

Running Head: AUTISM AND ASPERGER'S TREATMENTS

Children Dealing with Autism and Asperger's Disorder and the Treatments Used

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Abstract

The rate of incidence of Autism diagnosis has increased dramatically in recent years. The cause is still unknown, but there are many different treatments for these cases. There are multiple theories of Autism along with different treatments. The question that this paper will focus on is the following: what are the current pharmacological and complementary and alternative medicine treatments for Autism and other Autism Spectrum Disorders? How effective are these treatments? Are there treatments that are more widely used than others? The answers to these questions will come from reviewing peer-reviewed literature on the effectiveness of various treatments.

According to MayoClinic.com, the rate of incidence of diagnoses of Autism and Asperger's Disorder is currently rising. In 2007, approximately two out of every 10,000 children were diagnosed with Asperger's and males were three to four times more likely to have the disorder. The rate of diagnosis of Asperger's was considerably lower than the rate of diagnosis of Autism. About three to six out of 1,000 children were being diagnosed with Autism. Males were also three to four times as likely to receive the diagnosis of Autism (Mayo Clinic, 2006). More children now than in the past are receiving diagnoses of Autism and Asperger's and there is still no cure or certainty of where these disorders come, therefore treatments are greatly varied. Trying to find the right treatment for the Autistic or Asperger's child is important and with so many to choose from, it is difficult. This literature review will analyze current popular treatments in terms of empirical evidence of treatment effectiveness.

Autism and Asperger's Disorders are both Pervasive Developmental Disorders (PDD). PDD is a general term for the category that contains disorders such as Autism and Asperger's. In the *Diagnostic and Statistical Manual of Mental Disorders* (4th edition) (DSM-IV), PDDs include more than Autism and Asperger's, they also include Rett's Syndrome, Child Disintegrative Disorder and Pervasive Developmental Disorder-Not Otherwise Specified (PDD-NOS) (American Psychiatric Association, 1994). I am limiting

my research to Autism and Asperger's because of the recent reports and stories on the news. I also limited the research to only the two diagnoses as a way of narrowing my question. Under the category of PDD, the disorders found are categorized by the commonality of symptoms, which include delays in certain developmental functions like communication, language, and socialization. What may cause symptoms of the disorders is slower development of the brain. Differences in the diagnosis of the disorders come from when the child is diagnosed, and the severity of the delays that child has. Autism and Asperger's are typically diagnosed by the age of three. Autism Spectrum Disorders is a synonym for Pervasive Developmental Disorders and is a more common term in research than PDD.

The DSM-IV (American Psychiatric Association, 1994) criteria for Autism includes three different categories and the child must exhibit symptoms from each of them. The first category being impairment in social interaction manifested by impairments in nonverbal behaviors (eye-to-eye gaze or facial expressions), not able to develop peer relationships at the appropriate level of development, lack of spontaneous seeking to share enjoyment with others, and lack of social or emotional reciprocity. The Theory of Mind states that children can realize that there are different states or emotions that everybody can have, and they may be different from their own. The lack of social or emotional reciprocity is the lack of Theory of Mind ability.

The second category for Autism is qualitative impairments in communication.

This includes lack of development of communication and spoken language, the inability to initiate or sustain conversation with others, stereotyped and repetitive use of language, and the lack of varied or spontaneous play at the appropriate development level. These symptoms can vary from very impaired to somewhat impaired.

The third category for Autism diagnoses involves restricted repetitive and stereotyped patterns of behavior, interests and activities. This can include a preoccupation or obsession with objects or parts of objects. Repetitive and stereotyped motor mannerisms like twisting wrists, tapping fingers, or body rocking is a symptom of this category. Included in this category is the inflexibility of rituals or routines.

The DSM-IV (American Psychiatric Association, 1994) criteria for Asperger's Disorder are a little different from Autism. There are six categories: qualitative impairment in social interaction, restricted repetitive and stereotyped behaviors, patterns and interests, the disturbance causes clinically significant impairment in social, occupational or other important areas of functioning, there is no clinically significant delay in general language, there is no clinically significant delay in cognitive development or in the development of age-appropriate self-help skills, adaptive behavior (other than social interaction), and curiosity about the environment in childhood, and finally the last category that needs to be met before a diagnosis of Asperger's is that criteria are not met for another specific Pervasive Developmental

Disorder or Schizophrenia. The biggest difference between Autism and Asperger's Disorder is the delay in language.

There are currently a wide variety of treatments available for individuals with Autism and Asperger's Disorder. An Internet survey was conducted by Green, Pituch, Itchon, Choi, O'Reilly & Sigafoos (2006) that asked parents which treatments they used for their child. This study shows how many treatments are available and the variety that are being used. Five hundred ten parents reported over 100 different treatments. From the treatments reported, Green et al. (2006), formed categories to make it easier to classify what type of treatment it was. The treatments were organized in to seven different categories: medications, vitamin supplements, special diets, medicinal procedures, educational/therapy approaches, alternative therapy/medicine and combined programs. This literature review will not look at all seven categories of treatments, but focuses more on Complementary and Alternative Treatments and selective serotonin reuptake inhibitors and serotonin reuptake inhibitors and I analyzed medications, some vitamin supplements, special diets, alternative treatments, where a lot of research is currently conducting experiments. Each treatment type is directed at specific symptoms of Autism or Asperger's Disorder. There is not one particular treatment that is used for all aspects of the two disorders.

Method

The purpose of this paper was to review different treatments that are used for Autistic children and those with Asperger's Disorder. The research was conducted on PsycINFO, Sage, ERIC, and Science Direct with keywords such as Autism treatments, GFCF diets, medicine and Autism. Articles were taken between the years of 1994 and January 2009. Studies that were reviewed were analyzed based on how the diagnoses were obtained, which treatments were used, the symptoms that were targeted and the findings the past research has found.

Treatments

The following sections will explain different treatment options; it will not explain all of the treatment options available. The first section will focus on Complementary and Alternative Medicine. The next section will look at some psychopharmacological treatments. In the results section there are three tables, one for Complementary and Alternative Medicine, psychopharmacological treatments and the third table is on dietary research.

Complementary and Alternative Medicine

Complementary and alternative medicine (CAM) treatments are a combination of conventional and unconventional medical and philosophical belief systems (Hanson, Kalish, Bunce, Curtis, McDaniel, Ware & Petry, 2006). Conventional beliefs systems

would suggest the use of medications or antibiotics and unconventional beliefs systems would suggest the use of herbal remedies and diet changes. Even though the complementary and alternative beliefs and treatments styles are different, they are so close in definition that they are often considered together. Complementary medicine is used together with conventional medicine, and alternative medicine is used instead of conventional medicine (Hanson et al., 2006).

One reason parents seem to be using CAM treatments is because whether conventional or unconventional; there is no one-treatment effective for treating all the core symptoms of Autism or Asperger's. Parents may have easier access to alternative medicines. Vitamins and other dietary supplements are alternative types of treatment, and could be used more because of their accessibility. According to Hanson et al. (2006) the National Center for Complementary and Alternative Medicine (NCCAM) describes five categories of CAM treatments. This is contradictory to Levy and Hyman (2008), which states the NCCAM categorizes CAM treatments in four categories. The categories for CAM treatments are mind-body techniques, biologically based theories, manipulative and body based methods, energy therapies, and alternative medicinal systems. The alternative medicinal systems category is not included in Levy (2008) article. Levy and Hyman (2008) compared different Complementary Alternative Medicine treatments and graded each of them depending on how much research has been conducted not on how effective the treatment is thought to be. The next four

sections will focus on the specific categories of CAM treatments, starting with Mind-Body Medicine.

Mind-Body Medicine

Mind-body medicine treatments include meditation and yoga. Both of these treatments have been given a grade of C, meaning only case reports or theories support this treatment and no experimental studies have been conducted for Autistic children on the effectiveness of meditation or yoga (Levy, 2008). Another mind-body medicine is music therapy. This was given a B according to Levy and Hyman (2008). The music is used to reinforce communication, and is commonly applied to educational interventions. Studies need to be conducted looking at the neurobiology of how music is processed in persons with Autism or Asperger's Disorder. With that understanding, music therapy could provide further rationale for treating Autism or Asperger's. The grade B means that small studies of case studies or very small sample sizes of a randomized experiment have been done, and there is potential for positive effects for children with these diagnoses, but no effect on overall behavior has been reported. It was not stated in Levy and Hyman (2008) what measures were used to determine if the treatment works.

Biologically Based Practices

Biologically based practices could include different diets, or dietary supplements, hormones, or possibly antibiotics. This is a much larger category than the others. It is

also one of the more commonly used CAM categories; about half of families of children with Autism or Asperger's use a biologically based therapy (Levy & Hyman, 2008). With more families using these types of therapies, there is more reason to conduct more research.

Some dietary supplements for the biologically based practices include different vitamins. Vitamin supplements have been used in mental health disorders for over 50 years and commonly have been used for Autism in the past 20 years (Levy & Hyman, 2008). Vitamins or supplements that can be added to the diets of children with Autism include: Vitamin B₆, Magnesium, Vitamin C, and Omega 3 fatty acids. In Levy and Hyman's (2008) review of CAM treatments, all of these additions to the diet were given a B grade; saying there is potential for positive effects but not many studies have been done to come to that conclusion. Vitamin C is usually not used alone, but added to other vitamin treatments. A study by Dolske, Spollen, and McKay (1993) reported positive results of decreased stereotyped behaviors with vitamin C, but this study has yet to be replicated (Levy & Hyman, 2008). Multiple studies have also looked at the differences in plasma levels of Omega 3 fatty acids in typically developing children and Autistic children; finding that Autistic children's plasma levels are decreased (Levy & Hyman, 2008) relative to non-diagnosed children. Increasing the Omega 3 fatty acids and those plasma levels could potentially decrease Autistic symptoms. Taking oral supplements

has been reported to improve severe behavioral difficulties with very mild side effects.

This was a pilot study with only 13 children, and should be replicated on a larger scale.

A very popular CAM, biologically based diet is the Gluten-Free, Casein-Free (GFCF) diet. The theory underlying the GFCF diet is those specific foods containing gluten and casein products will decrease communication and socialization and decrease repetitive behaviors, and so removing them will do the opposite effect. Levy and Hyman (2008) gave the GFCF diet a grade B. This diet exempts all gluten, which can be found in wheat, barley, and rye, and all casein products, which are found in dairy. This diet is intended to improve core behaviors of Autistic children. The reason for a dietary treatment so extreme is because of the immune system, genetic susceptibility, and environmental factors (Elder, Shankar, Shuster, Theriaque, Burns, & Sherrill, 2006). There have been multiple anecdotal reports of "cured" children after being placed on the GFCF diet. The scientific data do not support these claims. Elder et al. (2006) conducted a pilot study on the GFCF diet. It was a study with high internal validity using a double blind clinical trial, however, it found no empirical evidence that this diet works and is effective for these symptoms: social interaction, communication, resistance to change, repetitive behaviors and stereotyped patterns. Fifteen children participants were included in this study. Physiological and behavioral measures were used to determine the GFCF's effectiveness. Urine samples were used as physiological measures and language summaries were obtained. Results showed no significant differences in

urine samples, or in behavior and language. The non-significant findings may be due to a small effect size in the small sample (Elder et al., 2006). This study needs to be replicated with larger sample sizes and a more heterogeneous sample.

A theory that is closely related to the gluten-casein problem is amino acid deficiencies in children with Autism. If there is a specific amino acid profile or deficiency, Autism could be more easily diagnosed and possibly treated. Arnold, Hyman, Mooney, and Kirby (2003) looked at amino acid profiles of typically developing children and Autistic children to see if there were any deficiencies. This was a pilot study, and their conclusion was that there is no specific Autistic amino acid profile. Arnold et al., (2003) reviewed medical charts of 150 Autistic children. They put the Autistic children into two groups, a restricted diet group and an unrestricted diet group. What Arnold et al., (2003) did find was that neither group had a specific profile but both groups had poor protein nutrition. It was found that Autistic children are significantly more likely to have deficiencies in both essential and non-essential amino acids when compared to children with developmental disabilities that do not include Autism (Arnold et al., 2003). It must be remembered that this is a pilot study using 58 subjects, and further investigations are needed in profiling amino acids in Autistic and Asperger's children. There may be deficiencies, but the specific deficiencies cannot be pinpointed as to what they are at this point.

A biologically based practice that has been widely researched is the use of Secretin. Secretin is a hormone used to treat gastrointestinal symptoms commonly associated with Autism (Sturmey, 2005). It is a natural hormone produced in the body by the last part of the small intestine and is secreted when the acidity in the stomach increases (Esch, & Carr, 2004). In simpler terms, Secretin acts as an Alka-Seltzer. Secretin can be administered for gastrointestinal complaints such as chronic diarrhea. Autistic children have had common complaints of gastrointestinal problems, and Secretin is naturally produced in the gastrointestinal tract. It was an idea to use Secretin with gastrointestinal problems. However, Secretin does not help with these gastrointestinal problems. Esch and Carr (2004) reviewed evidence of past studies that used Secretin as a treatment for Autism, Asperger's and other PDD that were not studied in this literature review. Esch and Carr's (2004) article reviewed 17 quantitative studies and 16 of them did not find that Secretin was helpful for treating symptoms of Autism or Asperger's. The 17 articles that were reviewed included many types of studies. They included everything from randomized, double-blind, placebo controlled, crossover studies, which provide most of the best empirical evidence on Secretin's efficacy; to case reports, which gives us little information on Secretin's actual efficacy.

Another review of Secretin by Sturmey (2004) came to the same conclusions as those of Esch and Carr (2004). Secretin is an ineffective treatment for Autism and Asperger's Disorder. Sturmey's (2004) article only reviewed double blind randomized

control trials, which are of high quality studies, for Secretin. A typical experiment for these double blind randomized control trials includes two groups, the experimental and control group. Depending on the study, different doses or times of administering the dose of Secretin differed. The control groups received the placebo and were not aware they were not receiving the actual treatment. The dependent variables used in the papers reviewed, came from psychometric instruments. Examples of these include: Autism Diagnostic Interview-Revised (ADI-R), Autism Behavior Checklist (ABC), and Ritvo Real Life Behavior Rating Scale and the Secretin Outcome Survey, these measures were used to determine whether Secretin was affecting the core symptoms of Autism. Baseline measures of behavior were taken; the same measures were also taken throughout the experiment to see if a change occurred. None of the papers reviewed reported any change in behavior for any measure used (Sturmey, 2004).

Manipulative and Body-Based Practices

Chiropractic visits are a form of manipulative and body-based practice for the treatment of Autism and Asperger's (Levy, Hyman, 2008). During my search, I could not find articles specifically for the use of chiropractic to treat Autistic children. Some Chiropractors may use craniosacral massage to help with Autistic children. Craniosacral massage is another form of manipulative and body-based practice, which involves physical manipulation of the skull and cervical spine. I could not find any articles

specifically on craniosacral massage that suggests two things: there is no research or, there are no statistically significant results so the research was not published.

Two other manipulative and body-based practices include massage/touch therapies and auditory integration. Sensory differences have been frequently reported by parents of Autistic children (Levy & Hyman, 2008), but in the fourth edition of the *DSM* sensory differences are not part of the criteria for Autism or Asperger's diagnosis. Auditory integration's goal is to improve concentration. There are different methods for auditory integration like listening through headphones to sounds or voices. Systematic reviews have been conducted, and significant methodological weaknesses were found in studies that investigated auditory integration which prohibits meta-analysis (Levy & Hyman, 2008). As of right now, this is considered an experimental treatment, until sufficient evidence has been found.

Energy Medicine

This treatment involves placing an electromagnetic coil on the Autistic child's head and produces a very low level of electrical currents (Levy & Hyman, 2008). In using this, there is potential to more closely examine the neurons and neurologic function of children with Autism or Asperger's. This is a research tool that is currently being used to examine the potential of overconnectivity in cortical neurons of Autism. Currently, there are no reports of using this treatment as a therapy, or any other magnet therapies for Autism (Levy & Hyman, 2008).

To conclude, the CAM treatment areas need more research. There could be promising treatments, but it is hard to say that and be extremely confident with the lack of randomized double blind controlled trials. Biologically based treatments show some positive effects with dietary supplements. The GFCF diet is shown to not work, but makes the parents feel better. Studies that have been mentioned for dietary treatments are located in Appendix C, and a table for the effectiveness for other CAM treatments is located in Appendix B.

Pharmacological Treatments

Pharmacological treatments are similar to the biologically based treatments in CAM. Pharmacological treatments must be prescribed by a doctor, and have a risk of more severe side effects than non-prescription dietary supplements. The first pharmacological treatment is an atypical antipsychotic treatment; Risperidone.

Risperidone

Risperidone is an atypical neuroleptic agent, and a highly potent serotonin and dopamine antagonist. Serotonin and dopamine are both neurotransmitters. Dopamine levels are associated with adrenaline. Serotonin is a neurotransmitter and its levels are related to mood, and lower levels could lead to symptoms of depression. It has been shown that the dopamine and serotonin transmitter levels could be dysregulated in some Autistic or Asperger's patients and Risperidone is supposed to regulate those levels (McDougle, Holmes, Carlson, Pelton, Cohen, & Price, 1998).

Risperidone is used to treat repetitive behaviors, aggression, sensory motor behaviors, socialization, effectual reactions, and language. McDougle et al. (1998) conducted a careful study on the efficacy of risperidone. The measures used were behavioral rating scales. Repetitive behavior used the Yale-Brown Obsessive Compulsive Scale (Y-BOCS), which contains ten items that can each be rated from 0-4: 0 indicated being least symptomatic and 4 indicated most symptomatic. Half of the questions are meant to assess repetitive thoughts and the other half assesses the actual repetitive behavior. Aggression was rated with a Self-Injurious Behavior Questionnaire (SIB-Q). It is a 25-item questionnaire that rates self-injurious behavior, physical aggression towards others, destruction to property, and other maladaptive behavior (McDougle et al., 1998). An observational measure was also used. The Ritvo-Freeman Real-Life Rating Scale included 30 minutes of observation to measure symptoms of Autism. During the course of the experiment, a global improvement item was given to systematically rate if there had been any improvement in the Autistic individual.

The subjects in the experiment and the administrator did not know whether the subject was on the drug (risperidone) or the placebo. Physiological measures including blood pressures when sitting and standing, pulse rates, body temperature, respiratory rates and weight were measured at the beginning as a baseline and three times throughout the experiment to look at changes that Risperidone caused.

Language was the only area in which results with risperidone were not statistically significant, different from results with the placebo (McDougle et al., 1998). Improvements in sensory responses, socialization, affectual reactions, sensory motor behaviors, and aggressive and repetitive behavior were shown with risperidone (McDougle et al., 1998). Side effects from this study were mild, and included transient sedation. Risperidone was well tolerated by all the participants (McDougle et al., 1998). Risperidone is an atypical antipsychotic and another pharmacological group of medications includes antidepressants, also known as selective serotonin reuptake inhibitors. Prolonged use of Risperidone should be investigated.

Selective Serotonin Reuptake Inhibitors

Selective serotonin reuptake inhibitors (SSRI's) are usually used to treat depression symptoms and have also been used for Obsessive-Compulsive Disorder. Some Autistic children exhibit the same symptoms as Depression and Obsessive-Compulsive Disorder. SSRI's are conventionally researched medication that act to control disruptive and interfering behavior (Fatemi, Realmuto, Khan, & Thuras, 1998). Fatemi et al., (1998) conducted an experiment with a popular SSRI called Fluoxetine, more commonly named Prozac. The study including Fluoxetine was a longitudinal open trial study that used the Aberrant Behavior Checklist to measure with irritability, lethargy, stereotypy, hyperactivity and inappropriate speech. The Aberrant Behavior Checklist (ABC) was a scale that was completed by the primary caretaker of the Autistic

child that was a systematic way of checking the child's behavior (Fatemi et al., 1998).

The ABC scores of the participants did show improvements in irritability, lethargy, stereotypy and inappropriate speech. Lethargy was the only area that was improved significantly (Fatemi et al., 1998). Hyperactivity was increased when Fluoxetine was used as a treatment for Autism.

Another study drew the same conclusions. Soorya, Kiarashi, & Hollander (2008) studied psychopharmacologic interventions for repetitive behaviors in Autism and Asperger's. Different SSRI's and SRI's including Fluoxetine (serotonin reuptake inhibitor's) were evaluated. The portion of the study on Fluoxetine was a double blind, placebo-controlled trial on persons with Autism. The findings suggested that Fluoxetine was well tolerated and effective in reducing repetitive behaviors in children with Autism. Measurements to assess how well Fluoxetine was tolerated included the children's version of the Y-BOCS (CY-BOCS) and the Clinical Global Improvement Scale Adapted to Global Autism (CGI-AD). The CGI-AD focused on core autistic symptoms independent of associated symptom domains. Results suggested Fluoxetine was effective in reducing repetitive behaviors.

Another serotonin reuptake inhibitor (SRI) Soorya et al. (2008) evaluated is Clomipramine. Clomipramine's brand name is Anafranil, and is an SRI. Soorya et al. (2008) compared Clomipramine to a placebo and then to another SRI somewhat similar to Clomipramine called Desipramine. Results conveyed that Clomipramine is more

effective than the placebo and Desipramine in reducing abnormal behaviors using the Children's Psychiatric Rating Scale (Soorya et al., 2008). Clomipramine also improved some Obsessive-Compulsive Disorder symptoms: repetitive and stereotypical behaviors. To make this result more conclusive, more studies need to be done in a double blind, placebo-controlled environment. A cross-over single blind design was used with Desipramine and Clomipramine and only 12 children participated. Results found that Clomipramine was more effective than Desipramine (Soorya et al., 2008).

Another SRI studied is Fluvoxamine more commonly recognized as Luvox. A placebo controlled study found significant improvements in repetitive thoughts and behaviors, aggression, social relatedness, and repetitive language (Soorya et al., 2008). The participants of that study were rated on the Clinical Global Impressions Scale (CGI). For children this anti-depressant needs to be highly regulated because of their plasma levels; the plasma levels of children on Fluvoxamine are substantially higher than adolescents or adults on Fluvoxamine. According to Soorya et al. (2008) an unpublished pediatric study in the same laboratory reported to have no effects to Fluvoxamine.

Sertraline is an SSRI with the brand name Zoloft. Studies suggest that Sertraline may be an effective treatment for repetitive behaviors, anxiety, irritability and aggression. The children involved had diagnoses of Autism, Asperger's and Pervasive Developmental Disorders-Not Otherwise Specified. Using the Y-BOCS, and the Ritvo-Freeman Real-Life Rating Scale to measure symptoms and the Self-Injurious Behavior

Questionnaire was also used (Soorya et al., 2008). Children with diagnoses of Autism had an 89% positive response to Sertraline. This shows that it is important for future controlled investigations on children with the use of Sertraline in the PDD population.

Citalopram is a highly selective SSRI with the brand name Celexa. Being highly selective means that the neurotransmitter serotonin receptor sites are more selective on which serotonin neurotransmitter is taken in to the receptor site. Using the CGI Scale, many of the children treated with Citalopram improved. It was found that the longer the child was on the SSRI, the more positive the response. The dosage the child was on did not make a difference (Soorya et al., 2008). Anxiety, repetitive behaviors and stereotypies were responsive to the treatment. In an open label chart review, 15 children and adolescents were included. Of the 15 cases 11 improved and ten of these showed improvement in anxiety. Results from this trial represent the largest evaluation of a psychopharmacological intervention in PDD (ASD) literature to date (Soorya et al., 2008).

Escitalopram (brand name, Lexapro) is similar to Citalopram. It is highly selective for the serotonin reuptake site. A ten-week open label trial was conducted to focus on Escitalopram's impact on global severity and irritability. Twenty-eight individuals were included and 17 of them were less irritable. Researchers reported that improvement was observed with the CGI scale (Soorya et al., 2008). Reports suggest a promising

safety, tolerability and efficacy, yet larger-scale controlled trials still need to be conducted.

In conclusion SSRI/SRIs, have been repeatedly shown to be effective in treating repetitive behaviors. They have also shown to be effective for anxiety and lethargy. Different SSRI/SRIs are more tolerated in younger children others. This also could depend on the severity of behaviors and symptoms the SSRI/SRI is to treat.

Clonidine

Clonidine is not an SSRI/SRI but is another pharmacological treatment for Autism and Asperger's Disorder. Clonidine is a medication that has more than one use. It has been used with sleep maintenance and the initiation of sleep and has also been used for controlling high blood pressure. It can also be used for hyperactivity and impulsivity or sedation. Ming, Gordon, Kang and Wagner (2008) investigated the use of Clonidine in children with Autism and Asperger's.

The study from Ming et al. (2008) was a pilot study, which used parental report to measure any changes and the efficacy of Clonidine in the treatment of Autism. It is an important study because it is the only study on Clonidine. A limitation of this study is that it uses a subjective measure of parental report. Diagnoses of Autism were made based upon the DSM-IV criteria, and four other subjects had additional testing for Autism. The Autism Diagnostic Interview-Revised (ADI-R) is a widely used method for

diagnosing Autism, Asperger's and other PDD's (Ming et al., 2008). The other method used was the Autism Diagnostic Observation Schedule-Generic.

This is a pilot study so more experiments need to be conducted before coming to a more confident conclusion. From Ming et al., (2008) Clonidine was reported to work for irritability, stereotypy, hyperactivity, and inappropriate speech according to the parents but not the clinicians. From the clinicians standpoint based on this study, Clonidine would probably not be prescribed as a treatment for Autism or Asperger's because of non-statistically significant findings. Appendix A includes a table for the studies for the effectiveness of psychopharmacological treatments.

Discussion

A good direction to take this information for the efficacy of treatments is to see what happens when some of the treatments are combined, for example, SSRI's help in areas that Clonidine doesn't and vice versa. What would happen if the two treatments were used together? What would the effects be?

There are so many different treatments for Autism and Asperger's disorder that it can be difficult to pick the best one or many treatments that will effectively work for the individual. To chose the best treatment or treatments for the child, it really depends on how impaired and in what areas the impairments are. The correct treatment is one that works for the child and the family.

In many of the CAM treatments there has not been sufficient experiments. There may be potential that they work, but no conclusions can come from one case study. Double blind, placebo controlled randomized studies of large heterogeneous samples need to be conducted to be able to confidently come to a conclusion.

There are also treatments like the GFCF diet where parents say that it helps and treats Autism, but there is no scientific empirical evidence that claims it works. The GFCF diet did not work. It comforts the parents because it is so strict and it follows a strict routine. Children respond well to that strict routine and not the diet itself.

With the information in this literature review, it is important to conduct further experiments of double blind controlled studies. These are the best type of studies to get a conclusion if the treatment actually works or not. It is also important to know that the time it took for me to research and analyze my research for this literature review, more research has been published. This literature review contains literature that has been published up to early 2009.

Glossary

Asperger's: a high functioning ASD.

Autism: a brain developmental disorder, which is characterized by social communication and may have repetitive behaviors. The signs and symptoms occur usually by the age of three.

Autism Spectrum Disorders (ASD): also known as Pervasive Developmental Disorders (PDD). A spectrum of disorders that have impairment in thinking, feeling, language and the ability to relate to others.

Dopamine: is an important neurotransmitter in the brain and is a precursor to adrenaline

Self-Injurious Behavior: a behavior that can inflict harm on themselves. It usually happens when emotions are high and the person is not sure how to cope with the emotion.

Serotonin: is a neurotransmitter in the brain that is closely related with mood. High serotonin levels may lead to symptoms of depression.

Stereotypy: a symptom of Autism. A form of repetitive movement or speech.

Theory-of-Mind: the ability to attribute mental states to other people and realize that they may and can be different from your own.

Tryptophan: is used to synthesize the protein that comes from foods like turkey, red meats and tuna.

Tyrosine: is a building block for neurotransmitters such as epinephrine, norepinephrine, serotonin, and dopamine

Medications

Clomipramine: a tricyclic antidepressant, not completely an SSRI. It is frequently used for obsessive-compulsive behaviors.

Clonidine: a medication to treat hypertension (high blood pressure). Used as a treatment for sleep initiation and sleep maintenance.

Haloperidol: is an anti-psychotic that can be used to treat stereotypies.

Fluoxetine: an anti-depressant commonly called Prozac. It is also an SSRI, these help with depression and obsessive-compulsive habits.

Fluvoxamine: an anti-depressant commonly called Luvox. It is a selective serotonin reuptake inhibitor (SSRI).

Risperidone: an antipsychotic that interferes with the communication of nerves in the brain. For autistics, it is used to treat irritability.

Secretin: a hormone in the small intestine. It stimulates the secretion of bile from the liver. It is also known to maintain and promote growth of the pancreas.

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Appendices

Appendix A

Table 1

Effectiveness of Psychopharmacological Treatments

Study	Symptom Targeted	Treatment	Assessment Tools	ASD Diagnosis	Findings
McDougle et al. 2009		Risperidone	Y-BOCS, SIB-Q, Ritvo-Freeman	DSM-IV, Autism Diagnostic Interview, Autism Diagnostic Observation Schedule, consensus of 2 psychiatrists	Risperidone helped in most areas analyzed.
Soorya et al. 2008	Repetitive behaviors	SRI/SSRI atypical antipsychotics	ADI-R, Y-BOCS, RBS-R, Ritvo-Freeman	Not specified	
Ming et al. 2008	Sleep disturbance hyperactivity impulsivity	Clonidine	Parental-reports	ADI-R, ADOS-G,	Helped with sleeping

Appendix B

Table 2

Effectiveness of Complementary Alternative Medicine Treatments

Study	Symptom Targeted	Treatment	Assessment Tools	ASD Diagnosis	Findings
Levy et al., 2008	Core symptoms	Complementary alternative medicine	Not specified	Not specified	More research and studies need to be done in many areas
Esch & Carr, 2004	Impairment in social interaction, communication, repetitive or stereotyped behaviors	Secretin	Autism Behavior Checklist; Clinical Global Impression Scale; Vineland Adaptive Behavior Scale; Treatment Emergent Symptoms Scale	Not specified	Not effective in treating these symptoms

Appendix C

Table 3

Effectiveness of Dietary Treatments

Study	Symptom Targeted	Treatment	Assessment Tools	ASD Diagnosis	Findings
Elder et al. 2006	Social interaction, communication, resistance to change, repetitive behaviors and stereotyped patterns	GFCF Diet	Childhood Autism Rating Scale (CARS) & Ecological Communication Orientation Scale (ECOS)	DSM IV, Autism Diagnostic Interview Revised (ADI-R)	Pilot study. Nothing empirical support for diet, but anecdotes from parents reported improvements in language, decreased hyperactivity and decreased tantrums
Arnold et al. 2003	Amino acid profiles	Regular diets, unrestricted diets, GFCF diet		DSM-IV, CARS, Pervasive Developmental Disorders Screening Test	No specific amino acid profile was found in autistic children Both groups did have poor protein nutrition