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Prevention of serious conduct problems in youth with attention deficit/hyperactivity disorder

### Permalink

<https://escholarship.org/uc/item/9xm9961s>

### Journal

Expert Review of Neurotherapeutics, 12(10)

### ISSN

1473-7175

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### Publication Date

2012-10-01

### DOI

10.1586/ern.12.119

Peer reviewed



Published in final edited form as:

*Expert Rev Neurother.* 2012 October ; 12(10): 1253–1263. doi:10.1586/ern.12.119.

## Prevention of Serious Conduct Problems in Youth with Attention Deficit/Hyperactivity Disorder

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### Abstract

The purpose of this review is to discuss issues in the prevention of serious conduct problems among children and adolescents with Attention Deficit/Hyperactivity Disorder (ADHD). We begin by reviewing research on the common genetic and environmental etiological factors, developmental trajectories, characteristics, and impairments associated with ADHD and comorbid Oppositional Defiant and Conduct Disorders. Next, we present empirically-based models for intervention with children and adolescents with ADHD that are at risk of developing serious conduct problems and detail the evidence supporting these models. Researchers have demonstrated the utility of medication and psychosocial intervention approaches to treat youth with these problems, but current evidence appears to support the superiority of multi-modal treatments that include both approaches. Future directions for researchers are discussed.

### Keywords

Attention Deficit/Hyperactivity Disorder; Conduct Disorder; Oppositional Defiant Disorder; stimulant medication; amphetamine medication; behavioral intervention; parent training; child training; classroom intervention behavioral management

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Attention Deficit/Hyperactivity Disorder (ADHD) is one of the most frequently diagnosed psychiatric disorders among children and adolescents, with prevalence estimates of 11% for males and 4.4% for females [1]. ADHD is divided into three subtypes characterized by pervasive symptoms of inattention (e.g., difficulty completing tasks) for the Primarily Inattentive subtype (ADHD-I), hyperactivity (e.g., difficulty sitting still) and impulsivity (e.g., difficulty waiting turn) for the Hyperactive-Impulsive subtype (ADHD-H), or a combination of both for the Combined subtype (ADHD-C). These symptoms typically first emerge during early to middle childhood, although they are not detected in some cases until middle school. These symptoms have been found to manifest in profound impairments across multiple contexts. At school, children with ADHD often have significant impairments in their academic performance and are frequently cited for behavioral problems [DuPaul &

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**Disclosures:** Drs Villodas, Pfiffner and McBurnett have received research funding from The National Institute of Mental Health (NIMH) and Dr. Pfiffner has received research funding from the Department of Education Institute of Educational Sciences. Dr. McBurnett has also received research funding from, acted as a Consultant, and/or served on an advisory board or speaker's bureau for Eli Lilly, Otsuka, Lexicor, McNeil Pediatrics, Shire, Abbott Laboratories, Cephalon, Johnson & Johnson, New River, and Sigma-Tau.

Stoner, 2]. At home, children with ADHD often have strained relationships with their parents and difficulty managing and organizing responsibilities [3,4]. Children's ADHD symptoms interfere with peer relations, as children with ADHD-I are often perceived as uninterested and "spaced out", while children with ADHD-H or ADHD-C are often perceived as aggressive and overbearing [5,6].

Multiple etiologies may lead to ADHD, but evidence supports neurological and genetic factors as leading causes [7]. Heritability of ADHD is high with an estimated 75-91% heritability rate based on twin research [8]. Although children with ADHD tend to have a variety of neuropsychological deficits, difficulty with executive functioning (and more specifically impulse control) is common, particularly among ADHD-H and ADHD-C subtypes [7,9,10]. Nevertheless, it is clear that social-environmental variables can impact symptom severity, extent, and type of impairment, and the development of comorbid disorders.

## ADHD and Disruptive Behavior Disorders

ADHD, particularly ADHD-H and ADHD-C, has high comorbidity rates with a number of disorders, but none higher than Oppositional Defiant Disorder (ODD), with which comorbidity rates are estimated to be approximately 60% [1,11]. In addition, ADHD has an estimated comorbidity rate of approximately 16-20% with Conduct Disorder (CD), although evidence indicates that this comorbidity is more common in boys than girls [12]. Although some consider ADHD to be a developmental precursor to ODD, both have been identified as early as 17 months of age [13,14]. Nevertheless, both disorders are thought to be precursors to the development of Conduct Disorder [15,16]. Indeed, twin studies have demonstrated that the three disorders share high genetic contributions from a common factor thought to represent behavioral inhibition or impulsivity, which are also common areas of neuropsychological deficits among youth with the three disorders [7,15,17-19]. However, it is clear that environmental risk and protective factors have a strong influence on the expression of these disorders among children and adolescents [20-22]. In particular, although the strong heritability of ADHD has been well established throughout the previous literature, researchers have identified substantial environmental influences on the development of ODD and CD with and without comorbid ADHD [23-25].

Although ADHD, ODD, and CD have been found to be associated with unique future consequences, there is evidence to suggest that comorbidities between ADHD and ODD or CD are associated with more persistent ADHD, early onset and persistent conduct problems, and a higher risk for substance use, among other consequences [26-30]. These patterns are particularly concerning as youth with early onset and persistent conduct problems have been shown to have the most severe outcomes (e.g., violent offending) and highest-risk trajectories [31]. Moreover, researchers have begun to identify pathways through which the impairments associated with these disorders compound to exacerbate problems among youth, such as the reciprocal relationships between poor social skills, peer rejection, and aggression among youth with ADHD [32]. Similarly, processes such as high parent-child conflict and school failure have often been identified as consequences of ADHD, ODD, and CD as well as risk factors for the development of conduct problems [3,33-37].

## Interventions for ADHD and Disruptive Behaviors

In addition to similar etiologies and risk/protective factors, researchers have determined that treatment approaches for ADHD often help improve symptoms and functional impairments associated with ODD and CD. Given the substantial risk of developing ODD and CD among children with ADHD, it is important to plan interventions that will address the current functional deficits and may reduce the risk of developing additional problems in the future. The purpose of the present review was to present evidence from clinical trials of interventions that involve medication and psychosocial strategies for children with ADHD that are at-risk for ODD and CD separately, as well as models for the implementation of these strategies. In order to identify peer-reviewed journal articles and edited books describing studies that evaluated interventions for ADHD and comorbid ODD/CD, electronic databases (i.e., Psychinfo and Medline) were searched between May 1 and May 30, 2012, using combinations of the search terms “intervention”, “treatment”, “Attention Deficit/Hyperactivity Disorder”, “disruptive behavior”, “Oppositional Defiant Disorder”, “Conduct Disorder”, “aggression”, “delinquency”, and “externalizing behavior”.

### Medication

While stimulant medication and atomoxetine, a selective noradrenergic reuptake inhibitor, are well-established treatments for children and adolescents with ADHD [38], researchers have also demonstrated that these medications, especially stimulants, reduce comorbid problems, such as aggressive behavior and symptoms of ODD [39-44]. Moreover, stimulant medications have been shown to significantly reduce aggression in children with comorbid ADHD and CD, with generally large effect sizes (average effect sizes of .69 and .84 for covert and overt aggressive behaviors, respectively) [45]. Nevertheless, the American Academy of Child and Adolescent Psychiatry recommends a stimulant medication trial, either amphetamine or methylphenidate, for children and adolescents with ADHD that can be titrated to the optimal dose over time [38]. It is important to note, however, that this recommendation is in the context of frequent monitoring of treatment response and symptom remission. Moreover, contrary to concerns that stimulant medications might increase children’s risk for future substance use, researchers have found that past stimulant treatment may actually reduce this risk [46,47]

If the youth’s response to stimulant treatment is insufficient, researchers have found that supplementing the stimulant with an alpha-2 receptor agonist may also be effective, although effects have not been as robust as those found for stimulant medication [48]. Augmentation with clonidine and guanfacine have also been found to be effective for children with ADHD and ODD, irritability, or aggressive behavior, with reported effect sizes for ADHD symptoms ranging from .43 to 1.34 [49-52]. If aggressive behaviors are persistent, risperidone has been found to be an effective supplemental medication as well (100% of risperidone patients vs. 77% placebo patients decreasing their aggressive behavior by at least 30% in first 4 weeks of treatment), but has been associated with substantial weight gain [53-55].

## Psychosocial Interventions

**Behavioral Training**—In consideration of the pervasive nature of ADHD and comorbid ODD/CD, psychosocial treatments have been developed that attempt to change the social environment through behavioral interventions in order to impact outcomes for youth with these problems. Behavioral interventions for parents focus on restructuring the “coercive” parent-child interaction process, as described by Patterson [56], among families with children characterized by behavior problems. In this process, parents and their children struggle to control one another’s behaviors through negative reinforcement [57]. For example, a child may learn to avert parental demands (e.g., chores) by engaging in increasingly undesirable behavior (e.g., argumentativeness, aggression) until his or her parents withdraw their demands. Conversely, parents may learn that they can achieve compliance from their children by engaging in extremely aversive or punitive behaviors (e.g., yelling, slapping). This process was initially identified among children and adolescents with ODD and aggressive behaviors and similar processes have been identified in youth with ADHD and CD more recently [3,37]. These processes can also disrupt the classroom environment in a similar fashion. Thus, teaching parents and teachers of children with ADHD and comorbid ODD/CD to implement effective behavior management techniques is particularly appropriate.

Behavioral programs have been adapted to target children and adolescents of all ages in the home and school settings, respectively, using behavioral parent training (BPT), behavioral classroom management (BCM), or a combination of the two. Although for younger children the primary focus is on training parents and teachers, as children get older and become more autonomous it becomes increasingly important to involve them directly by including child skills training components (discussed below) [57]. When implemented alone, BPT is typically 8-16 sessions and can be administered in a parent group format or to individual parents/families, or as a mixture of group and individual sessions [58,59]. A substantial literature supports these approaches, including a recent meta-analysis that reported large average effect sizes (Cohen’s  $d$ s ranging from .70-3.78 depending on study design) that were stable across demographic factors (e.g., age, IQ, and race of children, family structure, etc.) [60]. Moreover, results generally indicated medium to large average effect sizes for improvements in reported and observed parenting practices and children’s ADHD symptoms, externalizing behaviors (e.g., aggressive, oppositional, and conduct problems), and impaired functioning, although effect sizes for measures of academic achievement were generally small to medium. These results provide strong support for the use of behavioral interventions for children with ADHD, ODD, and/or CD.

Behavioral interventions typically begin with a functional behavioral analysis, in which positive and negative behaviors are chosen as targets to increase or decrease, respectively, using a structured system of contingencies (i.e., immediate incentives and consequences) that are directly linked to the target behaviors [57]. Researchers have found that children with ADHD, ODD, and CD similarly tend to lack responsivity to partial reinforcement [61], delayed reinforcement [62], and signs of punishments or loss of rewards [63]. They may also have elevated reward thresholds [64]. Such reward-related deficits may relate, at a neural level, to an inherent lack of crucial receptors for dopamine in key brain tracts [65].

Based on these findings, parents are taught to give clear and effective instructions, develop a structured routine with consistent rules and expectations, reward appropriate behavior, actively ignore negative behaviors, develop a token-economy system, coordinate this system with the child's school, and effectively manage noncompliant and/or aggressive behaviors at home and in public places. Teachers are trained by mental health professionals in analogous behavior management techniques (e.g., the use of token-economies, positive reinforcement, and prudent negative consequences), and receive regular consultation [66,67]. Finally, a useful variant of the token economy that facilitates coordination of behavioral management systems at school and at home is the daily report card, in which the child is rated each day on his or her performance in a number of pre-specified domains of behavior that require improvement—and is rewarded for their performance [68].

**Child Skills Training**—As mentioned above, skill-training interventions that directly address the common skill deficits of children with ADHD and comorbid ODD/CD have also been developed. For example, social skills training programs have been developed to address the common social impairments of youth with ADHD and ODD/CD (such as aggressive behavior, poor conflict resolution, impulsivity, lack of social awareness, etc.) [5,6,69] that often result in fewer friendships, a greater likelihood of association with deviant peers, and more frequent peer rejection [6,32,69,70]. In these social skills training programs, children are taught a variety of social skills such as good sportsmanship, conversation and communication skills, and handling teasing and disagreements. Researchers have emphasized the importance of training children at the point of performance, among similar-age peers, in order to reinforce the acquisition of skills and increase the likelihood that they will generalize beyond the treatment context [71-74].

Although these treatments have generally reported moderate to large effect sizes (Cohen's *ds* ranging from .59 to .99) for improvements in externalizing and aggressive behaviors, in the case of interventions that target deviant and delinquent behaviors, group treatments have been found to foster peer training in undesirable, deviant behaviors [75]. Moreover, studies have found that training parents to reinforce or coach the skills taught in social skills training groups results in greater improvements in social skills. However, it is not apparent that improvements in social skills translate to improvements in the quality or quantity of children's friendships. Thus, researchers have recommended that social skills training interventions focus on friendship-making skills that facilitate the acquisition of social skills and the improvement of friendship quality and peer acceptance [76].

Youth with ADHD and ODD/CD are also often characterized by academic problems (e.g., lower scores on academic achievement tests, poorer class work and homework completion, lower report card grades, etc.) that result directly and indirectly from difficulties performing executive functions such as organizing tasks, managing their time, and planning effectively [2,4,7,10,77-79]. Training programs that promote academic success have been developed to improve organizational skills, self-management, note-taking, and homework skills [77,80-84]. Comprehensive programs that teach many of these skills, such as the *Challenging Horizons Program* [77,80,85], have recently demonstrated their utility for the improvement of children's academic outcomes as well as their organization and homework skills. However, evidence of the efficacy of these programs for improving aggressive and

disruptive behaviors has not yet been reported. The *Challenging Horizons Program* can be implemented in different forms, but generally involves intensive intervention two to four days each week, with sessions lasting approximately two hours each from ten weeks up to a full academic year. The intervention can be implemented by mental health professionals or school personnel.

**Multi-component Implementations**—As mentioned above, children who develop early, persistent aggressive and conduct problems have been found to have the poorest prognoses and be the most treatment resistant. Thus, these children typically require more intensive implementation strategies that maximize the impact of the intervention by coordinating psychosocial treatment approaches, as described above, across multiple contexts. This multi-component approach to implementation facilitates the coordination of context-specific impairments or treatment targets within a common, behavioral framework. While a number of multi-component interventions have been developed for youth with either ADHD or ODD/CD, few programs have been developed that adequately address both sets of problems.

One example of a multi-component implementation is the *Incredible Years* program, a comprehensive, multi-setting intervention for young children (ages 3-7) at-risk for ODD/CD that integrates BPT, BCM, and child skills training interventions [86]. Each component of the program can be implemented separately, but the program is more potent when the components are combined. Although *Incredible Years* has shown some evidence of utility for children with comorbid ADHD problems, the only evaluation for children with primary ADHD problems, a 20-week randomized clinical trial of only the BPT and child skills training components, demonstrated evidence of moderate effects (Cohen's *ds* ranging from .41 to .51) for improvement in externalizing behavior problems by parent and teacher reports of child behavior and moderate to large effects (Cohen's *ds* ranging from .41 to .77) for improvement in inattention, hyperactivity, aggression and oppositionality, in particular, but only for parent reports of child behavior [87]. Another similar multi-component intervention program *First Steps to Success*, targets children in Kindergarten-3rd grade with ODD/CD problems and consists of BPT and BCM components that are implemented in the home and school contexts, respectively [88]. The program consists of 30 "program days" in which the intervention is implemented at school, plus six home sessions, in which parents learn to implement BPT strategies. Seeley and his colleagues [89] conducted a randomized clinical trial for children with primary ADHD problems and found that children assigned to the intervention condition had significantly greater improvements in ADHD behaviors, social skills, and academic problems at school, but not at home. The lack of consistent findings across contexts may indicate that these interventions need further adaptation to adequately address the impairments of children with ADHD in general. However, a moderate effect (Cohen's  $d = .60$ ) for improvements in problem behaviors was found in the home context, in addition to a moderate effect (Cohen's  $d = .74$ ) for improvements in oppositionality in the school context for the intervention group. These findings indicate that the intervention had similar effects on disruptive behaviors in children with primary ADHD diagnoses as those reported in children with primary ODD and CD diagnoses.

Similar multi-component programs have also been developed that specifically target children with ADHD, such as the *Collaborative Life Skills* program, which targets



elementary school-aged children and includes BPT, BCM, and child skills training components. All intervention components are implemented at the child's school by existing school mental health personnel called learning support professionals [90]. As part of the program, learning support professionals conduct 10 weekly BPT and child skills training groups at the children's schools, lead a 30-60 minute orientation meeting for participating teachers, and coordinate approximately 2-3 meetings with teachers, parents, and their children to develop a school daily report card to complement the home daily report card developed by the parents. Initial results revealed that children demonstrated significant and moderate and large improvements in ODD and ADHD-related problem behaviors, respectively, at home and significant and small and moderate improvements in ODD and ADHD-related problem behaviors, respectively, at school, in addition to improvements in a variety of other social, organizational, and academic outcomes.

Similar, but more intensive interventions for children with ADHD in grades one through eleven are *Summer Treatment Programs*, which combine BPT, child skills training, and analogous BCM interventions in a summer camp-like setting that children attend for approximately nine hours per day for eight weeks [91-93]. Trained behavioral counselors maintain a behavior management system analogous to BCM as the children engage in sports, art, and academic classes. Included in the regular curriculum is child social and academic skill interventions, with individual daily report cards developed for each child. In addition, group BPT sessions and medication evaluation and management are provided. *Summer Treatment Programs* have generally been found result in moderate to large effect sizes for improvements in symptoms and functional impairments associated with ADHD and disruptive behaviors related to ODD/CD, across a variety of domains as rated by parents, teachers, and counselors, although the long-term maintenance of treatment effects following the withdrawal of intensive treatment is unclear. In addition, comparable effects sizes have been found when comparing the effects of *Summer Treatment Programs* to medication treatments alone or combined medication and *Summer Treatment Program* treatment approaches.

Despite the success of these programs for reducing symptoms and impairments in youth with ADHD, none of these programs directly address the problems of the most concerning youth at the highest risk for the development of conduct problems (i.e., youth who present with severe conduct problems at a very early age). To target these youth in particular, researchers developed and tested an extremely intensive, multi-component intervention, *Fast Track*, which was implemented over a 10-year period as part of a randomized clinical trial and included BPT, BCM, and child skills training components [94]. *Fast Track* was developed to address the environmental mechanisms that exacerbate and maintain conduct problems in at-risk children [e.g., parent-child conflict, peer rejection, etc.; 36]. The BPT and child skills training components were implemented during a two-hour after school enrichment program that occurred weekly for 22 sessions during first grade, bi-weekly for 11 sessions during second grade, and monthly for 9 sessions during third through fifth grades. In addition, teachers implemented behavioral strategies and taught emotional understanding and communication, friendship, self-control, and social problem solving skills. During middle school, joint and separate parent and youth groups addressed



adolescent issues such as sex education, parental monitoring, coping with peer pressure, etc. Individualized interventions were also developed and implemented between seventh and tenth grade ranging from the minimal monthly contact to more intensive and targeted interventions for areas of continued impairment. The intervention group showed some improvements in their aggressive and disruptive behaviors during the elementary school phase of the intervention, but these improvements were less pronounced during middle school [95-97]. However, more detailed analyses revealed that the most prominent improvements were for the highest risk youth, who were in the highest 3% of risk for conduct problem scores at their initial assessments. For these youth, the intervention proved to significantly reduce the lifetime prevalence by parent report of ADHD (46% in the intervention group vs. 64% in the control group), ODD (37% in the intervention group vs. 56% in the control group), and CD (20% in the intervention group vs. 41% in the control group) across developmental periods and these effects were maintained two years after the intervention was withdrawn. These findings indicate that, although extremely time- and labor-intensive, *Fast Track* was effective for the most severe youth, at the highest risk for developing CD. However, the impact of the intervention on other at-risk youth was less encouraging.

### Multimodal Interventions

Given the individual successes demonstrated by medication and multi-component psychosocial interventions, it is not surprising that the combination of these intervention strategies is likely the most effective treatment approach. For example, the Multimodal Treatment Study of Children with ADHD found a combined medication and behavioral intervention to be the optimal treatment for ADHD and ODD-related problems over either medication treatment alone (Cohen's  $d$ s ranging from .26 to .28) or behavioral treatment alone (Cohen's  $d = .58$ ) [98]. It is important to note, however, that in order to adequately address the immediate impairments of children with ADHD and comorbid ODD/CD, as well as prevent the development of more serious problems, it is crucial that multimodal treatment strategies include sufficient doses of medication and multi-component psychosocial interventions that adequately address impairments inherent to ADHD as well as ODD/CD.

One example of a multimodal intervention implementation that addresses multiple problems simultaneously is *Multi-Systemic Therapy*, which involves the coordination of multiple intervention approaches by a team of service providers across contexts in order to comprehensively treat serious psychopathology such as CD alone as well as in combination with ADHD and/or ODD, and to prevent out-of-home placements, such as juvenile detention, residential treatment, etc. [99]. The model integrates a number of evidence-based treatments such as BPT, BCM, child skills training, and pharmacotherapy using an ecological framework that can include peers, school, extended family, family supports, the neighborhood, community groups, and other services. The treatment is delivered in a home-based format, includes availability of therapists 24/7, as needed, and typically lasts approximately three to five months. A number of randomized clinical trials have demonstrated the effectiveness of its implementation for youth with severe ADHD, ODD, and CD problems as well as substance use and family relations. It should be noted, however,

that the precise combination of intervention strategies varies depending on the problem being addressed.

Another implementation of a similar scale, *Multidimensional Treatment Foster Care*, also coordinates a number of services, including medication and multi-component psychosocial intervention approaches, for youth with severe CD. Youth who receive this intervention are placed in specialized foster homes that serve as an alternative to out-of-home placements, such as residential treatment or juvenile detention [100]. As with *Multi-Systemic Therapy*, there is some variability in the treatments that are implemented, but youth generally receive behavioral and skills training from a behavioral support specialist and an individual therapist, respectively, behavior management from a foster parent experienced in BPT, family therapy with their biological family (which includes BPT), psychiatry services as needed, and coordination of services from a program supervisor. Family and individual therapy are delivered during weekly sessions, and youth meet individually with the behavioral support specialist one or two sessions for two to six hours of treatment each week. The intervention typically lasts between six and nine months with the goal of reunifying the child with their biological parents at the end of the intervention. This intervention has been found to reduce aggressive and delinquent conduct (Cohen's *ds* ranging from .38 to .79 in comparison to usual group care) problems in boys and girls as well as reduce out-of-home placements.

## Conclusion

Extensive research has focused on the development and treatment of ADHD, ODD, and CD, culminating in adequate evidence that interventions are effective for these problems. Given the complex interactions between genetic/heritable factors and myriad environmental risk and protective factors for the development of ADHD and ODD/CD, it appears that more comprehensive and intensive intervention implementations are the most effective. In particular, evidence supports the use of multi-component psychosocial intervention approaches that coordinate treatment components across contexts in order to maximize the potency of the intervention. Moreover, the success of medication and psychosocial interventions appears to be enhanced when the intervention approaches are combined and may produce the most robust effects. Nevertheless, it is important to consider the importance of accurately identifying and diagnosing youth in order to efficiently plan effective treatment strategies. It will also be crucial for future researchers to rigorously evaluate the impact of these combined intervention strategies for youth with ADHD and comorbid ODD/CD.

## Expert Commentary

In light of extensive research on the common etiological factors that contribute to high comorbidity rates between ADHD and ODD/CD, the current understanding of the development of these disorders has advanced substantially. Researchers have identified common genetic contributions that partially explain the co-occurrence of these disorders in children and adolescents, but leave substantial variability to be explained by environmental factors [15]. Nevertheless, the high rates of heritability have resulted in the identification of

biological explanations for common features that contribute to each disorder, such as impulsivity or behavioral disinhibition [9]. These findings provide key insights into the early development of disruptive behavior problems, which have been reliably identified as early as 17 months of age [13,14]. Given these insights, it is plausible to intervene by 2 years of age if children are promptly assessed and provided with access to services. In fact, this may be the most efficient strategy for intervention, as it may require less intensive treatment approaches.

Nevertheless, many children do not manifest these problems or their problems are not detected until closer to school-age, at which time their etiologies are complicated by transactions among environmental factors from multiple contexts and may require more intensive intervention approaches. Indeed, researchers have begun to identify mechanisms and processes through which these problems are exacerbated and maintained. For example, researchers have identified that impairments inherent to ADHD, ODD, and CD, such as poor social skills, parent-child relational problems, and academic problems, often lead to cascading developmental problems such as association with deviant peers, harsh parenting, school failure and/or dropout, etc., which in turn exacerbate ADHD, ODD, and CD problems [3,32-37]. Identifying these mechanisms and processes has been crucial to the development of many of the interventions discussed in this article and will continue to play a vital role in the personalization of these interventions for specific subpopulations.

The interventions discussed in this article are examples of treatment approaches that have been developed in the context of many years of developmental research. The criteria by which these interventions are evaluated have become increasingly rigorous as clinical researchers strive to meet the standards of evidence-based treatments. In addition to the strong theoretical models on which these interventions have been established, researchers have generally implemented well-controlled evaluation methods, such as randomized clinical trials, that have demonstrated the superiority of these evidence-based interventions over commonly implemented treatments that were not empirically developed. However, despite efforts to identify the efficacy of individual intervention components (e.g., BPT or BCM), many multi-component interventions still include components that do not have established empirical support. Moreover, clinical evaluations of interventions have often been limited to comparisons between comprehensive treatment packages and a control or usual care condition, but not an alternative treatment approach. This limits the conclusions that can be drawn about the individual contributions of each component of the treatment package, which is a particularly salient consideration for some of the more intensive interventions discussed herein. Nevertheless, the process of evaluating these interventions is time-intensive and evidence from increasingly methodologically rigorous investigations continues to accumulate for each intervention as the field continues to progress.

Finally, it is crucial to note that youth with ADHD and comorbid ODD/CD represent a heterogeneous group. Given the substantial variability in the presentations of ODD and CD, the specific symptoms that present in combination with ADHD can vary greatly [101]. In particular, many experts have identified a particularly concerning group of youth who present with comorbid ADHD and CD that also present with psychopathic or callous-unemotional features, may have unique etiological factors related to their psychopathology,

and are especially resistant to treatment in the long term [102]. Given the variety of etiologies, presentations, and treatment responses of youth with comorbid ADHD, ODD, and/or CD, it will be important for researchers to develop interventions that target a broad range of disruptive behavior problems and their antecedents.

## Five-Year View

Although research on the development and treatment of ADHD, ODD, and CD has progressed substantially, myriad questions remain. For example, recent initiatives issued by research groups involved in the refinement of the clinical criteria that will define these disorders in the DSM-V have highlighted controversies over issues as basic as the existence of these disorders as distinct phenomena (e.g., whether or not ODD is distinct from CD) and their symptomatic structures [101,103]. Indeed, in recent years researchers have responded with evidence from sophisticated investigations in support of a number of theoretically- and empirically-derived revisions to the current taxonomic structures, but this research is far from a consensus. Other controversies include the developmental progression of these disorders, their comorbidities with one another as well as other disorders, differences between their presentations and development in boys and girls, etc. Despite the considerable need for additional empirical evidence, efforts to address these controversies have initiated an escalation in research production on these topics that will continue to inform the development of more refined interventions.

In the future development and refinement of interventions, it will be increasingly important for researchers to establish the efficacy of those interventions over more parsimonious and existing treatments. For example, rigorous evaluations that examine the efficacy of specific components of multi-component interventions will be essential to determining the most cost-effective implementations. Moreover, conducting randomized clinical trials that directly compare new interventions to control or usual care conditions as well as alternate and existing treatments will empirically establish the superiority of novel intervention strategies. Also, researchers should continue to evaluate the immediate and long-term effects of treatments on a variety of domains of functioning based on multiple methods of assessment across multiple contexts of functioning in order to optimally determine the potency of the intervention's impact on all domains of impairment.

With regard to intervention development, it is critical that researchers increase efforts to personalize interventions. Intervention strategies may require adaptation to meet the needs of different subpopulations such as genders, ethnic/racial and cultural groups, individuals with comorbid disorders (e.g., ADHD and CD), and individuals in different contextual environments (e.g., single-parent homes, foster care, homeless shelters, etc.). For example, although researchers have found that youth with ADHD and comorbid ODD benefit from group interventions, numerous studies have reported an exacerbation of symptoms among youth with CD in group interventions as a result of the deviant peer contagion effect or deviancy training [75,98,104,105]. It is likely that innovative implementation strategies will need to be developed in order to personalize these interventions. An example of this is the development of the *Multidimensional Treatment Foster Care* model, which allows clinicians to intervene with individual youth that have severe conduct problems and would otherwise

be receiving less effective services in juvenile detention or residential treatment [100]. At the same time, it will be important to continue developing feasible and sustainable intervention models with a particular focus on improving access for underserved populations. In order to achieve this objective, researchers will have to successfully demonstrate the effective implementation of these interventions in the most common mental health care settings, as well as the improved cost-effectiveness of that implementation.

Finally, despite the nearly universal recognition of the overlap in etiology and development of ADHD and ODD/CD highlighted throughout this review, there has been a lack of interventions that specifically focus on simultaneously addressing the symptoms and impairments inherent to each disorder. Although researchers have demonstrated some initial evidence for the common efficacy of interventions, the findings have been somewhat inconsistent and, often, context specific. Moreover, evidence indicating that individuals with comorbid ADHD and conduct problems represent a particularly high-risk subgroup suggests that this group may have unique risk factors and impairments that will need to be targeted specifically. Thus, it will be important to develop longitudinal psychosocial intervention approaches that address risk factors across the lifespan, such as intensive behavioral parent training with younger children and prevention of school dropout and separation from deviant peers for older children. Moreover, although detailed medication algorithms for ADHD are well developed, algorithms for comorbid disruptive behavior have not been well studied and thus represent an opportunity for future research. As the empirical foundations of intervention strategies for these disorders continue to develop, the adaptation of these interventions to efficiently address the specific impairments of youth at-risk for comorbidity will be essential.

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### Key Issues

- Children with ADHD are at an increased risk of developing serious conduct problems.
- ADHD and ODD/CD have been found to share common genetic etiologies and are associated with similar neuropsychological impairments.
- ADHD and ODD/CD share substantial environmental etiologies and risk factors.
- Stimulant and amphetamine medications are well-established treatments for ADHD and have been shown to decrease aggression in children with ADHD and comorbid conduct problems.
- Psychosocial interventions, such as behavioral interventions, are well-established treatments for ADHD, ODD, and CD separately.
- Multi-component psychosocial interventions that coordinate treatments across contexts are likely to have the most profound and sustained impacts on children's functioning.
- Intervention implementations that include medication and multi-component psychosocial interventions may be necessary in order to adequately address the problems of youth with ADHD and comorbid ODD/CD.