Disruptive Mood Dysregulation, and Other Disruptive or Aggressive Disorders in ADHD

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Background, Phenomenology, and Prevalence

Approximately 30–45% of children with attention-deficit/hyperactivity disorder (ADHD) experience significant impairments because they are prone to anger, rageful outbursts, irritability, or other manifestations of excessive, negative emotionality [1–4]. These incidents most often occur after provocations or irritations that age-mates without ADHD would usually handle with composure. Related descriptors of the clinical picture include brittle frustration tolerance, irritability, abrupt and extreme changes in mood, and drastic and exaggerated behavioral reactions. For a number of these youngsters, the resulting behavior often escalates to interpersonal or self-directed aggression. Massive upsets of this sort are deeply disturbing to others, and high vulnerability to them is not conducive to a satisfying self-image or an enjoyable childhood. Bearing in mind that ADHD alone has adverse risks for quality of life, these additional features of disturbed emotion regulation further increase the likelihood of serious impairments as well as family strain, social marginalization, and numerous long-term disadvantages. Since ADHD is the most prevalent and chronic psychiatric disorder among children receiving mental health care, the high rate of these mood-related difficulties results in a large patient population of young people with symptoms of poor impulse control and high negative emotional reactivity.

Overblown anger and hostile behavior in the face of easily triggered irritations are prominent symptoms of oppositional defiant disorder (ODD). They are also quite common among those with conduct disorder (CD). Similarly, chronic rageful outbursts are the hallmark of disruptive mood dysregulation disorder (DMDD), introduced in DSM-5 within the mood disorder group. Despite their frequency, fundamental questions remain unresolved that concern the disturbances in emotional processes these behaviors seem to reflect. Do these troubling clinical problems

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reflect a distinct disturbance of mood or are they better regarded as a component or complication of more severe ADHD? In any event, why should problems that clearly involve emotional functioning be so prevalent among those ADHD? What are the implications for treatment?

To veteran practitioners and investigators, this line of questioning reflects years of controversies that still linger. Newcomers who soon learn that these difficulties characterize a large proportion of their patients may be surprised that these issues have not been settled yet, and that their mentors and teachers propose diverse diagnoses and treatment strategies for what seem like the same kinds of problems. This chapter's objectives are to review the psychopathology and other influences that contribute to such highly negative and excessive emotional reactivity in ADHD patients, to offer a framework for assessment, and to summarize current treatment approaches and possible directions for future research and improved clinical care.

Associations of Aggressive Behavior, Negative Affect, and ADHD

In youth, the association between ADHD, negative affect, and harmful behavior is well documented, and a literature concerning adults with these problems is also emerging [1–12]. The emotion-related constructs in this research vary, and studies purport to examine emotional lability, emotional regulation/dysregulation, emotional reactivity, emotional impulsivity, and irritability, among other related terms. In principle, one can meaningfully distinguish each of these concepts and define it as a separate process. Practically speaking, however, the content of various measures' items overlap considerably, and emphasize quickness to anger, hostile behavior, angry outbursts, low frustration tolerance, and other indicators of "hot" affect.

Most studies in this area have evaluated aspects of emotional processes (e.g., prevalence, correlates, neuroimaging, and longitudinal stability) *related to the level of* ADHD symptoms (cases vs. controls, high vs. lower severity, etc.) in population- or clinic-based samples. From a clinical standpoint, though, volatility and touchiness frequently motivate coming for care, in which case the inverse of the question is informative: *given that* one has these disturbing emotion-related problems, what is the diagnostic context in which they develop? This approach shows that ADHD is ubiquitous in clinical and epidemiological samples of children and adolescents characterized as high in emotional lability/dysregulation and aggression [13–16]. We discuss the implications for treatment later in this chapter.

History and Conceptual Issues

The susceptibility of people with impulse control deficits, attentional problems, and hyperactivity to showing drastic displays of anger and hostile behavior was recognized long before ADHD became formalized as a medical diagnosis [5]. In the late 1700s, Melchior Weikard in Germany and Alexander Crichton in England described attentional problems that resemble today's conception of ADHD. In their few

references to emotion, they appeared to view affective disturbances as potential drivers of the attentional ones. Weikard referred to overactivity as "excessive mercuriality," and under-excitability as "*inactive floppiness"* [17, p. 628 (italics added)]. Crichton observed that "some men … are disposed to certain emotions or passions, rather than to others…for instance to the violent emotions of anger…. Such men have their attention most readily engaged by every object or thought which excites these emotions" [18, pp. 262–3]. He thus hinted at a major research focus of modern times, biases in cognition related to uncontrolled affective states (a so-called "bottom-up" etiology).

Influenced by the American philosopher, William James, and his own clinical observations of 43 children with intellectual as case studies, the British pediatrician, Dr. George Still, published three lectures in 1902, widely believed to be the earliest extensive medical discussions of behavioral disorders in children. The aim of Dr. Still's presentations was to place problematic behaviors of children into what would be described today as a developmental psychopathology framework. The emphasis of these talks was on symptoms much like today's disruptive disorders and DMDD, which were thought to arise from impaired development of inhibitory control, and diminished capacity for emotional regulation. He described a "predominance of passionateness" as the most common sign of "morbid diminution or defect of moral control…," which he viewed being based on a lack of inhibitory control [19, p. 1009]. He went on to suggest that "outbursts of rage in some of the cases where there is no evidence of cerebral lesion may be due to a similar exaggeration of excitability with consequent insufficiency of inhibitory volition" [20, p. 1165]. Dr. Still suggested that intense and volatile affective reactions are common drivers of severe conduct problems. These deficits are not exclusively the result of global developmental impairments nor of other obvious neuropathological causes. Toward the end of this work, he drew a connection between conduct problems, affective volatility, and attentional problems, saying "a notable feature in many of these cases … is a quite abnormal incapacity for sustained attention" [20, p. 1166]. In contrast to others' suggestion that strong emotions subvert cognition, Dr. Still pointed to the reverse process, in which weakened cognitive control contributes to problematic behavior by impeding emotion regulation.

Taken together, passages of these various early ADHD luminaries anticipate what we now view as the interplay between "bottom-up" and "top-down" neural processes in generating emotional states. On one hand, susceptibility to intense and rapid experiences of strong emotions that compromise judgment, inhibitory control, and the capacity to direct one's behavior to more adaptive ends might suggest poor "bottom-up" control. On the other hand, when one shows impaired self-control across a range of cognitive and behavioral functions (e.g., inattention, hyperactivity, impulsivity), the incapacity to willfully regulate emotional expression might suggest poor "top-down" control.

Emotion-related problems of any sort are not among the formal diagnostic criteria for ADHD, but some have been mentioned as associated features of ADHD since DSM-III. Based on the frequent co-occurrence of affect problems and ADHD, and on models of ADHD that emphasize a pervasive inadequacy of self-regulatory

functions, some experts consider emotional under-control an integral manifestation of ADHD, at least regarding its hyperactive/impulsive components [21–23]. At the same time, not all children with ADHD are irritable, prone to anger, or have massive overreactions to minor irritations. Furthermore, these problems are not specific to ADHD, and become relatively more associated with mood disorders with age [24, 25]. Although having ADHD increases the risk for periodic, extreme bursts of emotional expression that are poorly controlled, it seems parsimonious to think that such moodiness is explainable only as a form of emotional impulsivity to go along with the behavioral impulsivity and "cognitive impulsivity" (or distractibility) of ADHD. Nevertheless, emotion-related problems were essentially defined out of ADHD from DSM-II onward. Barkley [5] attributes this to several factors operating in the 1970s and 1980s, including a growing interest in behavioral phenomena that researchers of ADHD could quantify in experimental paradigms. DSM-III also introduced ODD, in which four of eight symptom criteria involved hostile affect, despite its classification among the disruptive behavior rather than among the affective disorders. The comorbidity between ADHD and ODD is among the strongest in psychiatry, rivaling that between depression and anxiety in adults in clinical populations [26, 27].

One consequence is that, over time, ADHD has increasingly been viewed as a more circumscribed problem involving attention problems and restlessness. ODD likewise evoked the image of bratty insubordination, a mere "behavior problem," and became regarded as not quite a real psychiatric illness. Even so, these patients kept coming—behaving in harmful ways to themselves and to others, suspended from schools, seen in emergency rooms, and admitted to inpatient care. In this context, concerns arose that ADHD and ODD underemphasized the affective disturbances that dominated the clinical picture, and the common refrain in the 1990s was that such patients had "more than just ADHD." For some years thereafter, it became common to diagnose this presentation as a form of bipolar disorder (BD), which introduced its own new set of difficulties, including a vast inflation of BD's incidence among youth in the US [28, 29]. Although BD has been defined by demarcated episodes of mania and major depression, very few preadolescents with the BD diagnosis have shown this pattern of episodic symptomatology. DMDD more recently is now intended to provide a new rubric for periodic enraged outbursts that occur consistently over time, along with a prevailing mood state or irritability or anger in between such outbursts.

Currently, emotion regulation has developed into a significant focus of research interest [30]. Neuroimaging and psychophysiological approaches now have a range of available tools for measurement and analysis, and paradigms for eliciting neural processes having greater precision to study underlying mechanisms. It may soon become possible to parse such aberrant emotional processes and maladaptive behavior into specific emotion generating (bottom-up) and emotion modulating (top-down) components [31, 32]. Alternatively, such a distinction may be an oversimplification, in part because bidirectional influences are common in neural networks and behavioral processes. Suppose that difficulty modulating even mild angry arousal leads quickly to hostile screaming and threatening. The behavior itself may amplify the

negative emotion, and understandably harsh reactions from others may further inflame the emotional upset, making it even harder to rein in. Then again, sensory gating abnormalities seen in a variety of disorders including ADHD may intensify bothersome stimuli so that they become more highly noxious.

In the meantime, current diagnostic approaches remain anchored in a taxonomy of mood disorders which emphasize pervasive disturbances in emotional tone and behavior, not the brief flashes of affective dyscontrol or blowups that are quickly followed by a return to a more normal baseline. These later "mood problems" are what characterize the majority of children with ADHD and severe behavioral disturbances [33, 34]. In short, a diagnosis of ADHD with ODD/CD can represent a wide range of variations in severity, and does not always convey the magnitude of these youngsters volatility. On the other hand, mood disorder diagnoses including DMDD reflect sustained abnormalities in affect that seem only seldom present. This large patient group has been appropriately characterized as "diagnostically homeless" [35]. The significance for practitioners is that making such diagnoses for these youngsters does little to direct their core responsibilities of evaluation, psychoeducation, treatment planning, and clinical management. Rather, the clinician most often has to weigh the relative contributions of (a) emotional impulse control deficits, (b) mood-related problems having "a life of their own," and (c) the environmental and social factors that may also be contributing to these problems. The following sections on assessment and treatment elaborate on this approach.

Assessment

Typical presenting complaints from families include poor frustration tolerance, excessive irritability, inexplicable anger, and belligerent often unpredictable reactions to minor provocations. The clinician's task is to determine which among many potential psychiatric, developmental, medical, and environmental factors is contributing to such behaviors and may require clinical attention in a given patient. This section suggests tactics for assessment of such behaviors and their contributing factors, but is limited to the common clinical scenario where ADHD is in the differential diagnosis. Experts have published excellent, evidence-based clinical recommendations and best practices regarding the evaluation and treatment of ADHD [36, 37]. Some offer guidance regarding specific comorbidities and complications, including aggression and mood disorders, or impulsive aggression [38, 39]. As such, we will not review in great detail the fundamentals of ADHD and its treatment here.

Is ADHD Really a Part of the Clinical Picture?

There are several reasons to determine early on whether ADHD is present, *regardless* of other disorders. First, even in the typical situation in which comorbid conditions are quite serious (e.g., disruptive behavior, mood, or anxiety disorders), high impulsivity increases their severity, and may have hindered prior efforts to manage

these symptoms [e.g. 40–42]. Second, the effect sizes for current ADHD pharmacotherapies are large, and such treatments when done systematically can lead to substantial reductions in affective volatility, aggression, and even mood symptoms. Accordingly, expert consensus algorithms suggest prioritizing ADHD treatment [43]. Third, these trials can be done quickly—it usually takes only a week or so to determine the efficacy and tolerability of a stimulant regimen and adjustments to the medication and dosage can be done promptly. Fourth, improved attention and diminished hyperactivity increase the likelihood that psychosocial treatments will gain traction. Fifth, stimulant pharmacotherapy has a reasonable chance of affecting not only core ADHD symptoms but also co-occurring impairments related to negative emotionality and explosiveness. In contrast, monotherapies that target mood-related disturbances (antidepressants, antipsychotics, mood stabilizers, etc.) are seldom effective treatments for ADHD symptoms.

Some common expressions to identify ADHD symptoms could also apply to people who lose their tempers often (e.g., "acts without thinking," "gets distracted," "impulsive," "impatient," "over-sensitive"). It is important to ask informants not only about times when the patient is upset, but also about the full breadth of ADHD symptoms and whether their onset and course is consistent with an ADHD diagnosis. It is helpful to compare rating scales from teachers and parents. However, clinicians should be vigilant for the so-called "horns effect" bias (a reversal of the "halo effect"), in which parents or teachers so annoyed or distraught by these behaviors in the child may overreport the child's true symptoms [44, 45].

Is a Mood Disorder Present?

While irritability is a common feature of major depressive, bipolar, and other mood disorders, a diagnostic criterion of these other conditions requires that the patient must have such abnormal moods *most* of the time. In contrast, many youth who become easily upset are otherwise euthymic without an event that unsettles them. However, if their negative reactions and outbursts are frequent or drastic enough, others may regard them as having an "irritable mood." Time spent during assessment to make this distinction is worthwhile. Examples of helpful questions to ask may include: "What is his mood like when things are going his way?" "When good things happen, how much does she seem to enjoy herself, or is she grouchy even at those times?" "If no one is doing anything to get on your nerves, do you still feel really down or aggravated? Do you keep thinking about things that annoy you even if there's nobody bugging you at the moment? Does that get in the way of having fun?" "Can you usually figure out what sets her off, or does she sometimes seem to become upset from out of nowhere?" "When he's starting to have a 'meltdown' and you give into what he wants, does that change his mood, or does he still seem pretty mad?" "Does she put herself down or say that no one likes her at other times?" [i.e., not acutely agitated after some provocation]. Weepiness, anhedonia, and sadness are less common in such emotional storms, and may be more suggestive of depression [34].

Many youth with ADHD experience school frustrations and interpersonal conflict, followed by demoralization and statements that they "don't care" about school, other people, and so forth. Seeing patients at a single time point can make it hard to distinguish such feelings rooted in frustration and futility from the more severe mood symptoms of anhedonia, loss of interest, and hopelessness.

Sleep problems in children with ADHD and disruptive behaviors are common, but most often involve problems settling into bed, anxieties about being alone, and sleep hygiene factors (inappropriate bedtimes, lack of calming routine, etc.); "true" insomnia or inability to fall and remain asleep even when fatigued is less common. Among US adolescents, sleep difficulties are so widespread that they are probably less pathognomonic of specific disorders [46]. However, impaired sleep often correlates with depression severity in patients with mood disorders [47].

Identifying a primary mood disorder, with or without comorbid ADHD or a disruptive disorder, has management implications. Psychoeducation and encouragement of behavioral activation toward positive experiences are certainly indicated. Diminished *capacity* for enjoyment and dampened goal-orientation may undermine behavioral interventions that use rewards to increase adaptive behavior, or cognitive approaches to motivate behavior change by aligning it with personal goals. The impact on the patient's family must also be addressed, especially when the patient's affect seldom brightens and is repeatedly punctuated by outbursts of anger.

What Are the Influences of Other Contributing or Complicating Factors?

Other Disorders

As addressed in other chapters of this book, numerous psychiatric, developmental, and medical disorders affecting children can lead to severe agitation or irritability that resembles the behavioral disturbances of ODD, CD, or DMDD. Often, history and assessment indicate these other conditions are comorbid with ADHD and disruptive disorders, and sometimes the more egregious emotional outbursts may stem from these other "underlying" disorders whose treatment must take first priority. We'll now mention a few that are not always obvious.

Anxiety Disorders. The comorbidity ("trimorbidity") between ADHD, disruptive disorders and anxiety disorders is high [27]. When faced with uncomfortable situations such as separating from caregivers, having to confront the object of a phobia or worry, or a stressful social situation, impulsive children with limited distress tolerance are more likely to use physical means of avoiding, escaping, or protesting. Some impulsive youngsters with obsessive-compulsive disorder can become quite distraught and hostile when blocked from completing a behavior driven by a compulsion. Agitated behavior can be a complication of a primary anxiety disorder when the explosions are limited to such situations, rather than being the general overreactivity to many types of frustration typical of disruptive and mood disorders. Of course, anxiety as a source of distress and impairment requires attention, whatever its etiological significance

for emotional explosiveness. It is important to recognize situations in which anxiety is primary, both to avoid over-diagnosing other problems as potential causes of child's volatility, and for effective management.

Specific Learning and Related Developmental Disorders. Learning disorders cause children to have enormous frustration such that the classroom environment can become highly aversive, and struggles over homework lead to greater conflicts at home. These problems are also highly prevalent among those with ADHD. Frequently, learning disorders are first identified only after years of slow academic skills development. For children who are inattentive, overactive, and disruptive, it is tempting and partly understandable to attribute underachievement to unruliness that interferes with learning. Unfortunately, it can be difficult to evaluate these learning disorders among children with severe ADHD. Their inattentiveness and restlessness can hinder their global performance on the tests used to tease out specific neuropsychological functions signalling learning disabilities. One approach is to defer the investment in formal assessment until ADHD symptoms subside with treatment. At that point, when emotional outbursts seem to coincide mainly with academic demands, support services and modifications to the educational program may be especially helpful.

Adverse Effects of Pharmacotherapy

Although literature is limited, some clinical trial data and clinical experience suggest that stimulant medications may at times adversely affect emotion, causing new or worsening irritability or dysphoria. These in turn lead to increased aggressive outbursts and disruptive behavior symptoms. Such "affective toxicity" is often a dose-dependent phenomenon, and the relative risks of amphetamine-based or methylphenidate-based stimulants are unclear. Many other medications can also have adverse impact on a child's mood and affect affective experiences. Clinicians who have known their patient for some time are in the best position to detect such treatment-emergent changes. Unfortunately, child and adolescent specialists often assume care of patients already on some regimen prescribed by the primary care physician, another specialist, or even an inpatient provider. In history-taking, it is useful to sort out if emotional symptoms might have been affected by a medication of dose change. In the case of stimulants, or of alpha-2 agonists at minimal doses, brief discontinuations, say over a weekend or holiday, can help rule in or rule out iatrogenic effects. Clinicians will need more time to reach a conclusion for drugs having longer half-lives or needing more gradual tapering (e.g., higher alpha-2 agonist doses).

Social and Familial Factors

Almost by definition, children with disruptive disorders compounded by negative emotional reactivity are prone to antagonistic interpersonal relationships, especially with family members. Such patterns may originate from parental psychopathology, child factors that elicit unhelpful parental reactions, or other factors. Whatever their origins, such hostile behaviors between the child and parent often generate retaliation or resentment in the other party, and that leads to a cycle that sustains the child's behavioral and emotional difficulties.

There are ample data to support that impulsive, easily frustrated, and aggressive children pose definite stresses and hardships for their families [48–51]. At the same time, children who experience antagonistic environments in which people influence one another's behavior through harsh and negative behaviors often adopt this way of interacting themselves through several processes: (1) learning from adult examples, (2) intermittent rewards that occur when coercive behavior is successful, and (3) high-frequency anger that arises from others' provocative behavior. Therefore, family strife and caregiver stress are common, and these difficulties are likely to exacerbate children's emotional negativity.

Child behavior management practices that are overly permissive can also promote disruptive behavior symptoms and emotion-regulatory problems. Such permissiveness can stem from parental disengagement, or from ambivalence about setting age-appropriate limits that would upset the child. Such patterns increase the chance that a child's misbehaviors will be reinforced, and deprive the child of opportunities to develop frustration tolerance typically gained through experiencing emotional upsets and having to cope with them.

In some situations, a clinician may perceive caregivers' impatience and discipline practices as especially unsuitable for an impulsive child, which leads the clinician to blame the child's behavioral problems and emotional outbursts on family factors. A fair number of children show behavioral disturbances more severely at home than in school or other settings [52, 53], which sometimes is taken to support a causal role for the family environment in these problems. There has traditionally been some tension about how to apportion the root causes of severe conduct problems between innate and experiential factors. On one hand, there has also been a reluctance to diagnose psychopathology in children whose behavior reflects shortcomings or disadvantages in their interpersonal milieu. On the other hand, it seems unwarranted if not cruel to implicitly blame family members for a child's impulsiveness and negative emotional reactivity that may stem as much from neurodevelopmental predispositions. Parental reactions to a child's behavior may appear overly harsh, indulgent, inconsistent, or counterproductive, but may also be potential consequences rather than causes of the child's difficult behavior. In contrast to such absolute positions, evidence has mounted over the years to support an interactive model that emphasizes the synergism for both types of influence. While problematic caregiver–child interactions are often a critical source of the apparent intractability of such behavioral problems in children, clinicians may eventually be forced to consider more aggressive, complex pharmacotherapy for such harmful behaviors in children.

Intervention Approaches

Issues in Treatment Selection: Diagnostically or Trans-diagnostically Based and Prioritizing Targets

Currently, there is some debate in psychiatric neuroscience whether the phenomena of impulsivity, affective dysregulation, emotional overreactivity, and aggression we have addressed in this chapter are "transdiagnostic" processes that go awry in a similar way regardless of the specific clinical psychopathology, or are distinct for the various

disorders that give rise to them. For instance, impulsivity might reflect impaired cognitive control that has the same neural substrate regardless of whether, using clinical taxonomy, the individual seems to have ADHD, bipolar disorder, or an autism-spectrum disorder. The hope is that we could identify a common mechanism that produces a problem like impulsivity and devise treatments that alter or compensate for that process. For the moment, however, clinical psychiatric practice continues to take the approach that identifying specific psychopathology that "underlies" these concerns offers the best leverage in treatment.

From this specific-psychopathology standpoint, children with ADHD, high emotional lability, or explosiveness by definition have numerous different impairments, and prioritizing them becomes an important issue. To the extent that there are specific interventions that address ADHD symptom, mood instability, and disruptive behaviors, is there a preferred sequence? One point of view is that for very labile individuals, mood stabilization is a prerequisite for improvements in attention, impulse control, and other concerns [e.g., 54]. Alternatively, some algorithms suggest giving priority to treatments that address ADHD symptoms and disruptive behaviors. The few studies that have examined sequences of treatments in this patient group indicate that, at least in the absence of a primary major mood disorder, targeting symptoms of ADHD and disruptive behaviors first is a reasonable starting point for most patients that balances efficacy, safety, and simplicity [55, 56].

Pharmacotherapy

Recent trials evaluating treatment approaches for preadolescents with ADHD and significant aggressive behavior indicate that the most robust impact on both the core symptoms of ADHD *and* aggressive behavior comes from first-line stimulant treatments for ADHD, accompanied by caregiver guidance on behavioral management strategies [55, 56]. Two studies included extensive efforts to titrate stimulant monotherapy in order to optimize response during an open-lead-in, after which children having persistent aggression could be randomized to controlled, blinded trials with adjunctive treatments (divalproex sodium, risperidone, or placebo) [55, 57]. These trials recruited only children who had had prior stimulant treatment with insufficient reductions in aggression—the lead-ins were intended to confirm that aggressive behavior was indeed refractory to stimulant monotherapy prior to the controlled trials of add-on medication. Despite this criterion (and other indices suggestive of their severity such as history of ED visits or hospitalization, special education services for behavioral reasons, etc.), well over half of such patients experienced *remission* of aggressive behavior during the lead-in phase. Another trial for children with aggressive behavior also had a 3-week stimulant monotherapy titration phase, after which children were randomly allocated to adjunctive risperidone or placebo for a six-week trial. The add-on placebo group who continued stimulant monotherapy showed further improvements that nearly matched those reported for the add-on risperidone group. In these studies, irritability, dysphoria, and emotional lability also improved with stimulant monotherapy [34].

These findings largely support the approach to pharmacotherapy that several expert-consensus algorithms have recommended, using first-line stimulant treatment when ADHD is present accompanied by close monitoring and prompt adjustments to optimize efficacy and tolerability [39, 58]. Even so, treatments involving combinations of medications remain widespread, despite the lack of an evidence base to support such combinations, especially for adolescents. In high-acuity clinical situations, a dilemma often arises for clinicians and families regarding when to persist with a single agent or another that may have a less favorable risk/benefit ratio but may stabilize things more quickly. Time to response becomes even more critical in settings where high service demands and a dearth of providers lead to long intervals between follow-up visits.

Among those who do not gain sufficient benefit from stimulant monotherapy, the effect size for risperidone is appreciable [56, 57]. Two other second-generation antipsychotics, aripiprazole and quetiapine, are also widely used in this context, but lack data from controlled trials. Adverse cardio-metabolic effects of SGAs are evident both acutely (e.g., during the initial weeks of treatment) and progressively following long-term use, and concern about the proliferation of these medications for youth without nonpsychotic illness has intensified [59]. Current guidelines for youth treated with SGAs for behavioral dyscontrol recommend time-limited trials, with tapering attempted within 6 months or so [60]. One controlled discontinuation trial [61] found a lower risk for recurrence of disruptive behaviors with continuation of risperidone monotherapy vs. placebo substitution (29% vs. 47%), as well as all-cause discontinuation (42% vs. 62%). It is not known whether careful adjustment of first-line ADHD treatments would have diminished relapse rates, but a trial that were to examine this issue would have strong clinical relevance.

Alternatives to SGAs widely used for impulsive aggression include antimanic/mood stabilizer treatments (antiepileptic drugs [AEDs] and lithium) and noradrenergic α_2 receptor agonists (guanfacine and clonidine-based products FDA-approved to treat ADHD). Evaluations of these treatments remain sparse. Among children with inadequate reductions in aggressive behavior following stimulant monotherapy, adding divalproex sodium culminated in improved aggression and mood-related symptoms compared to adding placebo [55]. Oxcarbazepine has come into common clinical use, but has no supportive data. Most alpha-2 agonist trials to date have reported on disruptive behavior as a secondary outcome in trials of youngsters with ADHD, and have not studied cohorts selected for high baseline aggression or mood problems [62]. Trials that have evaluated clonidine in combination with stimulants have shown modest benefits over monotherapy [63, 64]. These compounds have short elimination half-lives and the development of long-acting preparations of clonidine and guanfacine with FDA-approval has contributed to wider use. Given their more favorable risk/benefit profiles, formal studies of these two medications' usefulness for disruptive behaviors cause by negative affect are sorely needed.

Increased interest in mood dysregulation, irritability, and mood lability as transdiagnostic concepts may heighten interest in antidepressant (AD) treatments for this patient group. Clinicians may also perceive that the inclusion of DMDD within the depressive disorders implicitly endorses AD use. However, empirical support for

AD treatment of major depressive disorders among youth is modest, especially among SSRI antidepressants apart from fluoxetine for adolescents [65, 66]. Effect sizes for treatment of anxiety disorders are larger and more consistent, especially when combined with therapy that emphasizes exposure and the development of coping and skills to facilitate and dampen the associated worry [67, 68]. In the context of children's negative emotionality and explosiveness coupled with impulsivity, subsequent research may eventually identify specific symptoms, patient subgroups, or co-therapy regimens for which AD treatments prove useful, but this remains speculative.

Psychotherapy and Psychosocial Interventions

The most established psychosocial treatments for disruptive behavior symptoms emphasize the interaction between caregivers and youth so that they promote prosocial behaviors and reduce problematic ones. The contents and formats of specific approaches vary somewhat, especially to the extent that are tailored to a particular age range. Nevertheless, they tend to share some basic principles and goals. First among these common elements is to ensure that the parent–child interactions are for the most part positive and mutually enjoyable. Acrimonious interactions undermine the success of any behavior management strategy, and, moreover, worsen the quality of life for all involved. Second, clear, consistent, and reasonable behavioral expectations and consequences should be communicated calmly, and prosocial behavior and efforts to handle upsets constructively should be recognized and thoroughly praised and rewarded. Third, various approaches to managing problematic behaviors are provided, often in a hierarchy of ignoring mild negative attention-seeking behaviors, warnings, response cost (i.e., lost points or privileges), time out, etc. Such consequences should be proportionate to the misbehavior and things like loss of a privilege should last only the minimum time needed in order for the child to then "re-earn" them through more positive behavior. The latter point is significant for many caregivers who have come to rely on excessive punishments, often as heat-of-the-moment overreactions to their own anger.

There has been some concern that, for impulsive children with brittle frustration tolerance, behavioral strategies based on delivering consequences for the child's behavior may in some instances be counterproductive or end up being overly punitive. If one lacks an adequate capacity to inhibit expressions of rapid-onset rage and to reason out and implement alternative responses, the prospect of further punishment may have little behavior-modifying impact. This would be especially true in high-intensity situations, and may further embitter the patient. Some approaches focus instead on "antecedent control," or altering expectations of the environment to reduce the likelihood of situations that will provoke the child's outbursts, while helping the child to develop better skills to manage such frustrations when they arise [69–73].

Another group of treatment approaches seek to scaffold the youth's development of more adaptive responses to irritations through direct instruction and rehearsal of skills thought to underlie emotion regulation. Such skills include self-monitoring

for early warning signs of heightened arousal and anger; reappraising challenging situations to avoid thinking of each one is a matter of life-or-death importance; acceptance of setbacks and frustrations as normal and not catastrophic; relaxation; and alternative, more composed behaviors that help the child to achieve his or her objectives with others. Often enough, highly impulsive youth with behavior disturbances may know what they are *supposed* to do, can role-play these behaviors, and can even give good advice to others on managing provocations. Yet, problems arise because suppressing drastic emotional reactions and utilizing alternatives in the heat of the moment requires Herculean self-restraint. Nevertheless, explicit identification and practice of substitutive coping behaviors insures that these skills are in the child's repertoire, provides prosocial models for handling upsets, and offers an opportunity for the parents and others to acknowledge and praise the child for a job well done, even if only in artificial, role-play or problem-solving settings.

Future Directions

It seems likely that the development of a comprehensive neurobehavioral of negative emotional reactivity in the context of ADHD will need to address some recurrent issues that this chapter touched on. Are there some manifestations of ADHD that include "emotional impulsivity" as a basic phenotype? Or do some youth showing highly irritable and aggressive behavior necessarily have a distinct disturbance in affective processing? Current clinical concepts of mood disorders focus on sustained sadness, irritability, and anhedonia, but these ideas do not seem quite adequate for the phenomenon of acute rages that revert to a euthymic baseline. Methodological approaches and theories in affective neuroscience that address "affective chronometry," however, may offer useful ways to consider these sorts of problems from a developmental psychopathology [74, 75].

Several treatments have the potential to yield profound improvements across areas of impairment. Among them, first-line treatments for ADHD can be highly beneficial when measurement-based treatment is provided that systematically optimizes the child's regimen and basic guidance in behavioral support strategies, though unfortunately such a standard of care remains uncommon in community settings [76, 77]. Overall, the impact of treatment on long-term outcomes remains unclear, partly because of difficulties disentangling quality and adherence of ongoing interventions from the natural course of the disorders.

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