Unimodal Versus Multimodal Treatment in the Context of ADHD Symptom Persistence into Adulthood

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Abstract. As more children and adults are diagnosed with attention-deficit hyperactivity disorder (ADHD), it is important to inform the general population about the extensive yet complex nature of the disorder. If left untreated, ADHD can negatively impact the academic, social, and economical aspects of a person's life. The concept of ADHD has historically shifted from decade to decade, each time focusing on a different etiology as well as symptoms. The main piece of literature examined in this paper is the Multimodal Treatment Study of Children with ADHD (MTA), a 14-month randomized clinical trial funded by the National Institute of Mental Health (NIMH) to determine the most effective method of treatment for ADHD. Four methods were introduced: medication, behavioral, combined (medication and behavioral), and community (already available) treatment. Results from the study indicated medication to be the most efficient treatment due to its convenience and cost-effectiveness. However, contemporary research revealed the persistence of ADHD symptoms into adulthood, and how they can negatively affect the educational, occupational, and emotional aspects of adult life. Further supplementary research showcases people's willingness to expend more resources to prevent greater losses in the future. Along with newly found efficacy of behavioral therapy in ADHD with anxiety comorbidity which is a leading predictor in ADHD persistence into adulthood, this paper suggests the multimodal combined treatment to be the most optimal mode of treatment. In summary, the purpose of this review is to inform the reader of ADHD as well as propose a novel and optimal treatment for those with persistence of ADHD symptoms into adulthood.

Keywords: ADHD; MTA Study; ADHD Treatment; Attention-deficit Hyperactive Disorder.

1. Introduction

Attention-deficit hyperactivity disorder (ADHD) is a neurodevelopmental disorder which originates during childhood. For a better part of its history, ADHD was thought to be "outgrown by adolescence" (Barkley, 2018). However, (these same researchers now think that ADHD persists into adulthood), and the diagnosis of adult ADHD continues to rise. With this comes the need to spread awareness of the disorder, (and evaluate the best treatments) as well as analyze and discuss an optimal while sustainable treatment. The goal of this paper is twofold. The first goal is to inform the readers about ADHD by first giving a brief overview of its history and symptoms. The second goal is to explore the effectiveness of various treatment methods for ADHD. This second goal will be accomplished by examining the Multimodal Treatment Study of Children with ADHD (MTA), a 14-month randomized controlled clinical trial which compared the efficacy of unimodal and multimodal treatment modalities.

2. Background

2.1 History of ADHD

The early historical classifications and explanations of ADHD can be described as inconsistent and vague at best. The oldest accounts of ADHD can be traced back to the late 1700s, where a German medical textbook described some children as being impulsive, inattentive, easily distracted, overly active, and lacking in persistence (Barkley, 2018). Up until the 1950s, knowledge on ADHD was largely unchanged and primarily thought to be biological and originate from brain damage. In the

1960s, however, the focus was shifted towards hyperactivity, as previous assumptions lacked substantial evidence. In its inclusion in the second edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-II), ADHD was only described in a single sentence: "The disorder is characterized by overactivity, restlessness, distractibility, and short attention span, especially in young children; the behavior usually diminishes by adolescence" (Barkley, 2018). In the early 1970s, research on ADHD sharply increased. This led to researchers' and experts' conclusion that instead of hyperactivity, attention deficiency was an essential condition of ADHD. Furthermore, the speculation of the environment as part of the etiology had gained traction. From the 1980s to present day, the rapid advancement in technology as well as the development of rigid diagnostic criteria have brought upon significant changes to the concept and definition of ADHD. For example, with the application of neuroimaging, studies found that children with ADHD usually have smaller brain structures than those without the disorder. Furthermore, genetic research found that monozygotic twins have 81% of concordance for ADHD (Barkley, 2018). Meanwhile, later versions of the DSM helped clarify the symptoms and diagnostic requirements for the disorder. Emerging during childhood, ADHD symptoms include hyperactivity-impulsivity (poor inhibition, impatience, recklessness, lack of volition, excessive levels of activity, etc.) and inattention ("poor attentional vigilance"). In addition, contrary to belief, most of these symptoms of ADHD persist well into adulthood, which will be discussed in a later section.

2.2 The MTA Study

In the 1990s, the National Institute of Mental Health funded a study known as the Multimodal Treatment Study of Children with ADHD (MTA) to determine the most effective long termed treatment for children with ADHD. Spanning 14 months, the study recruited 579 children ranging from 7 to 9.9 years old who had been diagnosed with ADHD-Combined type, and their families; the participants were randomly assigned to one of four treatment groups: "behavioral treatment,", "medication management", "combined treatment", or "community care" (citation). It is important to note that to imitate real-life scenarios, the study was "conducted in parallel at (...) six sites" (Hinshaw et al, 2015).

3. Treatment Methods

3.1 Medication Management

This treatment method mainly employs the use of rapid-acting stimulant methylphenidate, also known as Ritalin. In the beginning, a titration process was used to determine the optimal dosage of the medication. Once ascertained, the dose was given three times a day to the participant, with monthly half-hour check-ups with pharmacotherapists to monitor and adjust accordingly as the study went on. Behavioral treatment was not administered in this condition, as it would overlap with the other modes of treatment. (MTA Cooperative Group, 1999)

3.2 Behavioral Treatment

Behavioral treatment consisted of "parent training, child-focused treatment, and a school-based intervention" (MTA Cooperative Group, 1999). Parent training was applied in the form of group and individual sessions with a therapist-consultant. The training aims to provide the parents with tools to promote child self-regulation as well as supportive environments. Meanwhile, child-focused treatment came in the form of an intensive summer treatment program (STP) which lasted eight weeks with a required participation of five days per week and nine hours per day. The STP utilized behavioral interventions which were "supervised by the same teacher-consultants who performed parent training and teacher consultation. Behavioral interventions were delivered in group-based recreational settings, and included a point system tied to specific rewards, time out, social reinforcement, modeling, group problem-solving, sports skills, and social skills in training." (MTA Cooperative Group, 1999) School-based intervention composed of "10 to 16 sessions of biweekly

teacher consultation focused on classroom behavior management strategies and 12 weeks (60 school days) of a part-time, behaviorally trained, paraprofessional aide working directly with the child." (MTA Cooperative Group, 1999)

3.3 Combined Treatment

Combined treatment incorporated both medication management as well as behavioral treatment. In this case, the pharmacotherapist and the teacher-consultant were to exchange information in order to monitor and guide the course of treatment. A unique property of combined treatment is the decreased dosage of medication given to the participants in relation to the medication management group. (MTA Cooperative Group, 1999)

3.4 Community Care

Community care is the fourth condition where the participants did not receive any of the treatments presented by the MTA. Instead, they were provided with a selection of mental health services. In other words, the participants in this group were to use resources already available to them in the real world - that is, to receive treatment without the help of the MTA. The assessment of community care progressed in parallel with the other three modes of treatment throughout the 14 months. (MTA Cooperative Group, 1999)

4. Analysis

4.1 Results of the MTA Study

The effects of the four methods of treatments were determined at three distinct points of the study: three, nine, and fourteen months into treatment. The assessment was split into six categories: ADHD symptoms, externalizing symptoms, internalizing symptoms, parent-child relations, academic achievement, and social skills. While all four types of intervention displayed reductions in symptoms and improvement in function, there were significant differences in the degree of change between the groups. Most notably, medication management and combined treatment resulted in significantly greater improvement of ADHD symptoms than behavioral treatment and community care did, but no significant differences between each other. In fact, combined treatment was shown to be superior to community care in the other five categories as well. However, the results of the three MTA-proposed treatments did not significantly differ from each other, except for combined treatment being superior to behavioral treatment in internalizing symptoms, externalizing (oppositional/aggressive) symptoms, and academic achievement (MTA Cooperative Group, 1999). The study emphasized on the lack of significant difference in improvement between medication management and combined treatment and the cost effectiveness of medication, promoting the idea of using medication as the primary response to ADHD.

4.2 Longitudinal Investigation

While the MTA study was groundbreaking and provided invaluable data on a scale never seen before, it is not without any complications. A subsequent longitudinal follow-up of the MTA which spanned up to 8 years revealed that as soon as active treatment of the study had finished, the clear benefits provided by medication management and combined treatment were in steady decline until there were no longer any significant differences in any assessment categories between the four treatments by the eighth year (Molina et al., 2009). This discovery highlights the difficulty in continuing the intensive, active care that the MTA study implemented. As Hinshaw et al. (2015) states, the "[quality] of delivery of pharmacologic intervention is crucial for optimal effects." Similarly, in a study done by the MTA Cooperative Group which tested the mediator in the form of attendance in treatment, frequency of attendance at pharmacotherapy sessions was associated with improvement. This means that regularly attending pharmacotherapy sessions to obtain medication prescriptions

resulted in increased improvement. Therefore, it is possible that after the 14-month trial, a substantial portion of participants failed to keep up the regular application of their respective treatments. Nevertheless, the participants at the 8-year follow-up were still significantly improved from their baseline (before the MTA study), but far from achieving normalization relative to the performances or ratings of those without ADHD (Molina et al., 2009).

4.3 Persistence of ADHD into Adulthood

16 years post-baseline, Hechtman et al. (2016) compared various functional outcomes of participants in the MTA study with those in a local normative comparison group (LNCG). The study split the MTA participants into "ADHD symptom-persistent" and "ADHD symptom-desistent" subgroups. Results presented three patterns of outcomes. The first pattern, and the most common, shows the symptom-persistent group performing the worst, with the symptom-desistent group being in the middle, and the LNCG group performing the best. This pattern includes number of times fired or quit a job, risky sexual activity, current income, obtaining a bachelor's degree, and receiving public assistance. The second pattern shows the symptom-desistent group not being significantly different than the LNCG group, but the symptom-persistent group functioned significantly worse than the other two groups. This pattern includes neuroticism, substance use disorders, anxiety and mood disorders, and affective lability. The final pattern shows no significant differences between the three groups. This pattern includes alcohol use disorder, number of jobs, and jail time (Hechtman et al., 2016). It is noteworthy that even though in this final pattern symptom-persistent group seemed to function on the same level as the other groups, it can be inferred from previous patterns that it might not be the case. For example, although the symptom-persistent group has held the same number of jobs as the other groups, they also proved to have less income. This means that rather than displaying stability, the symptom-persistent group impulsively quit or got fired and have difficulty finding a new job. In other words, whether explicit or implicit, having ADHD symptoms as an adult can negatively affect one's educational, sexual, emotional, and occupational outcomes (Hechtman et al., 2016). Thus, it is important to study the persistent nature of ADHD symptoms and provide suitable treatment as soon as possible. In another study, Roy et al. (2016) employed regression analyses to determine the correlations between different childhood factors with the persistence and desistance of ADHD symptoms in adulthood. Results show four predictors of ADHD symptom persistence: parenting styles, parental mental health, parental marital relationships, and childhood comorbidity. However, only parental mental health and childhood comorbidity was directly associated with ADHD symptom persistence into adulthood (Roy et al., 2016).

5. Discussion

5.1 Optimal Treatment in Context of Adult ADHD

While the MTA study suggests medication as the primary form of treatment, with substantial research showcasing the complexity and persistence of ADHD into adulthood, it may be time to reconsider "which intervention strategies, delivered at which time intervals and at what levels of intensity, are optimal in promoting maintained change for different subgroups of youth with ADHD" (Hinshaw et al., 2015). One of the biggest arguments in favor of the use of only medication is its cost-effectiveness. In the MTA study, the administration of medication was simple compared to its behavioral counterpart - the participants needed to intake the determined dosage three times a day, with only a necessary once-a-month check-up with the pharmacotherapist. On the other hand, behavioral intervention required consistent and intensive work from the children as well as their families (MTA Cooperative Group, 1999). In addition, for behavioral treatment to be most effective, it would have to be used in conjunction with medication. With the fact that medication management and combined treatment did not yield any significant difference in the MTA study, the increased resource expenditure does not justify the miniscule improvement in outcome. In addition, as the

longitudinal study suggested, if participants fail to maintain the quality of treatment outside of the study, it is not practical and sustainable for them to utilize the multimodal approach.

However, subsequent research on the MTA found participants with anxiety comorbidity benefited greatly from behavioral interventions to the point where the outcome was not significantly different from medication and combined treatment (MTA Cooperative Group, 1999). Furthermore, guardians of youth with anxiety comorbidity or disruptive comorbidity were willing to pay more for behavioral treatment in hopes to prevent greater costs such as juvenile delinquency (Hinshaw et al., 2015). In fact, the MTA study mentioned medication's ability to "reduce negative peer interactions dramatically" (MTA Cooperative Group, 1999), but inability to positively increase social behavior. Referring to Hinshaw et al., to tackle the issue of persisting ADHD symptoms into adulthood, the use of combined treatment would be the most effective long-term solution. Specifically, if childhood comorbidity is a core factor associated with ADHD symptom persistence into adulthood, coupled with the fact that behavioral treatment results in significant improvements and the willingness of the affected to expend the additional resources, it is certain that the addition of consistent behavioral therapy to medication treatment will minimize ADHD persistence into adulthood. Moreover, Pelham et al. (2016) found the importance of sequence in administering treatment. In multimodal treatment, applying behavioral treatment before medication resulted in the best outcome. In unimodal treatment, adding medication when behavioral treatment was insufficient resulted in the best outcome. Therefore, with the goal of preventing ADHD symptom persistence into adulthood, using a multimodal structure with the initial application of behavioral treatment followed by medication would be the most optimal course of treatment.

6. Conclusion

As ADHD increases in prevalence, it is imperative to be aware of its extensive yet complex nature. Perhaps the single most important study on this disorder, the MTA study has provided indispensable data and counsel, with an abundance of subsequent research aiming to further expand upon its findings. As a result, the discovery of the persistence of ADHD symptoms into adulthood led to the questioning of the effectiveness of conventional unimodal treatment - medication. While cost-effective, medication fails to provide any positive social impact, and anxiety comorbidity is found to be a strong predictor for adult ADHD. If left unchecked, the potential costs associated with adult ADHD such as educational, occupational, and emotional risks may heavily outweigh those saved by withholding behavioral therapy. Now with substantial evidence showcasing the potency of combined treatment, it should be seriously considered under the appropriate circumstances.

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