindicating results and most of these studies have focused on temporal lobe epilepsies (TLE) with extratemporal lobe epilepsies (ETLE) almost neglected. In the Indian context, there have been a scarcity of research aimed at understanding confrontation naming skills in PWE. The current study was conceived with the aim of using a locally developed visual confrontation naming test to explore the naming skills of 64 carefully recruited temporal and extratemporal epilepsies affecting dominant and nondominant hemisphere along with 64 normal controls. Results showed absence of difference between PWE and normal controls as well as between right or left hemispheric temporal and extratemporal epilepsies on visual confrontation naming tests. Results are discussed in terms of lack of sensitivity of visual confrontation naming tests in PWE with higher levels of education. Data driven cues suggest development of specific confrontation naming batteries for use in PWE.

1. Introduction

Naming difficulties are widely reported in persons with drug resistant epilepsies (PWE), especially temporal lobe epilepsy (TLE) (1,2). As left temporal lobe mediates dominant language functions, naming impairments are affected significantly in persons with left TLE (2–4). However, there are studies that also report word finding difficulties to be observed in both right TLE (RTLE) and left TLE (LTLE), with a pronounced effect in LTLE (5). There are also reports of word finding difficulties without significant disparity between RTLE and LTLE (6–8).

Studies that report naming impairments to be obvious when the epileptic foci are in the language dominant hemisphere deliberates that the TLE associated structural alterations and electrophysiological disturbances could induce changes in the semantic networks of language mediated by the left temporal lobe, resulting in measurable naming deficits. On the other hand, naming problems in RTLE were assumed to be resulting from the damage to right hemisphere regions that support lexico-semantic systems or as an effect of epileptic discharges on left hemisphere (9).

When several studies have looked into the naming deficits of TLE there were not many reports on the status of naming skills in extratemporal epilepsy patients. A widespread neuronal network which also involves left frontal lobe sub serves naming functions in humans. Studies have reported naming difficulties in left frontal, left neocortical, left mesial and right mesial epilepsy patients compared to normal controls. Left temporal and frontal pathologies could cause naming deficits in epilepsy patients (10).

Studies that have attempted to understand naming skills in PWE has invariably used Boston Naming Test (BNT) which was demonstrated to have utility towards presurgical lateralization in this population (11). Among European epilepsy centers, BNT is reported to be the widely used tool (12). When western epilepsy centers have significantly contributed to understand the naming deficits in epilepsy, there are hardly any studies in Indian context, that have prioritized naming research in epilepsy. Also, there are not many studies that have tackled naming skills in extratemporal epilepsy either in Western context or in Indian context.

The current study was envisaged on the background of the lack of consensus on naming performances between dominant and nondominant TLE and scarcity of research in naming skills of extratemporal epilepsies and lack of published reports specifically in the Indian scenario. Hence the current study tried to specifically understand the confrontation naming skills of PWE with a locally developed naming test in Malayalam.

2. Methods

Sixty-four right handed persons with refractory epilepsy and Malayalam as first language were included in the study. All participants belonged to the age group of 18-45 years. All participants had a minimum of 12 years of formal education. There was a total of 24 males and 40 females included as participants for the study. There were 16 patients each with right and left temporal lobe epilepsy and 16 patients each with right and left extratemporal lobe epilepsy. An age, gender and education matched right handed healthy normal controls (NC) with Malayalam as first language were included. Participants had to be right hand dominant as evidenced from Edinburgh handedness inventory to be included in the study. All normal controls were selected after revealing normal cognitive functions as per Addenbrookes Cognitive Examination test in Malayalam (ACE - Malayalam, (13). Similar to patient groups,

NC also had 24 male and 40 female subjects. Participants were enrolled for the study after getting their informed consent. With the participants' consent, all of them were tested for confrontation naming skills using the confrontation naming subsection of semantic battery developed in Malayalam (14).

Semantic battery in Malayalam assess semantic memory in depth and includes attribute identification, naming to description, verification of semantic attributes, sentence completion, confrontation naming and picture pointing. For confrontation naming a total of 55-line drawings of many objects/ items are shown one at a time. This tool was used to assess semantic memory and there are published reports on the utility of this test in patients with primary progressive aphasia (14).

3. Results

The statistical analysis was performed using IBM SPSS statistics for Windows version 21 (Armonk, NY, USA). Demographic details such as age, education, handedness and confrontation naming scores were compared across control and patient groups using independent t test. One-way Analysis of Variance (ANOVA) was carried out across the four patient groups to compare confrontation naming scores within PWE. For all the analysis, the threshold of significance was set at $p<0.05$.

Demographic details of normal controls and PWE are summarized in Table 1. The two groups did not differ in variables like age, education and handedness as revealed by the independent t tests.

Table 1
Group demographic information

	NC (N=64)	PWE (N=64)	*p* value
	Mean (+/-SD)	Mean (+/-SD)	
Age (years)	25.9 (6.66)	26 (6.85)	.938
Education (years)	14.56 (1.78)	14.10 (1.57)	.130
Handedness (EHI* score)	96.34 (8.12)	97.76 (6.44)	.274
ACE-Malayalam score	94.59+/-3.12		

Note. NC = Normal controls; PWE = Persons with epilepsy; EHI = Edinburgh Handedness Inventory; ACE-M = Addenbrooke's Cognitive Examination – Malayalam; N= Number of participants

Table 2
Mean confrontation naming (CN) scores and standard deviation for each group

Groups	N	Mean	SD
Right Temporal Lobe Epilepsy (RTLE)	16	51.68	2.47
Left Temporal Lobe Epilepsy (LTLE)	16	52.37	2.16
Right extratemporal lobe epilepsy (RETLE)	16	52.75	2.46
Left extratemporal lobe epilepsy (LETLE)	16	52.56	2.34
Normal controls (NC)	64	52.45	2.05

Note. N – Number of participants

Table 2 above provided the mean and standard deviation of confrontation scores of epilepsy groups. Independent t test was used to compare NC with PWE on the confrontation naming scores. It was noted that there was no significant difference in the confrontation naming scores between controls and patient groups, t (126) = -.282, p =.129. One-way ANOVA was then carried out across the four epilepsy patient groups as independent variables and confrontation naming score as dependent variable. It was noted that there was no significant difference between epilepsy groups with respect to their confrontation naming scores, F (8,119) = .828, p = .579. Thus, there were no differences in the performance on semantic battery confrontation naming subsection across the different epilepsy groups, or between PWE and NC as measured by visual confrontation naming scores.

4. Discussion

The current study utilized confrontation naming subsection of semantic battery in Malayalam to understand the naming skills of persons with refractory temporal and extratemporal epilepsy affecting dominant or nondominant hemisphere. It was brought out that there were no significant differences in confrontation naming skills between neither PWE and NC nor within the subgroups of persons with epilepsy recruited to the study.

The current study is presumed to be the first study in the Indian context with the specific aim of assessing confrontation naming skills in epilepsy. Though there have past studies that have described naming deficits in epilepsy patients, so far there have been no consensus on the exact nature of this impairment in PWE. Many studies showed reduced language skills in temporal lobe epilepsy (15–17) but the current study is not in concordance with the above reports. A literature on the confrontation naming tests in RTLE and LTLE have reported that LTLE group is more impaired than RTLE in the confrontation naming tests (2,4,7,18) while few studies also report absence of measurable differences between the two groups (19). The absence of measurable difference between RTLE and LTLE was discussed majorly in terms of the poor utility of BNT in measuring naming skills mediated by anterior temporal structures that are affected in temporal epilepsies

(16,20). In concordance to these studies reporting a lack of difference in the performance between RTLE and LTLE, current study also did not elicit differences in the visual confrontation naming performances between various epilepsy groups.

Confrontation naming subtest of semantic battery has never been applied in PWE. Many of the studies pertaining to naming in epilepsy have so far used BNT. The normative studies on effect of education on total test scores in BNT showed that education accounts for around 32% variance in BNT performance followed by age and living environment. But in well-educated persons, age or living environment did not influence BNT performance (21). Lower levels of education lead to salient difference in BNT outcome measures with effects of education on BNT to be particularly salient at lower education levels. In the non-institutionalized elderly, the difference between subjects with 6–9 years of education and those with 10–12 years of education was much greater than the difference between subjects with 10–12 years and those with 12 years or more (22). One study had reported greater variability in the group with less than 12 years of education on BNT performance (23). While understanding the role of education on performance in BNT, it is striking that the majority of research designs pertaining to confrontation naming in epilepsy, education was not particularly controlled for.

In line with the current findings, were no differences were elicited between temporal or extratemporal epilepsies of dominant or nondominant hemisphere on visual confrontation naming tests, Hamberger and Tamny (16) also reported a lack of difference between LTLE and RTLE on visual confrontation naming tests. They reported that auditory naming tasks measure significant differences between RTLE and LTLE as this task involves anterior temporal areas which were affected in temporal epilepsies.

Drane et al. (20) included RTLE and LTLE patients with comparable education levels (mean education of 13.3 years for LTLE and 13.8 years for RTLE) and brought out that the naming performances between RTLE and LTLE are comparable. They postulated that BNT test which they used for assessment of naming skills was not sensitive to pick up semantic skills mediated by anterior temporal lobe structures and BNT only looked at the naming of categories mediated via posterior temporal regions namely, animate items. The current study also included participants with mean education of 12 years approximating the educational level considered in the Drane et al (20) study. Also the tool used in current study is similar to BNT in terms of the picture stimuli used. The above two studies could adequately explain the absence of quantifiable naming impairment in the subjects selected in the present study.

Though studies on naming skills in extratemporal epilepsies are few, the reported research by Braun et al. (10) showed that patients with left frontal, left neocortical, left mesial and right mesial epilepsies showed naming deficits when compared to healthy controls. However, an interesting fact is that, on the grounds of education on BNT performance, it is clear that this study has not controlled for education and had utilized BNT for assessing object naming in focal temporal and frontal epilepsies of both hemispheres. The results then described could be influenced by the methodological limitations in this regard also.

Bell et al. (24) reported that early onset TLE can have poor semantic knowledge and that causes dysnomia when compared to healthy subjects. Again, in this study there was significant difference the education levels of controls and TLE patients. Controls had a mean education of 13 years while TLE only had mean education of 11.9 years. Busch et al. (11) described that BNT was a useful presurgical tool for language lateralization in refractory TLE. But a closer examination of patient demographics of that study revealed that the years of education of subjects ranged from 6 to 20 years with a mean of 12.83 years.

Raspall et al. (25) highlighted that language measures from BNT was better in terms of material specific dissociation rather than predictions from memory measures. In this study also the mean education level of RTLE and LTLE was less than 12 years. However, these studies when assessed patients' performance after comparing their demographics at lower levels of education, could show differences in confrontation naming skills between RTLE and LTLE. An introspection on other variables like vocabulary knowledge and living environment playing a role in this differential performance need to be looked at a greater depth.

On carefully analyzing the above studies, that reported variability in naming performances of RTLE and LTLE and frontal epilepsy patients, it could be inferred clearly, that most of these studies failed to control for the variability that could be contributed by "years of education". In addition to this, most of the research studies in this regard, had used BNT for assessment of naming. Drane et al. (20) reported the lack of efficacy of BNT in assessing naming skills of PWE. They postulated that BNT test was not sensitive to pick up semantic skills mediated by ATL structures and BNT only looked at the naming of categories mediated via posterior temporal regions namely, animate items.

It was reported that there are organizational differences in language representation in PWE and semantic deficits may not be directly recorded at behavioral level due to factors such as task on demand, or compensation by other brain areas (26). The current study matched the variabilities of education and age between normal and patient group while recruiting participants to the study and has kept 12 years as the minimum educational level and has used a test similar to BNT. The mean years of education and the item nature in the test used would adequately explain the absence of any noticeable difference between temporal and extratemporal epilepsy from normal controls. Thus, the standard clinical speech and language measures usually used in epilepsy testing may not adequately tap the subtle semantic impairments in PWE.

The present study is relevant in the Indian context as it is a novel study that specifically addressed the naming skills of refractory PWE. It also contributed to the scarce literature on naming skills in persons with extratemporal epilepsy. The study

putforth that the confrontation naming tests should also include items for naming that specifically address the functions sub served by various brain areas that would be part of the epileptic network and appropriate norms should be established after considering variables such as age, education, vocabulary knowledge and living environment. This study also suggests that conclusions drawn from studies on confrontation naming skills in PWE that have failed to match the demographic variables at the very first stage should be interpreted with caution.

Though the present study failed to find differences in confrontation naming skills between PWE and NC, it does not ascertain that there is no difference in the semantic processing of PWE especially with TLE. The study only putforth that when using common scales for confrontation naming in PWE, it may be ascertained that the naming performance in such scales are not confounded with vocabulary knowledge and other psycholinguistic/ demographic variables. The confrontation naming subsection of semantic battery in Malayalam like BNT also has high level low frequency items which may not adequately capture the not so severe semantic processing impairments in PWE, as such items are more influenced by vocabulary knowledge of the testee. The study however reports that the current test used is insensitive towards lateralizing language deficits or identifying naming deficits in PWE, especially for participants with a mean education greater than 12 years.

5. Conclusion

The present study showed that the visual confrontation naming was unaffected in persons with epilepsy compared to healthy normal. The study could not bring about any differences in the naming skills of dominant and nondominant temporal and extratemporal epilepsies in Malayalam speaking refractory epilepsy patients. It was concluded that visual confrontation naming tests applied to highly educated patients may not be sensitive to pick up the possible semantic deficits in temporal and extratemporal epilepsy patients.

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