

# Behavioral Treatments for Attention Deficit/Hyperactivity Disorder and Their Efficacy

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**Abstract:** This paper starts with a historical overview of childhood Attention Deficit/Hyperactivity Disorder (ADHD), along with an analysis of its clinical manifestations and diagnostic methods. On this basis, it elaborates on various behavioral psychology-based intervention approaches for affected children, supplemented by practical application cases. Finally, it discusses the clinical effectiveness of behavioral interventions for childhood ADHD by drawing on scientific research findings.

**Keywords:** attention Deficit/Hyperactivity disorder, behavioral intervention, behavioral psychology

## 1. Introduction

Attention Deficit/Hyperactivity Disorder (ADHD) is a behavioral syndrome caused by brain dysfunction. It is relatively common in children and also manifests in many adults. The international medical and psychological community has been describing and researching ADHD for a full century. During this period, numerous diagnostic and intervention methods have emerged and evolved. However, many issues remain to be better explained by scientific progress. This paper will introduce and discuss the history and current status of ADHD, its clinical manifestations and diagnostic methods, behavioral psychology-based interventions for affected children, as well as application cases and clinical effectiveness of these methods.

## 2. History and Current Status of ADHD

Although records and discussions related to ADHD can be found in literature from ancient Greece to the 19th century, most of these documents are scattered and unsystematic. Some reflect ADHD issues from a literary and artistic perspective; for example, in 1845, British author Hoffmann vividly depicted the disorder through cartoons. At the beginning of the last century, British pediatrician George Still made the first relatively objective and comprehensive description of ADHD in 1902. Still noticed that some children under his care shared similar symptoms: inattention, hyperactivity, difficulty staying still, and non-compliance with general family education. Affected children had many behavioral problems, such as poor self-control or aggression towards others. Regarding the cause, Still suggested that it was likely innate rather than acquired. Additionally, he astutely observed that these symptoms usually appeared before the age of 8 and often had a long-term course.

After the two world wars, especially World War II, medical and psychological understanding of the human brain advanced further due to the treatment of war-trauma victims. Research and intervention on ADHD also developed rapidly. For instance, it was recognized that patients with brain injuries would exhibit inattention and hyperactivity. Based on this, Strauss and others proposed a theory in 1947, attributing childhood ADHD to brain damage and terming it "brain injury syndrome." He also pointed out that the core issue of this syndrome was children's proneness to distraction; controlling this distraction could significantly improve their functioning.

However, in the 1950s and 1960s, researchers began to realize that many patients had never suffered brain injuries. In 1962, child experts from various countries gathered in Oxford, UK, and proposed an accepted term for childhood hyperactivity: "Minimal Brain Dysfunction (MBD)." This term revised the brain injury theory, implying that patients' brains were basically normal, but certain functional impairments led to the behavioral syndrome. During this period, experts emphasized hyperactivity in children, and many related drugs such as Ritalin were developed.

In the 1970s, Canadian researcher Virginia Douglas was the first to discover through her studies that the primary issue in affected children was attention deficit, while hyperactivity was secondary or derivative. Subsequent studies confirmed her view, which profoundly influenced later research, diagnosis, and treatment. Consequently, the American Psychiatric Association (APA) named the condition "Attention Deficit Disorder (ADD)" in the *Diagnostic and Statistical Manual of Mental Disorders (3rd edition)* published in 1980. In the revised version of the same manual in 1987, considering that attention deficit

and hyperactivity often coexist in children, the term "Attention Deficit/Hyperactivity Disorder (ADHD)" was proposed, which was retained in the 1994 edition and became widely used globally.

It is conceivable that hyperactivity and similar traits were not negative, and even had positive significance, in much of human history. For example, in eras when humans had to fight animals, intuitive and rapid actions had survival value. Even in modern society, some individuals with childhood ADHD have grown into outstanding figures, such as British Prime Minister Winston Churchill and renowned scientist Albert Einstein. However, overall, the known impacts of childhood ADHD on individuals and society are often negative. For instance, modern educational institutions (schools) do not tolerate students who cannot sit quietly in class or concentrate. Over 50% of individuals with childhood ADHD develop various behavioral and emotional disorders in adulthood, many of which are social behavioral disorders. Families with ADHD children often face significant stress; some parents may even experience marital problems, separation, or divorce. The economic losses caused by childhood ADHD to society are substantial. For example, statistics from the United States in 1995 showed that public schools spent \$3 billion annually on special education for ADHD children. Social problems caused by some ADHD children, such as violent behavior, are even harder to quantify.

To date, research on the causes of childhood ADHD remains in a state of coexisting theories, with no definitive conclusions. However, most experts agree on the following aspects:

First, ADHD has a genetic basis. Evidence includes that parents or relatives of patients often had similar histories in childhood, showing a familial tendency. Additionally, twin studies have found that the incidence of ADHD in monozygotic (MZ) twins (developed from a single fertilized egg) is much higher than in dizygotic (DZ) twins (developed from two fertilized eggs), supporting the theory that genetic factors play a key role.

Second, ADHD is mainly caused by brain dysfunction. Neuropsychological experiments suggest that affected children may have frontal lobe function impairments, leading to difficulties in self-control and action planning—similar to the inattention and hyperactivity observed in monkeys with frontal lobe resection or adults with frontal lobe injuries from accidents. This view is supported by PET and MRI observations since the 1990s, which show that approximately 70% of ADHD children have significant differences in frontal lobe function compared to normal children. Some scholars also believe that ADHD is related to imbalances in brain biochemical factors; for example, insufficient levels or reduced activity of dopamine in the central nervous system may interfere with information transmission from synapses to the cerebral cortex, impairing children's ability to control their behavior.

Third, ADHD is not caused by improper parental education, but its development and prognosis are affected by family and social conditions. Studies show that improving family and educational environments can help affected children overcome difficulties caused by ADHD. Conversely, the incidence of ADHD is higher in families with low socioeconomic status, unstable parental relationships, or a history of adoption or child abuse.

### **3. Clinical Manifestations and Diagnostic Criteria**

This section follows a logic from experience to theory. It first describes clinical manifestations of childhood ADHD, including issues commonly reported by parents, then introduces diagnostic criteria and assessment methods used by professionals.

#### *3.1 Inattention is the first clinical manifestation of ADHD children.*

These children may not differ significantly from ordinary children in daily activities; they may perform normally while watching TV, playing video games, receiving one-on-one tutoring, or undergoing psychological tests. However, their deficits become apparent when engaging in independent activities requiring effort and focus. For example, they often lose patience within minutes while doing homework. They are also highly distractible; even minor external stimuli can divert their attention. Clinically, parents often report: "My child seems to have hearing problems—things I say go in one ear and out the other"; "My child can focus well while playing video games"; "I have to supervise him while doing homework, otherwise he daydreams"; "He can remember things from two years ago but forgets what I said two minutes ago."

#### *3.2 Excessive hyperactivity and restlessness are the second set of symptoms.*

ADHD children seem to have endless energy, often described as being driven by an internal "small motor," leading them to start new tasks before finishing the current one. Waiting is extremely difficult for them. In the eyes of parents and teachers, they are fidgety and clumsy. Common parental complaints

include: "My child was hard to raise since childhood—he takes up every minute of my time"; "He's like a ball, bouncing around all day"; "When I take him to others' homes, he touches everything and often breaks things"; "He loves being outdoors; keeping him indoors is harder than anything"; "He can't sit still at home." Fortunately, these symptoms generally improve as children reach their teens.

The third set of symptoms is poor impulse control. These children are not unaware of right and wrong; instead, they tend to act impulsively without thinking, often disregarding consequences in both actions and interactions. For example, while other children might disturb peers only when the teacher isn't looking, some ADHD children may fight back in front of the teacher. They often interrupt in class, answering questions before the teacher finishes speaking. They are emotionally unstable, with mood swings, making them appear unruly and hard to get along with in peers' eyes. Parents describe: "He never learns from mistakes, repeating the same ones"; "He's old enough but still interrupts like a toddler"; "Every time we visit others, he either breaks things or fights with their kids"; "At school, other kids always pick on him, but he's the one criticized by the teacher." In short, these children often respond to people and situations reflexively, and when combined with hyperactivity, this trait causes problems for themselves and those around them.

In addition to these three main manifestations, affected children often face other related issues. They struggle socially: desiring friendships but often being unpopular and isolated. Their motor coordination is generally poor, most notably in messy handwriting. They are often disorganized, with cluttered rooms and frequent forgetfulness, making others distrust them. Over 50% of ADHD children have various learning disabilities, such as difficulties in spelling, reading, writing, or arithmetic. These problems lead to low self-esteem; they are often sensitive and insecure. Setbacks in friendships, academics, and work make them prone to psychological issues.

It should be emphasized that exhibiting the above phenomena does not necessarily mean a child has ADHD. A pathological diagnosis of ADHD requires following specific procedures. The diagnostic criteria widely used globally are those in the *Diagnostic and Statistical Manual of Mental Disorders (4th edition)* (DSM-IV) by the APA, which include the following five key aspects:

- a) The child meets either of the following criteria:
  - i. Inattention: Exhibiting six or more inattentive symptoms for at least six months, inconsistent with developmental level.
  - ii. Hyperactivity-impulsivity: Exhibiting six or more hyperactive-impulsive symptoms for at least six months, inconsistent with developmental level. For example, hyperactive symptoms include fidgeting with hands/feet or squirming in seats; impulsive symptoms include answering questions before they are fully asked.
- b) The onset of inattentive or hyperactive-impulsive symptoms occurs before the age of 7.
- c) Symptoms cause significant impairments in social, academic, or occupational functioning.
- d) Symptoms are present in at least two settings (e.g., school and home).
- e) Symptoms are not exclusively associated with pervasive developmental disorders, schizophrenia, or other mental illnesses, and cannot be attributed to other mental disorders (e.g., mood disorders, anxiety disorders, personality disorders).

Clinically, diagnosing ADHD requires a comprehensive, collaborative process involving reports from parents and schools, as well as tests and assessments by professionals (e.g., doctors or psychologists). When analyzing data, professionals must compare it with international diagnostic criteria and other children's behaviors to identify problems, while ruling out other causes such as cognitive or emotional disorders. This diagnosis forms the basis for treatment and intervention.

#### **4. Behavioral Psychology Interventions**

Interventions for ADHD should be comprehensive and multi-faceted. Here, we focus on non-pharmacological, behavioral psychology-based approaches.

Before introducing specific methods, a fundamental principle must be emphasized: parents should conduct a functional analysis of ADHD symptoms. A key theoretical premise of functional analysis is that every behavior has a specific function, which can be understood as purpose or motivation. Even odd or problematic behaviors have functions and value for the individual. Parents and teachers should analyze and understand these underlying functions and causes to select appropriate interventions. Crucially, they

must determine whether a child's behavioral symptoms stem from "noncompliance" (unwillingness) or "incompetence" (inability). For example, if a child loses behavioral control, adults should ask: is the child unwilling or unable to control their behavior? If the former, intervention should involve consequences tied to the behavior; if the latter, punishment alone is ineffective—instead, skill-building through education and enhanced self-confidence through attention and care are more important. A common analogy is: both typical children and ADHD children need attention and care, but while typical children are like intact containers that retain the "water" of attention, ADHD children are like leaky containers, requiring more attention and care to compensate for the "leakage." Unfortunately, although most ADHD children's problematic behaviors stem from inability, some parents and teachers mistakenly view them as deliberate mischief. When children perform poorly academically due to inability, adults may attribute it to lack of motivation, leading to ineffective interventions like punishment or attempts to boost motivation—often with counterproductive results. Thus, functional analysis and accurate understanding of children's behaviors are prerequisites for all interventions.

Due to space constraints, this paper focuses on key behavioral interventions for ADHD: teaching compliance with rules, structuring the environment, signing behavioral contracts, and improving self-control skills. These methods are applicable in both family and school settings, and "educators" here refer to both teachers and parents.

#### *4.1. Teaching Compliance with Rules*

Generally, children learn to control their behavior in three stages: in the first stage, behavior is controlled by external forces; in the second, they gradually learn self-control but often rely on external cues (e.g., verbal self-instructions, discussed below); in the third, they transition to control through internalized, silent commands. In a sense, teaching ADHD children to control behavior is similar to teaching typical children—starting with obeying rules and adult instructions—though educators need to invest significantly more time and effort. American late expert on child behavior Glenn Latham summarized effective strategies for teaching compliance, which, combined with other experts' insights, include the following four methods:

First, educators must communicate requirements clearly. For example, when asking a child to start homework, they should first gain the child's attention (e.g., starting with "Listen carefully") and have the child repeat the requirements to ensure understanding. To increase cooperation, limited choices can be offered: "After school, do you want to do math or Chinese homework first?" Such conversations are brief, usually lasting a few minutes. Some experts suggest writing down requirements, which is also effective.

Second, after the child understands the requirements, educators should discuss consequences. Children should understand that complying leads to rewards, while non-compliance results in losing specific opportunities or benefits. However, educators should guide children to state the consequences of rule-breaking (e.g., "If I don't do homework, I can't watch TV at night"), helping them take responsibility instead of blaming adults. If the child reacts angrily, educators should acknowledge their emotions but emphasize that rules are for their benefit. Actions speak louder than words: once rules and consequences are clear, educators must act promptly when the child disobeys. Consistent, predictable enforcement increases children's respect for rules.

Third, educators should selectively praise positive behaviors and ignore minor misbehaviors. They must recognize that children are most likely to repeat behaviors that attract attention. Thus, focusing on tantrums while overlooking good behavior may inadvertently encourage tantrums. Instead, educators should actively seek opportunities to praise progress—even in difficult children. Minor misbehaviors should be ignored to avoid reinforcing them.

Fourth, for serious behavioral problems or dangerous actions, educators must first stop the behavior, then guide the child. For young children, immediate placement in a toy-free "time-out" area for a few minutes may be effective. For school-age children, educators should first stop harmful or destructive behavior, then direct them to alternative actions. For example, if a child hits another, the educator should stand between them, make eye contact, and say calmly but authoritatively: "Stop! No hitting!" They can hold the child's hands at their sides to aid self-control, then guide them: "I know you're angry. Go to your room and calm down. I'll talk to you when you're ready." At this stage, reasoning is ineffective—discussion of right and wrong should wait until the child calms down.

Notably, educators must establish reasonable authority. Generally, more authoritative educators rarely need to assert authority, while those without authority struggle to teach compliance. Thus, educators should apply the above skills from the start to build authority.

#### 4.2. Structuring the Environment

ADHD children are easily distracted. Due to potential brain dysfunction and reduced self-control, they often focus on irrelevant stimuli instead of target tasks. To address this, educators should structure the child's physical space and time to create a supportive environment.

Spatial structuring involves using visual materials and layout to clarify and differentiate areas for learning, socializing, and playing, helping children distinguish activities, understand relationships between them, remember rules, and control behavior.

Dividing spaces is critical. At school or home, educators can use materials to mark learning, play, and living areas, tailored to the child's abilities. For less developed children, three-dimensional structures work better: a desk placed in a corner without pictures or near windows to reduce distractions; a screen separating learning and play areas; an arrow indicating "study first, then play." For more developed children, two-dimensional visual cues (e.g., a large carpet marking the play area) suffice.

When an adult is present during learning, the child's seat should be as close to the adult as possible, using spatial proximity to enhance control over ADHD-related behaviors—applicable in both school and home.

Temporal structuring uses visual materials (e.g., arranged pictures) to show specific activities at specific times, increasing children's sense of predictability and control over their actions. Educators should create age-appropriate visual schedules: more concrete materials (objects, pictures) for less developed children, and more abstract ones (words, numbers) for more developed children.

Another key aspect of time management is considering the child's attention span: assignments and tasks should include regular breaks, allowing physical activity to improve subsequent focus. Similarly, difficult, time-consuming tasks should be broken into smaller steps, enabling ADHD children to complete them gradually.

#### 4.3 Improving Self-Control Skills

Self-control skills for ADHD children mainly include self-instruction and self-monitoring.

Self-instruction is a widely used training method. ADHD children struggle with adapting to changing conditions and transitioning between tasks. Self-instruction helps them control themselves and complete tasks by improving attention, reducing impulsivity, managing emotions, and facilitating task transitions. The model proposed by Kirby & Grimley (1986) outlines effective self-instruction training:

- a) Educators select appropriate tasks requiring attention, based on observations or assessments to ensure the child can succeed.
- b) Educators demonstrate self-instruction steps: understanding the problem, generating solutions, choosing and implementing one, and self-evaluation. As psychologist Bandura showed, modeling and imitation are key to children's learning. For example, when building a block house, educators verbally guide themselves: "Let me think—my task is to build a house with these blocks"; "I could stand the door up first or build the four walls"; "If I stand the door first, it might fall. Better build the walls first—it's easier"; "The walls are done, and the door fits. This works."
- c) Educators guide the child through steps: issuing instructions while the child acts (e.g., "I'm building the house walls"), with the child following.
- d) The child imitates self-instruction to complete steps, verbally guiding themselves. Educators provide assistance (e.g., verbal reminders, physical support) as needed, repeating steps until mastery.
- e) Educators demonstrate transitioning from overt to covert self-instruction: starting with loud verbal cues, then whispering, mouthed words, and finally internalized instructions.
- f) The child imitates this transition, eventually using internalized self-instruction—reaching a level comparable to typical children.

This training helps ADHD children develop self-control, increasing their chances of succeeding in challenging tasks.

Self-monitoring is based on the principle that observing and recording one's own behavior enhances self-control. Combining self-monitoring with behavioral contracts significantly improves ADHD children's behavioral control.

To train self-monitoring, educators must prepare thoroughly: defining target behaviors, setting intervention goals, preparing recording tools, and arranging rewards.

First, target behaviors (either appropriate or problematic) must be clearly defined—specific, not vague. For example, "hitting" or "stealing toys" are clearer than "poor social skills."

Next, educators set goals. If reducing misbehavior, goals can be the proportion of time without problems (e.g., five 10-minute intervals without issues in 60 minutes). Initial goals should be achievable based on the child's current behavior (e.g., maintaining 10 minutes without problems if 30 minutes is rare), ensuring success and sustained engagement.

Educators then help the child learn to observe and record behavior, providing tools like a schedule and a timer. When the timer rings (e.g., every 10 minutes), the child marks on the schedule whether they behaved appropriately. If no timer is available, educators remind the child to record at intervals, gradually encouraging self-timed recording. Various tools (e.g., notebooks, index cards) can be used.

After preparing materials and rewards, educators start training. At scheduled times, the child receives rewards based on self-recorded scores. Importantly, rewards should recognize both target behaviors and accurate self-monitoring (e.g., timely, honest recording), fostering skills for independent behavior management. Thus, educators should frequently praise and reward accurate self-observation and recording.

Finally, training children in social and psychological skills also helps control ADHD, which will be discussed in another paper.

### **5. Application and Evaluation**

To illustrate the practical operation and clinical effectiveness of these methods, we review representative clinical studies, then provide a general assessment of behavioral psychology interventions for ADHD.

Rieth's (1980) study explored the effectiveness of using different consequences to regulate behavior in an 8-year-old boy with ADHD. Despite a high IQ (120), he had poor academic performance and problematic behaviors: leaving his seat in class and disobeying rules at home. Under researchers' guidance, teachers and parents used behavior-contingent consequences. At school, since he enjoyed borrowing/returning audio equipment from the library, a deal was made: he could do so if he left his seat or spoke loudly no more than three times per class. After five days of improved behavior, the standard was raised to no more than once per class. His behavior improved drastically: from an average of 5.2 seat-leavings and 7.8 loud outbursts per class to fewer than one each. At home, his parents used pre-agreed consequences: praise for good behavior, extra pocket money for chores, and a 5-minute "time-out" (sitting alone facing a wall) for serious misbehavior (e.g., fighting). His home misbehavior decreased, and he often helped with chores. The study concluded that combining rewards and punishment effectively reduces ADHD-related behavioral problems.

Rosen and O'Leary (1984) conducted four similar experiments, confirming the effectiveness of combined reward-punishment consequences. Participants were students from a special school for ADHD, with "focused learning" as the target behavior. Rewards included smiles, verbal praise, and privileges; punishments included verbal criticism, confiscating materials, and shortened recess. All experiments had four stages: combined rewards and punishment, removing punishment, reintroducing combined consequences, and removing rewards. Results showed that omitting appropriate punishment for misbehavior most negatively affected focus. Inappropriate punishment (e.g., delayed, vague, or inconsistent criticism) worsened behavior. The study concluded that praising good behavior alone is insufficient—appropriate punishment for misbehavior is needed for optimal results.

Zentall and Leib's (1985) experiment demonstrated the effect of external structure on controlling ADHD. Fifteen patients were divided into a structured task group (using specific paper and following patterns to draw) and a low-structure control group (drawing freely). The low-structure group showed more hyperactive symptoms, leading researchers to conclude that structuring daily activities helps control excessive movement in ADHD children.

Robinson, Newby, and Ganzell (1981) and Rapport et al. (1996) showed the effectiveness of behavioral contracts from different angles. Robinson et al. worked with 18 third-grade ADHD students with behavioral problems and poor academic performance. They helped the Chinese teacher use a token system: students earned a green star for learning a new word, a yellow star for teaching it to a peer, a red star for using it in a sentence, and a white star for teaching others to use it. Four stars earned 15 minutes of video games. The experiment followed a B-A-B design (contract intervention, no intervention, reintervention). Results: students completed an average of 34.81 learning units daily during intervention, 3.8 during no intervention, and 39.57 during reintervention—nine times more efficient, with all students benefiting.

Rapport et al. (1996) combined behavioral contracts with medication for two 6-year-old twin girls diagnosed with ADHD. Medication (e.g., Ritalin) improved attention but not behavior. In the second stage, an electronic "Attentional Training System" (similar to educational software) was used, which tracked attention duration and displayed scores. The girls were told "Mr. Attention" would observe them, adding a point every minute of focus and deducting one for distractions; points could be exchanged for gum or stickers. Results: increased attention duration and reduced behavioral problems. The study concluded that medication alone is insufficient—combining with behavioral contracts yields better results.

Behavioral psychology interventions for self-control have also shown effectiveness. Christie et al. (1984) tested self-monitoring in three ADHD students. During the baseline (no intervention), teachers recorded their focused time and distractions, sharing results after a week. During intervention, students also self-recorded using a desk chart, with teachers reminding them to mark behavior at intervals. Teachers checked consistency and praised accurate recording. After one month, focused time increased significantly, while distractions and other problems decreased, leading to the conclusion that self-monitoring has great potential for controlling ADHD.

The effectiveness of self-instruction was shown in Cameron and Robinson (1980) and Hinshaw, Henker, and Whalen (1984). Cameron and Robinson trained three ADHD children in self-instruction to improve attention to math steps. Two showed significantly longer focus, and all three improved math accuracy, maintaining progress post-training. Hinshaw et al. trained 21 ADHD boys over three weeks to use self-instruction to avoid anger and violence in confrontations. They practiced preselected strategies (e.g., reading, looking out the window, chatting, ignoring provocation). Post-training, all improved self-control, with a significant reduction in retaliatory violence.

A general assessment of these interventions comes from DuPaul and Eckert (1997), who analyzed 63 English-language papers (1971–1995) on school-based behavioral interventions for ADHD. The most common methods were environmental improvement (e.g., structuring), consequence management (e.g., rewards/punishment), and self-control training (e.g., self-instruction/monitoring). Findings: school-based interventions strengthened over 24 years, with increasing experimental research; most interventions were behaviorally based; all showed positive, significant effects; consequence management was more effective for behavioral problems, while self-control training worked better for academic performance; these methods are applicable at home. Cognitive-behavioral interventions are more studied in schools due to experimental convenience.

The 2000 consensus statement from the U.S. National Institutes of Health (NIH) international ADHD conference noted that while many interventions claim effectiveness, only behavioral interventions and professional medication are evidence-based.

Based on current research and clinical experience, the authors believe behavioral psychology interventions should be the first step for childhood ADHD. Medication can help when necessary but has side effects. For example, Duke University School of Medicine research linked adolescent ADHD medication use to potential recreational drug abuse. Thus, medical professionals, parents, and teachers must exercise extreme caution when considering medication for children and adolescents with ADHD.

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