Article

Adult Diagnostic and Functional Outcomes of DSM-5 Disruptive Mood Dysregulation Disorder

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Objective: Disruptive mood dysregulation disorder (DMDD) is a new disorder for DSM-5 that is uncommon and frequently co-occurs with other psychiatric disorders. Here, the authors test whether meeting diagnostic criteria for this disorder in childhood predicts adult diagnostic and functional outcomes.

Method: In a prospective, population-based study, individuals were assessed with structured interviews up to six times in childhood and adolescence (ages 10 to 16 years; 5,336 observations of 1,420 youths) for symptoms of DMDD and three times in young adulthood (ages 19, 21, and 24–26 years; 3,215 observations of 1,273 young adults) for psychiatric and functional outcomes (health, risky/illegal behavior, financial/educational functioning, and social functioning).

Results: Young adults with a history of childhood DMDD had elevated rates of anxiety and depression and were more likely to meet criteria for more than one adult disorder relative to comparison subjects with no history of childhood psychiatric disorders (noncases) or individuals meeting criteria for psychiatric disorders other than DMDD in childhood or adolescence (psychiatric comparison subjects). Participants with a history of DMDD were more likely to have adverse health outcomes, be impoverished, have reported police contact, and have low educational attainment as adults compared with either psychiatric or noncase comparison subjects.

Conclusions: The long-term prognosis of children with DMDD is one of pervasive impaired functioning that in many cases is worse than that of other childhood psychiatric disorders.

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Disruptive mood dysregulation disorder (DMDD) was added to DSM-5 to account for nonepisodic irritability and includes many of the criteria first proposed for severe mood dysregulation (the hyperarousal criterion was eliminated and the age of onset criterion was changed to 10 years old) (1). In a previous study of 3,258 participants from ages 2 to 17 years, DMDD was uncommon and frequently comorbid with other common childhood disorders, most frequently oppositional defiant disorder and depressive disorders. In fact, it was rare for DMDD to occur without comorbid disorder (an overlap of 63%−92%). Given their high levels of mood and behavioral dysregulation and also comorbidity, children with DMDD may be at elevated risk for long-term problems. We used the community-based, longitudinal Great Smoky Mountains Study to evaluate the adult psychiatric and functional outcomes of children with DMDD.

Several community and clinical studies have looked at long-term psychiatric outcomes of irritability (2–4). Brotman et al. (2) followed children with severe mood dysregulation in late adolescence in a community longitudinal study. Children with severe mood dysregulation had a seven times greater risk of having a depressive disorder than children without severe mood dysregulation. A follow-up of chronically irritable children from another community longitudinal study found increased risk of major depression in early adulthood (4). This same study looked at outcomes predicted after 20 years of follow-up and found that after adjustment for baseline comorbidities, childhood irritability predicted adult major depressive disorder, generalized anxiety, and dysthymia (3). Together, these studies suggest that irritability is a key feature in risk for adult mood and possibly anxiety disorders. None of these long-term follow-up studies has, however, applied the new DSM-5 criteria for testing adult outcomes of childhood DMDD.

Psychiatric functioning is only one measure of long-term functioning. Individuals may or may not meet full criteria for an adult psychiatric disorder, but may still fail to attain optimal functioning in important life areas. The developmental literature on severe childhood irritability had previously reported that severely dysregulated children "move against" the world as they grow up—into a spiral of downward mobility, erratic work lives, and dysfunctional relationships (5). Here, we tested whether meeting criteria for DMDD in childhood predicted adult health functioning, risky or illegal behaviors, or educational, financial, and social functioning. Taken together, our goal is to provide a broad psychiatric and functional outcomes profile of young adults with a history of DMDD.

The present analyses used the same sample followed by Brotman et al. (2) in their late adolescent follow-up of

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children with severe mood dysregulation. We applied the DSM-5 DMDD criteria during childhood and adolescence, and looked at adult outcomes at ages 19, 21, and 24–26 years. In contrast to Brotman et al. (2), we excluded the first wave of study from this analysis. We hypothesized that children with DMDD are a severe subset of childhood psychiatric cases and they display worse psychiatric and functional outcomes than noncases and some psychiatric comparison subjects. Previous research on severe mood dysregulation and chronic irritability suggest that adults with a history of DMDD may have the highest rates of anxiety and depression in particular.

Method

Participants

The Great Smoky Mountains Study is a longitudinal, representative study of children in 11 counties of North Carolina (6). Three cohorts of children, ages 9, 11, and 13 years, were recruited from a pool of some 12,000 children using a two-stage sampling design, resulting in 1,420 participants (49% female) (6). American Indians were oversampled to constitute 25% of the sample; 7% of the participants were African American. Annual assessments were completed for the 1,420 children until age 16 and then again at ages 19, 21, and 25 for a total of 9,941 assessments.

The interviews were completed by both a parent figure and the case subject until the child was 16 years old and by the study participant alone thereafter. Before all interviews, the parent and child signed informed consent and assent forms approved by the Duke University Medical Center institutional review board. All interviewers had bachelor's level degrees, received 1 month of training, and had audio recordings of all interviews reviewed by a senior interviewer.

Childhood and Adolescent Psychiatric Status

DMDD was assessed with the Child and Adolescent Psychiatric Assessment interview (7, 8) completed with a parent figure and the case subject between the ages of 10 and 16. A symptom was counted as present if the parent, child, or both endorsed it. To minimize recall bias, the timeframe for determining the presence of psychiatric symptoms was the preceding 3 months. However, because onset dates were collected for all items, the duration criterion could still be calculated.

This study began before DMDD was proposed, but it was possible to diagnose disruptive mood dysregulation post hoc because its criteria overlap entirely with those of oppositional defiant disorder and depression. Table S1 in the data supplement that accompanies the online edition of this article provides the specific interview sections and items used to assess various criteria. Criteria A to C were defined by items assessing temper outbursts and tantrums as part of the conduct problems section. If these behaviors were reported, the informant was then queried about the onset of the behavior and frequencies of these behaviors at home, school, and elsewhere, which informed criteria E, F, and H. Frequency of losing temper in different contexts was not assessed for the first wave of the Great Smoky Mountains Study, and so, in contrast to Brotman and colleagues' study (2), this wave was not included in the present analyses. Criterion D was assessed through items about being touchy, easily angered, angry, resentful, and irritable from the conduct problems section and depressed mood from the depression section. Case subjects were required to display these moods on more days than not. The timing of onset for these items was used for criteria E and H. Criterion G requires a diagnosis to be made first between 7 and 18 years old. Criteria I, J, and K are exclusions based on other psychiatric disorders or conditions. Criterion I excludes case subjects based on concurrent manic episode, and one individual was excluded as a result of this criterion (this case subject did not complete an adult assessment). Criterion J would have affected the results, as it involves exclusion for common psychiatric disorders. This criterion was not applied, as we have previously demonstrated that it would exclude many cases (9). Criterion K excludes symptoms as a result of drugs or medical conditions, but this did not affect the number of cases identified. The SAS syntax for this diagnosis is available from the first author by request.

The diagnostic groups included depressive disorders, anxiety disorders (generalized anxiety disorder, social phobia, separation anxiety disorder, and specific phobia), conduct disorder, attention deficit hyperactivity disorder, oppositional defiant disorder, and substance disorders. Two-week test-retest reliabilities of interview-derived diagnoses were comparable to those of other structured interviews, with kappas ranging from 0.36 to 1.0 (7, 10).

Adult Psychiatric and Functional Outcomes

All outcomes except officially recorded criminal offenses were assessed through interviews with the young adults at ages 19, 21, and 24–26 years with the Young Adult Psychiatric Assessment (11).

Psychiatric status. Scoring programs, written in SAS (12), combined information about the date of onset, duration, and intensity of each symptom to create diagnoses according to DSM-IV. Two-week test-retest reliability of the interview was comparable to that of other highly structured interviews (kappas for individual disorders range from 0.56 to 1.0) (13). The validity was well established using multiple indices of construct validity (8). Diagnoses included any DSM-IV anxiety disorder (generalized anxiety, agoraphobia, panic disorder, social phobia, obsessive-compulsive disorder, and posttraumatic stress disorder), depressive disorders (major depression, minor depression, and dysthymia), antisocial personality disorder, alcohol abuse or dependence, and marijuana abuse or dependence. Psychosis was not included in the analyses as it was very rare in the community.

Health functioning. The participants reported any diagnosis of a serious physical illness, being in a serious accident at any point during young adulthood, or having a sexually transmitted disease (report of testing positive for herpes, genital warts, chlamydia, or HIV). Weight and height measurements were used to derive body mass index (BMI), with obesity defined as a BMI value $\geq$30. Regular smoking was defined as smoking more than one cigarette per day for 3 months. Self-reported perceived poor health, high illness contagion risk, and slow illness recovery were derived from a physical health problems survey (adapted from the Center for Disease Control 1988 National Health Interview Survey Child Health Supplement; www.icpsr.umich.edu/icpsrweb/NACDA/studies/09375/documentation).

Risky or illegal behaviors. Official felony charges were collected from North Carolina Administrative Office of the Courts records. Self-report was used to assess recent police contact; frequent lying to others; frequent physical fighting; breaking into another's home, business, or property; frequent drunkenness (drinking to excess at least once weekly for 3 months); recent use of marijuana or other illegal substances; and one-time sexual encounters with strangers (hooking up with strangers).

TABLE 1. Descriptive Statistics and Childhood Family Characteristics in a Study of Adult Outcomes of Disruptive Mood Dysregulation Disorder (DMDD)[a]

	Noncase Comparison Subjects		Psychiatric Comparison Subjects		DMDD Case Subjects		DMDD Case Subjects and Noncase Comparison Subjects			DMDD Case Subjects and Psychiatric Comparison Subjects		
Characteristic	N	%	N	%	N	%	Odds Ratio	CI	p	Odds Ratio	CI	p
Female	436	51.2	161	40.0	33	50.6	1.0	0.5–2.2	0.95	0.7	0.3–1.5	0.31
White	622	90.2	300	87.2	61	85.4	0.6	0.2–1.9	0.41	0.9	0.3–2.6	0.79
Black	49	6.3	32	8.2	7	11.3	1.9	0.5–7.3	0.36	1.4	0.4–5.8	0.62
Indian	249	3.5	87	4.6	13	3.3	1.0	0.5–1.9	0.88	0.7	0.3–1.5	0.35
Impoverished families	385	28.6	230	50.2	46	63.1	4.3	2.0–9.3	<0.001	1.7	0.8–3.8	0.20
Single parent	329	31.1	205	47.4	42	56.5	2.9	1.3–6.3	0.01	1.4	0.6–3.3	0.39

[a] Total N=1,420. All reported N values are unweighted and all percentages are weighted. p values are significant at p<0.05.

Financial and educational functioning. Being impoverished was coded using thresholds issued by the U.S. Census Bureau based on income and family size (14). High school dropout and completion of any college education were coded based on the participant's educational status at the last adult assessment. Job problems were assessed as being dismissed or fired from a job and quitting a job without financial preparations. Finally, other financial problems assessed included failing to honor debts or financial obligations and being a poor manager of one's finances.

Social functioning. Marital, parenthood, and divorce status were determined through self-report at the last adult assessment. The quality of the participant's relationship with his or her parents, spouse or significant other, and friends, including arguments and violence, was measured at each assessment. Variables were included to indicate any violence in a romantic relationship, a poor relationship with one's parents, no best friend or confidante, and problems making or keeping friends.

Analytic Strategy

All analyses compared children who met criteria for DMDD at some point in childhood and adolescence with two other groups: individuals meeting criteria for a psychiatric disorder other than DMDD in childhood or adolescence (psychiatric comparison subjects) and individuals never meeting criteria for a psychiatric disorder in childhood or adolescence (noncase comparison subjects).

All associations with adult outcomes (at ages 19, 21, and 24–26 years) were tested using weighted regression models in a generalized estimating equations framework implemented by SAS PROC GENMOD (SAS Institute, Cary, N.C.). Robust variance (sandwich type) estimates were used to adjust the standard errors of the parameter estimates for the sampling weights applied to observations.

Results

Descriptive information

Of the total sample of 1,420 individuals, 4.1% (unweighted N=81) met criteria for DMDD at some point between the ages of 10 and 16. In all, 1,273 participants (89.7%) were followed up in young adulthood. Follow-up rates were similar across diagnostic groups (75 of 81 DMDD case subjects [93.8%]; 372 of 419 psychiatric comparison subjects (88.8%); and 826 of 920 noncase comparison subjects [89.8%]) with no differences in follow-up rate between the case subject group and either comparison group (case subjects and psychiatric comparison subjects, p=0.33; case subjects and noncase comparison subjects, p=0.45).

DMDD case subjects did not differ from other groups in the likelihood of being female, white, African American, or American Indian (Table 1). Participants with a history of DMDD were more likely to come from impoverished families and single parent households than noncase comparison subjects, but not more likely than psychiatric comparison subjects.

Childhood DMDD and Adult Diagnostic Outcomes

Table 2 compares the childhood diagnostic groups on rates of adult psychiatric diagnoses. Each association was tested with weighted logistic regression models, and associations are reported as odds ratios with 95% confidence intervals and associated p values. Individuals with childhood disruptive mood dysregulation were significantly more likely to meet criteria for an adult diagnosis than noncase comparison subjects. Specifically, they were more likely to have an adult depressive or anxiety disorder and more likely to meet criteria for adult anxiety or depression relative to psychiatric comparison subjects. Individuals with DMDD were most likely to meet criteria for multiple adult disorders, with 10.3 greater odds than noncase comparison subjects and 5.9 greater odds than psychiatric comparison subjects. Case subjects were not at elevated risk for adult substance-related disorders.

Childhood DMDD and Adult Functional Outcomes

Health functioning and risky or illegal behaviors. Table 3 summarizes the rates of adult health outcomes and risky or illegal behaviors in childhood DMDD case subjects, psychiatric comparison subjects, and noncase comparison subjects. Relative to noncase comparison subjects, individuals with a history of DMDD had worse health outcomes in adulthood (elevated on four of eight indicators) with high self-reported rates of sexually transmitted diseases, regular smoking, and illness contagion. Case subjects were less likely to have been diagnosed with a serious illness than noncase comparison subjects. Relative to psychiatric comparison subjects,

TABLE 2. Associations of Childhood/Adolescent Diagnostic Groups With Young Adult Diagnostic Categories[a]

Psychiatric Diagnosis	Noncase Comparison Subjects		Psychiatric Comparison Subjects		DMDD Case Subjects		DMDD Case Subjects and Noncase Comparison Subjects			DMDD Case Subjects and Psychiatric Comparison Subjects		
	N	%	N	%	N	%	Odds Ratio	95% CI	p	Odds Ratio	95% CI	p
Any	207	24.6	156	49.2	33	56.6	4.0	1.8–9.0	<0.001	1.4	0.6–3.2	0.49
Depressive	43	4.3	35	6.7	9	24.9	7.4	2.3–23.3	<0.001	4.6	1.4–14.9	0.01
Anxiety	55	7.4	62	20.7	18	45.4	10.4	4.2–26.0	<0.001	3.2	1.3–8.1	0.02
ASPD	9	1.9	12	3.2	2	1.7	0.9	0.2–4.7	0.87	0.5	0.1–3.0	0.46
Alcohol	124	14.9	83	25.2	18	19.7	1.4	0.5–3.7	0.50	0.7	0.3–2.0	0.54
THC	114	14.1	75	21.1	22	29.5	2.6	1.0–6.4	0.05	1.6	0.6–4.1	0.37
≥2 disorders	39	5.2	43	8.8	16	36.1	10.3	3.8–28.4	<0.001	5.9	2.1–16.6	<0.001

[a] N=1,273. All reported N values are unweighted and all percentages are weighted. DMDD=disruptive mood dysregulation disorder; ASPD=antisocial personality disorder; THC=marijuana-related disorders. p values are significant at p<0.05.

TABLE 3. Associations Between Disruptive Mood Dysregulation Disorder (DMDD) in Childhood and Young Adult Health Functioning and Risky/Illegal Behaviors[a]

Characteristic	Noncase Comparison Subjects		Psychiatric Comparison Subjects		DMDD Case Subjects		DMDD Case Subjects and Noncase Comparison Subjects			DMDD Case Subjects and Psychiatric Comparison Subjects		
	N	%	N	%	N	%	Odds Ratio	95% CI	p	Odds Ratio	95% CI	p
Health Outcomes												
Serious illness	38	5.6	26	7.0	3	1.3	0.2	0.1–0.9	0.04	0.2	0.0–0.8	0.03
Serious accident	99	13.8	51	10.8	15	15.2	1.1	0.4–3.0	0.82	1.5	0.5–4.3	0.46
Sexually transmitted disease	29	4.5	27	4.4	13	21.9	5.9	1.9–18.1	0.002	6.0	1.9–19.7	0.003
Obesity	308	25.2	150	35.7	30	28.2	1.2	0.5–2.6	0.71	0.7	0.3–1.7	0.43
Any nonsubstance psychiatric disorder	128	15.9	108	33.0	30	54.1	6.2	2.7–14.2	<0.001	2.4	1.0–5.7	0.04
Regular smoking (>1 day)	377	37.1	224	57.7	49	75.0	5.1	2.2–11.8	<0.001	2.2	0.9–5.4	0.08
Self-report of poor health	129	15.7	83	26.5	16	37.6	3.2	1.3–8.1	0.01	1.7	0.6–4.4	0.30
Self-report of illness contagion	206	21.7	110	34.5	25	45.0	3.0	1.3–6.9	0.01	1.6	0.6–3.8	0.34
Self-report of slow illness recovery	50	6.3	40	14.7	11	15.3	2.7	0.8–8.7	0.10	1.0	0.3–3.6	0.95
Risky/Illegal Behaviors												
Official felony charge	59	6.1	63	11.3	11	20.3	4.0	1.3–12.1	0.02	2.0	0.7–6.1	0.23
Police contact	52	9.5	54	18.4	20	30.5	5.9	2.1–16.5	0.001	3.7	1.4–10.3	0.01
Lying	30	3.6	26	6.4	2	1.7	0.5	0.1–2.2	0.32	0.3	0.1–1.2	0.09
Physical fighting	99	5.9	69	8.9	16	26.8	4.2	1.5–11.5	0.005	2.0	0.7–5.6	0.21
Breaking in	26	1.7	34	11.2	7	18.9	13.7	3.6–52.2	<0.001	1.8	0.5–6.9	0.37
Driving when impaired	52	6.8	44	14.2	10	13.2	2.1	0.6–7.6	0.27	0.9	0.2–3.5	0.90
Marijuana use	241	28.8	157	44.6	28	39.0	1.6	0.7–3.7	0.29	0.8	0.3–1.9	0.61
Other illicit drug use	79	8.1	64	15.9	13	9.0	1.1	0.5–2.6	0.76	0.5	0.2–1.2	0.14
Hooking up with a stranger	77	12.9	59	18.3	14	16.3	1.3	0.5–3.9	0.61	0.9	0.3–2.7	0.81

[a] N=1,273. All reported N values are unweighted and all percentages are weighted. Odds ratios significant at p<0.05.

DMDD case subjects had higher rates of adult sexually transmitted diseases and lower rates of serious illnesses.

Children with a history of DMDD were also at elevated risk for risky or illegal behaviors (four of nine indicators) relative to noncase comparison subjects. Case subjects had higher rates of having official felony charges, self-reported police contact, physical fighting, and breaking into buildings illegally relative to noncase comparison subjects. Similar to the findings for substance-related diagnostic outcomes, case subjects did not have elevated rates of illicit drug use. Little difference was observed between psychiatric comparison subjects and case subjects on risky or illegal behaviors (elevated on one of nine indicators).

Financial, educational, and social outcomes. We also tested associations with adult financial, educational, and social outcomes (Table 4). DMDD case subjects had elevated rates on five of seven financial/educational indicators relative to noncase comparison subjects. Individuals with a history of DMDD were more likely to be impoverished and have trouble keeping a job and less likely to have graduated from high school or completed any college than noncase comparison subjects. DMDD case subjects were also more likely to be impoverished and have lower educational attainment than psychiatric comparison subjects. Adult social functioning was more disrupted in case subjects than in noncase comparison subjects (violent

TABLE 4. Associations Between Disruptive Mood Dysregulation Disorder (DMDD) in Childhood and Young Adult Financial and Social Functioning[a]

	Noncase Comparison Subjects		Psychiatric Comparison Subjects		DMDD Case Subjects		DMDD Case Subjects and Noncase Comparison Subjects			DMDD Case Subjects and Psychiatric Comparison Subjects		
Characteristic	N	%	N	%	N	%	Odds Ratio	95% CI	p	Odds Ratio	95% CI	p
Financial/educational functioning												
Impoverished	521	56.9	255	68.0	57	86.3	4.8	2.4–9.5	<0.001	3.0	1.4–6.3	0.005
No high school diploma	226	18.5	127	22.9	30	40.9	3.0	1.3–6.9	0.008	2.3	1.0–5.5	0.05
No college	482	42.4	278	62.4	64	82.3	6.3	2.5–16.2	<0.001	2.8	1.1–7.5	0.04
Dismissed from a job	205	21.1	150	39.3	43	37.7	2.3	1.0–4.9	0.04	0.9	0.4–2.1	0.87
Quit multiple jobs	94	10.7	93	25.0	28	27.8	3.2	1.4–7.5	0.007	1.2	0.5–2.8	0.74
Failing to honor financial obligations	78	10.3	66	22.7	11	8.5	0.8	0.4–1.8	0.62	0.3	0.1–0.8	0.009
Poor financial management	77	7.7	53	17.0	13	10.2	1.4	0.6–3.0	0.46	0.56	0.2–1.3	0.18
Social functioning												
Violent relationships	41	3.2	46	10.0	11	15.0	5.4	1.6–18.8	0.007	1.6	0.5–5.5	0.45
Poor relationship with parents	111	16.1	89	30.2	20	37.2	3.1	1.1–8.5	0.03	1.4	0.5–3.9	0.55
No best friend/confidante	251	21.7	143	36.6	32	41.1	2.5	1.1–5.8	0.03	1.2	0.5–2.9	0.68
Problems making/keeping friends	31	3.8	28	9.8	10	7.6	2.1	0.8–5.4	0.13	0.8	0.3–2.1	0.59

[a] N=1,273. All reported N values are unweighted and all percentages are weighted. Odds ratios significant at $p<0.05$.

relationships, poor parental relations, and no best friend) but not when compared with psychiatric comparison subjects.

Comparisons across summary functional outcome scales. Indicators of adult outcomes were summed within each functional domain (health, risky/illegal behaviors, wealth, financial/educational functioning, and social functioning) and these scales were standardized (mean=0, SD=1; i.e., the mean of 0 indicates the mean problems for each domain in the total sample). Figure 1 displays z scores for each of the four outcome domains for all groups. Across all domains, positive scores indicate fewer problems and negative scores indicate more problems. DMDD case subjects had elevated scores across all domains relative to noncase comparison subjects and had worse health functioning than the other psychiatric comparison subjects. In all cases, DMDD case subjects had the lowest standardized scores, indicating poorer functioning.

A follow-up analysis comparing DMDD case subjects to psychiatric comparison subjects who had met criteria for more than one diagnosis in childhood (comorbidity comparison subjects) found no significant differences on any functional scale, although DMDD case subjects always had the lowest means scores (i.e., more problems).

Discussion

Irritability is a symptom or associated feature of many psychiatric disorders, but it is a core feature of DSM-5 DMDD. As such, DMDD is a distinct disorder in terms of its high rates of associated comorbidity (9). Our study suggests that this pattern of comorbidity extends into adulthood, where case subjects who displayed rates of comorbidity five to seven times higher than rates observed for noncase and psychiatric comparison subjects were at increased risk for both anxiety and depressive disorders. The poor prognosis for individuals with DMDD also extended to health, legal, financial/educational, and social functioning. Indeed, the composite profile of DMDD case subjects in adulthood is one of pervasive, impaired functioning.

Children with DMDD were worse off in adulthood than children with other psychiatric disorders in a number of domains (depression, anxiety, psychiatric comorbidity, poverty, and low educational attainment). One possible explanation of this finding is that the severity of psychiatric symptoms is higher in children with DMDD relative to children with other common psychiatric disorders. It is also possible that this increased risk might be attributable to its high levels of comorbidity. These two interpretations are not exclusive. Indeed, in our sample, so few cases of DMDD were without a comorbid disorder that we could not test whether severity and comorbidity differentially contributed to adult outcomes. When we compared case subjects to psychiatric comparison subjects with multiple childhood disorders, DMDD case subjects had lower scores in all functional domains (i.e., worse functioning), but these differences were not statistically significant. We conclude that DMDD is a severe and highly comorbid childhood disorder that marks children at risk for long-term impaired functioning.

DMDD has proven to be controversial. Concerns include the potential for increased psychotropic medication use in children, pathologizing of "normal" tantrum behavior, and the lack of any empirical basis (15–18). This analysis and previous research (9) suggests that the concern about pathologizing normal behavior is likely overstated: DMDD

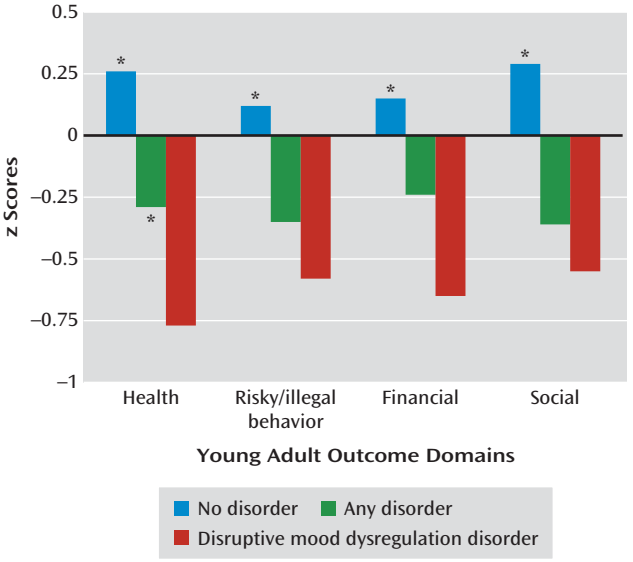
is relatively rare, almost always comorbid, and commonly associated with long-term impairment. These children should be a clinical priority. The risk of increased medication use (or psychotherapy) depends on what clinical trials suggest about the optimal treatment strategy and long-term outcomes of treatment for such children. Finally, the concerns about the lack of empirical basis are being addressed rapidly with basic epidemiological studies available before the publication of DSM-5 and also with extensive prior study of severe mood dysregulation and chronic irritability (2–4, 9, 19, 20).

One empirically supported critique of this new disorder is that DMDD is merely a new category for children with comorbid depression and oppositional defiant disorder (9). The reason that DMDD can be studied in existing samples is that the criteria can be almost entirely derived from the symptomatic criteria for those two disorders (i.e., persistent irritable/angry affect punctuated by temper outbursts). Is it, therefore, necessary to propose a new category or is it sufficient to note this comorbidity group as one of interest? This distinction may be a reasonable taxonomic issue, but another validity criterion is how the diagnostic entity informs prognosis and treatment planning. Our findings suggest that this disorder identifies children who in some cases may have a worse prognosis than children with other common psychiatric disorders.

It is important to note several potential limitations. The Great Smoky Mountains Study is not nationally representative; compared with the U.S. population, the study overrepresents American Indians and underrepresents blacks. Rates of poverty in children who have participated in the Great Smoky Mountains Study are slightly higher than are found in the United States in similar age cohorts. Despite these caveats, prevalence rates for common disorders and comorbidity patterns derived from these studies are similar to those from other community epidemiologic studies (21–23). To date, there is no nationally representative longitudinal study of childhood mental health that has used gold standard psychiatric interviews. Thus, geographically limited, epidemiologic, longitudinal studies like this one have been an important source of information on the etiology, phenomenology, and developmental course of childhood psychopathology.

The study attempted to minimize recall biases and forgetting by focusing interviews on the 3 months immediately preceding the interview. At the same time, individuals may have met criteria for DMDD outside of our assessment window. To the extent that cases were not identified, our results underestimate the long-term effect of DMDD. Finally, diagnostic criteria were applied post hoc using symptoms of oppositional defiant disorder and depressive disorders, as the diagnosis had not been proposed at the time of the interviews. As such, additional information about this particular constellation of symptoms, apart from oppositional defiant disorder and depressive disorders (e.g., impairments and service use) was not collected.

FIGURE 1. Means Values for Adult Standardized Outcome Scales by Childhood Diagnostic Status[a]



[a] Negative scores indicate more problems than the mean for the total sample. Asterisks indicate whether the comparison group was statistically different from the disruptive mood dysregulation disorder (DMDD) group ($p<0.05$). Children with DMDD had worse health outcomes than noncase comparison subjects (means ratio=2.8; 95% CI=1.8–2.1, $p<0.001$) and psychiatric comparison subjects (means ratio=1.6; 95% CI=1.0–2.5, p=0.04). DMDD case subjects had higher levels of all other outcomes compared with noncase comparison subjects (risky/illegal means ratio=2.0; 95% CI=1.1–3.6, p=0.02; financial/educational means ratio=2.3; 95% CI=1.6–3.3, $p<0.001$; and social means ratio=2.2; 95% CI=1.5–3.3, $p<0.001$). Relative to psychiatric comparison subjects, DMDD case subjects did not have worse risky/illegal behavior outcomes (means ratio=1.2; 95% CI=0.7–2.3, p=0.45) or financial/educational outcomes (means ratio=1.2; 95% CI=0.8–1.8, p=0.34), but had marginally worse social outcomes (means ratio=1.5; 95% CI=1.0–2.3, p=0.06).

Conclusions

Disruptive mood dysregulation disorder is a new disorder to DSM-5, and there is no question that research on irritability has increased dramatically over the last decade, but children with this constellation of symptoms have always been with us (24). Caspi et al. (5) described children with high levels of temper tantrums as "moving against the world" and documented their downward social mobility and turbulent social lives. Our analysis suggests that this bleak prognosis includes increased health problems, continued emotional distress, financial strain, and social isolation. For most children, development provides a constant series of opportunities for recovery and rehabilitation (25), but for children with DMDD, the accumulation of early failures may perpetuate a lifetime of limited opportunity and compromised well-being. As such, children with persistent irritable mood punctuated by frequent outbursts—regardless of what we call this cluster of symptoms—should be a priority for clinical care and treatment development.

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References

1. Leibenluft E, Charney DS, Towbin KE, Bhangoo RK, Pine DS: Defining clinical phenotypes of juvenile mania. Am J Psychiatry 2003; 160:430–437
2. Brotman MA, Schmajuk M, Rich BA, Dickstein DP, Guyer AE, Costello EJ, Egger HL, Angold A, Pine DS, Leibenluft E: Prevalence, clinical correlates, and longitudinal course of severe mood dysregulation in children. Biol Psychiatry 2006; 60:991–997
3. Stringaris A, Cohen P, Pine DS, Leibenluft E: Adult outcomes of youth irritability: a 20-year prospective community-based study. Am J Psychiatry 2009; 166:1048–1054
4. Leibenluft E, Cohen P, Gorrindo T, Brook JS, Pine DS: Chronic versus episodic irritability in youth: a community-based, longitudinal study of clinical and diagnostic associations. J Child Adolesc Psychopharmacol 2006; 16:456–466
5. Caspi A, Elder G Jr, Bern D: Moving against the world: life-course patterns of explosive children. Dev Psychol 1987; 23:308–313
6. Costello EJ, Mustillo S, Erkanli A, Keeler G, Angold A: Prevalence and development of psychiatric disorders in childhood and adolescence. Arch Gen Psychiatry 2003; 60:837–844
7. Angold A, Prendergast M, Cox A, Harrington R, Simonoff E, Rutter M: The Child and Adolescent Psychiatric Assessment (CAPA). Psychol Med 1995; 25:739–753
8. Angold A, Costello EJ: The Child and Adolescent Psychiatric Assessment (CAPA). J Am Acad Child Adolesc Psychiatry 2000; 39:39–48
9. Copeland WE, Angold A, Costello EJ, Egger H: Prevalence, comorbidity, and correlates of DSM-5 proposed disruptive mood dysregulation disorder. Am J Psychiatry 2013; 170:173–179
10. Egger HL, Erkanli A, Keeler G, Potts E, Walter BK, Angold A: Test-retest reliability of the Preschool Age Psychiatric Assessment (PAPA). J Am Acad Child Adolesc Psychiatry 2006; 45:538–549
11. Angold A, Erkanli A, Copeland W, Goodman R, Fisher PW, Costello EJ: Psychiatric diagnostic interviews for children and adolescents: a comparative study. J Am Acad Child Adolesc Psychiatry 2012; 51:506–517
12. SAS Institute: SAS/STAT Software, version 9. Cary, NC, SAS Institute, 2004
13. Angold A, Costello EJ: A test-retest reliability study of child-reported psychiatric symptoms and diagnoses using the Child and Adolescent Psychiatric Assessment (CAPA-C). Psychol Med 1995; 25:755–762
14. Dalaker J, Naifah M: Poverty in the United States: 1997. Washington, DC, US Department of Commerce, 1993, pp 60–201
15. Parens E, Johnston J, Carlson GA: Pediatric mental health care dysfunction disorder? N Engl J Med 2010; 362:1853–1855
16. Axelson D, Birmahe B, Findling R, Fristad M, Kowatch R, Youngstrom E, Arnold E, Goldstein B, Goldstein T, Chang K, Delbello M, Ryan N, Diler R: Concerns regarding the inclusion of temper dysregulation disorder with dysphoria in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition. J Clin Psychiatry 2011; 72:1257–1262
17. Stringaris A: Irritability in children and adolescents: a challenge for DSM-5. Eur Child Adolesc Psychiatry 2011; 20:61–66
18. Taylor E: Child Psychology and Psychiatry, in Diagnostic Classification: Current Dilemmas and Possible Solutions. Oxford, UK, John Wiley & Sons, 2011, pp 223–228
19. Stringaris A, Zavos H, Leibenluft E, Maughan B, Eley TC: Adolescent irritability: phenotypic associations and genetic links with depressed mood. Am J Psychiatry 2012; 169:47–54
20. Leibenluft E: Severe mood dysregulation, irritability, and the diagnostic boundaries of bipolar disorder in youths. Am J Psychiatry 2011; 168:129–142
21. Jaffee SR, Harrington H, Cohen P, Moffitt TE: Cumulative prevalence of psychiatric disorder in youths. J Am Acad Child Adolesc Psychiatry 2005; 44:406–407
22. Bernstein DP, Cohen P, Velez CN, Schwab-Stone M, Siever LJ, Shinsato L: Prevalence and stability of the DSM-III-R personality disorders in a community-based survey of adolescents. Am J Psychiatry 1993; 150:1237–1243
23. Cohen P, Cohen J, Kasen S, Velez CN, Hartmark C, Johnson J, Rojas M, Brook J, Streuning EL: An epidemiological study of disorders in late childhood and adolescence I: age- and gender-specific prevalence. J Child Psychol Psychiatry 1993; 34:851–867
24. Rutter M, Lebovici S, Eisenberg L, Sneznevskij AV, Sadoun R, Brooke E, Lin TY: A tri-axial classification of mental disorders in childhood: an international study. J Child Psychol Psychiatry 1969; 10:41–61
25. Copeland W, Shanahan L, Miller S, Costello EJ, Angold A, Maughan B: Outcomes of early pubertal timing in young women: a prospective population-based study. Am J Psychiatry 2010; 167:1218–1225

Clinical Guidance: Adult Outcomes of Disruptive Mood Dysregulation Disorder

Children with the new DSM-5 diagnosis of disruptive mood dysregulation disorder are more likely than healthy children to become young adults with anxiety or depressive disorders, general health problems, risky or illegal behaviors, financial problems, or social impairment. They also fare worse than children or adolescents with other psychiatric disorders, in terms of early adulthood health problems and comorbid psychiatric diagnoses, report Copeland et al. In his editorial, McGough (p. 607) differentiates childhood disruptive mood dysregulation disorder from bipolar disorder on the basis of nonepisodic irritability, the brain mechanisms of which may ultimately hold the key to effective treatment.