

CHAPTER 13

Part Summary: Psychological and Neuropsychological Evaluation of the Patient with Non- Epileptic Seizures

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The chapters in this section have introduced several issues of importance with respect to the psychological and neuropsychological evaluation of patients with non-epileptic seizures. This overview focuses on two of these: the use of neuropsychological tests to differentiate between patients with epilepsy and patients with non-epileptic seizures, and the use of personality and adjustment inventories to make the same distinction. In addition, new data are presented from the authors' own laboratory, and efforts are made to draw conclusions that will stand the test of time.

Neuropsychological Performance and Non-Epileptic Seizures

Several of the authors in this section have rightfully raised the question about the possible usefulness of tests of mental abilities in differentiating persons with non-epileptic seizures from those with epilepsy. The rationale for this line of thinking is easily understood. Individuals with

epilepsy have an organic brain disorder that may have a continuing impact on functioning, even between seizures. Persons with non-epileptic seizures have disorders, which are primarily psychiatric or behavioral in origin, and no compromise in brain functions is therefore necessarily implied. Neuropsychological tests are sensitive to brain damage, and it therefore stands to reason that patients with epilepsy may well perform more poorly on neuropsychological tests than patients with non-epileptic seizures.

Literature Review

Despite the reasonableness of the rationale just offered for finding cognitive differences between non-epileptic and epileptic patients, such differences have not always been discovered. In one early paper,¹ for example, it was noted that patients with non-epileptic seizures were neither more intelligent nor less impaired neuropsychologically than a matched group of patients with epilepsy. A second study² found that patients with non-epileptic seizures were less impaired cognitively than persons with epilepsy, but the epileptic seizure group was also less well educated. The critical importance of education was demonstrated in a third study in which it was shown that non-epileptic patients performed better on cognitive tests when they were better educated but that when education was controlled, all or nearly all of the differences disappeared.³ A fourth paper reported cognitive impairment in 16 of 20 persons with non-epileptic seizures.⁴ A fifth investigation showed no cognitive differences between small but intensively studied non-epileptic and epileptic seizure groups.⁵ A sixth report noted no differences in intelligence between non-epileptic patients and temporal lobe surgery candidates, but the non-epileptic patients had a superior performance over the surgery candidates on some tests of memory.⁶ However, no differences were found between epileptic and non-epileptic patients in an additional investigation of both intelligence and neuropsychological functions.⁷ A small number of perceptual tests were reported in an eighth study, with a tendency for non-epileptic patients to make more errors than epileptic patients.⁸ Finally, non-epileptic seizure patients performed similarly to surgical patients on the recall but less well on the recognition portion of a verbal memory task, perhaps because of a reluctance to guess or due to denial.⁹

In summary, for these nine studies in the literature, no general neuropsychological superiority of non-epileptic patients to people with epilepsy has been demonstrated when these individuals are matched for critical variables such as age, gender, and education. Small differences on measures of perception and memory have been found that sometimes favored non-epileptic patients over epilepsy surgery candidates⁶ and which at other times favored the epilepsy surgery candidates.^{7,8}

Why do the non-epileptic patients not consistently outperform matched patients with epilepsy? One explanation, offered in the first of these studies,¹ is that patients with non-epileptic seizures very commonly have positive neurologic histories. In that particular study, 80% of the non-epileptic patients in fact had events in their histories that were likely to have impacted the functioning of the nervous system, including head injuries, brain surgeries, infectious disorders, birth trauma, and combinations of these and similar events. It may be that persons with compromises in brain functions are less able to cope with stressors in everyday life and that they are therefore more likely to develop emotional disorders such as those that often underlie non-epileptic seizures.

Original Investigation

Despite the studies just cited, the data presented by the other authors in this section again raise the possibility that patients with non-epileptic seizures may be distinguishable from those with epilepsy by cognitive measures. Because of this, data were assembled to see if this question could be answered more definitively than has been possible heretofore with a large group of patients. In particular, 100 patients were found who had undergone video-electroencephalographic (EEG) monitoring at the Regional Epilepsy Center of the University of Washington and who had demonstrated multiple non-epileptic attacks that were said to be typical of the spells reported before their hospitalizations. This sample of 100 is intended as an inclusive sample for our center because it includes most of the non-epileptic cases from previous studies.^{1,7} Each patient demonstrated behavioral unresponsiveness during the attacks with no EEG changes. The events were usually characterized by motor movements, such as bilateral shaking, body stiffening, out-of-phase bilateral body movements or pelvic thrusting, and/or by affective changes, such as moaning, weeping, affective changes symptomatic of panic, and forcible eye closure during the ictus. In no instances were there EEG changes characteristic of epilepsy, and no interictal EEG discharges occurred with any of these patients. Individuals with subjective spells only (reports of "seizures" but with no EEG or behavioral changes) were excluded.

A group of patients with epilepsy was formed for purposes of comparison. These individuals were all under evaluation for possible epilepsy surgery, and nearly all went to operation. In every instance, these persons demonstrated epileptic seizures accompanied by epileptiform patterns, and in no instance did they demonstrate attacks that appeared likely to represent non-epileptic seizures. A total of 100 cases were selected; they were chosen to match the 100 non-epileptic cases for age, gender, and years of formal education. Of the 100 surgical cases, 56 had epileptiform discharges recorded primarily over the left cerebral hemisphere, and 44 had discharges primarily from the right cerebral hemisphere.

TABLE 13.1
Basic Information on Groups of Non-Epileptic and Epileptic Patients

Variable		Non-Epileptic (n = 100)	Epileptic (n = 100)	Significance
Age	M	32.48	32.54	.962
	SD	9.79	7.74	
Education	M	12.24	12.31	.843
	SD	2.70	2.28	
Gender	Female	72	72	1.00
	Male	28	28	
Onset of attacks	M	22.97	13.54	.001
	SD	12.39	9.42	

M = mean; SD = standard deviation.

Basic information about data on the two groups is provided in Table 13.1. The only statistically significant difference found between the two groups was on the variable of age of onset of attacks and, as has been noted in many of these studies, persons with non-epileptic seizures had much later onsets of attacks than did individuals with epilepsy.

Data from the Wechsler Adult Intelligence Scale-Revised are presented in Table 13.2. Patients with non-epileptic seizures performed

TABLE 13.2
Means (and Standard Deviations) of Non-Epileptic (n = 100) and Epileptic (n = 100) Groups on the Wechsler Adult Intelligence Scale-Revised

Variable	Non-Epileptic	Epileptic	Significance
Verbal IQ	93.91 (14.62)	89.85 (10.53)	.038
Performance IQ	92.37 (14.42)	89.28 (11.37)	.122
Full Scale IQ	92.78 (14.51)	88.62 (10.28)	.031
Information	8.78 (3.05)	8.41 (2.69)	.364
Comprehension	9.81 (3.05)	8.95 (2.78)	.038
Arithmetic	8.17 (2.88)	8.57 (2.63)	.306
Similarities	9.45 (2.89)	8.91 (2.61)	.167
Digit Span	8.94 (3.05)	8.65 (2.91)	.492
Vocabulary	9.70 (3.08)	8.66 (2.66)	.011
Digit Symbol	8.03 (2.56)	7.57 (2.78)	.225
Picture Completion	9.06 (2.72)	8.70 (2.61)	.341
Block Design	8.89 (2.62)	8.99 (2.59)	.785
Picture Arrangement	9.18 (2.84)	8.12 (2.24)	.004
Object Assembly	9.25 (2.96)	8.42 (2.60)	.037

TABLE 13.3
Mean Scores (and Standard Deviations) of Non-Epileptic (n = 100)
and Epileptic (n = 100) Groups on the Neuropsychological Battery for Epilepsy

<i>Variable</i>	<i>Non-Epileptic</i>	<i>Epileptic</i>	<i>Significance</i>
Stroop I (secs)	105.18 (42.69)	110.90 (39.10)	.328
Stroop II-I (secs)	166.48 (61.67)	159.44 (56.67)	.405
WMS-I Logical Memory Immediate (total)	18.45 (6.30)	17.61 (6.68)	.360
WMS-I Visual Reproduction Immediate	8.63 (3.24)	8.75 (2.80)	.785
Perception examination, total errors	12.09 (15.00)	13.18 (13.14)	.639
Name writing (letters/secs)	.84 (.29)	.79 (.29)	.238
Category	43.08 (27.17)	47.80 (28.81)	.236
TPT, Total Time (mins)	18.59 (11.70)	22.22 (13.29)	.042
TPT, Memory	7.35 (1.72)	7.01 (1.55)	.149
TPT, Localization	3.77 (2.38)	3.05 (2.09)	.026
Seashore Rhythm	24.38 (4.58)	23.12 (4.28)	.047
Seashore Tonal Memory	21.20 (6.95)	19.05 (6.84)	.029
Finger Tapping, total	89.21 (14.12)	88.40 (13.53)	.679
Trail-Making Test, Part B (secs)	84.46 (48.36)	104.40 (64.16)	.014
Aphasia Screening, total errors	3.78 (4.64)	3.43 (3.40)	.544
Construct dyspraxia, rating*	1.20 (.92)	1.19 (.86)	.937
Percent of 16 scores outside normal limits	48.06 (24.71)	55.12 (26.60)	.053
Halstead Impairment Index	.44 (.27)	.50 (.28)	.113

TPT = Tactual Performance Test; WMS-I = Wechsler Memory Scale-I.

*Rating of constructional dyspraxia: 0 = none; 1 = questionable; 2 = mild; 3 = moderate; 4 = severe.

slightly better on this test than did epilepsy surgery candidates, with statistical significance achieved especially in the verbal area with this large sample. The variable best separating the groups (Picture Arrangement) was able to correctly classify 60% of patients when an optimal cutoff score was established (45% of the non-epileptic group had scores greater than 9, 76% of the epilepsy group had scores less than 10).

Attention is next turned to the results of the Neuropsychological Battery for epilepsy,¹⁰ which is an expanded Halstead-Reitan battery with particular attention to the variables most relevant in epilepsy. Table 13.3

shows that in the 16 brain-sensitive test measures in this battery, patients with non-epileptic seizures performed better than the surgery group on 12, with statistically significant differences found on four, all of which favored the non-epileptic seizure groups. The most noticeable statistically significant difference was on part B of the Trail Making Test, in which a cutoff line between 79 and 80 seconds rendered a correct classification rate of 61% (66 of non-epileptic cases had scores lower than 80, 56 epilepsy cases had scores higher than 79).

In conclusion, for the question of differential neuropsychological abilities across non-epileptic and matched epileptic groups, it is evident that some slight differences exist that favor the non-epileptic patients. These differences are so slight, however, that they are of no practical use in assisting to make a differential diagnosis between these groups. Note is made that even the 60% accuracy rate is likely to shrink at least somewhat on cross-validation. Of likely greater significance is the fact that mental abilities for both the non-epileptic and the epileptic groups are below average and outside normal limits, as would have been readily evident had a normal control group been included. Thus, the key point is not that patients with non-epileptic seizures may have slightly worse scores on tests of abilities than persons with epilepsy. Rather, it is that both groups are on the low side of average intelligence, and both show mild but definite impairment in brain functions. This impairment is likely due to both the positive neurologic histories¹ frequently found in these cases and to maladaptive response styles.^{8,9}

Emotional Adjustment and Non-Epileptic Seizures

The second part of this chapter deals with the use of personality and adjustment inventories to help in the differential diagnosis of epileptic and non-epileptic patients. There has been some dispute in the literature with respect to the value of tests such as the Minnesota Multiphasic Personality Inventory (MMPI) to differentiate between epileptic and non-epileptic patients. In fact, one review of the area is especially critical, saying that "no psychological profile appeared to be of help in the differentiation" of patients in epileptic and non-epileptic groups.¹¹ Such a conclusion is surprising in view of the fact that the authors have found that the MMPI is of definite value in daily clinical work with patients who have non-epileptic seizures. Clearly, a review of the literature is needed to determine whether or not personality inventories are of value in differentiating epileptic from non-epileptic cases and, if so, to what degree they can be relied on to make this differentiation. In this literature review, we focus on the MMPI exclusively because it is only rarely that other tests have been studied in attempting to differentiate between epileptic and non-epileptic patients.

Literature Review

All of the known literature on the MMPI and non-epileptic seizures is summarized in Table 13.4 except for those cases in which the same data set was presented on two or more occasions, whereupon, with a single exception due to new information presented,³ it was cited only once. A total of 15 investigations appear here, and due to diversity in defining non-epileptic seizures and in establishing contrasting groups, a summary of all of these papers is somewhat challenging. Nevertheless, the conclusions were fundamentally positive from 11 studies^{1,3,4,10,12-18} relative to the use of the MMPI to differentiate non-epileptic from epileptic patients. In contrast to the negative review of the area,¹¹ the investigators from these studies concluded that the MMPI was helpful even though imperfect in differentiating between non-epileptic and epileptic groups. Many of these investigators pointed out that their patients with non-epileptic seizures represented a heterogeneous sample, with various causes of their non-epileptic seizures likely, which no doubt relates to the fact that multiple elevations were commonly noted on the various MMPI scales even though the greatest elevations were typically observed on hysteria and schizophrenia. In general, the authors concluded that although the differential diagnosis problem is difficult, the MMPI was at least of some help in making this diagnosis.

The question should be raised about the four studies in which the investigators concluded that the MMPI had limited value.^{5,19-21} Reasons are evident to the current authors why the MMPI may not have performed as well as anticipated in each of these studies. In the first of these,⁵ the primary sample was a group of 12 patients who represented especially difficult diagnostic problems and for whom invasive electrodes had to be placed to determine if the attacks were epileptic or non-epileptic. This sample was thus highly atypical. A secondary sample in the same paper of surgical patients produced a "hit" rate of 71%, which other investigators considered to be of value but which these investigators thought to be poor. In the second study,¹⁹ the non-epileptic patients selected had primarily motor manifestations to their attacks rather than affective components, and this restriction in subject selection no doubt resulted in reduced effectiveness of the MMPI, as was later shown.³ The third investigation included a variety of patients with syncope, sleep disorders, migraine, and so forth, which were said to manifest non-epileptic "events" that other investigators would not include in a non-epileptic seizure group.²⁰ Finally, investigators in the fourth study²¹ could not effectively differentiate non-epileptic and mixed (epileptic plus non-epileptic) patients with the MMPI, but because both of their groups had the same non-epileptic disorder, the differentiation between those groups using the MMPI would appear to be difficult. In short, all four studies used samples that were atypical in one respect or another, and results were not considered to be satisfactory.

TABLE 13.4
Summary of Studies of Patients with Non-Epileptic Seizures Using the Minnesota Multiphasic Personality Inventory (MMPI)

<i>Investigator(s)</i>	<i>Subjects</i>	<i>Results and Rule Classification</i>
Shaw (1996)	15 patients with non-epileptic attacks (13 also had epilepsy), 15 with epilepsy only, 15 "pseudoneurologic" patients; EEG monitoring not used.	Pseudoneurologic scale separated epileptic and mixed epileptic/non-epileptic groups with an uncross-validated hit rate of 83% overall; mixed group had somewhat poorer adjustment.
Finlayson and Lucas (1979)	13 adolescents with non-epileptic attacks from files indexed "seizure with conversion reaction"; EEG monitoring not used	MMPI findings not presented in detail; unusual thought patterns most in evidence in combination with hysteroid tendencies; depression was variable.
Wilkus et al. (1984)	25 patients (84% women) with solely non-epileptic attacks, 25 patients (84% women) with solely epileptic attacks.	Configural rules set up that correctly classified 84% of all cases (80% of non-epileptic, 88% of epileptic).
Vanderzant et al. (1986)	19 patients (68% women) with non-epileptic attacks consisting only of loss of consciousness or bilateral motor activity; 20 patients (50% women) with generalized seizures selected from the clinic population; groups not matched for age or education.	Rules of Wilkus et al. (1984) correctly classified 61% of all cases (37% of non-epileptic, 88% of epileptic); diverse personalities emphasized with sampling differences across groups likely.
Henrichs et al. (1988)	31 with solely non-epileptic attacks (61% women), 113 with focal or generalized discharges (a consecutive series of cases with unequivocal findings).	Rules of Wilkus et al. (1984) correctly classified 72% of all cases (68% of non-epileptic, 73% of epileptic); concluded patients are heterogenous.
Barrash et al. (1989)	44 with solely non-epileptic attacks, 43 with epileptic and non-epileptic (83% women)	Rules of Wilkus et al. (1984) correctly classified 70% of all cases (53% of non-epileptic, 79% of

Wilkus and Dodrill (1989)	Same patients as Wilkus et al. (1984); all patients classified according to extent of motor and affectual expression during typical attacks.	Non-epileptic patients with major affectual/minimal motor features to their spells were more disturbed on the MMPI than were patients with partial seizures; non-epileptic patients with minimal affectual/major motor features could not be distinguished on the MMPI from patients with generalized seizures.
Drake et al. (1992)	20 patients (95% women), 16 with some previous suggestion of epilepsy but with currently negative EEGs; most showed back arching and pelvic thrusting.	MMPIs available on 16 patients were elevated in 15 "conversion V" profiles (hypochondria and hysteria up, depression down) common, although no scores were given and no configural rules were applied.
Hermann (1993)	12 patients (83% women) with especially difficult diagnostic questions (non-epileptic seizures vs. epilepsy) that remained even after scalp monitoring; strip electrode implantation resulted in six diagnosed as having epilepsy and six as having non-epileptic seizures.	Rules of Wilkus et al. (1984) correctly classified approximately 50% of all cases (60% of non-epileptic, 39% of epileptic).
	92 patients (60% women) with intractable seizures of temporal origin; all had EEG monitoring, and none had suspected non-epileptic seizures.	Rules of Wilkus et al. (1984) correctly classified 71% of patients as epileptic (29% were classified as non-epileptic).
Dodrill et al. (1993)	23 patients (87% women) with non-epileptic seizures and 22 epilepsy surgery candidates (36% women); these patients had not been studied previously.	Rules of Wilkus et al. (1984) correctly classified 76% of all cases (70% of non-epileptic, 82% of epileptic).
Derry and McLachlan (1996)	24 patients (54% women) with non-epileptic seizures of which 13 were also said to have epilepsy; 115 patients (53% women) had epilepsy only.	The authors devised their own set of decision rules based on the new form of the MMPI (MMPI-2) with a 94% classification accuracy overall (92% for mixed, 94% for epilepsy).

TABLE 13.4
Summary of Studies of Patients with Non-Epileptic Seizures Using the Minnesota Multiphasic Personality Inventory (MMPI)
(Continued)

<i>Investigator(s)</i>	<i>Subjects</i>	<i>Results and Rule Classification</i>
Mason et al. (1996)	27 patients (78% women) with non-epileptic seizures and 27 patients (59% women) with epilepsy.	Rules of Wilkus et al. (1984) with adjustments for MMPI-2 rather than the MMPI correctly classified 65% of all cases (60% of non-epileptic, 70% of epileptic).
Connell and Wilner (1996)	21 patients (86% women) with non-epileptic seizures and 24 patients (63% women) with epileptic seizures.	MMPI-2 used along with biographic variables in a multivariate context; age at onset of attacks and the hysteria scale together best predicted group classification ($p < .0001$).
Warner et al. (1996)	58 patients (78% women) with non-epileptic seizures and 89 patients (63% women) with epilepsy.	Rules of Wilkus et al. (1984) were applied to MMPI-2 profiles with an accuracy rate of 74% overall (74% of non-epileptic, 74% of epileptic); Derry and McLachlan rules correctly classified 69% of all cases (71% of non-epileptic, 67% of epileptic).
Kalogjera-Sackellares and Sackellares (1997)	55 patients (84% female) had either non-epileptic seizures alone ($N = 40$) or non-epileptic seizures plus epilepsy ($N = 15$) as determined by records review; 43 cases had EEG monitoring.	Rules of Wilkus et al. (1984) applied to the "pure" group showed a 60% correct classification (rules do not apply to a mixed sample); basic MMPI scales did not differ across the two groups.

An objective evaluation of the results from the studies can be done with a configural rule approach. Although investigators occasionally developed their own unique MMPI scales or configural rules,^{12,17} when configural rules were used, they were typically those of Wilkus et al.¹ These rules state that, among monitored patients, an MMPI profile is characteristic of non-epileptic seizures when one or more of the following apply: (1) Hysteria or hypochondriasis is 70 or higher and one of the two highest points, disregarding masculinity-femininity and social introversion; (2) hysteria or hypochondriasis is 80 or higher even though not among the two highest points; and (3) both hysteria and hypochondriasis are higher than 59, and both are at least 10 points higher than depression.

In nine studies the Wilkus et al. rules were applied to the patient groups evaluated.^{1,5,14,16-21} It is important to note that this group includes all four negative studies, and thus it does not appear to be biased in the direction of finding unrepresentative positive findings. Of a total of 272 patients with non-epileptic seizures included in the nine studies, 174 (64%) were correctly classified using the Wilkus et al. (1984) rules. Of the 469 patients with epilepsy to whom the rules were applied, 352 (75%) were correctly classified by the rules. Overall, the correct classification rate for epileptic and non-epileptic subjects was 71% (Fisher's exact, $p = .0018$). This figure includes all negative studies in the literature and also some groups of patients for whom the diagnosis of non-epileptic seizures could be questioned, as well as some persons classified as "epileptic" based on histories rather than EEG monitoring. A reasonable statement about the configural rules (and the MMPI) is that it is able to classify approximately seven of 10 patients with either epileptic or non-epileptic attacks, or possibly slightly better when patients are carefully defined.

Summary and Recommendations for Future Work

The findings from the literature and an original investigation showed that patients with non-epileptic seizures only are very slightly more capable cognitively than matched persons with epilepsy. The difference is on the order of four IQ points, not a great enough difference on any variable to be of practical use in differentiating epileptic from non-epileptic patients. In the area of adjustment, the MMPI has been by far the most commonly used measure to distinguish between patients having epileptic and non-epileptic attacks. Such a test is imperfect and has a correct classification rate of 70%, or slightly better with careful definition of subject groups. It is nevertheless useful in day-to-day work with people with non-epileptic seizures.

For future work in this area, several areas are evident. Application of gender-specific rules to MMPI profiles has not been explored, but it might result in better classification rates. Such inventories also have not been

applied prognostically in terms of relief from seizures, but they might be very useful in that context. The combination of personality variables with biodata variables such as age at onset of attacks is especially promising,⁹ and it may in fact be one of the best ways to improve accuracy in differential diagnosis. Finally, there are now indications that what patients do during the non-epileptic attacks is related to their personality profiles,³ and considering these behaviors could significantly improve correct classification rates or at least identify those cases in which a correct classification is unlikely.

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