

Ideal Treatment Model for Children Diagnosed with ADHD

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ABSTRACT

This paper proposes an ideal treatment model for children diagnosed with Attention Deficit Hyperactivity Disorder (ADHD) whose symptoms include inattention, hyperactivity, and impulsivity. Medication, which most patients have relied on to cope with ADHD, is clinically effective but at the same time imposes a heavy financial burden and carries high risks for side-effects. Responding to this issue, professionals recently began to examine various psychotherapeutic and dietary treatments as alternatives. While research studies show some correlation between these treatments and symptomatic improvement, their evidentiary base is yet too small to be considered effective. Given the current situation in which more than seven percent of America's schoolchildren are diagnosed with ADHD, it is critical to capacitate the public with the ability to discern desirable treatments from undesirable ones and tailor a treatment plan that accommodates the patient's individual conditions such as medical history and personality. Therefore, this paper synthesizes related scientific literature to analyze the three aforementioned treatments in terms of effectiveness, side-effects, and financial cost and finally proposes an ideal five-stage treatment model that integrates at-home and professional therapies.

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I. Introduction

Attention Deficit Hyperactivity Disorder (ADHD) is a common neurobiological disorder from which currently around 7% of American schoolchildren suffer (Freedefeld, 2010). According to the Diagnostic and Statistic Manual of Mental Disorders, the symptoms of ADHD fall into the following categories: lack of attention, hyperactivity, and impulsivity (American Psychiatric Association, 2000). Children with ADHD may display inattentive symptoms such as not paying attention to details, having difficulty completing or concentrating on tasks, failing to follow instructions and being unable to stay organized (American Psychiatric Association, 2000). Next, hyperactive symptoms include fidgeting, inability to stay calm, and excessive talking (American Psychiatric Association, 2000). Lastly, symptoms such as blurting out answers before questions have been fully stated, experiencing difficulty waiting for turns, and intruding upon others during conversations fall under the umbrella of impulsivity (American Psychiatric Association, 2000).

In order to treat this disorder, patients have traditionally focused on consulting medication such as psychostimulants (Jacobson, 1999). However, as many research studies began revealing the severity of the side-effects of such medicines, dietary and psychotherapeutic therapies have been receiving close attention as possible alternatives (Kottow, 1992). Given this situation, it has become necessary to comprehensively evaluate the advantages and disadvantages of the currently available ADHD treatment modes and advise the public with a new treatment plan. In this research paper, the three aforementioned treatment modes were analyzed with regards to clinical effectiveness, side-effects, and financial cost.

These criteria were selected as the yardsticks to gauge the desirability of each treatment because they are easily analyzed based on publicly available literature. Furthermore, by appropriately incorporating the three routes of treatment, an ideal model that minimizes side-effects and financial costs and maximizes clinical effects was proposed. The model consists of preventive, consultative, parent training, psychotherapeutic, and pharmacological stages.

The ideal treatment model proposed in this research paper is significant because it not only synthesizes three different, unrelated treatment modes but also takes into account the relative advantages and disadvantages of each category. Also, while the majority of the previously published scientific literature took for granted and emphasized the professional aspects of treating children with ADHD, the model prioritizes at-home remedies and parental training before professional psychotherapy and medication. Furthermore, it encourages the parent to acknowledge that he or she is ultimately responsible for tailoring a treatment plan that best accounts for the child's conditions and individual household's financial plan, rather than solely relying on professional help.

It is important to note that the scientific sources cited in this paper and the research paper itself

II. Method of Research

The majority of the research consists of the meta-analysis of previously published scientific literature pertaining to the pharmacological, psychotherapeutic, and dietary treatments of ADHD. All sources, with the exception of the one written by M. Kottow (1992) on the difference in perception between classical and alternative medical practices, are from the 2000s and contain contemporary statistics and experiments. The sources regarding the pharmacological treatments provide background knowledge about the different classes of drugs, their mechanisms of action, and side-effects, which function as the basis of determining the clinical

effectiveness and overall desirability of such treatments. The sources on psychotherapeutic treatments discuss major at-home and professional strategies that can be employed to alleviate a child's ADHD symptoms. While some sources go as far as defining and introducing such strategies, others provide more information regarding their relative clinical effectiveness. Lastly, the sources on dietary treatments contain not only basic information about the two types of diets discussed in this paper—Feingold and Artificial Food Dye Diets—but also meta-analysis of previously conducted experiments on the validity of such dietary treatments.

It is important to note that the sources cited in this paper and the paper itself focuses on the situation in the United States and Western countries. The choice to do so was made due to the lack of publicly available literature that contain information about the situation and treatments of ADHD in Korea; the literature on the medication, therapies, and diets employed in Western countries, mostly the United States was more accessible and abundant. Therefore, the ideal treatment model presented in this paper may not be generalized to other countries including Korea.

III. Discussion of Theory

1. Pharmacological Treatments

Commercial medicine is today the most scientifically supported mode of ADHD treatment. Not only do a great number of scientific research studies support the clinical effectiveness of ADHD drugs, health professionals commonly prescribe them as the first resort. However, they can be hazardous to children as they cause various common side-effects, some of which affect children for the rest of their lives. This section discusses some of the most prominent forms of ADHD medication by examining mechanisms of action, side-effects, brand-name drugs, and financial costs.

1) Psychostimulants

The most common class of ADHD drugs is psychostimulants, which stimulate the central nervous system so as to produce wakefulness and alertness. Stimulant drugs include the subcategories of methylphenidates and metamphetamines (Drugs and Alcohol Services South Australia, 2006).

(1) Methylphenidates

A. Mechanism of Action

Methylphenidate is a molecule that alleviates symptoms of ADHD by increasing levels of dopamine and norepinephrine, which are critical to attention and behavior regulation (Mlekuz & Spadafora, 2010). Also, a research study has discovered that methylphenidate elicits attention and better performance during a cognitive task by assuring efficiency in the brain by reducing glucose breakdown in areas that are irrelevant (Mlekuz & Spadafora, 2010). However, it is important note that methylphenidates do not have long-lasting effects despite their established effectiveness in controlling short-term behavior (Consumer Reports, 2012).

B. Side-effects

Despite its wide acceptance by ADHD patients, using methylphenidate drugs implies many side-effects. Some of the most common ones include nervousness, nausea, loss of appetite, diarrhea, and dry mouth (American Society of Health-System Pharmacists, 2012). Also, in children, it may stunt growth or cause weight gain (Consumer Reports, 2012). Furthermore, in rare, severe cases, it may cause sudden deaths or heart attacks in children and teenagers with heart problems (Mlekuz & Spadafora, 2010).

(2) Amphetamines

A. Mechanism of Action

Similar to methylphenidate, amphetamine produces stimulant effects by increasing the availability of dopamine and norepinephrine due to their similarities in chemical structure (Lundbeck Institute, 2003). It not only hinders transporter molecules from carrying away dopamine and norepinephrine, but also blocks the breakdown of excess dopamine and norepinephrine by the enzymes in neurons (Lundbeck Institute, 2003).

B. Side-effects

Statistics show that 26% of amphetamine-derived drug users experience headache as a general side-effect (Amphetamine, 2013). It may also cause depression, restlessness, dizziness, and motor and phonic tics (Amphetamine, 2013). In severe cases, it may cause sexual impotence (Amphetamine, 2013).

2) Non-psychostimulants

(1) Guanfacine

A. Mechanism of Action

Guanfacine's general mechanism of action of in alleviating ADHD symptoms is different from that of methylphenidate and amphetamine because it is not a psychostimulant (Consumer Reports, 2012). Rather, it manipulates blood flow in the central nervous system to enhance executive functions and cognitive tasks (Levin, 2007). For instance, when guanfacine was administered to monkeys in an experiment, it increased blood flow into the regions of the brain responsible for working memory (Levin, 2007). Research studies have demonstrated that the clinical effectiveness of guanfacine is enhanced when it is used in conjunction with a psychostimulant drug (Consumer Reports, 2012).

B. Side-effects

The most common side-effects include drowsiness, dizziness, dry mouth, and decreased blood pressure (Children's Hospitals and Clinics of Minnesota, 2011). It is recommended that the patient increase the dose gradually and do not take guanfacine with another drug for high blood pressure because such action

may elicit serious decrease in blood pressure and heart rate (Consumer Reports, 2012).

2. Psychotherapeutic Treatments

Although commercial ADHD drugs are backed up by scientific research and specific mechanisms of action by which drug molecules directly influence the chemical dynamics in the central nervous system, they carry various common side-effects and lack long-term effectiveness. Therefore, some health professionals defer to non-pharmacological treatments such as psychotherapy.

Among the numerous psychotherapeutic methods currently used to treat ADHD, many professional organizations including the National Institute of Mental Health have agreed that behavioral therapy is the only one with sufficient base of scientific evidence (National Resource Center on ADHD, 2004). Behavior therapy can be described by its “ABC,” or its three key components: antecedents, which set off the child’s behavior; behaviors, which need to be changed; and consequences, which directly follow the behaviors (National Resource Center on ADHD, 2004). While there exist many variations of behavioral therapy, they are all designed to employ reinforcement strategies for positive behaviors and consequences for undesirable behaviors (Department of Education, 2003). The most widely used behavioral approaches include “behavioral training for parents and teachers, a systematic program of contingency management, clinical behavioral therapy, and cognitive-behavioral treatment” (Department of Education, 2003).

1) Contingency Management

Contingency management mainly focuses on the consequences (“C” from the “ABC”) in order to modify the child’s undesirable behaviors (Brock, 2002). The key components of contingency management are external reinforcement, time-out, response-cost program, and token economy (Department of Education, 2003).

2) External Reinforcement

Generally, the purpose of this component of contingency management is to employ direct teaching strategies to elicit positive behaviors and apply direct consequences for undesirable behavior (Department of Education, 2003). While only positive reinforcement was emphasized in the past, it has become important to incorporate negative consequences into this component as they have been proven to be effective in terms of behavior internalization (Brock, 2002). Time-outs, which remove the positive reinforcement of being involved in classroom activities or other collective tasks, are especially useful in decreasing disruptive or disrespectful behaviors in school (Brock, 2002). However, teachers and parents need to note that negative consequences should not be delivered in a manner in which the child would be embarrassed and that the balance between positive and negative consequences should be maintained (Brock, 2002). Research studies demonstrate that intensive contingency management programs conducted in specialized classrooms and summer camps controlled by professionals are highly effective (Department of Education, 2003).

3) Response-Cost Program

While external reinforcement mostly focuses on administering positive consequences, the purpose of response-cost program is to decrease undesirable symptoms of ADHD by concentrating on exercising mild negative contingencies (Brock, 2002). It has been proven that these programs are more effective when used in conjunction with token economies, which involve giving out tokens, in lieu of direct consequences, that can be exchanged for gifts or privileges (Brock, 2002).

4) Parent Training

Parent training, or parent behavior management, is the education provided to parents with children diagnosed with ADHD in order to improve their ability to

regulate undesired behavioral patterns and encourage positive development in their children (Hazell, 2000). Although it is not difficult for parents to access training or other means of education regarding behavior modification and implementation of homemade programs, professional help is often required (National Resource Center on ADHD, 2004). With professional psychiatrists, parents are typically offered six to twelve informative sessions (Hazell, 2000). During such professional sessions regarding parent training, diverse topics are covered such as the following: building house rules, learning to praise and reinforce appropriate behavioral patterns, using desirable commands, planning drills for emergency situations with children in public spaces, and tracking behavior and performance in school (National Resource Center on ADHD, 2004). After the training sessions, parents are encouraged to replicate the aforementioned methods at home (National Resource Center on ADHD, 2004).

As parental interventions are means of treating children with ADHD in an indirect manner, it is difficult to assess their clinical effectiveness; therefore, relatively few studies exist regarding this behavioral therapy (Hazell, 2000). Yet, many professionals assert that active participation in parent training will eventually result in a child with improved interpersonal relationships with family members and peers (National Resource Center on ADHD, 2004).

5) Cognitive Behavioral Therapy

In general, cognitive behavioral therapy (CBT) is a combinatorial form of psychotherapy that focuses on the interactions between the patient's thoughts and behavioral patterns (Somers, 2007). Specifically looking at ADHD, due to the lack of long-term effectiveness of ADHD drugs, professionals recently began to focus on CBT for treating ADHD in children (Shute, 2010). Currently, psychotherapists practicing CBT use praise and tangible rewards to motivate children with ADHD to reduce their oppositional symptoms and enable proper functioning in school and at home (Shute, 2010). For instance, a therapist may train children with re-

gards to managing time, concentrating on school-related tasks, and establishing daily routines (Shute, 2010). CBT for ADHD typically lasts for twelve weeks of sessions, while some families continue for nine months (Shute, 2010). This is not considered to be prolonged as CBT is time-limited and lasts for ten to twenty sessions in most cases (Somers, 2007).

Besides being a time-limited treatment and a useful, nonmedical means of controlling ADHD symptoms, CBT is also becoming popularized due to the growing access to qualified practitioners (Shute, 2010). Since the advent of psychotherapy, many families have been concerned with where and from whom they could receive treatment; however, several large organizations, such as the Duke Child and Family Study Center in North Carolina, now provide CBT (Shute, 2010). Furthermore, online therapist finders provided by organizations such as the Association for Behavioral and Cognitive Therapies help families locate therapists in their respective areas (Shute, 2010).

Many researchers view CBT with positivity because studies have demonstrated that medical treatment works well with CBT and that CBT alone is also effective in treating many psychological disorders such as depression and obsessive compulsive disorder (Somers, 2007).

3. Dietary Treatments

Many pediatricians and psychologists shifted their attention to the possibility of improving ADHD symptoms including hyperactivity by altering diet plan. The reasons are similar to those behind the shift to psychotherapy. One important reason behind this shift is the skepticism toward the safety and long-run clinical effectiveness of psycho-stimulant drugs (Jacobson, 1999). Although psychiatrists commonly prescribe psycho-stimulant drugs such as Ritalin, several experiments testing the adverse effects of such drugs on animals have demonstrated that severe problems, such as brain tumor, can arise as a result of drug use (Jacobson,

1999). Another reason behind this shift is the belief that the causes of ADHD, although not completely known today, are multifaceted: Advocates of dietary treatments choose to concentrate on eliminating environmental factors that alter the concentrations of dopamine and norepinephrine in the brain (Stevens, et al., 2010). More specifically, these researchers intend to examine how certain foods and additives trigger hypersensitive and intolerant behavior (Stevens, et al., 2010). The two most well-studied and widely known diet plans that will be discussed are the Feingold (Kaiser-Permanente, K-P) Diet and Artificial Food Dye Diet (Stevens, et al., 2010).

1) Feingold Diet

(1) ADHD and Salicylates

Although acetylsalicylate, which is a specific form of salicylate, is a common cure for headache, people have displayed adverse reactions, both physical and psychological, to many other forms of salicylates (Feingold Association, 2011). The connection between ADHD and salicylates is not a clear one; yet, according to the information provided by the Feingold Association of the United States, many families have experienced improvement in their child's hypersensitive symptoms by eliminating them from the diet (Feingold Association, 2011).

(2) Content of the Feingold Diet

The key component of the Feingold Diet is avoiding any kind of food that contains natural salicylates (Stevens, et al., 2010). Some of the foods disapproved by the Feingold Association include almonds, currants, plums, prunes, cloves, apples, grapes, raisins, tangerines, coffee, apricots, cucumber, pickles, teas, berries, oranges, green peppers, oil of wintergreen, cherries, peaches, and tomatoes (Stevens, et al., 2010). In addition to avoiding foods containing salicylates, children with ADHD are advised against consuming artificial colors and flavors in foods, medications, and cosmetics (Stevens, et al., 2010). Moreover, preservatives such as butylated hydroxyanisole (BHA) and butylated hydroxytoluene (BHT) are

also disapproved (Stevens, et al., 2010).

(3) Effectiveness

In 1976, Conners and his colleagues were the first ones to conduct scientific research on the effectiveness of Feingold Diet (Stevens, et al., 2010). In the experiment, they used fifteen hyperactive children, half of which were assigned to four weeks of the Feingold diet and to four weeks of the control diet, and the other half of which were assigned first to four weeks the control diet and to four weeks of the Feingold diet afterwards (Stevens, et al., 2010). In order to maintain a double-blind design, the researchers designed the control diet so as to match the Feingold Diet in terms of the difficulty of food preparation and similarity in food groupings (Stevens, et al., 2010). When parents were asked to rate their children's hyperactivity, those administering the Feingold Diet at the time rated their children as being less hyperactive, whereas those administering the control diet did not (Stevens, et al., 2010). Furthermore, teachers at school saw more notable improvement in the children's hyperactive behaviors (Stevens, et al., 2010). With the parents' ratings having a p-value of less than 0.01 and those of the teachers less than 0.001, the overall results of the experiment were statistically significant; however, "only four to five children were rated as improved on both parent and teacher ratings" (Stevens, et al., 2010). Such results indicate that, while the Feingold Diet is effective in alleviating hyperactive symptoms, its effectiveness greatly varies by child. It can also be concluded that four weeks is not long enough to test its true effectiveness.

2) Artificial Food Dye Diet

(1) Concept

This dietary treatment is similar to the Feingold Diet in that it attempts to alleviate symptoms of ADHD by removing a certain class of food from the child's diet. However, it is also unique in that it solely concentrates on alleviating hyperactive behaviors by eliminating artificial food colorings. Most important color-

ings include “allura red, erythrosine, brilliant blue, indogotine, tartrazine, and sunset yellow” (Stevens, et al., 2010).

(2) Effectiveness

The majority of relevant experiments followed the same process in testing the effects of artificial dyes on children’s hyperactivity. After a baseline diet free of all artificial food colorings (AFC’s), subjects were “challenged” by a mixture of AFC’s or a placebo under a double-blind setting (Stevens, et al., 2010).

An important experiment was conducted by Goyette and his colleagues in 1978. In the first part of the experiment, Goyette and his fellow researchers recruited sixteen hyperactive, diet-responsive children between the ages of four and eleven to go on a diet completely free of AFC’s (Stevens, et al., 2010). At the end of the testing period, parents and teachers reported that children’s hyperactive problems were reduced by 57% and 34%, respectively (Stevens, et al., 2010). In the second part, Goyette and his colleagues performed a double-blind experiment on thirteen children who had experienced an average of 45% decrease in hyperactivity in the previous experiment. Results demonstrated that more immediate problems were observed following an AFC challenge rather than a placebo challenge (Stevens, et al., 2010). Based on comprehensive results, the researchers concluded that “artificial colors do indeed act to impair and disrupt the behavior of children” (Stevens, et al., 2010).

(3) Skepticism

In Swanson and Kinsbourne’s experiment in 1980, eight significantly hyperactive patients were placed on two days of baseline diet and three days of double-blind 100mg AFC and 26mg AFC (placebo) challenges (Stevens, et al., 2010). Afterwards, the participants were observed while engaging in a laboratory learning task (Stevens, et al., 2010). Although results indicated that participants challenged with 100mg of AFC’s erred more, no significant treatment effect for the placebo was observed (Stevens, et al., 2010). Such finding may suggest that, while consuming large amounts of AFC’s is impairing, eliminating them from a

patient's diet does not help lessen hyperactive symptoms.

III. Comprehensive Evaluation of the Three Treatment Modes

Prior to constructing the treatment model for children with ADHD, pharmacological, psychotherapeutic, and dietary treatments were comprehensively evaluated with regards to clinical effectiveness, side-effects, and financial cost. Although other factors also determine the desirability of a treatment, the three aforementioned ones were used as they can easily be analyzed with published literature.

1. Clinical Effectiveness and Side-effects

As far as effectiveness is concerned, pharmacological treatments, or commercial drugs, are the best among the three. This is because the mechanism of action by which an ADHD drug functions has to be scientifically proven before it is commercialized. For instance, methylphenidate, which is a major class of psychostimulant drugs, reduces symptoms of ADHD by inhibiting the reuptake of dopamine and norepinephrine, which are hormones integral to attention and behavior regulation (Mlekuz & Spadafora, 2010). Based on extensive studies on ADHD drugs, researchers have concluded that they are highly favorable in providing short-term symptomatic improvement while they are active in the body (National Resource Center on ADHD, 2008). The existence of favorable studies—most likely funded by pharmaceuticals themselves—make drugs trustworthy even in the advent of alternative treatments as society tends to adhere to the preexisting norm when faced with new circumstances (Kottow, 1994). However, no drug has ever been proven to help ADHD in the long run despite its effectiveness in controlling short-term behavior (Consumer Reports, 2012).

As psychotherapeutic and dietary treatments only recently emerged, little re-

search has been conducted to draw a decisive conclusion regarding their effectiveness. Yet, psychotherapy is more scientific than dietary treatments because psychotherapy itself has been around for a considerable amount of time; it is the application of psychotherapy to ADHD that is new with respect to pharmacological treatments. Still, many professional organizations including the National Institute of Mental Health have agreed that behavioral therapy has a sufficient base of scientific evidence (National Resource Center on ADHD, 2004). Behavioral therapy provides parents and teachers with realistic, tangible methods, such as response-cost programs and parent training, to regulate and discourage children's ADHD symptoms (Brock, 2002). Also, "contingency management conducted in specialized classrooms and camps with [professionals] have been found to be highly effective" (Department of Education, 2003).

While dietary treatments well establishes an association between particular food groups and hyperactive symptoms of ADHD, there is insufficient information about whether eliminating certain food groups, such as salicylates or AFC's, is actually effective. Although several studies, such as the one conducted by Conners and his colleagues, do name the improvements made by dietary treatments statistically significant, researchers still doubt dietary treatments' effectiveness (Stevens, et al., 2010). Not only does the magnitude of improvement vary greatly by child, dietary treatments accomplish nothing if the child is unresponsive to changes in his or her diet plan (Stevens, et al., 2010).

2. Side-effects

With regards to clinical effectiveness, commercial drugs may seem the most desirable; however, their inability to induce long-lasting improvements and implication of various side-effects complicate the issue. While ADHD drugs, such as methylphenidates, amphetamines, and guanfacines, induce immediate short-term improvements, using them implies many common side-effects. For instance,

approximately 26% of amphetamine users experience headache as a general side-effect (Amphetamine, 2013). Also, patients who take methylphenidates commonly experience nervousness, nausea, diarrhea, and dry mouth (American Society of Health-System Pharmacists, 2012). Moreover, some severe side-effects include sexual impotence, depression, and tics (Amphetamine, 2013). Patients with heart problems are especially advised to be cautious with taking ADHD medications (Mlekuz & Spadafora, 2010).

Despite the fact that commercial drugs have the largest base of clinical evidence, the common and numerous side-effects they entail stop them from automatically being the best solution to treating children with ADHD. Therefore, other factors like financial cost and accessibility should also be considered.

3. Financial Cost

Financial cost is an important factor in determining the desirability of a treatment because it significantly affects a family's budget plan and finance. It should be considered with respect to clinical effectiveness because different treatment options within a certain price range may result in varying magnitudes of symptomatic improvement.

Dietary treatments are the most affordable among the three treatment categories. They do not financially burden families because changing the components of a child's diet does not necessarily require allocating more money for groceries. Families do need to pay consultation fees if they wish to consult and receive information from dietitians or other health professionals, such as the Feingold Association. However, a significant amount of information regarding the Feingold Diet, Artificial Food Dye Diet, and other types of eliminative diets is available on the internet, free of charge. By gathering free, accredited information, which ranges from scientific papers to professional advice from health organizations, parents can learn to manage their children's diet and prohibit the intake of sub-

stances that worsen hyperactive symptoms. Although it has not yet been proven how exactly eliminating salicylates and artificial colorings contribute to alleviating hyperactivity, the low financial burden of dietary treatments makes them attractive candidates. Still, families must remember that some children are more diet-responsive than others (Stevens, et al., 2010).

Some psychotherapeutic treatments can be financially appealing because they can be learned and practiced at home by parents themselves. For instance, token economies, which are a type of external reinforcement technique that involves giving out tokens in lieu of direct consequences, can be adapted at home in order to give children the incentive to control their hyperactive and disrespectful behavior (Brock, 2002). Also, simple negative reinforcement strategies, such as time-outs and bans from privileges, can be helpful if properly implemented (Brock, 2002). However, although these methods are advantageous in that they are free and easily applicable, the child's behavior may remain constant or worsen if a parent incorrectly implements them. Furthermore, professional sessions that administer parent training and CBT, cost a considerable sum of money (Department of Education, 2003). For instance, a typical CBT program for children with ADHD in the state of Washington cost approximately \$963 in 2011 (Washington State Institute for Public Policy, 2012). As families typically receive more than twelve weeks of sessions, the financial cost can grow overwhelming (Shute, 2010).

Pharmacological treatments are the most financially burdensome because commercial drugs are generally expensive and require frequent intakes. For instance, 20mg tablets of Methylin, which is a brand containing methylphenidate, cost approximately \$516 per year (Consumer Reports, 2012). 10mg tablets of Ritalin, which is another widespread brand of methylphenidate, cost \$1,032 per year (Consumer Reports, 2012). More advanced forms of these drugs cost even more; for instance, 10mg sustained-release capsules of Ritalin cost \$2,148 per year (Consumer Reports, 2012). Although generic forms of these drugs are more affordable, their different coatings and additives may result in side-effects and

other problems (Ramsey, Robinson, Segal & Smith, 2013). Once a child begins using a certain ADHD drug, it is not easy to stop medication or switch to another drug because such actions can result in side-effects; also, ADHD drugs do not induce long-lasting improvements (Consumer Reports, 2012). For these reasons, families have no other choice than to continue to pay for the high prices of ADHD medication. Despite the drugs' large evidentiary base of short-term effectiveness, their high costs make families reluctant to choose pharmacological treatments.

IV. Ideal Treatment Model

Based on the analysis of the advantages and disadvantages of the three treatments, an ideal five-stage treatment process was devised for families with children diagnosed with ADHD to follow. This treatment model is named "ideal" because different circumstances such as finance and accessibility to certain ADHD treatments vary from family to family.

1. Preventive Stage

During this stage, the parent carefully observes the child's behavior and searches for symptoms of ADHD according to the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV-TR) published by the American Psychiatric Association. If, based on observations and the DSM-IV-TR, the parent decides or suspects that the child should be diagnosed with ADHD, the instructions of this preventive stage should be followed before seeking professional help.

This stage consists of dietary and non-professional psychotherapeutic treatments. If the child's symptoms lean toward the "hyperactive-impulsive" category, the parent follows the Artificial Food Dye Diet by removing AFC's from the child's diet plan such as "allura red, erythrosine, brilliant blue, indogotine, tartrazine, and sunset yellow," which are found on the nutrition labels of market

products (Stevens, et al., 2010). The intended goal of such diet is to prevent the child's symptoms from becoming aggravated, as scientific research has shown that excess consumption of AFC's leads to hyperactive behavior (Stevens, et al., 2010). Along with the Artificial Food Dye Diet, the parent follows the Feingold Diet, which is also designed to ameliorate hyperactive behavior by eliminating salicylate-containing food from the child's diet (Stevens, et al., 2010). However, the parent should take caution against strictly adhering to the Feingold Diet because it eliminates food that provides valuable nutritive materials such as vitamins and unsaturated fat (Stevens, et al., 2010).

On the other hand, behavioral treatments are useful for preventing and treating both inattentive and hyperactive symptoms. Here, the parent employs at-home strategies that require no professional intervention. The most well-known technique is contingency management, which focuses on the consequences of the child's undesirable behaviors (Brock, 2002). In other words, the parent encourages the child to be attentive and control behavior by administering positive consequences and discourages the child from performing undesirable, disrespectful behavior by administering negative consequences. Effective examples of contingency management include time-outs and token economies (Department of Education, 2003). The awards and punishments given out by the parent must be determined according to the child's personality and daily routine so that they are important enough to elicit behavioral improvements. Furthermore, the parent meets with the child's schoolteacher to seek cooperation in exercising such consequences in order to improve the child's behavior in an academic environment as well as at home.

The aforementioned dietary and psychotherapeutic treatments are appropriate preventive measures because they are not financially burdensome and are easily carried out with little professional resources. They can be especially appropriate for children who easily learn from consequences and are diet-responsive (Stevens, et al., 2010). The preventive stage ends at a different time for each family

based on the child's symptoms and the parent's perception of their severity.

2. Consultative Stage

If the parent sees little improvement in the child by implementing dietary and non-professional psychotherapeutic strategies in the first stage or wants to incorporate medication or professional psychotherapy into the treatment plan, consultation with a professional must occur beforehand. The term "consultation" does not refer to parent training or psychotherapy; it signifies a meeting with a psychiatrist, health professional, or ADHD specialist to discuss future treatment plans. It is important to undergo this step before receiving any kind of professional help because not only are there many options available, different ones are suitable for different children depending on their symptoms and health conditions.

Aside from choosing whether the child is better off receiving therapy or going on medication or both, the parent and professional need to discuss the child's behavior to diagnose him or her with ADHD and then consider a number of factors to determine the child's future treatment plan. The parent should ask the professional several key questions to weave the most appropriate treatment. An important question to ask is whether the child can manage his or her symptoms without taking medication (Ramsey, Robinson, Segal & Smith, 2013). The answer to the question is critical because, if the child's symptoms are not severe enough to necessitate regular medication, the family does not have to experience the large financial cost and common side-effects that it entails.

However, if the child needs medication, the parent should ask the professional to recommend specific drugs based on the child's medical history and specific symptoms because, among various drugs prescribed to manage ADHD, some are clearly more suitable than others for the child. For instance, children with known heart problems are recommended against using psycho-stimulants because they have been found to cause sudden deaths in children with heart problems in rare

cases (Consumer Reports, 2012). For another instance, children with inattentive problems are better off taking a drug other than blood pressure medications such as guanfacine because they are only helpful in managing hyperactivity and impulsivity (Ramsey, Robinson, Segal & Smith, 2013). Also, if the child also happens to suffer from depression, taking antidepressants instead of ADHD-specific drugs is recommended (Ramsey, Robinson, Segal & Smith, 2013). As sensitivity to different side-effects, medical history, and specific symptoms greatly influence which medication suits the child, this issue should be discussed in great depth.

If therapy is recommended for the child, the parent and professional should decide which type of therapy the child will undergo and for how long. This is important because, similar to medication, different therapies result in varying levels of improvement based on the child's personality traits and symptoms.

If medication was recommended, the family skips to the fifth and final stage of the treatment model. On the other hand, if therapy was recommended, the family proceeds to the fourth stage. All parents are recommended to undergo the third stage.

3. Parent Training Stage

As a parent whose child has been diagnosed with ADHD by a professional, knowledge of ADHD, child's symptoms, at-home strategies applicable at home, therapy, medication, and possible side effects is crucial. Therefore, during the third stage, the parent attends individual or group parent training sessions—based on preference and financial situation—in order to acquire such information.

During the training sessions, the parent is educated on how to implement at-home programs, such as establishing house rules, using appropriate commands, and devising drills for emergency situations in public (Hazell, 2000). Through these sessions, the parent becomes capable of modifying such strategies to suit the family's various living conditions and incorporate them into the techniques that began during the preventive stage.

Although the Australian Early Intervention Network for Mental Health in Young People concluded that parent behavior management has only moderate effectiveness in reducing undesirable symptoms, it is expected to function synergistically in conjunction with therapy or medication (Hazell, 2000). Most parent training programs typically last from six to twelve sessions (Hazell, 2000).

4. Psychotherapeutic Stage

The psychotherapeutic stage takes place after or concurrently with the parent training stage. During this stage, the child undergoes a psychotherapeutic treatment that is seen as the most appropriate by the parent and professional. Undergoing a form of behavioral therapy is strongly recommended because it is the only type of therapy with adequate evidentiary base (National Resource Center on ADHD, 2004). Some of the most widely used behavioral approaches families can take include “a systematic program of contingency management, clinical behavioral therapy, and cognitive-behavioral treatment (CBT)” (Department of Education, 2003).

As most contingency management programs have been found to be highly effective in a specialized classroom or camp setting, children who respond well to repetitive learning or easily obey authority figures are recommended to explore this route (Department of Education, 2003).

Another prominent mode of behavioral therapy is CBT, which takes place in a traditional clinical setting. Choosing to undergo CBT provides families with more options because it comes in forms of individual, group, and family sessions (Somers, 2007). Also, in contrast to contingency management programs in classroom settings, CBT allows the therapist to focus on the child’s specific symptoms and needs, and tailor personalized activities and programs to induce symptomatic improvements (Shute, 2010). On top of offering various options, CBT is gradually becoming easily accessible in many places. Not only is it avail-

able in large health facilities, various organizations offer online therapist finders (Shute, 2010).

During this stage, the parent is encouraged to continue exercising homemade strategies, as mentioned in the first stage, so as to boost the effectiveness of psychotherapy. Not only do at-home behavioral techniques provide the parent with opportunities to gauge the child's symptomatic improvement, they also allow the child to apply the skills learned in contingency management or CBT to a domestic setting. If the child turns out not to be responsive to therapy, the parent should revisit the consultative stage and discuss the possibility of the child's going on medication or another type of therapy.

5. Pharmacological Stage

Seeking help from medication is the last stage in the ideal treatment model because drugs carry common side effects and heavy financial burden, although they are clinically well-supported and highly accessible. Therefore, only children whose symptoms are deemed severe enough to necessitate regular medication should be in this stage. In other words, families should attempt dietary, at-home behavioral, and professional therapeutic treatments before turning to medication. Receiving help from medication is a complex process because it raises several issues. First, once the child starts taking a certain drug, medication should not be suddenly put on halt (Ramsey, Robinson, Segal & Smith, 2013). Second, the child is advised against switching from one drug to another without professional consulting because of their different mechanisms of action and side-effects (Ramsey, Robinson, Segal & Smith, 2013). Third, there is a potential danger of abusing ADHD drugs as "smart pills," which are thought to momentarily increase intelligence and perform better on academic tasks (Consumer Reports, 2012). Therefore, the parent should be knowledgeable of the drug's all possible side-effects and the three aforementioned potential problems.

As helpful as drugs are in controlling the child's behavior in the short term, they have been found to have no long-lasting effectiveness (Consumer Reports, 2012). For this reason, the ideal treatment process does not end at the fifth stage. Not only should families incorporate dietary and at-home behavioral treatments into regular medication, they should also always be ready to return to the psychotherapeutic stage. In contrast to drugs, which merely improve the child's symptoms by altering the chemical dynamics in the brain only while they are active in the body, psychotherapeutic treatments are intended to improve the child's symptoms by altering the behavioral patterns and eventually normalize the brain chemistry in the long run. Despite how well the child may seem to be doing while on medication, the parent needs to keep in mind that no improvement is guaranteed once the child goes off medication. In conclusion, the fifth stage is not the final stage, and children seeking help from medication before psychotherapy need to eventually return to the fourth stage and receive treatment that is more long-lasting.

V. Conclusion

Given the circumstances in which a growing number of children are being diagnosed with ADHD and alternative approaches to treating ADHD symptoms are gaining popularity, it is necessary to devise a new treatment model that is effective and easily replicable by the public. This paper contributes to solving this issue by comprehensively synthesizing and evaluating the major treatment modes so as to fabricate an ideal treatment model. By following this five-stage plan, families will be able to choose and adhere to treatments that minimize financial burden and best suit the child's personality and health conditions. In the future, more research studies and meta-analyses need to be conducted in order to effectively test the validity of psychotherapeutic and dietary treatments, which would significantly improve the model proposed by this paper.

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초 록

본 논문은 부주의, 활동항진 및 충동성의 증상들을 포함하는 주의력결핍 과잉행동장애 (ADHD)를 가진 아동들을 위한 이상적인 치료 모델을 제안한다. 현재 미국 아동들 중 7% 이상이 ADHD로부터 고통 받고 있으며 대부분의 환자들은 약물 치료를 통한 상태 호전에 치중해왔다. 그러나 시중에 판매되는 약품들은 고가일 뿐만 아니라 여러 흔한 부작용을 지니고 있다. 이 문제점에 대응하기 위해 전문가들은 최근 심리치료 및 식이요법을 통해 ADHD를 치료할 수 있는 방안들을 마련해왔다. 연구 결과는 새로운 치료 방법들과 증상의 호전 사이에 어느 정도의 연관성이 존재한다고 밝혔으나 아직도 과학적 증거가 부족한 상황이다. 본 논문은 기존의 연구결과와 관련자료를 바탕으로 약물치료, 심리치료 및 식이요법의 상대적인 장단점을 임상적 유효성, 부작용, 그리고 비용의 관점에서 종합적으로 분석하여 다섯 단계로 이루어진 이상적인 치료 모델을 제안하고 있다.

핵심 주제어 : ADHD, 약물치료, 심리치료, 식이요법, 부모 훈련

