Biopsychosocial Aspects of Attention-Deficit/Hyperactivity Disorder: Toward a Self-Regulated Behavior Paradigm

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In this article, an overview of attention-deficit/hyperactivity disorder (ADHD) is presented from a biopsychosocial perspective, an attempt to circumvent disparate psychological and medical viewpoints and offer a broader, more integrated view of ADHD. Through a review of the current literature on ADHD treatment within the clinical field, as well as intervention strategies for ADHD within the educational field, the author proposes the self-regulated behavior paradigm. This person-centered paradigm uses both pathological and growth-oriented constructs of human nature. As such, it offers the advantage of being able to integrate pathologically oriented approaches with growth-oriented approaches within a single comprehensive intervention plan.The impact of this approach in helping people with ADHD is discussed.

ADHD is one of most researched disorders in medicine (Spencer, Biederman, & Wilens, 2000). The fourth edition of the *Diagnostic and Statistical Manual of Mental Disorders* (*DSM-IV*; American Psychiatric Association, 1994) lists ADHD as a developmental disorder that is usually first diagnosed in childhood. The diagnostic criteria focuses on developmentally extreme symptoms in the domains of inattention and disorganization or hyperactivity and impulsivity that are of early onset (before the age of 7 years), long-standing (at least 6 months' duration), pervasive (displayed in multiple situations), and impairing (*DSM-IV*).

Epidemiological studies suggest that 3% to 6% of the school-aged population suffer from ADHD (Goldman, Genel, Bezman, & Slanetz, 1998). Some researchers claim that ADHD is overdiagnosed, but evidence exists that diagnostic criteria for ADHD are based on extensive empirical research (Goldman et al.). Investigations have led to a diagnosis possessing high interrater reliability, good face validity, and high predictability of course and intervention responsiveness (Barkley, 1998).

ASSESSMENT OF ADHD

Assessment in determining ADHD usually starts with three components: a medical examination; followed by a clinical interview, which includes a family and developmental history; and a behavioral rating scale, consisting of three scales: parent, teacher, and self (Barkley, 1997). Other assessments can help in making a diagnosis: (a) observing the person in given situations; (b) assessment of perceptual skills; (c) continu-

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ous performance tests, which measure inattention, impulsivity, reaction time, and variability (Corkum & Siegel, 1993); and (d) neuropsychological assessment of executive functions (Kempton et al., 1999). A comprehensive assessment battery is important, not only for ruling out other possible diagnoses, but also for further delineating the ADHD syndrome, such as the existence of comorbid symptoms.

In a school setting, such a comprehensive assessment battery is usually provided by the child study team through what is referred to as a "functional behavioral assessment" (FBA). An effective FBA would not only provide historical and evaluative data of the child's symptoms, but would also provide clear guidelines on intervention strategies and outcome measures.

MEDICAL INTERVENTIONS: PHARMACOTHERAPY

The use of drugs leads all other interventions in the treatment of ADHD. Comprehensive reviews of research studies clearly demonstrate the effectiveness of medication in treating certain symptoms of ADHD (Spencer, Biederman, & Wilens, 2000). The most widely used medications are the central nervous system stimulants. Stimulants, such as amphetamines, caffeine, and cocaine, cause an inhibitory affect on the brainstem circuitry via the descending neural pathways from the self-regulation region of the brain. This enables a person to ignore new stimuli and hold the attention within a working memory system where goal setting, self-reflection, problem solving, and other cognitive processes can take place. The four most commonly used stimulants are: methylphenidate (Ritalin), dextroamphetamine (Dexedrine), pemoline (Cylert), and dextroamphetamine aspartate (Adderall). Methylphenidate is the most prescribed of all stimulants. Consequently, this drug has the largest body of research supporting its effectiveness. For example, single positron emission computerized tomography analysis has demonstrated that methylphenidate increases dopamine availability in the frontostriatal region and improves symptoms in people with ADHD (Krause, Dresel, Krause, Kung, & Tatsch, 2000). Functional MRI studies have shown that methylphenidate increases dopamine functioning in the basal ganglia in people diagnosed with ADHD, and that this is correlated with improvement in motor functioning (Teicher et al., 2000). Other studies on this drug have shown: (a) increased reaction time, accuracy, and speed (Krusch et al., 1996); (b) improvement in sustained attention, working memory, and motor steadiness (Zeiner, Bryhn, Bjercke, Truyen, & Strand, 1999); (c) visuospatial orienting (Sheppard, Bradshaw, Mattingley, & Lee, 1999), and improved response inhibition (Vaidya et al., 1998).

Various antidepressant drugs have been found to be effective in selective cases. Spencer et al. (2000) found 33 studies demonstrating the effectiveness of antidepressants for ADHD. Cholinergic drugs have also been used in treating ADHD. This is based on the "nicotine hypothesis" of ADHD, because nicotine has been shown to enhance dopaminergic release (Dalack, Healy, & Meador-Wookruff, 1998). Various researchers have found cholinergic drugs to be effective in helping certain symptoms of ADHD (e.g., working memory and sustained concentration improved; Meck & Church, 1987).

In conclusion, few researchers would question that drug therapy has proven helpful in treating many of the ADHD symptoms. However, nondrug approaches are also needed for the following reasons:

1. Drugs for ADHD are powerful artificial substances. The toxic side effects related to these drugs are stated in the *Physicians' Desk* Reference (2001).
2. These drugs travel via the bloodstream and into the central nervous system; thus, they cannot go to only one part of the body. Therefore, other areas of the body will be affected, and we simply do not sufficiently understand all of the interactive affects of the different neurotransmitter, neuronal, and biochemical subsystems to know all of the possible effects a drug may be having (Austin, 1999).
3. Most ADHD sufferers have comorbid symptoms (Barkley, 1997) and more than one drug is often prescribed to address each symptom. This further enhances the above-mentioned concerns.
4. Medications for ADHD are compensatory, not curative (Barkley, 1997). Therefore, the only logical research response is to continue to search for more effective approaches (with fewer downsides).

BIOPSYCHOSOCIAL FACTORS

A review of the literature indicates that ADHD represents a syndrome in which many mind-body subsystems are involved. Figure 1 shows the different interpsychic and intrapsychic systems that have supportive research indicating their role in ADHD symptoms.

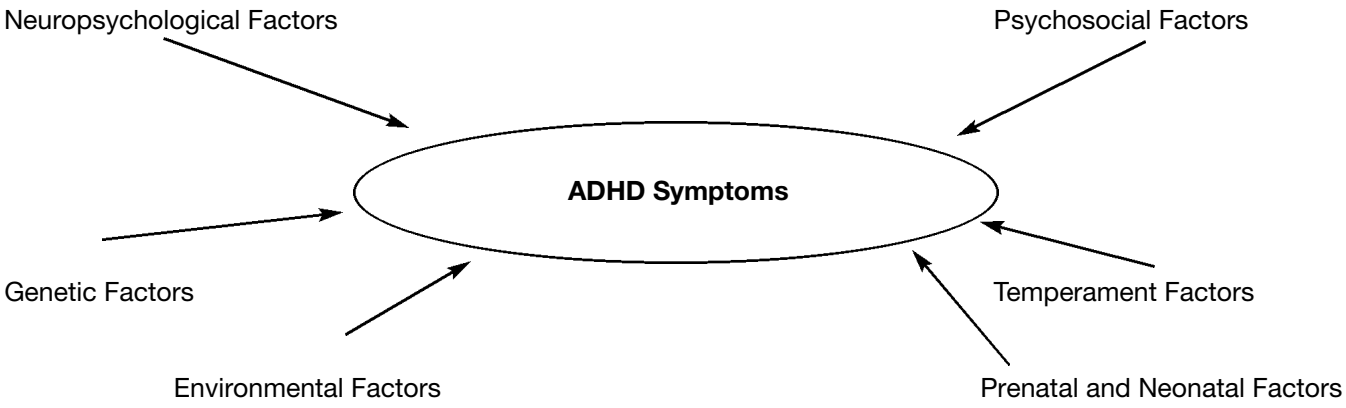

FIGURE 1
Biophysical Aspects of ADHD symptoms

Neuropsychological Factors

Most counselors and psychologists do not have a strong background in neuropsychology or psychopharmacology. However, a basic understanding of these fields as they apply to ADHD can be useful. This is helpful when interacting with the medical profession and when trying to relate the medical perspective to psychology. With this knowledge in hand, we are also in a better position to understand and appreciate how and why nonpharmacological interventions for ADHD impact on the brain and neurochemical system. This allows the counselor to directly compare drug therapy with nondrug therapy strategies.

Inattention is one of the primary symptoms of ADHD. Parasuraman (1998) pointed out in *The Attentive Brain* that varieties of attention exist and many brain-mind systems are intimately involved in attention. Theorists have also viewed the various parameters of attention in different ways, which adds to the difficulty of understanding the role of attention in ADHD. There are, however, commonly used concepts of attention. For the sake of discussion, in this article, attention is demarcated around (a) vigilance or sustained attention, (b) selective or orienting attention, and (c) divided attention.

Attentional processes are sometimes separated neuroanatomically between posterior and anterior regions of the brain. In the posterior region, at the level of the brainstem, attention begins in the form of arousal, alertness, and an orienting reflex. Selective attention is also related to this region. In a general sense, the role of these structures is to orient the mind to novel stimuli through information from the exteroceptive and proprioceptive sensory systems. Most of the neural structures corresponding to arousal and attention are located in the reticular activating system of the brainstem, which has multiple neural connections, both to the peripheral nervous system and to most brain regions, and possesses both active and inhibitory features (Pliszka, Maas, Javors, Rogeness, & Baker, 1994).

In the anterior region of the brain, attentional processes correspond mostly to the frontostriatal system. This neural network is represented neuroanatomically by the prefrontal cortex and the basal ganglia and its related neural sites. The prefrontal region corresponds, psychologically, to the executive functions, including self-regulation, impulse control, planning, simple and complex problem solving, organization, self-reflection, and self-awareness (Barkley, 1997). This region is most often correlated with sustained and divided attention (and, for some theorists, attentional control).

The other primary symptoms of ADHD are impulsivity and hyperactivity. Some of the descriptors include impatience, difficulty in delaying responses, interrupting others, fidgetiness, and excessive physical activity. Impulsivity and hyperactivity often occur together. The ability to control one's impulses is directly related to the executive functions, especially the right frontal region. The ability to control motor activity is also related to the frontal cortex, but through interconnections with the basal ganglia and motor cortex.

Barkley (e.g., 1995, 1997, 1998), one of the leading researchers in the psychology of ADHD, has devel-

oped a "behavioral disinhibition" theory. He believes that the lack of impulse control is the most significant issue in ADHD. In fact, he excluded inattention as a significant factor. Because the executive functions are mostly (although not exclusively) responsible for inhibiting responses to novel stimuli (which is necessary for sustained and divided attention), Barkley (1997) has targeted these functions as holding the key to understanding ADHD.

Besides inattention, impulsivity, and hyperactivity, researchers are beginning to delineate other cognitive deficits in persons with ADHD. Williams, Stott, Goodyer, and Sahankian (2000) also found significant impairment on spatial span and have suggested that this reflects parietal lobe problems. Bradshaw and Sheppard (2000) found left visual field neglect. Berman, Douglas, and Barr (1999) found reduced performance on a complex visual-memory search task. And Aman, Roberts, and Pennington (1998) found deficits in visual-spatial cuing tasks and spatial relations.

A study conducted by Kempton et al. (1999) is an example of the specificity of cognitive factors that are being correlated with ADHD. Using the Cambridge Neuropsychological Test Automated Battery (Luciana & Nelson, 1998), they were able to delineate the following impairments: executive planning, movement time (number of steps required to problem solve), attentional set shifting, spatial working memory, visuospatial memory, spatial recognition, delayed matching, difficulty in applying cognitive rules to new but similar situations. These cognitive impairments correspond, for the most part, to the executive functions and to the frontostriatal system, although other brain regions, such as the parietal region, may also be involved. According to Kempton et al., many of these symptoms indicate that those with ADHD are "not yet able to develop systematic strategies to assist performance" (p. 535).

Because of the complexity, and in some cases disparate views, integrating the research that has been presented thus far could be helpful. Fortunately, this has already been done. Theorists have proposed various models that represent attempts at offering more integrative constructs of brain and neurocognitive processes and ADHD:

1. Posner and Raichle (1994) identified three core divisions. The first is an inattentive type where sustained attention and effort are dysfunctional. This type is related to the right frontal cortex, with connections to the right posterior parietal and the locus ceruleus. The second is an inattentive type where selective attention is dysfunctional. This type is related to the posterior parietal cortex, with connections to the bilateral parietal, the superior colliculus, and the thalamus. The third is an impulsivity and hyperactivity type where divided attention and executive control are dysfunctional. This last type is related to the anterior cingulate, with connections to the anterior cingulate, the left lateral frontal, and the basal ganglia.
2. Malone, Kershner, and Swanson (1994) developed a left hemisphere and dopamine deficit theory.
3. Voeller and Heilman (1988) developed a right hemisphere and norepinephrine deficit theory.
4. Swanson et al.'s (1998) right hemisphere and norepinephrine theory correlated with inattention. Their left hemisphere and dopamine theory is correlated with impulsivity and hyperactivity.
5. Pliszka, McCracken, and Maas's (1996) multistage model involves the peripheral nervous system, the posterior brain region, and the anterior brain region.

Other Biopsychosocial Factors

Twin studies, adoption studies, and evidence of a greater prevalence of psychopathology in the parents and relatives of people with ADHD than among the general population point to genetic influences. Overall, this research supports ADHD as a trait that is highly hereditary (Barkley, 1997).

Prenatal factors have also been related to the later development of ADHD. Most of the studies have found a relationship with alcoholism, drugs, and tobacco use (Shen, Hannigan, & Kapatos, 1999; Tizabi, Popke, Rahman, Nespor, & Grunberg, 1997), although other factors may be included: tissue hypoxia during the prenatal period, which can interfere with the formation of the frontostriatal circuits and possibly lead to behavioral disturbances (Toft, 1999), and exposure to early adverse events (Graham, Heim, Goodman, Miller, & Nemeroff, 1999).

Environmental factors have been correlated with the development of ADHD. Physically induced stressors include such factors as malnutrition, toxins, diseases, and traumas. For example, elevated lead levels have been shown to have a small but consistently significant

relationship with certain symptoms of ADHD (Barkley, 1997). Kidd (2000) stated that food additives, intolerance to foods, sensitivities to environmental chemicals, and exposure to heavy metals can be related to the development of ADHD in some cases. Researchers have found that children with ADHD may have an increased sensitivity to simple sugars, which may contribute to some of their symptoms (Browne & Sutton, 1995). Particular nutritional substances may also have some benefit in treating the symptoms of ADHD (Dykman & Dykman, 1998). A final example is evidence correlating previous head injury with the development of ADHD symptoms (Herskovits, Megalooikonomou, Davatzikos, Chen, & Bryan, 1999).

Psychosocial factors that have been implicated in the development of ADHD symptoms include marital distress, family dysfunctions, and low socioeconomic class (Faraone & Biederman, 1998; Fischer, 1990; Swallow, 1998). Because most of this research centers on the effects of psychosocial stress on biochemical and neurophysiological functions, this will be addressed in a separate section.

Finally, the role of temperament is significant. Most researchers currently view temperament as having a strong genetic basis but capable of being modified through one's lived experiences (Hallahan & Kauffman, 2000). Some evidence also exists for correlation between different temperaments and ADHD. The strongest evidence comes from such research as Thomas and Chess's (1984; see also Kazdin, 1997) investigations indicating correlation between different temperaments and the predisposition to develop emotional or behavioral disorders. A one-to-one relationship between temperament and disorders, however, has yet to be identified. Researchers such as Peled, Carraso, Globman, & Yehuda (1997) have moved closer to such identifications. These authors have described three behavioral styles of people with ADHD symptoms.

Individual differences are also evident when one considers the presence of comorbid factors in those with ADHD. From individual to individual, one or more different comorbid symptoms (e.g., anxiety, learning disorder, oppositional defiant disorder, conduct disorder, depression) can exist.

DIATHESIS-STRESS MODEL

One of the models used in this review as a way of accounting for the different etiological variables of ADHD is the diathesis-stress model. This view represents an integrated theory of psychopathology. The diathesis component refers to a biological vulnerability to develop a particular pathological response. Stressful life events represent the stress component of the model. The biological vulnerability is believed to be an overactive psychophysiological response to stressful life events or situations (Brown & Barlow, 1997). A genetic predisposition alone is insufficient in predicting the manifestation of certain psychopathologies. Research (see below) supports the view that stress plays a crucial role in whether a disposition remains inactive or becomes activated. ADHD is an example of one such psychopathology.

A growing body of research demonstrates a significant relationship of stress with the development of ADHD symptoms. Austin (1999) stated that, in the early stages of stress research (during the 1960s and 1970s), researchers demonstrated that stress activates two major systems in the body: hormonal and neural. Stress activates immune system responses and the hypothalamo-pituitary-adrenal axis, resulting in autonomic nervous system responses and endocrine secretions on peripheral organs. More recently, a third route of stress responses has been studied; this is the avenue through which stress directly affects the brain and neurochemical system (Arnstein, 1999; Skosnik, Chatterton, Swisher, & Park, 2000).

A direct effect on the brain is possible through a functional integration of the hypothalamo-pituitary-adrenal axis and the system of corticotropin releasing factor neurons. As Austin (1999) stated, stress causes a release of corticotropin releasing factor and acetylchomine widely throughout the diencephalon and the upper brainstem. Included in these changes are altered activations and changes in mood associated with noradrenergic and serotonergic systems (Lovallo, 1997). Neuroanatomically, stress appears to have the greatest effect on prefrontal, limbic, hypothalamic, and brainstem functioning. A review of the literature has revealed a variety of changes in the neurotransmitter systems as a result of stress.

Norepinephrine system. Horger and Roth (1996) and Konstandi, Johnson, Lang, Malamas, and Marselos (2000) have found a broad range of negative effects on norepinephrine. Chronic stress depletes the norepinephrine and alters the ability of the prefrontal cortex, amygdala, and hippocampus to evaluate incoming stimuli, as well as formulate and initiate behavioral responses. Funk and Stewart (1996) have also noted

negative changes in the activation of the prefrontal cortex. Additionally, negative changes in attention (Skosnik et al., 2000) and posttraumatic stress disorder (Southwick et al., 1999) have been correlated with changes in norepinephrine levels caused by stress.

Serotonin system. Uncontrollable social stress, especially early in life, can produce chronic reductions in serotonin, with subsequent changes in behavior and emotions (Higley, Suomi, & Linnoila, 1992; Isogawa et al., 2000). These changes can remain long after the early social stressors cease.

The dopamine system and related frontostriatal region. Significant data supports the effects of stress on the frontostriatal system and the corresponding dopamine system. Early research supported the view that stress had a generalized stimulating effect on these systems. Horger and Roth (1996) stated that the mesoprefrontal dopamine system is particularly vulnerable to stress and causes an activation of this system. Other researchers have concurred with this view (Adler et al., 2000; Funk & Stewart, 1996). Because stress tends to stimulate dopamine release, many researchers believed that stress was not directly related to ADHD symptoms. More current research has challenged this view. Researchers have found that stress can have both stimulating and depressing effects, depending on the brain region and particular dopamine gene (Kurata, Tanii, Shibata, & Kurachi, 1993; Wu, Yoshida, Emoto, & Tanaka, 1999). Other researchers have found that stress can have a depressing effect on this system (Arnstein, 1999; Berridge, Mitton, Clark, & Roth, 1999; King, Barkley, & Barrett, 1998). In general, researchers have found that short-term stress tends to stimulate dopamine release, whereas more chronic stress can often result in a depression of the dopamine system. In addition, even brief, but frequent stress can result in a kind of exhaustion of the dopamine system, which can then produce a decrease in the dopaminergic response.

The peripheral neurotransmitter systems. Stress has a broad range of effects throughout the mind-body system. The effects of stress on other systems besides the brain have also been correlated with ADHD. For example, research data supporting the role of the sympathetic nervous system in ADHD, and a correlation of peripheral catecholamine functioning and ADHD is especially evident (Baker et al., 1993; Pliszka et al., 1994; Spivak et al., 1999).

Overall, this research clearly supports the view that impingement of stress on physiology and psychosocial functioning can directly impact brain and neurochemical functions related to the development of ADHD symptoms. Combining this research on stress with earlier discussions highlights the need to expand conceptions surrounding the development of ADHD.

For example, returning to Pliszka et al.'s (1996) multistage model discussed earlier, one finds that stress is involved at all three stages—the peripheral nervous system, the posterior brain region, and the anterior brain region. Including the research on the role of stress during early development, one now arrives at a view in which both genetic and stress factors impact on different areas of the mind-body system and within different time sequences.

Shifting the focus to clinical intervention, researchers need to conceptualize an intervention model of ADHD that incorporates the diathesis-stress view. Because of the strong genetic role in ADHD, whether interventions are effective depends on whether the stress-related central nervous system and peripheral bodily activations have been reduced. Because stress-producing psychosocial factors can be directly correlated with ADHD symptoms, then it is a logical extension to surmise that changing psychosocial factors that cause stress could reduce ADHD symptoms. A growing body of evidence supports such a view.

BEHAVIORAL AND COGNITIVE-BEHAVIORAL METHODS

In a review of the literature, I found that behavioral and cognitive-behavioral methods dominate all other psychological approaches in the treatment of ADHD. However, very few therapeutic programs in school settings address ADHD alone. Instead, most programs are focused on emotional and behavioral disorders as a whole. The majority of the students who are referred to child study teams, though, tend to have either a primary or secondary diagnosis of ADHD (usually comorbid with oppositional defiant disorder and, to a lesser extent, conduct disorder). Therefore, most of the programs reviewed included methods for addressing ADHD.

Over the past 5 years, the National Institute of Mental Health (NIMH) and six academic research sites have undertaken a major treatment study for ADHD (Pelham, 1999). NIMH selected ADHD as the first childhood mental health disorder for which to conduct a large, randomized clinical trial of treatment efficacy. This landmark study, known as the Multimodal Treatment Study for Children with ADHD, now com-

plete, is expected to have a significant impact on future research and clinical practice. Consequently, I selected it as an important indicator of what current research is telling us about ADHD in terms of clinical effectiveness.

Pelham (1999), one of the primary researchers in the study, described the four treatments they offered for ADHD: behavioral treatment (BT), medication management (MM), combined BT and MM, and a community comparison control group. The study generated an extremely complex and multifold data bank of information that will continue to be analyzed over the next few years. To summarize, the study showed that all four treatment groups had dramatic improvements from baseline to 14 months. MM was superior to BT on parent and teacher ratings of inattention and teacher ratings of hyperactivity, but not on any of the other 16 measures. Combined treatment was better than BT on parent and teacher ratings of inattention and parent ratings of hyperactivity-impulsivity, parent-rated oppositional behavior, and reading achievement, but not on any other measure. Both MM and combined treatments were generally superior to community treatments (Pelham).

Pelham (1999) described certain limitations of their study. For example, medication treatment was never phased out, even though behavioral treatment was withdrawn. Had BT been continued in the same way as in the MM group, the effects of BT might have been much more significant as compared to the MM group. Of course the study was based on the generally accepted assumption that medication should never be discontinued because treatment benefits would immediately cease. Physicians have assumed that behavioral treatments should be stopped at a certain point and that the benefits should continue. Pelham admitted that this approach was not an accurate comparison of the benefits of MM versus BT. Yet, despite being phased out, BT was still almost as effective as the ongoing MM. Pelham concluded that behavioral treatment offers a valid, clear alternative to medication, although a combination of treatments seems to be the most effective. In Pelham's opinion, medication should never be used alone unless the concern is only for short-term outcome. This study clearly validates the significant role that behavioral methods can play in treating those with ADHD. Whether used in conjunction with a medication regimen or independently, behavioral interventions offer a viable treatment approach.

A review of the literature has shown that the majority of programs treating ADHD and related symptoms recognize the significant role of generalization skills and self-management training (Hinshaw, 2000). Over the past 20 years, mental health professionals have placed greater emphasis on teaching children self-management skills that will help them function in environments other than where the skills are taught (Shapiro, DuPaul, & Bradley-Klug, 1998). Self-management usually includes self-monitoring, self-evaluation, and self-reinforcement. An important extension of self-management training is helping students develop self-awareness and self-reflection. Research has revealed that those with ADHD have very poor self-awareness and struggle with being able to reflect on their behavior (Barkley, 1997). Any training that can enhance these skills would be extremely beneficial.

Because most current behavioral models contain elements that are clearly cognitive in form (such as self-monitoring, self-evaluation, planning, and problem solving), no clear distinction exists between current behavioral approaches and cognitive-behavioral approaches (Hinshaw 2000).

A central issue elucidated in a review of intervention strategies is that current practices increasingly incorporate a conception of intervention that is centered on self-regulation (Nolan & Carr, 2000). An example of two of the more widely used models that incorporate self-regulation are the Boys Town Model (Dowd & Tierney, 1992) and the Teaching Family Model (Timbers, McWhorter, Ownbey, & Jones, 2000). For instance, a recent study funded by the Georgia Department of Education at the South Metro Psychoeducational Program used the Boys Town Educational Model (Swan, 2000). A published report of the results of a 5-year strategic plan indicated the following results: For elementary students, statistically significant increases were identified in all four scores of teacher-preferred behaviors, peer-preferred behaviors, school adjustment, and total score. For adolescent students, statistically significant increases were identified for all four scores of self-control, peer relations, school adjustment, empathy, and total score. And across all diagnoses, the majority of the students were *able to decrease or eliminate medication usage* over the 5 years.

By including the research on stress (as reviewed earlier in this article), counselors can integrate the use of intervention models with the stress construct. This inclusion enables the counselor to directly correlate

intervention strategies, not only with psychosocial changes, but with neurophysiological changes as well. The connection between psychological intervention and neurophysiological drug intervention enables greater communication between medical and psychological practitioners and provides a larger conceptual framework from which to understand ADHD. The counselor can now clearly understand how psychological interventions directly impact on the same mind-body domain as that of the medical practitioner. However, whereas psychopharmacological agents are compensatory, psychological treatment attempts long-term changes.

THE SELF-REGULATED BEHAVIOR PARADIGM

The medical model of modern allopathic medicine represents a particular philosophical paradigm in health care. This paradigm is one in which the human being is conceptually reduced to biological structures and functions. In addition, the focus is almost entirely on pathology within the biological system. The diathesis-stress model represents a broader view than mere biology; it incorporates psychogenic factors with biological factors. It is, however, philosophically reductionistic and pathologically oriented. Like the medical model (and in the field of psychology, like psychoanalysis) many of the currently held views in mainstream psychotherapy still hold to this pathological conception.

In addition to these pathological views, however, there is a view that incorporates both pathology and growth: the self-regulated behavior paradigm, which represents a major shift in the way human beings are conceptualized. This paradigm has a long historical tradition dating back to the Romantic philosophy and medicine of 19th-century Europe. This philosophy strongly influenced the psychology of Carl Jung and William James. In more recent times, this paradigm has represented the merging of several disciplines, the major influences being humanistic psychology, cognitive neurosciences, systems theory (especially cybernetic theory), behavioral medicine, cognitive-behavioral models, and the meditative disciplines of the East (e.g., yoga psychology; Taylor, 1993).

A closely related paradigm is self-regulated learning, which has been growing rapidly over the last 15 to 20 years in the field of education (Schunk & Zimmerman, 1994). Because most treatment of ADHD takes place with school-age children, the use of the self-regulated learning paradigm begs incorporation with the self-regulated behavior paradigm. In actuality, the two approaches overlap around such issues as classroom management and the way curricula are structured for teaching.

The self-regulated behavior and learning paradigm does not reject the use of outside forces, such as medication or external behavioral controls, to effect change. But according to the paradigm, change also occurs within the person and outside forces are best used when they stimulate the natural self-regulational forces within the mind-body system. For example, even in the behavioral field, those researchers who once argued vehemently for a purely externalized, environmentally controlled model of change now recognize the value of the self-regulation paradigm.

Within this paradigm, medication would be viewed as a single and, hopefully, temporary component that may be used as part of a comprehensive therapy regimen. I view the use of medication in the same way as certain temporary behavioral management strategies. However, if we as health care practitioners have to continue to rely on medication or certain behavioral methods, it would be because of our failure to find better long-term solutions.

In conclusion, the greatest impact in the treatment of ADHD seems likely to come through early intervention. As with treating many learning disorders, such as dyslexia, or other disorders such as autism, health care professionals are increasingly recognizing that they need to start as early as possible in identifying the symptoms and finding viable treatments. This will inevitably involve working more closely with the families. To do this effectively, community-based programs will need to be implemented where long-term treatment can be made available. This does not, of course, mean that other more short-term approaches, or those implemented at a later time will not prove helpful, but they will surely be more difficult. The natural constraints that such factors as age, social influences, and long-term habits can have when trying to elicit change cannot be ignored.

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