Validating the Diagnosis of Sensory Processing Disorders Using EEG Technology

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KEY WORDS
- behavior
- brain
- electroencephalography (EEG)
- event-related potential (ERP)
- pediatric
- sensory gating
- sensory integration
- sensory processing
- sensory processing disorder (SPD)

OBJECTIVE. This study tested the assumption of sensory integration theory that states that a relationship exists between brain function and the behavioral manifestations of sensory integrative dysfunction.

METHOD. Electroencephalographic measures were used to examine brain processing in 28 children with sensory processing disorders (SPD) and 25 children who were typically developing, ages 5–12 years.

RESULTS. Children with SPD demonstrated less sensory gating than children who were typically developing. A significant relationship between sensory gating and age was found in children who were typically developing but not in children with SPD. Brain activity correctly distinguished children with SPD from children who were typically developing with 86% accuracy.

CONCLUSION. These results present empirical evidence that children with SPD display unique brain processing mechanisms compared to children who are typically developing and provide external validity for the diagnosis of SPD.


Jean Ayres’s theory of sensory integration has generated more research and controversy than any other theory developed by an occupational therapist (Bundy & Murray, 2002). These fervent controversies have emphasized how particularly important it is to find more precise methods to study the phenomenon of sensory integration and the treatment of children with sensory processing disorders (SPD). One approach yet to be pursued in the study of sensory integration is to directly test the assumptions of the theory itself. Bundy and Murray (2002) articulated five assumptions of the sensory integration theory related to the neural and behavioral bases of sensory integration (pp. 10–12). The assumptions that are most germane to validating the theory of sensory integration relate to the relationship between brain maturation or function and behavioral manifestations of sensory integrative dysfunction, which was eloquently stated by Short-Degraff:

Sensory integration theory assumes that the brain is immature at birth and also is immature [or dysfunctional] in some individuals with learning problems. The goal of sensory integration therapy is to provide stimulation that will address certain brain levels (primarily subcortical), enabling them to mature [or function more normally], and thereby assisting the brain to work as an integrated whole. (Short-Degraff, 1988, p. 200) [Bracketed material added by Bundy & Murray, 2002, p. 11]

Of these assumptions, two can be postulated as hypotheses that can be directly tested using a brain imaging technique commonly used by neuroscientists. First, Ayres’s (1972, 1989) theory proposes that behavioral expressions of sensory integration dysfunction are related to immaturity or malfunction in brain processing. This assumption leads to the hypothesis that, when presented with