THE ISSUE IS

Validity of the Southern California Postrotary Nystagmus Test: Misconceptions Lead to Incorrect Conclusions

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This article was accepted for publication March 1, 1990.

In her article entitled "Testing Vestibular Function: Problems With the Southern California Postrotary Nystagmus Test" (*American Journal of Occupational Therapy,* July 1989), Helen Cohen concluded: "Although postrotatory nystagmus is indicative of vestibular system function, the SCPNT [Southern California Postrotary Nystagmus Test] does not provide a valid measure of that behavior. Therefore, results from this test are not valid indicators of vestibular function" (p. 475). Although Dr. Cohen is to be applauded for providing an excellent review of some aspects affecting the testing of pure vestibular responses and for attempting to educate therapists on the validity of a widely used test, she has failed to recognize the distinction between the testing of pure vestibular responses and the purpose of the Southern California Postrotary Nystagmus Test (SCPNT) (Ayres, 1975). This distinction is central to the use and interpretation of results on the SCPNT.

Ayres (1972, 1976, 1978, 1982) was consistent in conceptually and operationally defining the vestibular system in a much broader context than that described by Cohen, including the vestibular receptors "and all major neuronal mechanisms influenced by sensory input from those receptors" (Ayres, 1978, p. 28). The vestibular receptors (semicircular canals and otoliths), vestibular nuclei, vestibulospinal pathways, vestibulocerebellar pathways, vestibuloocular pathways, and vestibulocortical projections are all considered to be components of the vestibular system (Clark, 1985). This view of the vestibular system emphasizes the global influences of vestibular stimuli processed within the central nervous system, including the effect of the vestibular nuclei on descending and ascending tracts and on other brain stem functions as well as the integration of vestibular information with other sensory data at both the brain stem and cortical levels (Ayres, 1972).

Research has supported this global perspective on the central processing of vestibular input. Fisher, Mixon, and Herman (1986), using electronystagmography, found that adults with suspected vestibular dysfunction (through a clinical diagnosis with nonotological assessments) "had normal phasic (peripheral) vestibular responses, but they demonstrated impaired tonic processing of vestibular inputs *within* the central nervous system (i.e., brainstem)" (p. 17). In their study of postrotatory nystagmus duration following rotatory stimulation induced by a manually operated Barany chair, Ritvo et al. (1969) compared 28 children with autism and schizophrenia with 22 nondysfunctional children. The researchers found no significant difference in duration of postrotatory nystagmus between the two groups when the subjects were blindfolded in a darkened room. The postrotatory nystagmus for the children with autism and schizophrenia, however, was significantly shorter than that for the nondysfunctional children when both groups were tested in lighted conditions. A later study demonstrated that a group of children with autism showed a suppression of postrotatory nystagmus when light impinged on the retina even when ocular fixation was eliminated (Ornitz, Brown, Mason, & Putnam, 1974). Because suppression of postrotatory nystagmus in children with autism occurred even in the absence of ocular fixation, these studies support the idea of the difficulty involved in the central processing of vestibular input. Difficulty appeared to exist in the ability to process the interaction of the visual and vestibular stimulation. Although Polatajko's (1985) study of children with learning disabilities suggested that these children do not have a discrete vestibular dysfunction, 45% to 50% of children with learning disabilities appear to have difficulty integrating vestibular stimuli with other sensory input (Ayres, 1978; Ottenbacher, 1978, 1980). The measures used by Polatajko (1985) and described by Cohen (1989) do not assess the effect of such diffuse vestibular processes.

Ayres (1975), in an attempt to measure this diffuse process, developed the SCPNT. Although the SCPNT involves "some aspects of vestibular function" (Ayres, 1975, p. 1), Ayres recommended that the SCPNT never be used in isolation. It was intended to be interpreted in conjunction with other standardized assessments and clinical observations of protective, righting, and postural responses; equilibrium; muscle cocontraction; ocular responses; and muscle tone (Ayres, 1972, 1976, 1980, 1989).

In nondysfunctional children, the duration of postrotatory nystagmus was not significantly correlated with scores on any of the other subtests of the Sensory Integration and Praxis Tests (SIPT) (Ayres, 1989). The data showed, however, that both exceptionally high and exceptionally low scores were suggestive of dysfunction.

In determining which neural conditions predispose the learning-disabled child to responsiveness to sensory integrative procedures (emphasizing carefully controlled vestibular stimulation and activation of related central nervous system mechanisms), Ayres (1978) found that the pretherapy duration of postrotatory nystagmus measured by the SCPNT was the best predictor of change in the reading and spelling test scores of the Wide Range Achievement Test and in the dichotic listening test. A hyporeactive nystagmus predicted a lack of achievement for the children in the control group and favorable achievement for the children receiving both sensory integrative procedures and special education. Conversely, the children with a prolonged postrotatory nystagmus appeared to have greater and more extensive neurological involvement. The SCPNT's ability to discriminate between children with and without difficulty in integrating vestibular stimuli and to predict which children will benefit from sensory integration procedures has resulted in its common use among therapists who use sensory integration procedures.

Therapists and researchers have been interested not only in the SCPNT's ability to predict responsiveness to therapy but also in the relation of SCPNT scores to performance and behavior. For example, Watson, Ottenbacher, Short, Kittrell, and Workman (1981) reported that children with perceptual-motor difficulties, educational difficulties, or both who had low SCPNT scores also performed more poorly on human figure drawings than did children with average SCPNT scores. Inappropriate behaviors have also been associated with low SCPNT scores. In a group of boys with learning disabilities, those judged by their teachers to have the most socially inappropriate behavior scored significantly lower on the SCPNT than those with more socially appropriate behavior (Ottenbacher, Watson, & Short, 1979). Further, studies of children with emotional or behavioral disturbances revealed a higher incidence of hyporeactive nystagmus on the SCPNT when compared with the nondysfunctional population (Royeen, 1984; Watson, Ottenbacher, Workman, Short, & Dickman, 1982).

Cohen (1989) also raised concern regarding the reliability of the duration of nystagmus obtained, due to the manner of obtaining and timing the nystagmus in the SCPNT. Theoretically, her arguments appear sound, but the actual data on the reliability of the test render her claims questionable. Although the test–retest correlation for the excursion of nystagmus was poor, most research concerning the SCPNT and the Postrotary Nystagmus subtest of the SIPT has indicated that the duration of elicited nystagmus is reliably measured on these tests. The test–retest reliability of the SIPT was evaluated in a sample of 41 dysfunctional children and 10 nondysfunctional children. The test–retest reliability coefficient of .49 for the Postrotary Nystagmus subtest was considerably lower than that previously obtained and was thus thought to be an underestimate of the actual reliability of this test (Ayres, 1989). Test–retest reliability on the duration of nystagmus for the SCPNT obtained by different examiners retesting 42 children at least 1 week apart was .834 (Ayres, 1975). Since then, other researchers have assessed the reliability of the total duration of nystagmus, according to the standardized method described by Ayres. Sixty-three kindergartners who were retested after 2½ years demonstrated a test–retest correlation for total duration nystagmus of .80, a relatively high stability considering the interval between tests and the brevity of the test (Kimball, 1981). A correlation of .82 was obtained for 372 children aged 3 through 10 years (Punwar, 1982). In 1985, Dutton reviewed published reliability data for normal 4- to 11-year-old children and found correlation coefficients ranging from .79 to .81.

Greater instability has been observed in examinations of nystagmus duration in children with learning disabilities. Morrison and Sublett (1983) found a test–retest correlation of .72 for 89 children with learning disabilities, 6 to 11 years of age, and Daniels (1985) reported a correlation of .9318 for 11 boys with learning disabilities, 5 to 8 years of age. Interrater reliability performed by two therapists independently measuring the duration of nystagmus for 29 children aged 4 and 5 years (with and without developmental disabilities) was .986 (Siegner, Crowe, & Deitz, 1982). In testing 63 children for interrater reliability on the SIPT, Siegner et al. obtained a coefficient of .98 for the average duration of nystagmus on the Postrotary Nystagmus subtest.

Test validation ultimately rests on the uses to which the measure is put. The SCPNT was not presumed to be nor is it currently used clinically as a pure measure of vestibular function; rather, it was intended to be a measure of the central nervous system's diffuse processing of vestibular input. Thus, Helen Cohen's review, which is from a researcher's perspective, is useful to those who are interested in the pure measurement of vestibular function, but it is irrelevant in the determination of the validity of the SCPNT. Cohen's misconception of the intent of the SCPNT resulted in an incorrect conclusion regarding its validity. We have reviewed the data and have found the SCPNT to demonstrate adequate reliability and validity for providing unique information related to central vestibular processes when used by trained, experienced therapists in conjunction with other standardized assessments and clinical observations. The SCPNT's simplicity, ease of use, and low cost of administration make it a valuable test for therapists to use clinically in understanding the performance and behavior of their patients. ▲

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