Is There a Link Between Learning Style and Neurophysiology?

Findings from studies of hyperactive children suggest that students' preferences for movement, sound, intake, and light are the result of signals from their central nervous systems.

To succeed in traditional classrooms, students must first learn not to talk, fidget, tap, eat, or move around. Structuring schools as though there is a paradigm for learning defined by such boundaries has led to a system increasingly ineffective in educating students. As Kidder (1989) stated,

> Put 20 or more children of roughly the same age in a little room, confine them to desks, make them wait in lines, make them behave. It is as if a secret committee, now lost to history, had made a study of children and having figured out what the greatest number were least disposed to do, declared that all of them should do it.

The field of neurophysiology provides clues that some students who do not succeed in the system fail initially because their physiological needs are being controverted. We must explore the possibility that students who prefer to learn while talking, fidgeting, tapping, eating, and moving are not acting out of spite or a lack of personal discipline but, rather, are responding to signals from their central nervous systems (CNS).

To underscore the importance of recognizing and acting on students' learning style, this article will attempt to establish a meaningful relationship between style and the field of neurophysiology. If teachers and parents can be convinced, for example, that a child's preference for sound in the background while studying is a neurophysiological response and *not* a whim or a ploy simply to listen to the radio, then the argument to apply learning style concepts in the classroom will be strengthened. Toward this end, research conducted with children diagnosed as having an attention deficit disorder with hyperactivity will provide the backdrop for an examination of some of the learning style elements identified by Rita and Kenneth Dunn (1978), including preferences for sound in the environment, tactile and kinesthetic stimulation, intake, and mobility.

Studies of Hyperactive Children

Satterfield (1975) described several studies of hyperactive children that found these "children differ from nonhyperactive children on measures which are indicators of central nervous system function" (p. 67). In his study, Satterfield found

> hyperactive children with the lowest arousal levels . . . had the most overall classroom behavioral disturbance . . . [and] those children . . . were rated by teachers as demonstrating more disturbance on

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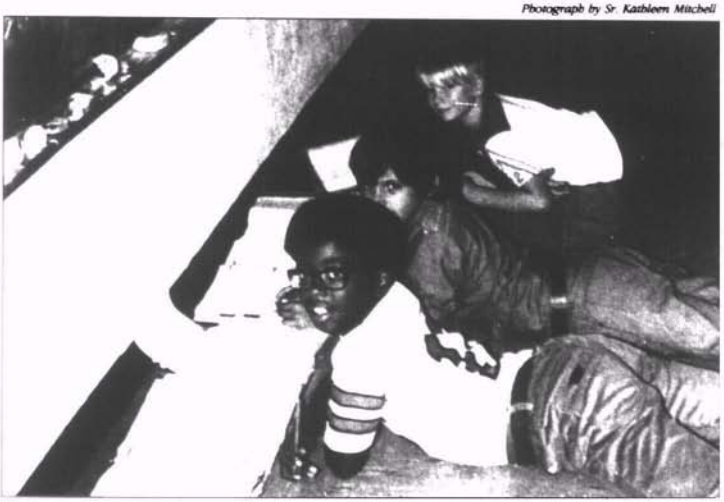

When students are not forced to work against their bodies' natural preferences, they feel more relaxed at school and accepted, and the end result is often better learning.

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items which reflect motor control (restlessness), distractibility (easily distracted), attention (does not follow directions), and impulsivity (talks a lot, irritable) (p. 72).

Further, he discovered that students with low CNS arousal levels demonstrated

greater restlessness as reported by school teachers . . . with the low aroused child responding to irrelevant stimuli as readily as to relevant stimuli (p. 76).

In personal classroom experience working with high school students, I found that making the perennial gum chewer throw out his gum or making a student stop her constant fidgeting (whether they were disturbing others or not) caused them to stop paying attention. They often became "restless, distracted, and irritable," some of the characteristics of those students described above as having low CNS arousal levels.

Satterfield further stated that "increased arousal and the associated increased inhibitory control over sensory function should enable the child to inhibit nonmeaningful stimuli in order to selectively attend in a learning situation" (p. 76). For the students he studied, this increase in the level of arousal was achieved by the use of prescribed stimulant medication. Lytton and Knobel (1959) also found that administering an amphetamine to children in their study

resulted in a decrease in the absolute amount of motoric activity but in an increase in the amount of motoric activity devoted to goal-directed behavior. Attention span was increased, and the child could keep his attention focused on the task at hand (p. 338).

Research by Conrad and colleagues (1971) further suggests that use of the amphetamine dextroamphetamine sulfate was responsible for a reduction in child hyperactivity and an improvement in the ability to pay attention and concentrate. And, in evaluating the effects of Ritalin on hyperactive children, Pelham and colleagues (1985) noted improvements on measures of disruption and of on-task behaviors as well as gains in several subject areas.

The Body's Internal Balance

The apparent paradox of prescribing stimulants to reduce hyperactive behaviors may be explained by thinking of the brain as an electrical/chemical system. The students in the studies cited earlier do not have enough cortical tone (the number of neurons in an active state) flowing through their systems to allow them to selectively attend to a learning task. Lacking enough electrical/chemical power to actually concentrate, they treat all incoming stimuli as equally important. The students cannot tell whether to pay attention to the teacher or to a noise in the hallway. The arousal initiated by the use of stimulant drugs serves to increase the cortical tone in the student's system. This increased level of neural activity is what enables the student to stay on task and control the effect of distracting stimuli.

It seems plausible in less severe cases than those just described, students' needs for mobility, tactile stimulation, intake, kinesthetic learning, and sound in the environment are in effect the body's adaptive strategies for increasing the arousal level of the neural system to make focusing on the task at hand possible. In other words, the stimulation to the CNS by gum chewing and fidgeting provides the system with a mild jolt, acting like a nonprescriptive amphetamine to increase the flow of electrical current. Thus, the body has naturally fashioned a compensating mechanism for its low arousal level, increasing cortical tone in the CNS, and enabling the student to focus on a specific task. In another example, a student with a learning style preference for sound, which takes the form of a radio softly playing in the background, when questioned about study habits, replies, "I only hear the radio when it is off." When that student is forced to study without the radio, the absence of sound calls

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attention to itself where the presence of sound did not. (Quiet has the same distracting effect on this student as sound does on the student who prefers a quiet environment for studying.) The internal balance of the body has been upset, and without sound the student cannot concentrate and will often fall asleep. This adaptive mechanism of the body does not imply a dysfunction in the nervous system but, rather, is indicative of the healthy body's ability to reach a consistent and effective internal balance.

Direction for the Schools

Relating style preferences of students to neurophysiological activity is a hypothesis that can neither be proven nor disproven. From a biological standpoint, there is far too much uncertainty involving the nervous system. In studies involving the brain, "it simply isn't possible to know what is taking place among all of the 10 to 15 billion neurons and their interconnections" (Restak 1982). Neither can we dismiss the important role developmental factors and the environment play in student learning behaviors.

Yet, from an educator's point of view, discovering the exact reason for how and why the body operates as it does is not the issue. What *is* pertinent is that schools respond positively to the learning proclivities of students. To do so, it is not necessary to devise some new all-purpose program. The literature on style provides adequate descriptions and methods for recognizing and teaching to individual differences using a learning style *approach* (Guild and Garger 1985/1988).

The dis-ease so many students experience in school may result from working against the body's natural inclinations when faced with a learning task. And, as with hyperactive children requiring medication, "until the child's inner-control systems are established, other treatment modalities may not produce desired changes" (Satterfield, 1975, p. 79; see also Conrad et. al., 1971, p. 515). At the very least, schools could recognize and accommodate the learning style preferences of students experiencing difficulty prior to planning more drastic remedial action. As educators consider the relationship between learning style and neurophysiology, it is my hope that they will acknowledge the role the central nervous system plays in the behaviors that compose the mysterious and individualistic process of learning—and that they will do something about it.□

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Stephen Garger is Coordinator of Secondary Education, School of Education, University of Portland, 5000 N. Williamette Blvd., Portland, OR 97203–5798.