Disruptive Mood Dysregulation Disorder at Ages 13–18: Results from the National Comorbidity Survey—Adolescent Supplement

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Abstract

Objective: “Disruptive mood dysregulation disorder” (DMDD) has been introduced into the *Diagnostic and Statistical Manual of Mental Disorders*, 5th ed. but the utility of this new label and the clinical correlates of the children it describes are yet to be determined.

Methods: A proxy for the DMDD diagnosis was extracted from the National Comorbidity Survey - Adolescent Supplement (NCS-A) data on 6483 adolescents (51.4% female) including Composite International Diagnostic Interview (CIDI) diagnoses and measures of impaired functioning from the Sheehan Disability Scale. Cross tabulations and logistic regression were used to assess for prevalence and comorbidity.

Results: A total of 310 (5.26%) adolescents met the criteria for DMDD when diagnostic hierarchy and frequency of outbursts were not considered. At the low end of prevalence estimation, only nine adolescents (0.12%) met the most stringent proxy diagnosis, and they also met criteria for a number of comorbid disorders and functional impairment. The rates of comorbidity and functional impairment in adolescents with bipolar disorder were the same, irrespective of their meeting criteria for DMDD.

Conclusions: The DMDD diagnosis captures a small group of adolescents with multiple other psychiatric and neurologic conditions. The specificity of this diagnostic label, therefore, at least in adolescents, remains an open question.

Introduction

PROBLEMS WITH EMOTIONAL REGULATION IN CHILDHOOD often manifest as one of a number of disorders including disruptive disorders, depressive disorders, and bipolar disorder (BPD). The increasing incidence of children diagnosed with BPD in both inpatient (Blader and Carlson 2007) and outpatient (Moreno et al. 2007) settings has led to further investigation of the way children with profound problems with self-regulation are assessed and treated (Neumann et al. 2010; Adrian et al. 2011). To deal with this increase, a new diagnostic category of “disruptive mood dysregulation disorder,” (DMDD) was introduced by the American Psychiatric Association in the *Diagnostic and Statistical Manual of Mental Disorders*, 5th ed. (DSM-5) (American Psychiatric Association 2013). DMDD evolved from the construct of “severe mood dysregulation” (SMD), originally introduced in 2003 (Leibenluft et al. 2003). SMD and DMDD are similar psychiatric constructs, both characterized by the presence of temper outbursts and chronic

irritable or angry mood for at least 12 months. Both SMD and DMDD specifically exclude previous distinct periods of elevated or expansive mood lasting most of the day and/or temper outburst that occur exclusively during an episode of a mood disorder. The age of onset varies slightly between the two but, overall, the two labels refer to a similar construct. The validity of the DMDD construct is based on evidence that children with SMD differ from those with BPD on several endophenotypic measures (Dickstein and Leibenluft 2006; Stringaris et al. 2010b), longitudinal course (Brotman et al. 2006), and risk for development of hypomanic or manic episodes over 2–3 years (Stringaris et al. 2010a).

A previous study of the prevalence of DMDD in a regional community sample yielded a very low 3 month prevalence estimate of DMDD ranging from 3.3% in preschoolers to 0.8% in older adolescents. The authors concluded that DMDD did not characterize a unique subset of subjects. However, the low prevalence rate of BPD, the primary disorder that DMDD was designed to replace in children and adolescents, precluded the ability of this previous

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study to address the primary goal of the introduction of DMDD in the DSM-5. In the DSM-5 field trial of DMDD, the test–retest reliability was unacceptable in the outpatient field sites, but was better in the only inpatient site (Regier et al. 2013). These findings in the field trials, the low prevalence, and high overlap with other disorders, when coupled with findings that family history of BPD increases the likelihood of DMDD (Sparks et al. 2014) raise concerns about specificity of the diagnosis.

In this study, we examine 1) the lifetime prevalence of DMDD in a large and well-characterized representative sample of United States adolescents with systematic investigation of the DSM-5 criteria; 2) the overlap between a DMDD proxy-diagnosis and other psychiatric disorders, including BPD; and 3) the degree to which DMDD is related to clinical indices of functional impairment and treatment.

Methods

Sample and procedure

The National Comorbidity Survey Replication-Adolescent Supplement (NCS-A) is a nationally representative face-to-face survey of 10,123 adolescents 13–18 years of age in the continental United States (Kessler et al. 2009). Information concerning the NCS-A sampling strategy, participation rates, and instruments is reported in greater detail elsewhere (Kessler et al. 2009; Merikangas et al. 2010b). The survey was conducted in a dual-frame sample that consisted of a household subsample ($n=879$) and a school subsample ($n=9244$). The adolescent response rate of the combined subsamples was 82.9%. Poststratification weighting corrected for minor differences in sample and population distributions of census sociodemographic and school characteristics (Kessler et al. 2009).

One parent/caregiver of each adolescent was mailed a self-administered questionnaire (PSAQ) to collect information on adolescent mental and physical health, and other family- and community-level factors. The full PSAQ was completed by 6491 parents, yielding an overall conditional response rate of 83.3%. This report focuses on the 6483 adolescent–parent pairs, with complete data for both adolescents and parents. All recruitment and consent procedures were approved by the Human Subjects Committees of Harvard Medical School and the University of Michigan.

Diagnostic assessment

A modified version of the World Health Organization (WHO) Composite International Diagnostic Interview Version 3.0 (CIDI), a fully structured interview of *Diagnostic and Statistical Manual of Mental Disorders*, 4th ed. (DSM-IV) diagnoses, was administered to adolescents by trained lay interviewers (American Psychiatric Association 1994; Kessler and Ustun 2004). The CIDI assessed different classes of lifetime disorders including anxiety disorders (specific phobia, agoraphobia, generalized anxiety disorder [GAD], panic disorder [PD], separation anxiety disorder [SAD], social phobia [SoPh], posttraumatic stress disorder [PTSD]), mood disorders (BPD I and II, dysthymic disorder, major depressive disorder [MDD]), behavior disorders (oppositional defiant disorder [ODD], conduct disorder [CD]), intermittent explosive disorder [IED], attention-deficit/hyperactivity disorder [ADHD], and substance abuse/dependence disorders (alcohol or illicit drug). Parents/caregivers provided diagnostic information about MDD and dysthymic disorder, SAD, ADHD, ODD, and CD. Only adolescent reports were used to assess diagnostic criteria for mood and anxiety disorders, based on prior work indicating that adolescents may be

the most accurate informants concerning their emotional symptoms (Grills and Ollendick, 2002). For behavior disorders, diagnostic data from both the parent and adolescent were combined, and classified as positive if either informant indicated the symptom/criteria for ODD and CD, and only parent reports were used for diagnoses of ADHD (Grills and Ollendick 2002 Green et al. 2010). Definitions of all psychiatric disorders adhered to DSM-IV criteria; however, diagnostic hierarchy rules were not applied to more accurately represent estimates of comorbidity.

DMDD

The DSM-5 criteria for DMDD and the items from the CIDI and PSAQ that were used to create the proxy diagnosis are provided in Supplementary Table 1 (see online supplementary material at <http://www.liebertonline.com/cap>). Because the CIDI does not provide an assessment of DMDD, symptoms reflecting criteria of the condition were selected from the screening, ODD, MDD, IED, and personality modules of the CIDI, as well as the Strengths and Difficulties section of the PSAQ. Therefore, DMDD definitions integrated adolescent and parent/caregiver reports using the “or” rule at the symptom level. One exception, consistent with the criteria of DMDD, was that parent endorsement was required to meet criterion D (Mood between temper outbursts is persistently irritable or angry most of the day, nearly every day, and is observable by others [e.g., parents, teachers, peers]). Items from the CIDI and PSAQ were selected by several clinical experts based on their face validity with DSM-5 criteria. Because of the nature of CIDI and PSAQ items, several exceptions to criteria were necessary. We approximated the frequency criterion (criterion C) by requiring the presence of temper outbursts, based on the Intermittent Explosive Disorder criteria from the CIDI, for 52 weeks of the year, with the presence of at least 156 (i.e., 52 weeks $\times$ 3 times per week = 156) temper outbursts per year. In addition, duration criterion (criterion E) could not be operationalized because of the varying time periods reflected by individual items. Criteria J and K (diagnostic exclusions) were not applied, to enable examination of overlap across conditions.

For the purposes of the current study, four different definitions of DMDD were created, ranging from least to most restrictive: 1) *DMDD Broad* imposed all operationalized criteria with the exception of the frequency (criterion C) and elevated/expansive mood exclusion (criterion I); 2) *DMDD with Hierarchy* imposed all operationalized criteria including the elevated/expansive mood exclusion (criterion I), but did not impose the frequency criterion (criterion C); 3) *DMDD with Frequency* imposed all operationalized criteria including the frequency criterion (criterion C), but did not impose the elevated/expansive mood exclusion (criterion I); and 4) *DMDD with Hierarchy and Frequency* imposed all operationalized criteria, including both the frequency (criterion C) and elevated/expansive mood exclusion (criterion I). We made the decision to manipulate frequency of temper outbursts (three or more times per week) in our definitions of DMDD, because this criterion is based on expert opinion that this frequency threshold is clinically meaningful. However, it is not entirely clear that having three or more temper outbursts per week differs considerably from having two temper outbursts per week. Consequently, we relaxed this criterion to examine its impact on prevalence. Similarly, we relaxed the manic/hypomanic episode criterion to examine one of the key justifications for developing the DMDD diagnosis: To differentiate subjects with persistent irritable mood who do not have BPD. Given that much of the debate around these subjects focuses on whether they should or should not receive a mania

diagnosis, we thought it important to examine DMDD both with and without this exclusion applied.

Clinical correlates

Adolescents were asked about the use of psychotropic medication in the past year for behavioral or emotional problems, and were provided with a list of 215 generic and proprietary names of commonly used psychotropic medications. The specific names of medications were checked from the actual prescription bottles by the interviewer, when available. These medications included antidepressants, stimulants, anxiolytics, mood stabilizers, and antipsychotics.

Disorder-specific mental health service use among adolescents was assessed in the CIDI immediately after questions related to diagnostic criteria for MDD, IED, and ODD with the following question: "Have you ever been to see someone at a hospital or a clinic or at their office for [specific symptoms of disorders]?" In a separate interview module focusing on services, respondents were asked whether they had ever received mental health services for emotional or behavioral problems. Likewise, parents were asked whether their adolescent had ever received mental health services for emotional or behavioral problems in the PSAQ. Any treatment, based on endorsement by the adolescent or parent, included health services in sectors such as mental health specialty, general medical, human services, complementary and alternative medicine, juvenile justice, and school services. Mental health specialty treatment was defined as the use of services from a psychiatrist in settings such as a mental health clinic or drug/alcohol clinic, and admissions to hospitals and other facilities. Additional information concerning the assessment of service sectors is provided in detail elsewhere (Merikangas et al. 2010a). The four treatment modalities considered were 1) any psychotropic medication in past 12 months, 2) disorder-specific treatment, 3) mental health specialty treatment, and 4) any treatment.

Adolescents with any past-year MDD, IED, ODD were asked to rate the degree of impairment and disability that they experienced during the worst month of the previous year in the areas of household chores, school or work, family relations, and social life (Sheehan Disability Scale) (Leon et al. 1997). The response scale ranged from 0 to 10. The maximum value endorsed by respondents across the four areas was used to derive a dichotomous variable of severe disability. Severe disability was considered present if scores equaled 10 and was considered absent if they scores were <10.

Other correlates

Adolescents were asked if they had ever experienced suicidal thoughts or behaviors in their lifetime. *Lifetime suicidality* included suicidal ideation, plans, and/or attempts (e.g., adolescents indicated that they had "seriously thought about," "made a plan," or "tried" to kill themselves). Parents were also asked whether their child had ever had a *learning disability*.

Statistical analysis

Cross-tabulations were used to calculate the prevalence of DMDD by respondents' demographic characteristics and clinical correlates. Logistic regression analyses were used to examine the association between clinical correlates and DMDD, after adjusting for sociodemographic characteristics and other comorbid DSM-IV disorders. Service patterns were compared in three subgroups, (No Disorder, One Class of Disorder without DMDD, and DMDD with

TABLE 1. PREVALENCE OF DMDD IN NCS-A (N=6483)

DMDD (4 definitions)	No. of cases	% (SE)
DMDD broad (no frequency, no hierarchy)	310	5.26 (0.45)
DMDD with hierarchy, no frequency	103	1.71 (0.28)
DMDD with frequency, no hierarchy	37	0.56 (0.13)
DMDD with hierarchy and with frequency	9	0.12 (0.06)

Frequency, the temper outbursts occur, on average, three or more times per week; hierarchy, mania/hypomania hierarchy exclusion applied.

DMDD, disruptive mood dysregulation disorder; NCS-A, National Comorbidity Survey - Adolescent Supplement.

or without another Class of Disorder). Parallel logistic regression analyses were conducted to examine the differences in the four treatment modalities between bipolar I/II adolescents with DMDD and those with without DMDD. All results were adjusted for design effects using the Taylor series method implemented in SUDAAN

TABLE 2. DEMOGRAPHIC CORRELATES OF DISRUPTIVE MOOD DYSREGULATION DISORDER IN NCS-A (N=6483)

Demographics	n	% (SE)	Crude OR (95% CI)
Total	6,483	5.26 (0.45)	
Age			
13–14 y	2,611	3.99 (0.54)	1.00
15–16 y	2,528	6.21 (0.97)	1.59 (0.97–2.62)
17–18 y	1,344	5.51 (0.77)	1.40 (0.91–2.16)
χ^2 [p value]			3.8 [0.149]
Sex			
Female	3,333	5.11 (0.55)	1.00
Male	3,150	5.40 (0.63)	1.06 (0.78–1.45)
χ^2 [p value]			0.1 [0.700]
Race/Ethnicity			
Hispanic	758	5.28 (1.16)	0.98 (0.55–1.77)
Black	1,097	5.01 (1.12)	0.93 (0.56–1.55)
Other	371	4.63 (1.43)	0.86 (0.41–1.79)
White	4,257	5.36 (0.62)	1.00
χ^2 [p value]			0.2 [0.970]
Parent's income			
PIR ≤ 1.5 (poor)	925	4.24 (0.85)	1.03 (0.56–1.90)
PIR ≤ 3.0	1,218	7.21 (1.00)	1.82 (1.17–2.81)
PIR ≤ 6.0	2,139	5.75 (1.01)	1.43 (0.81–2.50)
PIR > 6.0	2,201	4.10 (0.70)	1.00
χ^2 [p value]			11.0 [0.012]
Number of biological parents living with adolescent			
0	528	7.60 (2.00)	2.50 (1.24–5.06)
1	2,284	7.81 (1.10)	2.58 (1.50–4.42)
2	3,671	3.18 (0.52)	1.00
χ^2 [p value]			13.2 [0.001]
Parent's education			
<High school	746	5.62 (1.26)	2.04 (1.06–3.91)
High school grad	1,852	6.66 (1.09)	2.45 (1.43–4.17)
Some college	1,364	7.33 (1.56)	2.71 (1.61–4.56)
College grad+	2,521	2.84 (0.46)	1.00
χ^2 [p value]			20.7 [0.000]
Parent's marital status			
Married/cohabiting	4,602	5.47 (0.64)	1.00
Previously married	1,009	4.81 (0.73)	0.87 (0.58–1.31)
Never married	308	2.58 (0.91)	0.46 (0.21–0.98)
Unknown	564	5.67 (1.64)	1.04 (0.51–2.12)
χ^2 [p value]			4.4 [0.108]

Adjusted for age, sex, and race/ethnicity.

NCS-A, National Comorbidity Survey - Adolescent Supplement; PIR, poverty index ratio.

version 10. Statistical significance was based on two-sided design-based tests evaluated at a 0.05 level of significance.

Results

The prevalence rates of all DMDD definitions are provided in Table 1. Without considering the criteria “frequency of outbursts” or exclusion for mania or hypomania, ~5.3% of the sample met criteria for *DMDD Broad*. When both the frequency and exclusion criteria were applied, the prevalence decreased to <0.1% in this general population sample of adolescents. To reduce the likelihood of imprecise estimates caused by the small prevalence rates of alternative DMDD definitions, only the *DMDD Broad* definition was examined in remaining analyses (hereafter referred to as DMDD). Age, sex, race, parental income, and parents’ marital status were not significantly associated with DMDD in the population (Table 2) or in the subset of adolescents with BPD (results not shown, but available upon request). If one or both of the parents of the adolescent were not living with the participating adolescent, there was an increased risk of DMDD. There was also a decreased risk of DMDD for teens whose parent(s) had completed college.

As is shown in Table 3, adolescents with DMDD were significantly more likely to meet criteria for a wide range of lifetime comorbid conditions, including conduct/ODD, mood disorders, ADHD, and substance abuse (all p 's <0.02) (Table 3). In particular, more than half of the adolescents with DMDD met criteria for lifetime mood and conduct/ODD. Overall, 92.8% of the 310 adolescents with DMDD had at least one other psychiatric disorder, leaving only 22 individuals who met criteria for DMDD in isolation.

Service patterns across the seven groups were also examined (Table 4). More than 86% of adolescents with a DMDD diagnosis (regardless of the number of comorbid diagnoses) were receiving some type of treatment. Those in the No Diagnosis group were significantly less likely to have received psychotropic medication within the past 12 months than were those in either of the groups with DMDD or another disorder. Adolescents in the DMDD group with or without another disorder had a significantly higher likelihood of receiving medication than those in the group with No DMDD but at least one class of diagnosis. The same patterns were observed for disorder-specific treatment, mental health specialty treatment, or any type of treatments.

Associations between DMDD and clinical correlates are displayed in Table 5. Adolescents with DMDD, irrespective of a concomitant comorbid disorder, were significantly more likely to report disability in daily activities, suicidal ideation and behavior, or learning disability than adolescents without DMDD but with at least one class of another disorder.

When the adolescents with both BPD and DMDD are considered, there is an additional increased likelihood of meeting criteria for conduct/ODD and eating disorders at some point during their lives. Adolescents with BPD and DMDD are more likely to experience suicidality than adolescents with BPD only. There was also greater likelihood of service utilization in adolescents with DMDD and BPD, but equivalent rates of psychotropic medication prescription use compared with those with BPD only. The likelihood of disability, headache, learning disability, or above average grades is not significantly different for adolescents with BPD with or without comorbid DMDD (data not shown, but available upon request).

We also did an analysis of family history, but did not have a specific diagnosis of BPD in parents. There was one question in the NCS-A PSAQ that asked for “Times lasting a few days or longer when you felt unusually high and full of energy?” When we stratified by this parental “mania” history, among those not reporting parental “mania” history ($n=5682$), there were 237 DMDD cases and a weighted DMDD prevalence of 4.84% (SE=0.52). Among those reporting parental “mania” history ($n=801$), there were 73 DMDD cases and a weighted DMDD prevalence of 8.14% (SE=1.30). This difference was significant (Wald $\chi^2=5.0$, $df=1$, $p=0.030$).

Discussion

Application of the most strict criteria for DMDD in this large nationally representative sample of adolescents yielded a prevalence rate of only 0.12%, which may underestimate the prevalence for DMDD using this proxy measure. As expected, the prevalence rate increased with systematic relaxation of the mania/hypomania exclusion criterion (0.56%), the frequency criterion (1.71%), or both (5.26%). However, even with the broadest definition, 92.8% of youth met criteria for another major class of DSM-IV disorder. Rates of DMDD tended to decrease with parental income and education, but few other demographic differences emerged among those with and without DMDD. Adolescents with DMDD tended to simultaneously

TABLE 3. COMORBIDITY OF DISRUPTIVE MOOD DYSREGULATION DISORDER WITH OTHER DSM-IV DISORDERS

Classes of disorder	Disruptive mood dysregulation disorder % (SE)		Adjusted OR (95% CI)	
	No n=6173	Yes n=310	Reference: No DMDD	Wold $\chi^2_{(df=1)}$ [p value]
Mood	11.62 (0.89)	58.43 (3.76)	5.81 (3.98–8.48)	87.9 [0.000]
CD/ODD	12.62 (0.97)	68.37 (5.35)	6.53 (3.37–12.68)	32.6 [0.000]
ADHD	8.27 (0.65)	31.75 (3.97)	1.95 (1.13–3.36)	6.1 [0.013]
Anxiety	24.78 (1.01)	46.27 (4.35)	1.13 (0.71–1.82)	0.3 [0.594]
Substance	9.75 (0.79)	43.14 (4.81)	2.36 (1.39–3.98)	10.9 [0.001]
Eating	2.81 (0.48)	6.36 (2.08)	0.65 (0.23–1.86)	0.7 [0.412]
Any class	44.35 (1.23)	92.80 (2.13)	14.50 (7.50–28.01)	67.1 [0.000]
Number of classes				
None	55.65 (1.23)	7.20 (2.13)	Reference	
One	27.31 (1.09)	14.69 (2.43)	3.97 (2.00–7.87)	146.4 ($df=2$) [$p<0.0001$]
Two or more	17.04 (1.24)	78.11 (3.25)	32.26 (15.92–65.36)	

Adjusted for age, sex, race/ethnicity, poverty index ratio (PIR), number of biological parents living with adolescent, parent education, parent marital status, and DSM-IV disorder.

DSM-IV, *Diagnostic and Statistical Manual of Mental Disorders*, 4th ed.; CD, conduct disorder; ODD, oppositional defiant disorder; ADHD, attention-deficit/hyperactivity disorder.

TABLE 4. TREATMENT PATTERNS BY DISRUPTIVE MOOD DYSREGULATION DISORDER WITH AND WITHOUT COMORBID DISORDERS

	n	Any psychotropic medication past 12 months		Disorder-specific treatment		Mental health specialty treatment		Any treatment	
		%(SE)	Adjusted OR	%(SE)	Adjusted OR	%(SE)	Adjusted OR	%(SE)	Adjusted OR
DMDD									
No DSM-IV disorder	3495	2.15 (0.37)	0.18 (0.12–0.29)	4.10 (0.45)	0.12 (0.09–0.16)	16.11 (1.11)	0.26 (0.21–0.32)	28.22 (1.16)	0.23 (0.19–0.29)
No DMDD; at least one other class of disorder	2678	10.13 (0.80)	1.00	26.95 (1.50)	1.00	43.51 (1.77)	1.00	63.47 (1.68)	1.00
Any DMDD	310	28.04 (3.91)	3.52 (2.32–5.35)	64.16 (3.98)	4.92 (3.36–7.21)	67.89 (3.79)	2.82 (1.89–4.20)	86.99 (2.30)	3.78 (2.61–5.47)
Wald χ^2 [p value]			94.6 [0.000]		386.1 [0.000]		463.9 [0.000]		289.1 [0.000]

Adjusted for age, sex, race/ethnicity, poverty index ratio (PIR), number of biological parents living with adolescent, parent education, parent marital status, and DSM-IV disorder.

Psychotropic medication use in the past 12 months, based on adolescent reports; disorder-specific treatment, based on treatment questions in adolescent report in CIDI disorder section of IED, and both adolescent CIDI and parent PSAQ reports in sections of depression and ODD; mental health specialty treatment and any treatment, based on both CIDI and PSAQ reports from service section.

DSM-IV, *Diagnostic and Statistical Manual of Mental Disorders*, 4th ed.; CIDI, Composite International Diagnostic Interview; IED, intermittent explosive disorder; PSAQ, Parent Self-Administered Questionnaire; ODD, oppositional defiant disorder.

TABLE 5. CLINICAL CORRELATES OF DISRUPTIVE MOOD DYSREGULATION DISORDER WITH AND WITHOUT COMORBID DISORDERS

	n	Disability		Suicidality		Learning disability		Above average grades	
		%(SE)	Adjusted OR	%(SE)	Adjusted OR	%(SE)	Adjusted OR	%(SE)	Adjusted OR
DMDD									
No DSM-IV disorder	3495	0.00	N/A	3.56 (0.41)	0.18 (0.14–0.23)	10.40 (0.90)	0.60 (0.47–0.76)	62.13 (1.39)	2.15 (1.77–2.60)
No DMDD; at least one class of disorder	2678	7.14 (1.03)	1.00	18.28 (1.35)	1.00	16.84 (0.98)	1.00	42.66 (2.18)	1.00
Any DMDD	310	27.48 (5.13)	4.89 (2.82–8.45)	48.30 (4.09)	4.40 (3.16–6.14)	26.09 (3.71)	1.69 (1.15–2.48)	32.23 (4.66)	0.74 (0.47–1.15)
Wald χ^2 [p value]			34.1 [0.000]		278.4 [0.000]		41.7 [0.000]		70.1 [0.000]

Adjusted for age, sex, race/ethnicity, poverty index ratio (PIR), number of biological parents living with adolescent, parent education, parent marital status, and DSM-IV disorder.

Disability is defined as Sheehan Disability Scale score 10, based on a maximum score of Sheehan Disability Score from Composite International Diagnostic Interview (CIDI) disorder sections; suicidality included suicidal thought, plan, or attempt; learning disability, taken from parent reports in Parent Self-Administered Questionnaire (PSAQ); above average grades based on both adolescent CIDI and parent PSAQ reports from education sections.

DSM-IV, *Diagnostic and Statistical Manual of Mental Disorders*, 4th ed.

meet criteria for numerous other emotional and behavioral disorders, and DMDD alone was extremely rare. Of course, in the DSM-5, exclusionary criteria are provided for DMDD such that other diagnoses (such as ODD, BPD, or MDD) cannot be made together with DMDD. However, relaxing these criteria demonstrated that nearly every adolescent in this sample with the broad diagnosis of DMDD had an alternative diagnosis that could have explained the symptoms, and 78% had two or more. Only 7% of the 5.26% of those adolescents who met the broad DMDD definition had no other diagnosis. Therefore, only 0.37% of the general population met criteria for DMDD with the application of diagnostic hierarchies. This finding should ameliorate concern that the diagnosis of DMDD would result in many more children getting a psychiatric diagnosis. Likewise, the vast majority of those with DMDD had already received treatment for another mood or behavior disorder. Therefore, in this community sample, DMDD does not meet the primary validation criteria for a diagnostic entity (Robins and Guze 1970), particularly with respect to delimitation from other disorders.

A history of learning disability was a major clinical correlate distinguishing adolescents with DMDD from those with other classes of disorders. This suggests that the irritability and behavioral outbursts that characterize adolescents with DMDD may be associated with an underlying learning or developmental disorder. The direction of causation for these symptoms, however, cannot be determined from these data. In addition, we observed that adolescents with DMDD were no more likely to exhibit comorbid mood disorders (62%) than they were to have behavior disorders (70%), or any of a wide range of other disorders including anxiety and substance use disorders. These patterns of comorbidity were remarkably similar to those reported in the earlier evaluation of DMDD in a series of regional community samples (Copeland et al. 2013).

Limitations

These findings should be considered in the context of several limitations. First, we had to derive the diagnostic criteria for DMDD from multiple sections of the interview and parental reports that were not collected in a specific module of the diagnostic interview. Therefore, our criteria can only be considered as an index of DMDD rather than a true validation of the concept. This is especially true of the frequency criterion, which required physical or verbal threats, but did not include other types of verbal aggression in the screening instrument. Second, the study is cross-sectional with retrospective recall of disorders and symptoms. Longitudinal measures would provide more valid information on the stability and outcomes of DMDD, as demonstrated by Stringaris and colleagues (2010a). Third, the younger age limit in our study was 13, after which earlier studies (Copeland et al. 2013) have shown that DMDD is increasingly rare. Fourth, parent informant information was collected by self-reported rating scales and diagnostic checklists rather than by direct interview, which is especially pertinent in the measurement of family history of mania. We attempted to minimize this limitation in the DMDD proxy diagnosis by careful selection of the core criteria for DMDD using both parent- and child-reported information. Finally, our proxy diagnosis of DMDD was based on lifetime criteria for symptoms and comorbidity. We could not derive 12 month prevalence rates for DMDD (criterion E), because many of the items were not associated with a particular time period. This is a limitation of this proxy diagnosis. However, this limitation would lead to less restrictive criteria; therefore, it would not have modified our conclusion regarding the low prevalence rate of DMDD.

Conclusions

In summary, the two major conclusions from these analyses are that DMDD is extremely rare in a nationally representative sample of adolescents, confirming the findings of an earlier investigation of the application of DMDD in three community samples in North Carolina (Copeland et al. 2013). Second, the overlap of DMDD with other disorders, particularly neurodevelopmental and learning disabilities, requires greater investigation. If our finding regarding the association between DMDD with learning disorders is replicated, then further work on the direction of causality of this association will be warranted. Third, as opposed to in younger children, DMDD is relatively uncommon in adolescence. The steep decline from 3.3% in younger youth to 0.8% in adolescents in Copeland et al.'s (2013) recent report, and our remarkably low prevalence rate suggest that the construct may not be the same in all youth <18 years of age, despite the DSM-5 criteria making it available across this age range.

Clinical Significance

The decrease in the prevalence of DMDD in adolescence makes it likely that there is a maturational element to these symptoms, with temper outbursts decreasing with age, which would be consistent with other studies of aggressive behavior. Altogether, the aggregate findings of extremely low prevalence rates of DMDD in the general population should to some extent alleviate the concern of some individuals that the use of DMDD will lead to labeling youth with nonspecific "temper tantrums" with a psychiatric diagnosis (Frances 2011).

The use of this proposed category, as we have defined it here, yields very few adolescents with the criteria for DMDD alone, suggesting that modifications to, or elimination of, this diagnosis, at least in adolescents, may need to be considered in the next version of the DSM.

Disclosures

No competing financial interests exist.

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