A Review of Current Treatment Methods
for learning and behavioral disorders

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Current treatments for learning and behavioral disorders have had limited success. The following will summarize the current treatments being used in the care of learning (LD) and behavioral (BD) disorders pharmaceutically, psychologically, educationally, and alternatively. These methods are then appraised to see if these methods are addressing the underlying physiological cause.

Introduction

Learning Disorders and Behavioral Disorders are Neurological Disorders

All learning begins with the brain (Jensen, 2000). Without a functional neurological substrate, learning in an academic or a social environment is biologically impossible. Yet many children do not have the basic neurological capacity to learn. For example, AD/HD is neurobiological in origin (White and Baton, 2003; Webb and Myrick, 2003). This is evidenced by functional imaging research that has demonstrated decreased mass of gray and white matter in the brain of children with attention-deficit hyperactivity disorder (AD/HD) (Castellanos, Lee, Sharp, Jeffries, Greenstein et al., 2002). The acting director of the National Institutes of Mental Health (which is a part of the National Institutes of Health) Richard Nakamura (2002), in testimony before the Committee on Government Reform United States House of Representatives, stated that conditions like AD/HD have been linked to specific brain regions by measures of decreased neural function.

AD/HD is one type of symptom caused by functional disconnection syndrome, along with other symptoms including learning disorders, obsessive compulsive disorder, Tourette syndrome, Asperger's syndrome, Autism, schizophrenia and others (Sharma, 2003; Melillo, 2004). Most tasks that the brain does are distributed spatially across many structures, a functional disruption of the normal activation pathways between the involved structures can cause a change in function of the brain for the worse (Sharma, 2003). This disruption is called functional disconnection syndrome (FDS). Failure of the brain to make these connections can cause long term problems just as covering an eye could cause blindness if done at a critical developmental stage (Nakamura, 2002). For example, AD/HD can cause academic and social problems for the individual (Barkley, DuPaul and McMurray, 1990).

As many as 21% of preschoolers and those aged 9-17 have mental disorders and these disorders affect their learning and/or behavior (Koppelman, 2004). For example, AD/HD is considered to be among the most commonly diagnosed chronic condition in school aged children (Wellmark, 2004). The fact that these conditions are chronic recognizes that current care regiments do not resolve the condition. At best current treatments cover it up for a while, and at worse as this paper will describe they may do more harm than good.

Purse Strings Determine Care

National trends demonstrate that there has been a broad increase in the accessibility to treat children with FDS symptoms like AD/HD, yet there a fewer number of visits for treatments because of more services being provided in special education classes, managed care restrictions and the

public acceptance of pharmaceutical treatments for learning and behavioral problems (Olfson, Gamerhoff, Marcus and Jensen, 2003). Who gets what care is often determined by stakeholders with financial interests. This means those in the insurance and political arena are the decision makers, not necessarily the physicians or researchers who know these conditions best. Managed care has become "the dominant force" in what care is received for these conditions (Jones, 2002, p. 13).

Insurance and managed care.

It is obvious how those with limited financial resources may have difficulty getting the services that they need. Yet, those on the more affluent end of the scale having insurance, still may not make their own decisions regarding mental health of their children. Often their insurance is a managed care organization that may be making decisions on cost containment versus health benefit. These cost containment strategies often decrease the access by referral to specialists (Brown and Sammons, 2002). The American Academy of Pediatrics recognizes the increased demands on primary care physicians for this reason (Brown, Freeman; Perrin; Stein, Amler et al., 2001).

There are a variety of methods used in cost containment. Insurance and managed care control the health care decisions for many Americans by policy limits, limited provider lists, restricted diagnosis selections for providers, limitations on referrals to specialists and other methods designed to contain costs. Cost containment is with an emphasis on containment management within a short term perspective (Brown and Sammons, 2002). One study proposing cost reductions did not consider the outcomes of the care (Stein and Orlando, 2001). Carey (1999) points out that because of excessive pressures by managed care constraints primary care physicians may be tempted to use therapeutic trials of stimulants rather than doing a complete work up. Cost cutting in the manner that significantly reduces the safety and the quality of the outcome is unacceptable; especially when the long term costs are considered.

IDEA, Section 504 and Medicaid.

For over 30 years legislation has been developed to protect those with learning and other disabilities (Altshuler and Kopels, 2003). Two of these laws, the Individuals with Disabilities Education Act (IDEA) and Section 504 of the Rehabilitation Act (504) provide direct benefits and funding for schools and other reimbursable services (ERIC, 2004). Medicaid pays directly to health care practitioners. All three, IDEA, 504 and Medicaid follow the current paradigm of care.

Untreated FDS Becomes a Chronic Condition

FDS if untreated becomes a chronic and ongoing problem. An example would be the chronic presence of AD/HD that occurs with adults. Adults with AD/HD frequently grow out of criteria being evaluated, not the condition (Barkley, Fischer, Smallish and Fletcher, 2002; Adesman, 2001). Chronic conditions make up a large part of medical practice (Glasgow, Orleans, Wagner, Curry and Solberg, 2001). Stein and Orlando (2001) believe that cost containment strategies may not always be cost-effective. This would be especially true if the care is managed in such a way as to not resolve the condition, thus making it a chronic life-long problem that has a variety of societal costs in addition to the future medical and educational costs. The American Academy of Pediatrics points out that uncorrected these conditions may persist for a person's entire life (Brown, Freeman; Perrin; Stein, Amler et al., 2001).

The chronicity of FDS symptoms like AD/HD, add to individual and societal problems. Adesman's (2001) review of the literature found those with AD/HD had three times the probability

of being suspended, failing a grade or expelled; to demonstrated some form of delinquent behavior; to abuse substances; and have other concurrent health or behavioral problems. Additionally conduct disorders and oppositional defiant behaviors have been found to develop in untreated AD/HD (Webb and Myrick, 2003).

Paradigms

The current paradigm is one that is based on symptoms and it predominantly uses pharmaceutical, psychological, and educational interventions. This paradigm is being contrasted to an alternative and more functionally based paradigm that purposely uses exercise and therapies based on the neurology of the condition that a patient has. It is as Gringras (2000) described the two paradigms as one covering the symptom and the other one looking for the underlying biological cause. The next sections will give a more thorough understanding of the strengths and weaknesses of these two paradigms as well as the foundations for their use. Additionally the following sections will describe that whatever the paradigm, the treatments work when they work because of the fact that the treatment affects the underlying neurology of the involved structures.

Current Paradigm

Symptom based perspective is the dominant way of thought

"If it looks like a duck, and quacks like a duck, we have at least to consider the possibility that we have a small aquatic bird of the family anatidae on our hands" (Douglas Adams as cited in Quote DB, 2005). So goes the thinking of diagnosis based on symptoms. Many algorhythms abound in both mental health and general health care based on presenting symptoms. An example would be the use of rating scales for diagnosing AD/HD on the basis of symptoms being expressed (Angello, Volpe, DiPerna, Gureasko-Moore, Gureasko-Moore, et al., 2003).

Yet if one were to consider the myriad of conditions that could create a cough, the folly of this type of diagnosis is evident. The cause of a cough could be a simple cold, yet it could just as easily be lung cancer. It could be from a person with a dry throat or from the last breaths of someone succumbing to AIDS. Basing a diagnosis on symptoms alone skips much of what is considered appropriate care. Appropriate care includes history taking and eliminates from consideration any insights from examination, blood tests, imaging, specialized testing and etc.

In the treatment of learning and behavioral disorders, the role of the symptoms of FDS, have defined their name as a condition. It is done via a book that is called the *Diagnostic and Statistical Manual of Mental Disorders, fourth edition* (DSMIV). The DSMIV has essentially check lists of symptoms called "criteria sets with defining features" designed to categorize them into conditions (First, 2000, p. xxxi). This would be the equivalent in health care of categorizing a cold with cancer because they have a common symptom of a cough. And just like diagnosing from a cough, focusing on the superficial symptoms as in the DSMIV makes misdiagnosis likely (Jensen and Hoagwood, 1997). White (2003) points out that a chronic ear infection can mimic the symptoms of an AD/HD learner; it is doubtful if many psychologists perform an otoscopic examination to rule this out prior to commencing treatment for AD/HD. There is evidence that practice of diagnosis for psychological problems has a lower validity and reliability than other types of diagnosis (Bauer, Ingersoll, and Burns, 2004). Webb and Myrick (2003) suggest that it is inappropriate for school counselors to diagnose or recommend medications.

The effort to maintain reliability and validity in a symptom based model has created a circular form of group think and tautology. The American Academy of Pediatrics (AAP), Committee on Quality Improvement, Subcommittee on Attention Deficit/Hyperactivity Disorder

has a six step algorithm for diagnosing AD/HD, of which four are entirely based on symptoms and the other two to evaluate for comorbid conditions (AAP, 2000). None of the steps evaluate for the underlying cause and the only difference between four of the steps is the observer of the symptom. The first observer is the physician who takes a history of presenting symptoms, the second step is observation by the same physician looking within the guides of a version of the DSM-IV symptoms written for primary care givers, the third observer of symptoms is the parent, and the fourth is observation of symptoms by the teacher (AAP, 2000). While much could be said about the validity and reliability of the symptoms actually present in a learner by this process; it remains only a single window of observation (symptom) even if it uses multiple observers or rating scales all looking at the same thing. It entirely focuses on the effect (symptoms) and not the cause (a lack of neurological function). Perhaps this is why the treatments originating from this paradigm are focused on symptomatic relief instead of purposeful correction of the underlying problem.

There is a significant chance of inappropriately diagnosing healthy children into an AD/HD diagnosis via the DSMIV/symptom model. Hartnett, Nelson and Rinn (2004) found evidence in the literature and in their own study that gifted children are frequently diagnosed with AD/HD. The gifted learners' boredom with waiting for the rest of the class to catch up is apparently fodder for acting in ways to lead observers to diagnose by symptoms healthy children into a DSM-IV category.

Symptom based methods can also cause a missed diagnosis to occur. Nahlik (2004) points out five reasons that the current symptom based model may under report the existence of AD/HD. The five consist of learners who have more attention deficit than hyperactive symptoms making it harder for educators to recognize; those with a mental versus a physical hyperkinesis; those with higher IQ's who do not struggle with class work; learners from supportive families; and those who do not present with symptoms until adolescence (Nahlik, 2004). Each of these could cause a learner with FDS symptoms of AD/HD to fall through the cracks because symptom based diagnosing is not an evaluation of underlying function. Instead this system is designed to wait until the condition deteriorates so badly that the inevitable symptoms finally appear. The difficulty is when waiting to diagnose until adolescence the symptoms may be less obvious and more obscured by comorbid conditions, (Nahlik, 2004). Additionally, adolescent self-reporting is considered unreliable (Nahlik, 2004). The introduction section of the DSMIV book itself describes the limits of using its homogenous system in evaluating heterogeneous individuals (First, 2000). Yet despite the above described weaknesses, it has become the standard currently in use.

Functional Models Are Ignored or Scorned

A variety of functional measures are available. They range from soft neurological findings, neuropsychology batteries, functional imaging, quantitative EEG, go-no go tests, measures of neurotransmitters, measures of hormones and others (Dommise, 2000; Brown, Freeman; Perrin; Stein, Amler et al., 2001; Melillo, 2004; Nahlik, 2004). Functional examination methods such as neurological soft signs have an advantage of presenting no bias to socioeconomic status as may bias other tests (Taylor, 1988). Researchers using neuropsychology tests such as Wechsler Intelligence Scale for Children (WISC-R) suggest that their research points to a common underlying cause (Longman, Inglis, and Lawson, 1991). The use of the term neuropsychological is by definition describing an underlying biological cause (Taylor, 1988). An additional advantage to the neurological function model is that it permits examination with high predictability for later school problems as early as age 1 (Olsen, Vainionpaa, Paakko, Korman, Pyhtinen, et al, 1998). This allows early intervention to be started much earlier when it is easier to correct.

There are some who believe that the elimination of the organic or brain-basis in the description of these conditions, as in the DSMIV, conveys the perception that psychiatrists wish to conceal the neurological origin (Baughman, 2001). Indeed the DSM-IV members developing the evaluation of AD/HD component were of limited scope, consisting of 12 psychiatrists and 4 psychologists (Carey, 1999). No primary care medical physicians or osteopathic physicians, and certainly no specialists like medical or chiropractic neurologists or imaging specialists were included. There was no one even consulted with a functional background.

With the bulk of the literature over the last 15 years pointing out the neurological origin of these behavioral and learning disorders it is curious why that fact is omitted in their model. Arguments that they are protecting their turf or protecting the sacred cow of their symptom based model are possible; but it is just as likely they are merely stuck in the paradigm they were originally trained in. An example of the latter would be the "dehumanizing" concerns by the psychological profession by recognizing the underlying neurological basis (Jones, 2002, p. 13). In the end, what is necessary is information in the analysis of a learner that translates to functional improvements in instruction and services (Fewell, 2000).

Treatment in the Current Paradigm

Treatment methods in the current paradigm primarily consist of pharmacological, psychological and educational interventions. Each of these methods can claim some effectiveness as will be described below. As will be shown, these methods are effective when they are successful because of changes that occur in the nervous system in response to the treatment. This neurological change that occurs may be an unintended consequence or at best is limited in the purposeful intention of making long term neurological change. As will also be described, these methods may be inefficient at best and dangerous at worse in regards the learners overall health and for the purpose of making long term neurological change. Sealey (2004) describes a first hand experience of the negative effects of misdiagnosis and prescription of medications. The implication that a lack of evidence based diagnosis and treatment puts the consumer at risk (Sealey, 2004).

Pharmaceutical interventions

Most authors recommend that other forms of treatment be used prior to or with medication. Gringas (2000) also points out that medications do not cure but rather suppress symptoms and that they should only be used secondary to educational and psychological methods. White (2003) points out that medications should not be used alone but as a part of a behavioral control plan. Brown and Sammons (2002) believe that medications should only be used with educational and psychological methods. Parents also prefer a combined behavioral and medication therapy over medications alone (Brown and Sammons, 2002). Even the American Academy of Pediatrics recommends behavioral therapy with medication for AD/HD (Wellmark, 2004). And the combination of the behavioral care and medications, have been found more effective than either treatment alone (Brown and Sammons, 2002). Yet in spite of these facts, nearly 75% of children with AD/HD are treated only by their primary care physician, meaning medication alone (Stein and Orlando, 2001).

As many as half of the autistic population have received medications, yet there is little to no evidence of their effectiveness on the ability to improve social impairments of autistic learners (Gringras, 2000; Melillo and Leisman, 2004). Others also question the validity of psychotropic drug use on school aged learners (Bauer, Ingersoll, and Burns, 2004). There is concern that some drugs are not studied at all; relying only on consensus of experts rather than controlled trials (Bramble and Coscrove, 2002).

Some medications can even interfere with behavioral interventions (Brown and Sammons, 2002). Even with those caveats, pharmacological intervention may be the first and only intervention for some learners. There is an apparent intellectual scotoma for other possible methods in the medical profession. The title of one article "First New ADHD Treatment in 30 Years" is yet another article promoting a new drug belies this point (Wimmett and Luasten, 2003). Using drugs is hardly new and there are a number of non-pharmaceutical treatments that have been introduced over the last 30 years. Many of these truly new treatments will be discussed later in this document after a more thorough discussion of pharmacological interventions.

Stimulant medications effecting the central nervous system are the most common treatment used for AD/HD (Pelham, Aronoff, Midlam, Shapiro, Gnagy, et al., 1999). The use of drugs for AD/HD has increased 83% and the costs of both new and old drugs have doubled in the last five years (Wellmark, 2004). When the cost of a drug is most frequently attributed to the research for its development, one has to ask, why is there still a doubling of the cost now when the research justifying such a cost increase has already been completed?

Medications work by temporarily altering nervous system function.

Drugs like Ritalin are stimulants that are similar to but much more powerful than caffeine (NIDA, 2005). There is the belief that the medications build up or assist in the regulation of the neurotransmitters dopamine and serotonin (Wellmark, 2004). The exact process of how stimulants work to suppress behaviors in learners who are already over stimulated remains unknown (Wellmark, 2004).

While there is some question among researchers if psychostimulant drugs like Ritalin are beneficial in peer relationships (Pelham, McBurnett, Harper, Milich, Murphy et al., 1990); there have been many studies to suggest it does help to attend (Pelham, Aronoff, Midlam, Shapiro, Gnagy, et al., 1999). Stimulants have been found effective in ADHD patients in the short term as well as up to 18 months (Olfson, Gameroff, Marcus and Jensen, 2003). The problem here is that learners are often put on these medications for longer than 18 months because their conditions are considered chronic (Wellmark, 2004) and this is just the beginning of the concerns with the pharmaceutical treatment of symptoms of FDS.

Concerns

One of the key concerns has to be the care in diagnosing and monitoring the use of medications. Unfortunately many counselors are ill prepared for this task. When rating their training and

preparedness in handling psychotropic medications, as many as 81% of counselors surveyed believed they were poorly prepared (Bauer, Ingersoll, and Burns, 2004). It would seem likely that poor preparation raises the risks for errors in judgment.

Unlike adults, children do not self-refer themselves for psychotropic medications and their bodies metabolize these drugs differently than adults (Brown and Sammons, 2002). This increases the risk of using psychotropic medications in children. Many medications are used off label, meaning for purposes other than what they were approved for by the FDA. Often prescribing physicians extrapolate from studies of adult populations for prescribing to children (Gringras, 2000). The combination of relatively few controlled studies in the pediatric population for drugs used for depression, Tourette syndrome, mental retardation and others combined with the off label use of medications has allowed the use of psychotropic medications to exceed their safe use (Brown and Sammons, 2002). Bramble and Cosgrove (2002) caution against the use of off label prescriptions in Tourette syndrome and AD/HD patients.

Stimulants are the majority of the medications used for AD/HD are controlled substances, (Wellmark, 2004). The DEA maintains strict restrictions on stimulants like Ritalin because of the risk of abuse by individuals (White, 2003). It is not uncommon for these medications to be sold to learners who do not need the medication, using them for recreational purposes (White, 2003; Melillo, 2004). The National Institute on Drug Abuse (NIDA) states that anywhere from 2.5% to over 5% of adolescents abuse Ritalin for recreational purposes (NIDA, 2005). The problem here is that learners with FDS symptoms of LD, AD/HD, Tourette syndrome, and others are at five times the risk of substance abuse already. Although there is some evidence when these medications are used correctly they may reduce the likelihood of later substance abuse (Wilens, Faraone, Biederman, and Gunawardene, 2003; Barkley, Fischer, Smallish, and Fletcher, 2003), there remains the fact that AD/HD medications can and do have many side effects. One of the risks includes addiction for stimulants like Ritalin if used incorrectly (White, 2003).

The goal of medications for AD/HD is to create the optimal benefit with the minimal of amount of side effects (Wellmark, 2004). This fact points out the reality that medications for AD/HD, just like all medications have side effects. These side effects can range from a mild nuisance to death. Here is just a short list of five fairly common medications: Adderall, Ritalin, Cylert, Prozac, and Lithium. These medications are representative of those most commonly prescribed. Stimulants like Adderall, Ritalin and Cylert are prescribed 94% of the time and antidepressants like Prozac or Lithium are prescribed 78% of the time (Bauer, Ingersoll, and Burns, 2004).

These medications are used for symptoms of FDS including right brain problems of AD/HD and left brain problems of depression (Melillo, 2004). The number of side effects that can occur is substantial. In addition to the wide range of these symptoms and the severity of those symptoms, there is an overlap of shared side effects of the various medications making it difficult or impossible to eliminate a negative side effect by simply changing the medication that is used by the student. Side effects of these five medications as listed by U.S. Pharmacopeia (Micromedix, 2000a-e) may include:

Cardiovascular and respiratory side-effects.

Fast or irregular heartbeat; chest pain; difficulty breathing; high blood pressure; shortness of breath; difficulty breathing; wheezing and tightness of chest.

Abdominal and digestive side effects.

Dryness of mouth, vomiting, nausea, unpleasant taste in mouth; constipation; diarrhea; weight loss; stomach pain; loss of appetite; black tarry stools; blood in urine; dark yellow urine; liver problems in children; excessive hunger; low blood sugar; low blood sodium; increased thirst; change in taste; gas; and weight gain.

Nervous side effects.

Large pupils; muscle twitches; over active reflexes; dizziness, tiredness; headache; nervousness; trouble sleeping; convulsions and seizures; increased sweating; muscle cramps; tics; uncontrolled and repetitive body movements; weakness; trembling; blurred vision; uncontrolled movements of the head, neck, arms and legs; uncontrolled movements of the eyes, tongue, lips, or face; unsteady walking; uncontrolled vocal sounds; agitation; coma; restlessness; inability to sit still; shakiness; lack of energy; and symptoms of serotonin syndrome.

Neuropsychological side effects.

Delusions; hallucinations; depersonalization; agitation; confusion; false sense of well being; unusual behavior; difficulty with concentration; depression; uncontrolled outbursts; uncontrollable talking, activity or excitement; mood changes; behavioral changes; anxiety; nervousness; and abnormal dreams.

Other side effects.

Fever; chills; cold sweats; cool pale skin; skin rashes; hives; sores; ulcers; purple, white or red spots; swollen or painful glands; unusual bleeding; bruising; slow growth in children; decreased drive and/or sexual ability; breast enlargement or pain; unusual secretion of milk in females; changes in vision; weakened bones in children and yawning. Death has also been tied to the use of Cylert according to the Childhood development Institute who quoted the FDA as requiring a warning added to the labeling of the medication following a report of 13 cases of liver failure (FDA as cited by CDI, 2005).

The above side effects do not include complicating factors.

Brown and Sammons (2002) state that there is an increase in polypharmacy, meaning multiple medications being prescribed and that practice increases risks of adverse reactions. The above side effects do not include problems that can occur with any medicine such as allergies, dietary effects, pregnancy, breast feeding, other medical problems along with complications with medicines prescribed for other health conditions (Micromedix, 2000). Each of these can cause further complications in an otherwise safe prescription. And children have special risks too.

Appropriateness of medication use in children.

The literature demonstrates an apparent push to broaden the label use of psychotropic drugs in children. For example, Brown and Sammons (2002) discuss a study that gave healthy kids stimulants for the purpose of improving relationships between the mother and the child. Pelham, McBurnett, Harper, Milich, Murphy et al. (1990) found that Ritalin did help children with AD/HD attend better during baseball games.

With the ethics concern in professional sports over the use of steroids being discussed before congressional hearings, does it make sense to research the use of psychostimulants ability to improve sports performance in 7-9 year olds? Will sports performance or overcoming poor parental

rapport be the next drive to promote drugs with so many serious side effects on a healthy population? With the advent of direct marketing by the pharmaceutical companies to the general population this could be a very real risk.

Many of these drugs have not been tested safe for children. Prozac for example, is not even approved for children because its use is for persons 18 years of age and older (although not tested safe for seniors either) (Micromedix, 2000). More research is necessary before Prozac can be considered safe for children (Micromedix, 2000). Yet teens are regularly prescribed Prozac for depression.

The amount of growth retardation in the children given methyphenidate (Ritalin) is dependent on the cumulative dose a child receives over time (Pelham, McBurnett, Harper, Milich, Murphy et al. 1990). This means the longer a child is on the medication, the greater the risk of growth retardations. Ritalin, Adderall, and Cylert have all been found to affect children's' growth so severely over time with their use that vacations from the medication on week-ends and evenings are recommended (Micromedix, 2000). Couple this with the use of these medications as early as age three, and the accumulative risks are multiplied. The differential between an active three year old and a child with AD/HD is slim at best. The risk for abuse and complications is high.

The public awareness of the use of psychotropic drugs on learning and behavioral conditions has achieved a very high level. The cover story of the November 2003 *Time* magazine was titled "Are We Giving Kids Too Many Drugs" and it demonstrates the general public is beginning to ask this question too. That article written to a lay audience points out that out of 12 medications commonly used to treat learning and behavioral disorders in children, only five are approved by the FDA for use in children (Kluger, 2003). This off label use for children based on limited FDA trials in adults is both common and suspect. Especially after the headlines of Vioxx, Bextra and now Viagra of having life threatening or life changing side effects which have been plastered across the media often enough to have become common knowledge.

Issues not resolved today, simmer to blow up later

The lay media also points to psychotropic medications as a cause for homicidal behavior. While their remains no blinded studies to support or deny the theory there are many who believe that the common denominator between high school shootings is psychotropic medications, there remains a plethora of mainstream press articles supporting this hypothesis (THC, 2005). A matrix of commonalities shootings similar to the Columbine High School shootings revealed 100% correlation with medications of incidents that reported the use or nonuse of psychotropic medications (Hololology, 2005). Clearly the dangers of using medication to sweep behavioral problems under the table have gone beyond the halls of academic concern, hitting squarely onto the streets of reality. These dangers can no longer be ignored.

Counseling and Behavioral Modification

Second only to pharmaceutical use is the practice of counseling and behavioral modification. This is possibly because the use of pharmacological treatment is less expensive than psychosocial methods (Jones, 2002). The use of medications should always include the use of psychological methods with their use (Gringras, 2000; Brown and Sammons, 2002; White, 2003; Nahlik, 2004). Jones (2002) expresses concern that the belief in the biological basis of origin promotes medication only, often when psychological therapy is necessary. Luhrman (as cited by Jones 2002, p. 14) describes it as "driving psychotherapy out of psychiatry". The psychiatry and psychology fields need not fear the

biological basis of these conditions, because as will be described later counseling itself uses neurological processes which by definition are biological.

With the schools often being a large source and sometimes the only source of mental health services (Koppelman, (2004), many educational psychologists use IDEA definitions for their diagnosis; while clinical psychologists are more apt to use DSMIV diagnosis (Dombrowski, Kamphaus, and Reynolds, 2004). These methods remain in the symptom based paradigm. Kemp (1992) describes a shortage of counselors who are trained in the neuropsychological field. He goes on to point out that because of this there may be misdiagnosis or omission in the recognition of appropriate neurological problems (Kemp, 1992).

School counselors can work in a variety of settings and styles. They may work individually, in small or large groups, with peer facilitation, with family, or by consulting with teachers or administrators, (Webb and Myrick, 2003). Often these sessions will bring out the behaviors in ways that allow the therapist to intervene and modify behavioral habits (Webb and Myrick, 2003). Counseling advocates argue that stimulant medication is not the teacher of appropriate behavior; the medication only allows appropriate behaviors that have been already learned to be expressed (Webb and Myrick, 2003).

There are advantages to informing the patient and family about the underlying neurological cause. Kemp (1992) gives several reasons why he believes it is beneficial. The first is that helps to separate out what is organic and what is a learned behavior; next are over coming labels of lazy, dumb, etc. and the self esteem issues that come with these labels; and finally it allows for the purposeful treatment of the underlying neurological problem concurrent with the coping and behavioral skills (Kemp, 1992).

Behavioral methods.

There is little question that neurological activity is critical in the production of behavior," writes Puente (2001, p. 69). He later credits the Nobel Prize winner Roger Sperry with proving the opposite to be true too. He says, "Sperry has already provided relatively simple examples of how the reverse can occur, that is, how mental events can cause physical changes. Thus it can be seen that nature and nurture work together to create behavior.

Behavioral modification is considered established method of treating AD/HD and has been used in approaches by teachers, parents and others (Olfson, Gameroff, Marcus, and Jensen, 2003). While behavioral modification is considered a psychological intervention, it is just as much neurological as it is psychological. Often the difference is only in the vocabulary used. The following will demonstrate the neurology beneath behavioral modification.
"All organisms move away from pain and towards pleasure," (Robbins, 1989). This is the kind of belief system that guided the beginning of behaviorism nearly 100 years ago. It started with Ivan Pavlov in the early 1900's, who was studying digestion and noticed dogs salivated in anticipation to feeding, (Ormrod, 2004). In 1913 John Watson first gave a lecture at Columbia University entitled "Psychology as the Behaviorist Views," (Plaud, 2001, p. 1090). Later in 1932, Torndike applied this concept in his "Law of Effect", (Plaud, p. 1092). Through the years there have been many who have championed the behaviorist views.

“Of all contemporary Psychologists, B.F. Skinner is the most honored and the most maligned, the most widely recognized and the most mis-represented, the most cited and the most misunderstood,” (Catania as cited in Schugrensky, 2001). Skinner himself said, "In my experience, the skepticism of psychologists and philosophers about the adequacy of behaviorism is an inverse function of the extent to which they understand it," (Skinner as cited in Plaud, p.1089). Yet even amongst the controversy that surrounds Skinner, there are significant findings that he and other behaviorists have found. Classical conditioning consists of processes very similar to Pavlov's methods, (Ormrod, 2004). Some authorities consider classical condition a form of signal learning. This is because the "the conditioned stimulus serves as a signal that the unconditioned stimulus is coming," (Ormrod, 2004, p. 33). This contrasts with a more Skinnerian method of using operant conditioning where the reinforcement comes after the behavior is done, (Skinner, 1971).

For any learning to occur whether behaviorally, cognitively or any other method, neurological changes have to take place. From a behaviorist perspective what appears to be a simple stimulus-response involves an enormous amount of physiology occurring through a dozen different levels of the nervous system. What is described in Behaviorists language actually occurs at a cellular level within the nervous system.

Neurology and behavior are fractals of one another. The primary central nervous system levels of learning include the cerebellum, basal ganglia, amygdala, thalamus and the cortex. These structures function together for all learning and conditioning to occur. A translation of terms from one field to the other will demonstrate how comparable and inseparable these two are.

A stimulus is described by Huitt and Hummell (1998) as an "environmental event". A neurologist would view this as a "sensory afferent," (Carrick 1997). The term "conditioning" as used by a behaviorist implies learning. A neurologist would use the term "plasticity" to describe something learned and maintained.

A conditioned response in the words of a behaviorist would be an association or a "binding" of events. When stacked together the behaviorist calls it chaining of behaviors, the neurologist would call those events the binding of cell assemblies which lead to pattern generations that we see expressed as behaviors.

The neurologist would also describe the physiological functions that occur within the cell when proteins are produced as there are more synaptic branches that occur. This process of protein production is called cellular early immediate gene response (CIEGR). CIEGR is a branching and reinforcing of synaptic pathways. The more CIEGR, the more effective and efficient the pathway becomes. Therefore, the more CIEGR that occurs, then the more "conditioned the response". Contrarily while the behaviorist uses the term "extinction," the neurologist would use the term chromatolysis and transneural degeneration to describe how the cells that used to be anchored together, no longer fire together. Chromatolysis describes the break down of the cell from a lack of its two requirements for survival. The first is fuel and the second is activation from other nerves. Without the activation of other nerve cells (reinforcement) then the cell becomes weaker. When it gets weaker it affects the other cells in the pathway. This process is called transneural degeneration.

Continuity is comparable to temporal and spatial summation. Temporal summation is where a nerve requires a lot of small inputs within a certain time period add together and "summate" to achieve a

threshold. Spatial summation is when there is input from a variety of different inputs that culminate to achieve summation, (Powell 2002).

Summation is what is necessary for contingency to occur. When there is enough input (whether temporal, spatial or combined) then a neuron will fire in an all or nothing response. This is similar Ormrod (2004) who states, "contingency is the essential condition: The potential conditioned stimulus must only occur when the unconditioned stimulus is going to follow…" Thus contingency like the firing of a neuron is an all or nothing phenomena.

Higher or second order conditioning would be binding issues, as would the differences in classical versus operant conditioning. The two would simply be timing variations between the thalamo-cortical oscillations. The thalamus oscillates at approximately 40 cycles per second, (Llinas, 2001). This is our internal clock. Events are linked synchroncitically to this internal clock. Hebbs (as cited by Alpiner, 2003) states that "when two neurons fire together they wire together." This is what has been referred to by Robbins (1989) as anchoring and it explains the stimulus-response relationship.

Even stimulus discrimination, which is something that can be shaped behaviorally, can be described by neurological structures. The ventral medial wall of the frontal cortex controls motivation and the reticular activating system of the mesencephalon raise awareness. That awareness is shaped in urgency by the amygdala which binds the event to emotions and the ability to attend or stay focused is maintained by the dorsolateral frontal lobe, (Melillo, 2004).

Education and a Cognitive Perspective

Learners with FDS symptoms are often in the normal classroom. Somewhere between 85-90 percent of AD/HD learners are in a general education classroom (Webb, and Myrick, 2003). This means that a cognitive learning approach is the intervention being used educationally. For example, over 50 percent of individuals with AD/HD will need academic tutoring or assistance, (Webb and Myrick, 2003).

Early interventions are often comprehensive and use service coordinators to map out a plan to fulfill the individuals needs (Dinnebeil and Hale, 1999). One of these needs is the decision for inclusion in the normal classroom or if special education is necessary. One concern is the marginalization of the learner when placed in a normal classroom (Nordmann, 2001). Kauffman, Bantz and McCullough (2002) argue that there are times for separation in classes and schools. Others argue for different instructional and assessment methods within the curriculum ala Gardner's multiple intelligence model (Gardner, 1983). While others argue against Gardner's theory basing their belief that much of Gardner's theory is biocultural (Messick, 1992). In the end, all these methods are cognitive in nature.

Cognitive processes can include how people perceive, interpret, remember, and other strategies they employ to cope with their environment. Tolman (as cited in Ormrod, 2004, p. 158) used the term "cognitive maps" to describe an algorhythm of how a person processes and learns. Other theorists such as Wertheimer, Kohler and Koffka (as cited in Ormrod) used the term Gestalt to describe the framing or as Thomas Kuhn (1962) would describe as a paradigm.

Another prominent cognitive theorist would be Piaget, who described various stages of development running with stages of cognition, (Ormrod, 2004). Piaget believed what is possible in learning and behavior is limited to how much development has occurred. Evidence of this being true is present in pervasive development disorders and is a corner stone of neurological rehabilitation as described by Melillo (2004b). Seress (1998, p. 42) says "Jean Piaget's 'stage theory'

suggests that cognitive development proceeds in discrete steps, among which the first is the sensorimotor period that occupies the first two years." He later adds, "Since this neuronal connection is the first link in the chain of the main hippocampal synaptic circuitry, it may be suggested that human hippocampus is impaired at birth." Thus this lends neurological support to

Piaget's cognitive approach.

Verbal learning research continues the trend towards more of a brain-based learning process within the cognitive theorist's perspective. Recognition of the fact that "overlearned" (Ormrod 2004, p. 173) material is remembered better is a demonstration of activation of neural nets and the existence of increased metabolic processes such as cellular immediate early gene response (CIEGR) discussed previously.

More modern perspectives of cognitivism include information processing theory, constructivism and contextual views. Information processing theory when oversimplified is comparing cognition in humans to that of a computer. What strategies and processes are used, are evaluated under the umbrella of information processing. Constructivists believe that all knowledge is built on previous knowledge so that it is built up like bricks of a wall. Finally contextual views observe how cognition occurs in different situations. This allows the evaluation of a hierarchy of behaviors. Looy (2001, p. 306) writes, "Forced choice procedures, which required a participant to select one of two or more constrained options, do not permit participants to reveal any contextual issues or qualifiers that could facilitate interpretation of their choices."

Other neo-cognitive theories include Neurolinguistic Programming by Bandler and Grinder along with Neuroassociative Conditioning by Robbins (Robbins, 1989).These theories include: metaprograms, values, beliefs and personal experiences into their model. Much of their foundational work was based on modeling the success of the therapist and hypnotist Milton Ericsson (Robbins, 1989).

The cognitive perspective has been a dominant force in psychology and psychotherapy and education since the 1970's. Cognitive therapies share an emphasis on the priority of changing cognition as the key to bringing about changes in patterns of dysfunctional emotional reactions and symptomatic behaviors. It is supported in many aspects by neurological research. "Psychological processes of learning may lead to biological changes in brain synapses, as was shown by Eric Kandel, Nobel laureate for 2000", (Rykbakowski, 2002, p. 5). This implies that thinking changes not only function of the brain but its form too. So if form follows function (Guyton, 2000) then changing our thinking changes our brain. Thus we see the premises of cognitive theory explained as changing thinking changes our ability to think.

This is supported by molecular biologist Bruce Lipton (2004) who describes genetic change occurring within the cell itself. He describes the process as a combination of neurotransmitters and hormones that are caused to be released by certain thoughts. An example would include cortisol released under stress or endorphins released in a feeling of ecstasy. These chemicals trigger a response by the cell to its environment. In the nucleus a genetic response including the possibility of producing new genes is caused by the unsheathing of genetic code. This code responds to two innate actions. Like a fractal of the brain with its left brained approach response or its right brained withdraw response (Melillo, 2004), the cell has two genetic responses: grow or protect. It can do one or the other, but not both simultaneously. Thus we see genetic change take place due to one's thoughts and thus the age old saying of motivational masters and cognitive theorists that thoughts are things is explained by modern science.

Lipton is not alone in his belief. David Thaler (1994) described biological expression as being defined by an individual's perception of their life experiences. Thalers put an emphasis on perception, by dynamically switching gene programs and also in its ability to cause the "rewriting" of existing gene programs so as to better adapt to the environment.

Cognitive theories are far reaching and backed by a good deal of science. Rybakowski (2002) states: "Experimental and clinical studies point to a prominent role for early untoward life experiences in brain development and vulnerability for psychiatric disturbances." The author later writes "changes in brain function or in the biology of the whole organism were measured, under the influence of psychotherapy" and the results were the same for pharmaceutical or cognitive therapy, i.e. both elicited a change.

Cognitive theory does have some neurological holes in regards to emotion. Shean (2001, p. 158) states that "neurobiological evidence is not consistent with the assumption that cognitions are necessary for emotions." This means that we can experience emotions without conscious thought of them. Shean, (2003, p. 195) states, "This evidence contradicts the assumption of many cognitive therapists that changing cognition is prior to and necessary to changing emotional reactions. Neurological evidence indicates that emotions can be experienced without cortical interpretations of stimuli, and clinical evidence indicates that experiences can be stored as isolated affective fragments that function later to distort cognition."

Here lies the rub in the neuroscientist' view of cognitive theory. The pathways that lead to cognition do suppress emotion, however there is also a direct path that leads to the emotions and then to cognition. It appears that these two paths are inversions of each other. Jensen (2000) describes that brain friendly learning is done in a low stress environment. These two reciprocal pathways explain why that is true. The brain under threat becomes subservient to the emotions as the amygdale dominates over the cortex and reason; conversely reason from the cortex can dilute emotion from the amygdale if the fear or threat has been minimized (Bamburg, 1994).

Biological influence.

Certainly conditioning affects behavior, but there is more to behavior than just conditioning. Franks (2003, p. 623) states it this way, "Since the external world can only be represented through modifications it causes in the acting and reacting 'behavioral' body, these mappings are somato-motor in character. In other words, biology flavors the experience.

Other biological evidence supports that cognition is not a function to its own. Willingham (1998, p. 558) describes a "neuropsychological theory of motor skill learning that is based on the idea that learning grows directly out of motor control." Later Willingham elaborates and says, "The theory accounts for patterns of impairment of motor skill learning in patient populations and for learning-related changes in activity in functional imaging studies. It also makes a number of predictions about purely cognitive, including accounts of mental practice, the representation of motor skill, and the interaction of conscious and unconscious processes in motor skill learning." These cycles of feed forward and feed back involve loops to and back from the cerebellum and cerebral nuclei (basal ganglia and thalamus). In more simple terms, visualizing lays down pathways. In that way cognition affects motor functions (physical skills). Conversely, errors in motor function can and do affect cognition.

Llinas (2001) and Melillo (2003, 2004a, 2004b) have described cognition in evolutionary terms tied to mobility. The ability to walk in a bipedal manner and the increase in proprioceptive input by the movement in the field of gravity is believed to be the driving force of cortical development and thus cognition. It is believed this increased input drove the development enough that there was left over cortical tissue, thus allowing brain to brain connections via association centers. These association centers are related to our more human functions, (Carrick, 1997). Thus we see there are biological and specifically motricity factors in the development of cognitive capabilities.

The brain is indeed designed for survival. Survival of the species meant that neurological development for movement and eating came before cognition and contemplation (Melillo and Leisman, 2004). Thus, the motor systems are a more primitive yet powerful input to the nervous system because of survival bias. This is backed neurologically by the 4:1 ratio of input of proprioception from the cerebellum to the cortex (Powell, 2002).

Nothing Short of Everything

Solomon (1995, p. 7) writes, "Biology is not destiny. Culture counts too." The writer Aldus Huxley (1932) once said, "Nothing short of everything will ever really do." This is true when we observe cognition through the neurological looking glass. The same neurological components that give us the ability to time and predict for bipedal motion are used in cognition. It is those same components that are used whether they are environmentally based as the behaviorists purport or whether they are innately cognitive as the cognitive theorists support.

Thus the resulting 'internal representations' cause permutations in the organism, which in turn guarantee endless changes that the brain must tract." Therefore we see that the understanding the nervous system requires not an "either or", but it requires both a behaviorist and a cognitive perspective in a biological frame to explain learning and behavior for the nervous system is a semi-open system.

Neither behaviorist nor cognitive theories appear to stand alone. Behaviorist views have not answered the concerns of everyone. Plaud (2001, p. 1093) writes, "…the historical absence of scientific consensus that psychology is the science of behavior has lead to the emergence of cognitivism/mentalism in psychology and served as the main stimulus setting the occasion for continual debate about the definition of psychology." What this means is that where behaviorism looks at the psyche from an outside in or afferent perspective; cognitive therapies look at the psyche from an inside out or efferent perspective. This sensory afferent or motor efferent perspective describes the nervous system accurately. The key is that both afferent and efferent components are necessary to describe the whole. It also explains the cognitive dissonance that exists between the neurological loops between brain and environment and the brain to itself.

It is why the nervous system is described as a semi-open system. It is open because the afferents bring in sensory afferents that the behaviorists focus on. It is closed because there are cognitive processes (brain to brain) that regulate and control as the cognitive theorists describe. It is semi-open because these two systems collide and form a single system in what Pribram (1998) called a holographic brain. He derives this description of consciousness because like a hologram formed by the interference pattern of two light sources colliding with each other; the nervous system's sub-systems that are both open and closed create a cognitive dissonance between what is real and what is perceived. Thus like left and right hands behaviorism and cognitive theory are part of the same whole.

Another perspective of the combination of behaviorist and cognitivist perspectives comes from Goswami (1996, p, 51) who writes, "What in the structure of the brain-mind allows both conditioned and creative experiences? The answer adapted here is quantum functionalism –the idea that the brain-mind must have quantum machinery in addition to its classical, neuronal machinery." Thus we see the union of biology and physics again related to consciousness and cognition. Wilson (2001) described the process of combining neurology, psychology and pedagogy as conductive education. Odom and Wolery (2003) described as a unified theory. And again, it can be said that "Nothing short of everything will ever really do" (Huxley 1932).

Alternative approaches

There has been a firm entrenchment of the current paradigm and approaches yet there are still many innovative efforts to approach the symptoms of FDS. Alternative approaches are not welcomed with open arms. Some of these approaches may be labeled by members of the established paradigm with scorn as snake oil (Kennedy, Mercer, Mohr and Huffine, 2002). Yet their successes can not be entirely denied as evidence by media events hosted by movie stars showcasing the successes as at the Defeat Autism Now (DAN) conference (ARRI, 2004).

Indeed, in spite of the labels given to them, some alternative approaches have produced promising results published in the scientific literature. Many of these approaches are intended to be functional approaches. By functional it is meant that they are designed as an approach to purposely improve some sort of neurological function.

There are many strategies for improving neurological function directly or indirectly. Indirect strategies include parenting that like cognitive and behavioral efforts makes changes indirectly through changes in habitual thought. There are also more direct methods that include nutrition, exercise, patterning, phonetics, light, sound and spinal manipulation that approach a more direct change in the neurology. The following is a brief survey of what methods are in this alternative category.

Parental Expectations.

Parents are often a wildcard in education. They can be an educators' best friend or worse night mare. They can also be the learner's greatest asset or biggest liability. And no legislation so far has mandated improved outcomes from parents.

Even though a wildcard, parents can be a powerful force in the development in a learner's achievement. One way parents can help is in their expectations. Parrikakou (1996) found that parental expectations drive learners' expectations of themselves and also their level of achievement. Additionally parents can play a role in advocacy for their children. This can be involvement in the creation of an individualized education plan as is required under IDEA and Section 504. It can also be by arranging appropriate care via speech pathologists, psychologists, chiropractic neurologists, physical therapists, occupational therapists and etc.

Nutrition

Psychoneuro-nutritional medicine is a term coined by Jeffrey Bland (Dommisse, 2000). The perspective is that nutritional components play a role in the neurochemistry and thus in behavior. In that way it follows the pharmaceutical paradigm currently in use, however it is innovative in that it uses natural substances that are in the category of food rather than medication. Bland has coined this use of nutrition as "functional medicine" (IFM, 2005). Neurologically speaking, nutritional remedies may work because of the basic biological need of every cell for survival: fuel and activation from other nerves (Powell, 2002). Proper nutrition provides the fuel.

Dommisse (2000) describes the areas that may be covered as: allergies to foods or additives to food; nutritional deficiencies; environmental hazards that are toxic; yeasts; and intolerances to refined sugars. The proteins casein derived from milk and gluten from wheat are common allergens (Knivsberg, Reichelt, Hoien, & Nodland, 2003). Common environmental hazards include lead poisoning, maternal smoking, and excitotoxins such as MSG (Marshall, 1989). Deficiencies include Omega-3 fatty acids and DHA (Dommisse, 2005; Sagduyu,
Dokucku, Eddy, Craigen, Baldassano, et al. 2005); the minerals calcium, zinc, iron (Dommisse, 2000); vitamins B3, B6, folic acid, and C (Dommisse, 2000).

In autistic syndromes the elimination of caseins and glutens from the diet has been found to reduce autistic behaviors and abnormal urinary peptides (Knifsberg, Reichelt, Hoien and Nodland, 2003). Elimination diets have been found to decrease candida yeast (Dommisse, 2000). The use of Omega-3 fatty acids have been used successfully in decreasing the irritability in bipolar disorder (Sagduyu,

Dokucku, Eddy, Craigen, Baldassano, et al. 2005). Supplementation of deficient vitamins and correction of malnutrition have been found helpful in Dommisse's (2000) review of the literature.

Exercise and patterning

Exercise and patterning have used successfully or advocated as a treatment modality for depression (Lawlor and Hopkeer, 2001); dyslexia and for improving reading ability (Reynolds, Nicolson, and Hambly, 2003); brain damage (IAHP, 2005); Down's syndrome, cerebral palsey, autism and learning disabilities (American Academy of Pediatrics, 1999). Exercise and patterning methods are frequently trademarked. Names like BrainGym (Brain Gym, 2003), SMILE Lab (Barrett, 2000), Handle Institute (Handle Institute, 2005); DDAT (Reynolds, Nicolson and Hambly, 2003), and others abound. The common thread is the use of motor and vestibular exercises or patterning to produce neurological change.

Sensory stimulation

Another alternative form of care involves using a variety of sensory inputs. One method of this popularized by the occupational therapy profession is Sensory Integration (Miller and Kinnealey, 1993). Massage has also been used effectively in AD/HD leaners (Khilnani, Field, Hernandez-Reif and Schanberg, 2003). The use of colored over-lays has been used effectively by Irlen (Robinson, Sparkes, Roberts, and Dunstan, 2004). Others have found in addition to the use of color, that eye patching can be beneficial with some kinds of reading difficulties (Fowler, Hebb, Walters, Soutcott and Stein, 2000). Aural sensory input that alters the phonetic sounds and helps develop speech and language recognition has been used effectively in the Fast ForWord program (Merzenich, 2000).

The Alternative's Common Denominator

Many of these methods have differing theories of why they work. Yet only one can explain not only why an individual alternative approach works, but also why the current paradigm works. It is a neurologically based model used by chiropractic neurologists. This model is based on the neurology that lies under the current neurotransmitter changes that the pharmaceutical methods use; and under the behavioral and cognitive neurology of psychological and educational interventions. It also lies under the sensory and somato-motor, occular and vestibular responses of many of the alternative models. It most importantly uses the most powerful method of effecting neurological change, the perception of gravity.

These methods are often effective in making changes to the nervous system in ways that appear to use the brain's natural evolutionary development towards survival. And while all of these methods propose theories as to why they work, only one of these approaches contains a full understanding of the nervous system and a reliable model that explains the purposeful change at a cellular level on up to the neural network level of cognition and behavior. It is the chiropractic neurology's summative brain-based model that explains how the symptoms of functional disconnection syndrome can occur and how the underlying cause can be corrected.

Chiropractic neurology: the model that explains this new paradigm

Research on the brain has brought a greater understanding of how it works and how to prevent or correct the effects of its disorders (Koppelman, 2004). A key researcher in functional rehabilitation of the nervous system is Frederick Carrick. Carrick (1996) proposed a model of neurological summation that could be used to measure changes in thalamo-cortical function. He then overviewed a baseline receptor based regiment of care (Carrick, 1997). Melillo (2002) described the use of this in the clinical practice and Melillo and Leisman (2004) described the evolutionary process of the nervous system to explain phylogenically the process of neural development and potentials for breakdown in the nervous system.

Chiropractic neurology is a receptor based form of care (Brock, 2005). In addition to using all the non-pharmaceutical methods described above, chiropractic neurology uses the most powerful and

constant input into the nervous system, gravity. The majority of the receptors to gravity are located in the muscle spindles (stretch receptors) and joint mechanoreceptors (joint

movement receptors); and the majority of these receptors are located at the level of the base of the head and the hips (Powell, 2002). The power of changing the receptor base by spinal manipulation (called adjusting) and increasing the sensory afferent inputs that arrive at the brain in a 4:1 ratio described earlier, mean that the activation of the target neurons is greater and also remains continuous when the adjustment is over since there is increased joint motion and muscle stretch thus driving a constant receptor activation at the joint and muscle spindle receptors.
This contrasts with other methods described above like coordinated exercise, light, sound, cognitive or behavioral interventions because their therapeutic effect is over when the treatment is over. Even pharmacological interventions are subject to the half life of their ingestion. Only the chiropractors' adjustment creates the long term activation and thus may be the most powerful tool for creating plastic changes in the nervous system.

Conclusion

What is Working

There is a major push of for results in both education and health care. In health care, managed care has promoted science-based care that creates measurable changes. In education, No Child Left Behind has demanded similar results of educators as managed care has for physicians. Danforth (1999) describes this process as pragmatism. In the pragmatic tradition, results can be assessed on both short term and long term perspectives. It is from this information that evidenced-based practices can be designed (Odom and Wolery, 2003).

There are many methods for assisting in behavioral and educational disorders. The current paradigm places a great deal of weight on pharmaceutical, behavioral counseling, and cognitive education methods. The chronicity of the symptoms of functional disconnection syndrome indicates that the current paradigm may provide short term symptom suppression but no correction.

There is an old saying that the more you do of what you are doing, the more you will get of what you have got. It is the definition of insanity to continue doing the same thing that has been done already, doing it only longer and harder and then expecting a different result. It must be recognized that in terms of long term change or resolution of functional disconnection syndrome and its symptoms, that what we have been doing in the current paradigm is not working and in the case of medications may be creating other serious or life threatening problems.

In order to move ahead there is a need to understand the nervous system and its development. Then it is necessary to find a method that uses this natural development process to help learners with delays to reach their potential. The field of chiropractic neurology offers educators, psychologists and other practitioners a model of care that provides just that. The new paradigm's time has come.

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