Electrophysiological Assessment in Learning Disabilities

GRANT L. MORRIS, JOEL LEVY, and FRANCIS J. PIROZZOLO

INTRODUCTION

This chapter will explore some of the nonbehavioral neurodiagnostic assessment techniques that were introduced in Chapter 3 of this volume. These techniques include neuroimaging techniques, such as computerized tomography (CT) and magnetic resonance imaging (MRI), electroencephalography, and evoked potentials. To illustrate the potential of these techniques for assessment in child neuropsychology we have chosen to focus specifically upon learning disabilities (LD).

The subtle and uncertain symptoms that characterize learning disabilities provide a challenge to both conventional psychometric assessment techniques and those nonbehavioral techniques that we will be reviewing in this chapter. As new neuropsychological assessment tools are introduced, often one of the first problems with which they are tested is LD. For this reason, and despite the relatively short time that some of these techniques have been around, considerable research already exists using both neuroimaging and electrophysiology in the assessment of learning disabilities.

Learning disabilities typically are not associated with any known neuropathology or trauma. However, LD symptoms often appear consistent with localized dysfunction in at least one brain system. Conse-
quently, learning disabilities have long been suspected as having a neu­rological basis. This presumed etiology was not made explicit in the definition of LD found in Public Law 94-142. The definition of LD subsequently published by the National Joint Committee for Learning Disabilities addressed this question: “These disorders are intrinsic to the individual and presumed to be due to central nervous system dysfunction” (Hammill, Leigh, McNutt, & Larsen, 1981). At the same time, individual learning-disabled children show such a variety of specific behavioral anomalies that assessment often ends with cataloging the problem behaviors rather than attempting to discover the underlying neurological dysfunction.

Some of the purposes potentially served by electrophysiological and neuroimaging techniques in the assessment of LD include the following (also see John, 1977; Otto et al., 1984):

1. **Providing insight into the neurological bases of LD.** Numerous models of aberrant brain function in LD point to problems in specific systems or regions of the brain. Will there be support from electrophysiological and neuroimaging findings, or will the suspected multiple etiologies of LD be confirmed by neurological correlates as variable as the behavioral dysfunctions themselves?

2. **Differential diagnosis of learning disabilities with neurological involvement.** Being able to confirm or exclude organic involvement in a child’s learning difficulties has clear implication for therapy.

3. **Early detection.** This may lead to therapeutic intervention at the onset or even prior to formal schooling rather than after the learning disability has manifested itself behaviorally.

4. **Culture-fair assessment.** This is a promise that follows from the presumption that neuroimaging and electrophysiology are measures of brain status and functioning that are not heavily affected by the child’s cultural experience and achievement.

5. **Assessment of the course of the disorder and effect of therapy.** An assessment can be made to the extent that the disorder is the result of, or at least correlated with, neurological status.

**Anatomical Correlates of Learning Disorders**

The roots of theorizing about anatomical bases of learning disorders began with the observations of Broca (1861) and Wernicke (1874) on aphasia. Later, Hinshelwood (1895) found areas of cerebral cortex to be damaged in patients with acquired reading disorders. However, it was left for Morgan (1896) to suggest that these areas probably were under-