EEG Slow Frequency and WISC-R Correlates

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On the basis of slow frequency indices obtained from computerized EEG assessments, 36 children were ranked the highest and 23 the lowest in a heterogeneous population of children involved in a brain-behavior assessment program. WISC-R results show the high or excess slow frequency group to have low verbal and normal performance subtest scores, while those with the least slow frequency activity were above normal on verbal and performance scores. Discriminant function analyses of the WISC-R profiles significantly separated the two EEG groupings, with the Information Subtest and Verbal IQ the best discriminating measures. The results suggested that diffuse EEG slow frequency reflected a "maturational lag." Cluster analyses showed that the subtest profile was constant independently of IQ. Other findings indicated that the presence of excessive slow frequency activity was associated with less electrophysiological and psychometric differentiation.

Current developments in quantitative electroencephalography (EEG) have added considerable precision and reliability to investigations that explore relationships between EEG indices and categories of cognitive and behavior disorders in children (John, 1977; Kellaway & Petersen, 1973). Although there are many findings that require elaboration and replication, EEG and evoked potential measures are usually found to covary with develop-
ment (Matousek & Petersen, 1973), lateralized brain functions (Galin & Ornstein, 1972), attention and arousal (Fuller, 1978), and sensory/perceptual capacities (Thatcher & John, 1977).

In spite of the increasing clinical value of the EEG in predicting and identifying dysfunction, it is often noted (for example, Hughes, 1976) that such relationships can be questioned because of the variability in defining the target group and the high incidence of abnormal EEG indices in normal children. Also, there are frequent reports that fail to establish reliable correlations between behavioral events and EEG features (Werry, 1972; Werry, Minde, Guzman, Weiss, Dogan, & Koy, 1972). The establishment of more specific and reliable relationships between behavioral and EEG profiles is important since psychometric and behavioral data are likely to be more accessible and less expensive and could be used to screen children for electrophysiological assessment.

A major problem in trying to identify clear brain-behavior relationships, and behavior-to-behavior relationships as well, resides in investigators overlooking the ontogenetic heterogeneity of behavioral functions because of apparent common features. As has been argued elsewhere, important behavioral events, such as symptoms, can be similar in manifestation, but the apparent commonality derives from a variety of causes (Corning, 1979; Corning, Dyal, & Lahue, 1976; Corning & Steffy, 1979; John, Karmel, Corning, Easton, Brown, Ahn, John Harmony, Prichep, Toro, Gerson, Bartlett, Thatcher, Kaye, Valdes, & Schwartz, 1977).

In spite of the possibility of multiple etiologies, research typically begins with the definition of a disorder based upon current functioning and accordingly uses traditional labels such as "hyperactivity," "schizophrenia," "conduct disorder," and so on. Establishing reliable electrophysiological correlates of such symptomatically defined groups is made difficult when some members of a diagnostic group do and others do not have a brain wave abnormality either as a cause, as a maintaining influence, or even as a noncausal correlate of the disorder.

Ideally, the heterogeneity problem could be resolved by using atheoretical "numerical taxonomic" strategies to isolate homogeneous subgroups studied on multilevel measures including behavioral manifestations (Corning & Steffy, 1979). However, such efforts require large populations of subjects, considerable computer capacity, measures that sample many levels of functioning, multidisciplinary research groups, and, last but not least, extensive and reliable funding.

The present study utilizes a strategy of establishing relationships between the EEG and psychometric (WISC-R) performance without an immediate concern over standard behavioral categories. To begin, we selected two measurement sets that have had reasonable validation: EEG