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Finding a Needed Diagnostic Home for Children with Impulsive Aggression

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Abstract

Aggressive behavior is one of the most common reasons for referrals of youth to mental health treatment. While there are multiple publications describing different types of aggression in children, it remains challenging for clinicians to diagnose and treat aggressive youth, especially those with impulsively aggressive behaviors. The reason for this dilemma is that currently several psychiatric diagnoses include only some of the common symptoms of aggression in their criteria. However, no single diagnosis or diagnostic specifier adequately captures youth with impulsive aggression (IA). Here we review select current diagnostic categories, including behavior and mood disorders, and suggest that they do not provide an adequate description of youth with IA. We also specifically focus on the construct of IA as a distinct entity from other diagnoses and propose a set of initial, provisional diagnostic criteria based on the available evidence that describes youth with IA to use for future evaluation.

Keywords Aggression · Impulsive behavior · Children · Diagnosis · Rage

Introduction

Aggressive behavior in young children is often considered to be a typical part of early development. Parents of toddlers are generally prepared to deal with the "terrible twos" expecting that aggressive behaviors will subside as the child grows older. In a vast majority of children, aggression begins to subside after their 3rd birthday (Tremblay et al., 2005). However, when aggression becomes impairing to the point of interfering with the child's and family's functioning, parents may seek help from a mental health care provider. The job of the mental health care provider during an evaluation becomes to accurately diagnose the child that presents with aggressive behaviors to recommend appropriate treatment.

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Unfortunately, no diagnosis in the DSM5 or ICD11 adequately captures the kind of impulsive aggression that can be so impairing to children and their families. Although aggressive behaviors can arise from various etiological pathways, several research groups have focused on aggression as a significant clinical problem requiring psychotherapeutic interventions (Blader et al., 2010, 2021). For example, within the past 10 years the Treatment of Severe Childhood Aggression (TOSCA) group (Aman, 2015; Barterian et al., 2017), as well as Blader et al., explored pharmacological treatments for children with Attention-Deficit Hyperactivity Disorder (ADHD) and severe aggressive behaviors.

The purpose of this review is to examine the selective limitations of the current nosology of impulsive aggression (IA) focusing on behavior and mood disorders. We further propose a set of *provisional* diagnostic criteria for youth with IA to continue to explore this relevant and important clinical problem. As we will review below, prior work suggests that children with IA who do not have a mood disorder may comprise a distinct group, and the criteria we proposed here will allow future work to focus on the robustness of the construct and its relationships with existing disorders and etiological pathways. While using the proposed criteria in clinical care is premature, we consider it a step towards potentially identifying and clarifying the boundaries of the construct of IA in youth.

Aggression is one of the most common reasons for referrals to pediatric mental health clinics, emergency room visits and admissions to inpatient units (Connor, 2002). Many etiological pathways to aggression have been proposed, including cognitive biases in social information processing (Crick & Dodge, 1994, 1996; Dodge & Coie, 1987), differences in reward processing (Gatzke-Kopp et al., 2015; Kempes et al., 2005; Ryan & Watson, 1968), and contextual factors (Kaehler et al., 2016; Patterson et al., 1989). Although these can be important for understanding the underlying mechanisms, children with IA have been left out of diagnostic classification systems. As we summarize below, this type of aggression is seen in, though not fully captured by, multiple diagnostic categories, and is often a presenting concern in itself.

Phenomenologically, aggressive behaviors, in one conceptualization, has been divided into two types: Proactive (premeditated, instrumental goal-directed behavior that occurs with little or no provocation) and reactive (in response to a stimulus, such as a frustrating event or a perceived threat) (Connor et al., 2004; Poulin & Boivin, 2000; Smeets et al., 2017; Vitiello et al., 1990). Reactive aggression is often described as "angry", "hostile" or "hot," while proactive aggression is commonly referred to as "cold" or "premeditated" (Connor, 2002; Connor et al., 2004). These two types of aggression have different biological and developmental correlates, as well as longitudinal courses (Kempes et al., 2005; Vitaro et al., 2006). Studies show a correlation between proactive aggression and the development of delinquency and psychopathy later in life (Card & Little, 2006; Fite et al., 2009; Hubbard et al., 2010), while reactive aggression was associated with internalizing problems (including depression and anxiety symptoms), negative affect, ADHD, and peer problems. (Card & Little, 2006; Evans et al., 2020; Fite et al., 2009, 2010) However, the relationship between the two forms of aggression is much more complex. For example, reactive aggression is more common in children than proactive aggression, although reactive aggression may precede proactive aggression during the course of a child's development (Dijk et al., 2021; Vitaro et al., 2006). In addition, while there are many individuals that show signs of both types of aggression, the distinctiveness of the subtypes remains to be determined (Barker et al., 2006; Evans et al., 2020; Smeets et al., 2017). This combined presentation is likely due multiple overlapping risk pathways, as mentioned above, such as shared brain regions that mediate evaluating the subjective value of actions in any situation, social threat, and affective regulation. (Blair, 2010; Harenski et al., 2014) Although there remains much to uncover about the mechanisms underlying aggressive behavior, our work is focused on characterizing observable behavioral phenotypes. Having reliable characterizations of these behaviors may help connect research on the etiology of aggression with research on effective interventions.

In this review, we specifically focus on children with IA. The terms "impulsive aggression' and "reactive aggression" have been used to describe similar, if not identical behaviors; however, we use IA because of recent work linking impulsivity and aggressive behavior in the context of ADHD, as we will elaborate further below. (Nigg et al., 2020; Waschbusch, 2002) Here we primarily focus on children with impairing IA that's inconsistent with their developmental level. In clinical experience, youth with debilitating symptoms of IA are often challenging to correctly diagnose and effectively treat (Carlson, 2009). Families often describe aggressive behaviors as "outbursts", "tantrums", or "rages". These children can have aggressive episodes several times a week, often daily, that include verbal and even substantial physical aggression. (Carlson et al., 2016) The severity and duration of these episodes vary greatly and do not seem to be predictable. These children may snap at a peer's comment or destroy their room in a fit of rage. Their aggressive behavior is impulsive in nature and is triggered by events that are perceived as minor or insignificant by others. In the absence of triggers, however, these youths are generally calm. Nevertheless, the aggression can be so impairing that it leads to expulsion from daycare or school, causes difficulty functioning at home, negatively affects peer relationships, contributes substantially to caregiver burden, and even increases the rates of suicidal behaviors and ideation

(Hartley et al., 2018), all of which lead to seeking mental health treatment.

Although mental health providers frequently encounter and assess youth with impairing IA, there is no clear diagnostic framework to capture such behaviors. These children are therefore described as "diagnostically homeless" (Carlson, 2009), despite symptoms of IA cutting across several extant diagnostic categories (DSM-5 and ICD-11) (Association & Diagnostic & Statistical Manual of Mental Disorders. Fifth Edition. American Psychiatric Association, 2013.doi:10.1176, appi.books.9780890425596. 2013; World Health Organization, 2020). In particular, symptoms of impulsivity and aggression appear in the criteria for conduct disorder (CD), intermittent explosive disorder (IED), and disruptive mood dysregulation disorder (DMDD), and are often associated with attention-deficit/hyperactivity disorder (ADHD), oppositional defiant disorder (ODD) and mood disorder diagnoses. Below, we suggest that these categories, as they are currently defined, do not sufficiently capture the phenomenology of IA. For that reason, our group evaluated the construct of IA and determined that it is distinct from attention, mood, and rule-breaking problems (Young et al., 2019). Here we propose to address the lack of an adequate diagnosis for children with IA by suggesting a set of diagnostic criteria to capture the IA construct.

Disruptive Behavior Disorders

Conduct Disorder

Early research on childhood-onset CD focused on identifying and treating youth with "severe aggressiveness, explosiveness, and disruptiveness unresponsive to various outpatient treatments" (Campbell, 1984). Other studies have focused on a group of youngsters with early onset CD and ADHD that fit the same criteria (Loeber et al., 2000). This description temporarily created a diagnostic home for children with frequent, impulsive outbursts who often present for treatment. With the transition from DSM-III (Association & Diagnostic & Statistical Manual of Mental Disorders.3rd ed., 1980. 1980) to DSM-III-R (American Psychiatric Association, 1987), however, more symptoms of proactive aggression and other behaviors (such as truancy, running away, using a weapon) were included in the criteria for CD, gradually shifting the diagnosis away from a focus on impulsive aggressive symptoms. Over the transition from DSM-III to DSM-IV (American Psychiatric Association, 2000), the antisocial behavior presentations that were then captured by different subtypes of CD came to be codified in a single CD category defined by a heterogeneous array of problem behaviors. These criteria (in DSM-5 there are 15, of which only 3 are needed for diagnosis) are classified not only as aggression—which is our focus here—but also include acts of deceitfulness/theft and serious rule violations. As this modern conceptualization of CD crystalized in DSM-IV and beyond, so too did it become clear that CD and ODD (discussed below) were both clearly distinct and closely related, with CD being the more severe of the two (Evans et al., 2020; Frick & Nigg, 2012; Lahey et al., 1992). Perhaps due to this evolution, including the increasing prominence of rule-breaking behaviors in CD criteria, the diagnosis became more stigmatizing (Murrie et al., 2005). The focus on rule-breaking behavior also confounded legal with mental health issues. These behaviors were considered to be difficult to treat, which led to most insurances in the USA not covering treatment of CD, leaving providers to search for another billable diagnosis for youngsters with IA. Nevertheless, many if not most youngsters with IA likely also meet current criteria for CD. Despite this, because the CD criteria now include such a broad range of proactive as well as reactive behaviors, they no longer provide an accurate description of youth with IA.

Understandably, research on CD followed the diagnostic criteria and lumped together youth with IA and rule-breaking behaviors. However, we argue that childhood-onset CD encompasses a different set of behaviors compared to the adolescent onset form of the disorder. Although CD can be diagnosed in children as young as 4–5 years of age (Kim-Cohen et al., 2009; Moffitt et al., 2008),, the age of onset of aggressive behavior problems generally ranges from 4 to 10 years with a sharp decline of aggression after age 10 (Lahey et al., 1998; Shaw et al., 2005). Additionally, some studies show that symptoms of CD in younger children may not be stable over time, and most children will no longer meet the full criteria for CD after 2–5 years (Kim-Cohen et al., 2009). Thus, these studies suggest that a childhood-limited course of CD could be a hallmark of a separate category compared to persistent-course CD. Additionally, there is evidence that many individuals with CD have family history of antisocial personality disorder, and often have comorbid anxiety and ADHD (Lahey et al., 1998; Stewart, 1985). However, the family and comorbidity studies did not separate proactive aggression from IA and it is unclear if youth with IA and proactive aggression share the same characteristics. Given that prior studies of childhood-onset CD provided inconsistent results in examining the of age of onset, presence of impulsivity alongside proactive aggression, and family history of ADHD or mood disorders, it remains an open question whether the current criteria for CD could represent a diagnostic home for youth with IA or if a separate category is needed. Having a reliable operationalization of early onset IA, as we proposed here, would allow for research to bring data to bear on these types of questions.

Oppositional Defiant Disorder

As noted above, CD and ODD are distinct but related. Rates of comorbidity between the two disorders are high, and ODD frequently co-occurs with various other mental disorders (Costello et al., 2003; Nock et al., 2007). Further, ODD and CD share developmental pathways such that many youths with CD previously had ODD as a developmental precursor (Burke et al., 2002; Loeber et al., 2000). Accordingly, clinicians and researchers typically do not focus solely on CD or ODD without any consideration of the other. Yet our attention to ODD here is not merely obligatory. Whereas CD includes many symptoms of *proactive* aggression (see above), ODD is characterized by *reactive* disruptive behaviors, akin to reactive aggression or IA. Specifically, ODD is defined by 8 symptoms (of which 4 must be present for the diagnosis), organized around at least two symptom dimensions: an angry/irritable dimension (temper; touchy; angry) and a defiant/headstrong dimension (argues; defies; annoys; blames; spiteful/vindictive (Burke et al., 2014; Evans et al., 2017; Stringaris & Goodman, 2009).

Although the diagnostic criteria for ODD do not explicitly include aggressive behaviors, ODD symptoms are very highly correlated with aggression, especially with reactive aggression (Evans et al., 2016). Indeed, many empirical models of youth psychopathology consider oppositional and aggressive behaviors as being closely related to one another, both falling along the *overt* (rather than covert) dimension of disruptive behavior problems (Achenbach & Rescorla, 2001; Conners, 2008; Frick et al., 1993; Lahey et al., 2008). However, clinical decision-making is categorical rather than dimensional. Thus, from a person-centered perspective, latent class/profile analyses support differential prediction of aggressive behavior as an outcome of different dimensions of ODD (irritable vs defiant) (Aebi et al., 2016; Althoff et al., 2014). At the same time, the distinction between ODD dimensions should not be overstated, and linkages to aggression require further investigation. In sum, ODD is a disorder with high comorbidity, great heterogeneity in presentation and outcome, characterized by emotional and behavioral dysregulation. For many youths with ODD, IA can be an important part of the clinical presentation. However, ODD, as currently defined in DSM-5 and ICD-11, does not identify IA as such; nor does it capture youths with IA in need of clinical care. The current proposal follows a similar path as recent work which sought to capture some of the heterogeneity in ODD diagnoses by adding a specifier for chronic irritability/anger (Evans et al., 2017). Whether IA should be considered a subtype of ODD or something broader is an empirical question that having a clinically informed and reliable description will help answer.

Attention-Deficit Hyperactivity Disorder

Aggression is not conceptualized to be a core symptom of ADHD in the current nosology (Association & Diagnostic & Statistical Manual of Mental Disorders.Fifth Edition. American Psychiatric Association, 2013.doi:10.1176, appi.books.9780890425596. 2013; World Health Organization, 2020). However, impulsivity is a core feature of ADHD, therefore it may not be surprising that children with this disorder are at a higher risk of exhibiting IA (Waschbusch, 2002). About 54% of youth with ADHD showed clinically significant levels of aggression in the Multimodal Treatment Study of Children with ADHD (Jensen et al., 2007). In fact, aggression is considered to be an associated feature of ADHD (King & Waschbusch, 2010). Specifically, reactive aggression (or IA) showed a much stronger correlation with ADHD, compared to proactive aggression (Murray et al., 2020). The severity and frequency of aggressive behaviors further increase when ADHD is comorbid with other behavior disorders, such as ODD and CD (Connor et al., 2004). There is evidence that IA and ADHD are distinct constructs, however, the relationship between the two is not entirely clear and may involve emotional impulsivity leading to anger outbursts (King & Waschbusch, 2010).

Despite the paucity of studies evaluating the nosology of ADHD and IA, a lot of aggressive children with ADHD are impaired and require treatment. For example, 26% of youth with ADHD and IA continued to have impairing symptoms of IA despite adequate treatment of ADHD (Jensen et al., 2007). To address the dearth of data in clinical interventions for aggressive children with ADHD, several trials were designed and targeted aggressive behaviors in addition to the primary diagnosis. In a large NIH-sponsored trial Treatment of Severe Childhood Aggression (TOSCA) participants were included if they had a primary diagnosis of ADHD with comorbid ODD or CD, as well as high baseline levels of aggression (Farmer et al., 2015; Findling et al., 2017; Gadow et al., 2014, 2016). A much more recent trial by Blader et al. utilized a similar methodology (Blader et al., 2021) and found a subset of children with ADHD for whom aggressive behavior did not remit with optimized stimulant use alone. There are more studies that chose comparable approaches (Blader et al., 2009, 2010; Stocks., 2012) while others targeted aggressive behaviors in youth with primary diagnosis of CD (Campbell, 1984; Cueva et al., 1996; Findling et al., 2006; Malone et al., 1997, 2000; Platt et al., 1981) with or without comorbid ADHD (Klein, 1997) or a combination of disruptive behavior disorders (DBD), including CD, ODD or DBD, not otherwise specified (Reyes et al., 2006). Mood disorders, such as Major Depressive Disorder (MDD) or Bipolar Disorder (BD), were excluded in most of these trials. While the methodology of these studies was drastically different, all of them attempted to select a population

of highly aggressive and impaired children with disruptive behavior disorders that do not have a comorbid mood disorder. Unfortunately, none of these trials separated aggression into proactive or reactive subtypes and it is unclear if only youth with IA were selected for these studies. However, the trials not only highlight efficacy (or lack of efficacy) of different psychopharmacological agents for management of aggressive behaviors, but also bring attention to this unique population of aggressive children without comorbid mood symptoms that do not yet have a diagnostic home.

Intermittent Explosive Disorder

Another possible home for youth with IA is IED. As the definition implies, IED manifests as a failure to control aggressive impulses. Most prior research on IED used the DSM-IV criteria (3 major aggressive episodes in the past 12 months), which likely captures a different phenotype from aggression that occurs on an almost daily basis. Changes made to the IED criteria in the DSM-5 allow for more frequent verbal and physical aggression (up to 3 times a week) than did earlier iterations of the DSM, however child-onset IED likely captures a different phenotype from the IA described above. Unlike the group of children with early onset CD and ADHD, IED is frequently comorbid with mood, anxiety and substance use disorders (Coccaro, 2019; Kessler et al., 2006; McLaughlin et al., 2012; Oliver et al., 2016). Some studies report additional comorbidity of IED with ADHD and ODD (McElroy et al., 1998; Olvera et al., 2001). Family history of individuals with IED also differs from that of CD. First degree relatives generally have mood disorders, substance abuse and other impulse control disorders (McElroy et al., 1998). In addition, available data suggest the age of onset of IED ranges from around adolescence to early adulthood rather than early childhood (Coccaro et al., 2005; Galbraith et al., 2018; Kessler et al., 2006; McElroy et al., 1998), setting IED apart from ADHD and CD. To our knowledge, there have not been prospective studies examining the prevalence and persistence of IED in preschool or elementary school children. Although IED and IA appear to have a similar behavioral profile, the combination of other attributes substantially differs between IED and IA. Those include adolescent age of onset of IED, family history of mood disorders and comorbidity with mood and other impulse control disorders, all of which make IED an unlikely nosological entity for kids with IA.

Mood Disorders

Aggression and irritability can also occur in the context of mood disorders. Severe outbursts were once hypothesized to be a hallmark of the pediatric BD (Wozniak et al., 1995), drastically increasing its rate of diagnosis in youth. Subsequently, it was shown that most irritable and aggressive children do not develop BD later in life, in contrast to those with more episodic presentations (Stringaris et al., 2010). To find an alternate "home" for youth with irritability, DSM-5 introduced a diagnosis of Disruptive Mood Dysregulation Disorder (DMDD), which specifically focuses on chronic irritability and frequent temper tantrums. However, in BD, aggression tends to occur specifically in the context of mood episodes. While irritability in DMDD is chronic by definition, aggression can occur episodically, i.e. as outbursts (Carlson, 2009). In contrast, many children with IA appear angry during relatively brief episodes but are otherwise generally euthymic and likely would not meet criteria for BD or DMDD.

DMDD was revised from its research precursor, severe mood dysregulation, largely by removing criteria for hyperactivity/arousal. The revision left DMDD to solely focus on a single, core construct, irritability, which is defined by two indicators: Temper outburst and "irritable"/angry mood in between outbursts. Despite emerging from investigations on mood disorders, the revision brought DMDD close to chronic irritability as it is defined in the aggression literature (Leibenluft & Stoddard, 2013). Developing "a home" for children with chronic irritability created a path for pharmacological trials to address chronic and severe irritability (Towbin et al., 2020). In current investigations, the degree to which these two indicators of irritability co-occur in clinical populations is being tested. Recent evidence suggesting they each may be individually present at a clinically significant level, i.e. they are separable (Cardinale et al., 2021; Laporte et al., 2021). IA is promising in that it may be diagnosed when there is no evidence of chronic irritable mood between outbursts. However, clinicians will need to take care in assessment, considering known issues by developmental stage and informant (Los & Kazdin, 2005) that obscure the detection of between outburst negative affect.

Aggression as a Construct

While symptoms of IA cut across several psychiatric diagnoses, none of the aforementioned diagnostic categories accurately capture phenomenology of IA. Aggression can, at times, be adaptive or maladaptive; it can be present with a variety of psychiatric diagnoses or in the absence of psychopathology (Connor et al., 2019). There is not yet a consensus on whether maladaptive aggression should be a criterion of several diagnoses, an associated feature, a separate disorder, a measure of severity or all the above. Connor et al (Connor & McLaughlin, 2006) began to answer that question by examining aggression in a group of psychiatrically referred children compared to healthy controls. They found that aggression scores were much higher in referred children with a variety of diagnoses, including disruptive behavior,

anxiety, and mood disorders, when compared to controls. In this study, different types of aggression, including reactive and proactive, were highly correlated with each other, which supported the authors' suggestion that there is a single distinct underlying aggressive construct that is transdiagnostic.

One effort to specifically focus on evaluating IA as a clinical construct occurred in a consensus conference with multiple experts, where the participants evaluated the research evidence available at that time (Connor et al., 2019). They concluded that there was indeed sufficient scientific evidence for the construct of IA, which can be measured and reliably recognized by experts. However, this construct is not specific to any particular diagnosis and can be present in youth with BD, depression, and ADHD. One possibility is that it constitutes a marker of severity. The authors of the report compared IA to non-specific symptoms such as pain or fever. The consensus conference helped advance the field's understanding of IA and its boundaries in relation to other disorders. However, there were still no published criteria defining a behavioral phenotype of IA that could be studied.

Several years ago, our group began to work on exploring the IA construct on a much larger scale using three data sets (Young et al., 2019), as well as further clarifying the boundaries of IA as it relates to psychiatric diagnoses. Results from our work showed that IA symptoms on questionnaires emerged as a separate factor in three distinct data sets when considering symptoms of disruptive behavior and mood disorders. These results alone do not adjudicate whether IA is a distinct behavioral profile, however they do indicate that IA or Aggression with Impulsivity and Reactivity (AIR) is a separate symptom domain from other mental health problems (such as mood problems, hyperactivity and rule-breaking behavior) (Association & Diagnostic & Statistical Manual of Mental Disorders.Fifth Edition. American Psychiatric Association, 2013.doi:10.1176, appi.books.9780890425596. 2013)

To explore whether AIR emerges as a distinct behavioral presentation, further work (Youngstrom et al., 2021) from our group used latent profile analyses (LPA) to examine whether a predominantly AIR profile exists among treatment-seeking youth. These analyses were performed in the same three heterogeneous samples as Young et al. (2019) replicating the results in three diverse groups of participants from community and academic settings with different demographic characteristics (Table 2). The LPAs identified groups of children with similar patterns of symptom elevation across five domains: AIR, depression, mania, rule-breaking and self-harm. Seven distinct symptom profiles replicated across the three samples. Of these, one had AIR as the predominantly elevated domain, although other profiles also showed moderate levels of AIR symptoms. Rates of ADHD diagnoses were higher in the predominantly AIR group compared to sample averages, as were rates of ODD and CD. Children in this group were slightly younger than average, and they did not have elevated mood or anxiety concerns. Of the other profiles that emerged, several showed AIR co-occurring with mood and self-harm symptoms, and others showed mood symptoms without the presence of AIR.

Overall, these works support three implications important for defining the AIR construct: first, a profile exists where AIR symptoms are the most elevated, significantly more than mood or other behavior concerns, suggesting that AIR is the primary concern; second, profiles exist where AIR does co-occur with mood and disruptive behavior diagnoses; third, AIR is not a necessary symptom for these diagnoses, since groups of children exist with these disorders and no elevation in AIR. Taken together, these results support a definition of AIR as both a distinct construct, and a transdiagnostic feature that co-occurs with other psychiatric conditions. These observations are therefore an important step toward identifying a diagnostic home for youngsters with IA, as well as an optimal construct for evaluating appropriate treatment. However, these results are also limited in delineating AIR from other diagnostic categories. Outbursts occurring during otherwise euthymic periods is hypothesized to be a key feature of AIR. However, because of the nature of the questionnaires used to measure AIR symptoms, it was not possible to determine from these data whether symptoms of aggression occurred during periods of hypomania or irritability or not. To further evaluate the distinctiveness of AIR compared to other diagnostic categories, a working definition of AIR is needed. Evaluating this definition in a clinical setting alongside careful assessment for other mood and behavior disorders could help evaluate our hypotheses about whether AIR is indeed a separate diagnosis, a specifier of another diagnosis, or a transdiagnostic construct reflecting the severity of symptoms. Such a trial would provide evidence for how the definition might be improved, e.g., the typical age of onset and frequency outbursts. Therefore, to further the aim of exploring the nosology of IA, we propose the following data-driven research diagnostic criteria (RDC). At this time, our findings do not constitute a final set of clinical diagnostic criteria, but rather the next step in reliably defining a construct and understanding the nosology of IA. Establishing the RDC provides an opportunity for further evaluation of its applicability in clinical practice, as well as fine-tuning the criteria to accurately reflect the population of children with AIR. In addition, developing the RDC for youth with IA provides a framework for designing improved rating scales and other assessment tools for accurate identification of children with IA.

In order to establish preliminary RDC of AIR, we selected items included in the empirically developed AIR construct reported in Young et al. and Youngstrom et al. These included symptoms such as "assaults people physically", "makes threats to others", "fights frequently with

others", "acts impulsively or rash". Unfortunately, many of the aggression items on the assessments are not specific to IA and do not provide context for the behaviors. We, therefore, supplemented the available AIR items from the assessments with other criteria that in our opinion describes IA. For that purpose, we added a more thorough description of verbal aggression ("screams, yells" and "insults adults") and physical aggression ("kicks, hits, bites", "scratches"). We also added the description of aggressive behaviors being impulsive, rather than planned. These additional criteria, including frequency and duration of the behaviors, as well as the number of criteria used to make the diagnosis of AIR were added based on extensive clinical experience and consensus among several experts. The provisional age of onset was informed by early research on CD (Lahey et al., 1998; Stewart, 1985). Since AIR is hypothesized to occur during otherwise euthymic periods, outbursts occurring during a mood disorder episode are excluded from the definition. The question of whether AIR might be considered a specifier for ADHD remains open, so ADHD is not exclusionary in this version of the criteria.

Proposed: AIR criteria.

A Recurrent failure to control aggressive impulses resulting in frequent outbursts (verbal and/or physical) often in response to minimal triggers (such as being given directions, non-preferred tasks or comments that are perceived as critical). The outbursts are grossly out of proportion in intensity or duration to the situation. The outbursts include at least 3 symptoms out of 7 from the following categories, and not limited to interaction with one person, such as parent or guardian

  a Verbal aggression

    1. Screams, yells; extraordinarily loud
    2. Insults adults
    3. Threatens others

  b Physical aggression

    1. Hits, kicks, bites, pushes other people or animals
    2. Hits, bites, scratches him/herself

  c Destruction of property

    1. Punches walls, kicks or hits furniture resulting in property damage
    2. Slams doors, throws small items or furniture

B Aggressive outbursts are inconsistent with developmental level.

C Most aggressive behaviors occur at least 5 days out of a week.

D Duration—at least 6 months.

E Behavior occurs in at least two settings (ex. home and school) and is not restricted to the individual's relationship with his/her parents or guardians.

F Age of onset—prior to age 10.

G Behaviors are not better explained by an episode of a mood disorder (depression or mania), anxiety disorder, psychotic disorder or ASD.

H Symptoms are not attributable to the physiological effects of a substance or another medical/neurological condition.

I The majority of recurrent aggressive outbursts are not premeditated.

J The behavior causes clinically significant impairment in social, academic, or occupational functioning.

The preliminary RDC of AIR listed above are a constellation of data-driven AIR-specific items, earlier research on childhood aggression (CD) and clinical experience of several experts (Fig. 1). While these RDC have face validity, we wanted to ascertain the clinical utility of AIR criteria. For this purpose, we applied the criteria to a small sample of patients presenting with a chief complaint of "aggression" at a community mental health clinic. Out of 15 patients with aggression, 7 met full criteria for AIR, while others were excluded due to IA occurring only in the context of a mood episode. We recognize the limitations of using such a small sample, however, this is the first step towards applying the criteria in a clinical setting.

It is apparent that these RDC of AIR resemble criteria for IED, which is a well-established diagnosis in the DSM-5 (Tables 1 and 2). Naturally, we wondered if AIR is an early onset of IED in children. Unfortunately, there are no data available to date to answer that question. The symptom frequency criterion for IED changed significantly from the DSM-III to the DSM-5, with DSM-5 resembling AIR the most. However, to our knowledge, no prospective clinical trials evaluated the onset of the IED criteria in a pediatric population and long-term outcomes in adulthood. Whether children with AIR grow up to be adults with IED is an empirical question that will need to be addressed in future studies.

In this proposal, IA in AIR is distinguished from temper outbursts in DMDD by requiring more frequent outbursts and defining the behavior as aggressive. Patient

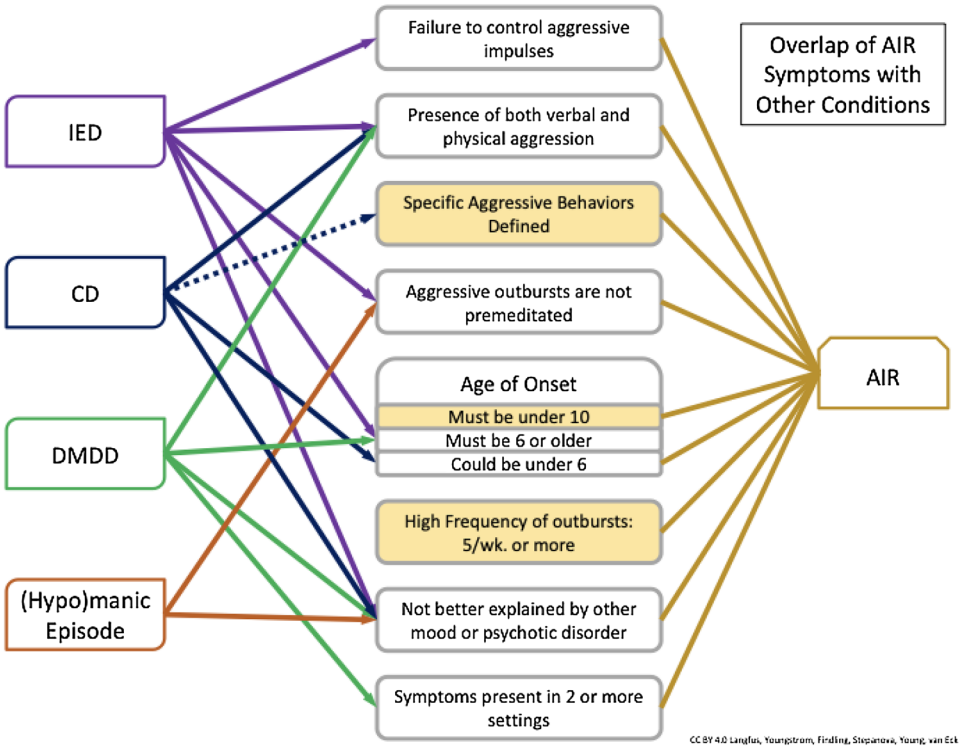

Fig. 1 Overlap between symptoms of AIR and other diagnoses in the DSM 5. *Note* Each box in the middle represents one of the diagnostic criteria of AIR. Boxes and arrows on the left show overlap of symptoms between related diagnostic constructs and AIR. Dotted line represents the difference between specific behaviors in the diagnosis of CD and AIR. *IED* Intermittent Explosive Disorder, *CD* Conduct Disorder, *DMDD* Disruptive Mood Dysregulation Disorder, *AIR* Aggression with Impulsivity and Reactivity

Table 1 Comparison between proposed AIR criteria to existing DSM-5 diagnoses of IED, CD, and DMDD

DIAGNOSIS	Similarities	Differences
IED	Failure to control aggressive impulses	Increased frequency of aggressive outbursts in AIR
	Presence of both verbal and physical aggression	Low frequency of physical aggression in IED (3 times a year)
	Aggressive outbursts are not premeditated	Specific details in description of aggressive outbursts in AIR
	Age of onset is under 10 years (starting age 6 in IED)	Presence of symptoms in 2 settings in AIR
	Exclusion of mood disorders and psychotic disorders	
CD	Presence of both verbal and physical aggression	Focus on premeditated aggression, deliberate behavior to cause harm and violation of rules in CD
	Age of onset prior to 10 years	Inclusion other symptoms, such as of cruelty, stealing, lying, deliberate fire setting in CD
		Exclusion of mood, anxiety and psychotic diagnoses in AIR
		Presence of symptoms in 2 settings in AIR
		CD diagnosis does not exclude mood disorders
DMDD	Outbursts may include verbal and physical aggression	Mood state between temper outbursts is euthymic in AIR and irritable in DMDD
	Presence of symptoms in 2 settings	Frequency of outbursts 3 or more times a week in DMDD and 5 times a week in AIR
	Exclusion of other mood disorders, including BD	Diagnosis of DMDD cannot be made prior to age 6 years

IED Intermittent Explosive Disorder, *CD* Conduct Disorder, *DMDD* Disruptive Mood Dysregulation Disorder, *AIR* Aggression with Impulsivity and Reactivity

characteristics described in AIR such as explosiveness, sensitivity to provocation, having impairment in two domains (e.g. with family, school, or peers), and having affective dysregulation are similar to those in DMDD. Thus, the focus on aggression is important here as a potential for discriminant validity aside from lack of predominantly negative between outburst mood. Aggression has most prominently been defined as a behavior intended to cause another person harm (Berkowitz, 2012; Olweus, 1979). Temper outbursts are intense, transient, negative affective expressions that often

Table 2 Demographic characteristics of Stanley, ABACAB and LAMS samples

Youth demographics	Stanley ($N=392$)	ABACAB ($N=636$)	LAMS ($N=636$)
Race			
Native American/Alaskan	0	0	20
Asian	1	2	6
Black/African American	46	435	210
Pacific Islander	1	2	2
White	326	157	437
Ethnicity			
Hispanic/Latino	5	11	32
Not Hispanic/Latino			
Age	11.4 (3.3)	11.1 (3.3)	9.4 (1.9)
Family Income	$36,700	$18,400	
Gender (M)	240	387	477

involve emotional, unplanned aggression and other affective displays. They have developmentally specific presentations, time course, and indicators for pathology (On & Mad, 2019). In the general population, trait aggression diverges from trait irritability (Bettencourt et al., 2006; Bolhuis et al., 2017) and in pediatric clinical populations (Evans et al., 2020; Meter et al., 2016; Wiggins et al., 2020). More specifically, aggression is not necessarily observed during outbursts in clinical populations, where for example, property destruction, self-harm, and negative self-talk are also reported by caregivers (Laporte et al., 2021). In sum, AIR differs from DMDD in highlighting the importance of aggression during extreme affective reactions to provocation. This distinction has promise in that aggression is readily observable, especially when directed towards peers (Coie et al., 1991), and has predictive value for psychopathology.

While symptoms of AIR are common across several diagnostic labels, we have endeavored to develop a construct of AIR that is the most relevant to clinical care and its associations with some mental disorders. The main limitation of such an approach is the lack of focus on etiology or developmental psychopathology of AIR, such as the role of experiences or exposures, e.g., experiences of adversity, violence, and trauma, that interact with innate susceptibilities to AIR, e.g., genetic and neurodevelopmental factors affecting current behavior. Having a clear definition of the clinical phenotype, as we have proposed here, will allow for further investigation of the individual and contextual factors that may contribute to IA and AIR. Fortunately, a robust literature on aggression and its development will facilitate future research in this area.

Future research should examine the RDC of AIR in prospective field trials in a variety of clinical settings. These trials will provide additional data on the number of specific criteria needed to identify youth with AIR, as well as duration of illness, frequency of outbursts and age of onset, as these were selected via expert opinion and informed by criteria of other disruptive behavior problems rather than empirically defined. It is important to test these criteria in the general population of young children as well, since tantrums can occur as a part of normal early development. In addition, collecting data as part of a field trial will clarify the transdiagnostic nature of AIR by evaluating the AIR criteria alongside those of, e.g., IED, DMDD, and ADHD to help find an answer to a question of whether AIR is a separate diagnosis or a specifier of another disorder (for example, ADHD), or none of those. Additionally, the field trial can help identify the role of childhood traumatic experiences and environment in development of IA. As comorbidity is usually the rule, rather than the exception, we recommend that future studies explore increases in impairment resulting from additive effects between AIR and other diagnoses. It is important to understand the longitudinal course and prognosis of AIR, including whether AIR in childhood leads to the development of IED later in adolescence or adulthood. Perhaps the most crucial question that needs to be answered is how to best help children with AIR and their families.

Declarations

Conflict of interest We do not have additional conflicts of interest to report. The original statement provided is current.

Ethical approval This article does not contain any studies with human participants performed by any of the authors. This issecondary data analysis only

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