

Disruptive Mood Dysregulation Disorder in Juvenile Justice

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Disruptive mood dysregulation disorder (DMDD) is a new diagnosis in the Diagnostic and Statistical Manual of Mental Disorders (DSM-5). We compared juvenile justice involved youths with DMDD to those with disruptive behavior disorders (DBDs) and other mood disorders, to clarify the differences and to investigate differential correlates to DMDD relative to DBDs or mood disorders. Diagnostic and demographic data were available for 9,819 youths served by 57 juvenile justice sites. A subsample of 2,498 youths had data relevant to our study. The youths self-assessed mental health status on the Voice Diagnostic Interview Schedule for Children (V-DISC), and we retrofitted the V-DISC data to derive an approximate DMDD diagnosis. The retrofitted criteria for DMDD were met by 3.3 percent of justice-involved youths. Results from multinomial regression showed that, after adjustment for covariates, those with DMDD had fewer differences compared with those with other mood disorders than did those meeting criteria for DBDs. Consistent with the DSM-5 classification of DMDD as a depressive disorder, those with DMDD shared more characteristics with youths with mood disorders than with those reporting DBDs. Externalizing behaviors leading to justice involvement may overshadow internalizing symptoms of DMDD, but mood-related conditions should be identified and treated in this population.

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Disruptive mood dysregulation disorder (DMDD) is a new diagnosis, included as a depressive disorder in children and adolescents in the Diagnostic and Statistical Manual of Mental Disorders (DSM-5).¹ DMDD is characterized by frequent severe temper outbursts manifested verbally (e.g., verbal rages) and behaviorally (e.g., physical aggression toward people or property) that are grossly out of proportion in intensity or duration to the situation or provocation, along with an irritable and angry mood between episodes.¹

The DMDD diagnosis arose from previous work on the construct of severe mood dysregulation (SMD) originally hypothesized as a subtype of bipolar disorder.² In contrast to SMD, however, DMDD

does not involve symptoms of hyperarousal (e.g., insomnia, agitation, distractibility, racing thoughts, flight of ideas, pressured speech, and intrusiveness).² It separates chronically irritable children and adolescents who are likely to develop depression and anxiety as adults from children and adolescents with true mania who are likely to develop bipolar disorder.³ The frequency of the diagnosis of bipolar disorder has risen dramatically in children and adolescents in the past 25 years.⁴ DMDD was developed to provide a diagnostic home for those children and adolescents with a mood disorder who showed irritability and rage outbursts, who did not meet stringent criteria for bipolar disorder but who may have been diagnosed incorrectly with bipolar disorder.⁴ The DSM-5 workgroups recognized that most children with a mood disorder who showed irritability would meet criteria for oppositional defiant disorder (ODD) and many may have attention deficit hyperactivity disorder (ADHD).

Recently, there have been a few empirical, community-based studies on the prevalence, comorbidity, and correlates of the DMDD symptom profile in children and adolescents.^{5,6} Prevalence rates for DMDD in the community have been documented

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to range widely, from 0.8 to 9.0 percent.^{5,6} DMDD has been found to co-occur with all common psychiatric diagnoses, substantially so with other depressive disorders (odds ratio, 9.9–23.5) and even more so with ODD (odds ratio, 52.9–103.0).⁵ Children meeting criteria for DMDD are found to have increased rates of social impairments, suspension from school, poverty, and use of behavioral health services relative to children without DMDD.⁵

In clinical samples, the DMDD symptom profile appears to be relatively common, with rates ranging from 26 to 31 percent.^{4,7,8} Although currently categorized under depressive disorders in DSM-5, recent work has suggested that DMDD may be better classified as a behavioral disorder. More specifically, in the clinical sample described in the Longitudinal Assessment of Manic Symptoms (LAMS) study,⁷ 96 percent of those with DMDD also met criteria for ODD or conduct disorder (CD); 77 percent met criteria for both ADHD and ODD/CD.

In both community and clinical samples, although there are reports of comorbidities between DMDD and both internalizing (e.g., depressive disorder and anxiety disorder) and externalizing (e.g., ODD, CD) disorders, comorbidity with substance use disorders (SUDs) or association with trauma history has not been examined. Clinically, it is important to examine a fuller range of comorbidities with DMDD, especially as substance use may indicate self-medication for underlying mood symptoms, and trauma history is associated with a wide range of disorders, such as lifetime mood disorders, disruptive symptoms, CD, and SUD.^{9–11}

Children and adolescents with internalizing disorders, such as major depressive disorder (MDD) or anxiety disorders, are often unidentified; only one-fourth to one-third of adolescents with MDD are receiving treatment¹² and internalizing disorders are commonly not detected in those who present with externalizing behavior.¹³ Externalizing problems, such as those seen in disruptive behavior disorders (DBDs), may impede identification of the less overt internalizing problems by those who recommend services (family, teachers, and juvenile justice gatekeepers).^{14,15} Given the high prevalence of DMDD in clinical samples and its association with externalizing disorders, examining youths in juvenile justice settings, where rates of DBD, SUD, and trauma exposure^{16,17} are also consistently elevated relative to

those in community youth, is a useful means of considering prevalence and comorbidities.

Studies of the prevalence of psychiatric disorders in juvenile justice populations reveal substantial elevations relative to youths in the community. In large studies of adolescents in juvenile justice settings, one-half to three-quarters met criteria for one or more psychiatric disorders.^{16,18–20} One-third to one-half met criteria for SUD, and more than one-third of males and females did so for DBD.^{16,20} More than 10 percent of females met criteria for major depressive disorder.^{16,20} It has also been shown that 80 to 90 percent of youths in juvenile justice have had exposure to traumatic events.^{21,22} Given the myriad associations of exposure to trauma with psychiatric diagnoses, we are investigating whether there is an association with DMDD.^{9–11}

Drawing on the National Comorbidity Survey–Adolescent Supplement (NCS-A),²³ a recent study created two retrofitted DMDD diagnoses from a sample of 6,483 community adolescents. Proxy measures were created that corresponded either strictly or more broadly to DSM-5 criteria. DMDD strict proxy diagnosis used information from both the structured interview in the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV) interview²⁴ and a parent/caregiver self-administered questionnaire.¹¹ The broad DMDD diagnosis did not include the “frequency of outbursts” criteria and did not exclude mania or hypomania. Only 9 adolescents (0.12% of the sample) met strict proxy criteria for DMDD, but 310 (5.26%) met the broad criteria. Compared with adolescents without broad DMDD ($n = 6,173$), those with a retrofitted broad DMDD diagnosis were more likely to meet criteria for a wide range of lifetime comorbid conditions, including CD/ODD (68.37% versus 12.62%), mood disorders (58.43% versus 11.62%), ADHD (31.75% versus 8.27%), and SUD (43.14% versus 9.75%). Almost all ($n = 288$; 92.8%) of those identified by the broad DMDD criteria reported at least one other psychiatric disorder.²³

Because DMDD includes elements of depressive (internalizing) and irritability and oppositional (externalizing) symptoms and because questions remain about whether this disorder fits better with mood or disruptive disorders, we wanted to compare youths with DMDD to those with other mood disorders and to those with DBDs, to determine whether DMDD is best classified as a mood

or disruptive disorder. We conducted an exploratory examination of whether there would be fewer differences between those with DMDD and mood disorders than those with DMDD and DBD. Furthermore, we sought to expand upon previous investigations of DMDD comorbidities for better understanding of this new diagnosis. We were particularly interested in SUD and trauma exposure, given their associations with mood and disruptive disorders.

The study was approved by Institutional Review Boards at Columbia University and New York State Psychiatric Institute (Protocol #6445R) and at collaborating institutions.

Method

Sample

Diagnostic and demographic data were available for 9,819 youths, who had been assessed between March 1999 and August 2008, in the course of a series of collaborations between Columbia University's Center for the Promotion of Mental Health in Juvenile Justice (CPMHJJ) and juvenile justice authorities.¹⁶ Beginning in 1999, CPMHJJ entered into collaborative agreements with juvenile justice agencies in 18 states (57 sites). Of this full sample, 2,498 youths had data relevant for our study. These agencies represent settings at three levels of increasingly restrictive juvenile system contact (penetration): including system intake sites (e.g., probation or family court intake), detention centers, and postadjudicatory correctional facilities. Juvenile justice agencies used standardized data collection protocols and employed universal or systematic random (e.g., random day of the week) sampling. Youths completed an audio computer-assisted diagnostic self-interview measuring a core set of psychiatric disorders soon after intake into the site's probation, detention, or secure care system. Sites deidentified information and provided assessment results and demographic and offense characteristics to CPMHJJ.

The data from this collaboration have been aggregated in the National Archive of Mental Health in Juvenile Justice Archive. Among those in the archive, full data on disorder, history of suicide attempts and traumatic exposures, offenses, and demographic characteristics were available for 9,442. Earlier reports on this sample have described the prevalence of

psychiatric disorders¹⁶ and traumatic exposure²¹ in this population.

Measures

Demographic and Offense Characteristics

Background information (age, gender, and race) was recorded by local staff at baseline. Agencies also provided information regarding current offense, extracted from justice records. For the current study, we considered data on repeat-offender status (first-time versus repeat offenders), age at first offense, and interpersonal (e.g., rape, assault, robbery, arson, homicide, and weapons charges) versus noninterpersonal (e.g., property, substance, or status) offenses.¹⁶ Agency setting was dichotomized as system intake (e.g., community probation) versus secure care (i.e., detention, residential corrections).

Psychiatric Disorders and Suicide Attempts

Youths self-assessed mental health status on the Voice Diagnostic Interview Schedule for Children (V-DISC), the audio computer-assisted self-report version of the Diagnostic Interview Schedule for Children.²⁵ The V-DISC measures 20 DSM-IV disorders in four clusters based on past-month symptoms according to the DSM-IV: SUD (alcohol, marijuana, and other substances), DBD, anxiety, and mood disorders (major depressive disorder, bipolar disorder). The DISC is the most extensively tested child and adolescent diagnostic interview, evaluated and validated in both community and clinical samples.^{25,26} Provisional diagnoses are generated based on DSM-IV criteria.¹ No significant differences have been found in reliability of diagnoses between self-administered and interviewer-administered versions.²⁶ The V-DISC has been widely used in research on the prevalence of psychiatric disorders among justice-involved youth.²⁷⁻²⁹ The one-month reliability of most diagnoses (κ) ranges between 0.50 and 0.70.³⁰

Because the V-DISC measures DSM-IV disorders, and DMDD is new in DSM-5, we used a methodology similar to that in the most rigorous of the previous DMDD retrofit work²³ to derive approximated DMDD diagnosis using items from the V-DISC ODD module. Table 1 summarizes the elements incorporated into our designation of DMDD. Of the 11 features of the DMDD criteria, we found analogs for 6 (60%); we did not have information on whether symptoms persisted for more than one year,

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Table 1 Retrofitting DSM-5 Diagnosis of DMDD From V-Disc Data

DSM-5 Criteria	Retrofit from V-DISC
A. Severe recurrent temper tantrums manifested verbally and behaviorally grossly out of proportion in intensity or duration to the situation or provocation:	“About how often do you lose your temper?” answering “A few days a week.” or “Nearly every day.”
B. Temper outbursts inconsistent with developmental level	“About how often do you lose your temper?” answering “A few days a week.” or “Nearly every day.”
C. Average, 3+ per week	“About how often do you lose your temper?” answering “A few days a week.” or “Nearly every day.”
D. Irritable mood between outbursts	“In the past six months, have you been grouchy or easily annoyed?” Answering “Nearly every day.”
AND	AND
Angry mood between outbursts.	“In the past six months, have you been mad at people or things?” answering “Nearly every day” or “In the past six months, have you gotten angry because you’ve thought things were unfair?” answering “Nearly every day.”
E. Criteria A–D for 12+ months.	Data unavailable on V-DISC, which asks specifically about presence of criteria within the past six months.
F. Criteria A–D in at least two settings (home, school, or peers); severe in one.	Data unavailable on V-DISC.
G. Not >6 years old and not >18 years old.	Age is an inclusion parameter.
H. Age at onset A–E: <10 years.	Data unavailable on V-DISC.
I. Episodes of elated mood plus manic-specific symptoms lasting more than one day cannot be present.	Exclusion criteria included that DMDD cannot coexist with ODD, intermittent explosive disorder (IED), or bipolar disorder.
J. Symptoms are not occurring exclusively during a psychotic or mood disorder or are better accounted for by another disorder.	Data unavailable on V-DISC.
K. Not from effects of a substance.	Data unavailable on V-DISC.

the setting of symptoms (home, school, or peers), or age at onset or whether symptoms occurred during a mood or psychotic disorder or were the effects of substance use.

Using V-DISC data, we were able to create four nonoverlapping groups of youths: Group 1 were those meeting our retrofitted criteria for DMDD ($n = 314$); Group 2 were those meeting criteria for DBD ($n = 1,952$) (ODD, CD, or ADHD), who did not meet our DMDD criteria and without another mood disorder (major depressive disorder, dysthymic disorder, or manic/hypomanic episode); Group 3 were those who met criteria for other mood disorder ($n = 232$), but did not meet criteria for DMDD or a DBD; and Group 4 were those who did not fit any of the above ($n = 7,321$). Data from Group 4 were removed from further analysis, because of our focus on the first three groups.

Traumatic Exposure

In addition to PTSD, we considered traumatic exposures, to investigate associations between type of exposure and psychiatric illness. The V-DISC includes eight questions about traumatic exposure. We characterized two of these as “assaultive violence” (being attacked or beaten badly or being threatened

by a weapon), and a third (experiencing forced sexual activity) as exposure to “forced sexual activity.”

Statistical Analysis

Bivariate associations examined two sets of pairwise comparisons to detect differences in the groups (DMDD, other mood disorder, and DBD). Demographic and offense characteristics, traumatic exposures, and psychiatric disorders were examined by chi-square test and analysis of variance. After inspection of interitem correlations between the pool of covariates and diagnostic status (Supplemental Table 1 accessible at <https://childadolescentpsych.cumc.columbia.edu/professionals/research-programs/center-promotion-mental-health-juvenile-justice/supplemental-materials>), variables empirically or theoretically linked with DMDD status and those that demonstrated a modest association with any outcome ($p < .20$) were included in a series of multinomial regression models. Moreover, because gender, race, age, juvenile justice setting, suicidal behavioral, and traumatic exposure have demonstrated clear associations with mental health status, these covariates were retained in multivariate modules. As repeat-offender status reflects both offense severity and frequency (e.g., several instances of property of-

Table 2 Sample Demographic, Offense, and Disorder Characteristics

Characteristics	DMDD + (<i>n</i> = 314)	DBD + (without mood or DMDD) (<i>n</i> = 1,952)	Other Mood + (without DBD or DMDD) (<i>n</i> = 232)
	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)
Female*	131 (41.7)	360 (18.4)	85 (36.6)
White	128 (40.8)	916 (46.9)	89 (38.4)
Age (mean, SD)*	15.8 (1.5)	16.0 (1.3)	15.9 (1.5)
Grade (mean, SD) [†]	8.7 (1.4)	8.9 (1.4)	9.0 (1.6)
Juvenile justice setting*			
System intake	122 (38.9)	403 (20.6)	82 (35.3)
Secure care	192 (61.1)	1549 (79.4)	150 (64.7)
Interpersonal offense*	127 (41.0)	582 (30.0)	92 (39.7)
Age at first offense (mean, SD)	13.3 (1.9)	13.2 (2.0)	13.4 (1.8)
Repeat offender*	221 (71.8)	1608 (84.0)	184 (80.3)
Posttraumatic stress disorder*	65 (20.8)	38 (1.9)	46 (19.8)
Traumatic exposure			
Forced sexual activity*	75 (24.0)	231 (11.8)	64 (27.6)
Assaultive violence	223 (71.2)	1374 (70.5)	150 (64.7)
Affective disorder** [†]	142 (47.0)	—	232 (100.0)
Major depressive disorder** [†]	132 (42.0)	—	195 (84.1)
Lifetime suicide attempt*	113 (36.0)	376 (19.3)	80 (34.5)
Disruptive behavior disorder*	188 (84.7)	1952 (100.0)	—
Substance use disorder** [†]	165 (54.3)	1221 (64.6)	68 (29.7)

* Significant difference ($p < .001$) between DMDD + and DBD + (without mood or DMDD).

[†] Significant difference ($p < .001$) between DMDD + and other mood + (without DBD or DMDD).

fenses versus a single instance of assault), the multiple possible interpretations precluded this measure from further consideration. The significant negative correlation between age at first offense and juvenile justice setting ($r = -0.18$; $p = <.001$; older youths more likely to be in secure care) suggested that one or the other was redundant in the analyses. We retained setting in the regression models, because this construct has demonstrated associations with co-occurring externalizing and internalizing psychopathology, the primary focus of these analyses.¹⁶

We analyzed data with multinomial regression, examining those categorized as DMDD+ as the reference group. All analyses were adjusted for gender, race (nonwhite versus white), and justice setting (system intake versus secure care). As state policy restricts the age range of youths seen by juvenile authorities, age was not included in multivariate models.

Results

Sample Characteristics

Of the 9,442 youths with complete data, 38.7 percent (3,800) were from intake settings (e.g., probation), 10.7 percent (1,050) from detention settings, and 50.5 percent (4,959) from postadjudicatory settings (secure placement after a court's determination of delinquency). Approximately 75 percent were

male; most were white or African American, with smaller proportions of Hispanics and American Indians from age 8 to 18 years old. Of this full sample, 2,498 youths had data relevant for our study; there were no significant differences in the DMDD, DBD, and other mood disorder groups when this subset was compared with the larger archive.

Based on these definitions, 314 youths (3.3% of the sample) met retrofit criteria for DMDD; 1,952 (20.5%) met criteria for DBD (without mood or DMDD) and 232 (2.4%) met criteria for other mood (without DBD or DMDD). The diverse group of youths ($n = 6,944$) who were not included in any of these three groups were excluded from further analysis; they included those who denied any disorder, those who endorsed only disorders other than mood or DBD, and those with comorbid mood and DBD, but not DMDD.

DMDD versus DBD

Table 2 shows demographic, offense, and disorder characteristics for youths in the three groups. The DMDD group differed from the DBD groups in many ways. Compared with those in the DBD group, those meeting criteria for DMDD were more likely to be female ($\chi^2_{(df=1)} = 86.35$; $p < .001$) and were, on average, slightly (two months) younger ($t_{(397.80)} = 2.32$; $p < .021$). Furthermore, those in

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Table 3 Multinomial Regression Estimates Predicting Diagnostic Status

	DMDD vs. DBD with neither mood disorder nor DMDD OR (95% CI)	DMDD vs. Other mood with neither DBD nor DMDD OR (95% CI)
Female	0.45*** (0.33–0.60)	0.73 (0.49–1.08)
White (vs. nonwhite)	1.25 (0.96–1.63)	0.88 (1.62–1.27)
System intake setting (vs. secure care)	0.46*** (0.34–0.61)	0.69 (0.47–1.01)
Interpersonal offense	0.69** (0.53–0.90)	0.86 (0.60–1.23)
Posttraumatic stress disorder	0.09*** (0.06–0.14)	0.90 (0.57–1.42)
Substance use disorder	1.27 (0.97–1.67)	0.32*** (1.22–0.47)
Lifetime suicide attempt	0.60*** (0.44–0.81)	1.03 (0.70–1.52)
Exposure to forced sexual activity	0.91 (0.63–1.30)	1.36 (1.87–2.13)

** $p < .01$; *** $p < .001$.

the DMDD group were about twice as likely to be in an intake, compared with a secure, setting ($\chi^2_{(df=2)} = 50.38$; $p < .001$) and were more likely to have been charged with an interpersonal current offense ($\chi^2_{(df=1)} = 14.95$; $p < .001$) than with a noninterpersonal offense. In addition, those with DMDD were about 10 times more likely to meet criteria for PTSD ($\chi^2_{(df=1)} = 219.85$; $p < .001$) and more than twice as likely to report a history of forced sexual activity ($\chi^2_{(df=1)} = 33.86$; $p < .001$). Finally, they were twice as likely to report a lifetime suicide attempt ($\chi^2_{(df=1)} = 44.71$; $p < .001$) and less likely to report a SUD ($\chi^2_{(df=1)} = 11.92$; $p < .001$) than those in the DBD group.

DMDD versus Other Mood Disorder

There were fewer statistically significant differences between those with other mood disorders and those with DMDD. Youths meeting criteria for DMDD were more likely to have completed fewer years of school ($t_{(408)} = 2.07$; $p < .039$) and were twice as likely to report a SUD ($\chi^2_{(df=1)} = 32.08$; $p < .001$).

Multivariate Analyses

Based on the bivariate differences reported above, our multinomial regression final model included gender, race, setting, interpersonal offense, posttraumatic stress disorder (PTSD), SUD, lifetime suicide attempt, and exposure to forced sexual activity. Table 3 shows results of analysis predicting membership in one of three diagnostic groups (DMDD+, DBD+ (without mood or DMDD), or other mood+ (without DBD or DMDD)).

DMDD versus DBD

Relative to those with DBD, those with DMDD were more than twice as likely to be female (OR =

0.45; CI = 0.33–0.60; $p < .001$). Compared with those with DBD, those with DMDD were 11 times as likely to meet criteria for PTSD (OR = 0.09; CI = 0.06–0.14; $p < .001$), almost twice as likely to report a lifetime suicide attempt (OR = 0.60; CI = 0.44–0.81; $p < .001$). Relative to those with DBD, those with DMDD were one and a half times as likely to have committed an interpersonal offense (OR = 0.69; CI = 0.53–0.90; $p < .01$) and were more than twice as likely to be in secure care (OR = 0.46; CI = 0.34–0.61; $p < .001$). The DMDD group did not differ significantly in justice setting, forced sexual activity, or race (white versus nonwhite).

DMDD versus Other Mood Disorder

Relative to those with another mood disorder (but without DBD), those with DMDD were three times as likely to report a SUD (OR = 0.32; CI = 0.022–0.61; $p < .001$). The DMDD group did not differ significantly in justice setting, forced sexual activity, or race (white versus nonwhite).

Discussion

Diagnostic Home for DMDD

Our goal was to determine whether, in a juvenile justice population, DMDD had fewer differences when compared with mood disorders or to DBD. Consistent with our hypothesis, we found that, for youths in justice system contact, DMDD was much more closely related to mood disorders than to DBD.

The study findings expand our understanding of the nosology of DMDD in two important ways. First, our results help clarify the epidemiology of DMDD, including its greater concordance with other mood disorders rather than with DBD. Even among those in juvenile justice settings, with their overall increased likelihood of externalizing disorder

and SUD, those with DMDD are clearly less different compared with mood disorders than they are compared with those meeting criteria for DBD, who do not have DMDD. From a clinical perspective, some externalizing behaviors such as temper outbursts or irritable or angry mood (each of which might lead to juvenile justice involvement) overlap with symptoms of DMDD; however, those with DMDD are distinct from those with DBD, and identifying this condition is feasible in this population. Compared with those with DBD, youths with DMDD were twice as likely to report a past suicide attempt, increasing the risk of future suicide attempts and illustrating the critical importance of comprehensive identification and treatment. Fortunately, there are several well-studied treatment modalities available to address the risk of suicide.^{31,32}

From another perspective, it has been noted that children of depressed mothers have significantly higher rates of oppositional defiant disorder, in addition to other psychiatric disorders than do children of nondisordered mothers.^{33,34} This has been interpreted to reflect less than ideal maternal parenting or socioenvironmental deficits secondary to the mother's symptoms of depression.³⁵ Our work suggests the possibility that the connection between maternal depression and childhood ODD may reflect an underlying genetic predisposition for mood disorders, and children of depressed mothers may actually be more precisely diagnosed with DMDD.

Epidemiology of DMDD in Juvenile Justice Settings

In this study, of those cases in CPMHJJ's Archive, 3.3 percent met retrofitted criteria for DMDD. Five previous studies have created retrofitted DMDD diagnoses according to various methods and have reported its prevalence to range from 0.12 to 9.0 percent in community samples to 26.0 to 31.0 percent in mental health settings (where, presumably, all youths carry some diagnosis).^{5-8,23} Our prevalence in the juvenile justice setting was consistent with rates reported in community samples, both of which include youths not preselected for disorder.

We also found that, compared with those endorsing DBD without mood disorder, those meeting criteria for DMDD were more than twice as likely to be female (41.7% versus 18.4%). In contrast, in the earlier community report of younger children (9-13 years old), DMDD was twice as common in males

(3.6%) as in females (1.9%).⁵ Our study's higher prevalence among females reflects that girls in justice system contact differ from girls in community samples in several ways. Compared with their peers in the community, females in juvenile justice settings report higher rates of past abuse, higher rates of witnessing family violence, more caregiver transitions during early and mid-childhood, and higher rates of engaging in delinquent activities with friends.^{36,37} Here, even in a justice sample with elevated rates of traumatic exposure, both female gender and a higher rate of PTSD (a likely marker for a history of abuse), are also more common in youths with DMDD. Our work suggests that a gender paradox may be operating that would explain these findings. In a gender paradox, the group (here, girls) that displays a problem (here, juvenile justice contact) that is generally more common in another group (here, boys) presents with higher levels of correlated adverse or impairing conditions than does the other group.³⁸ Thus, girls who appear in juvenile justice settings would be more impaired across co-occurring dimensions than would boys who appear in those settings, so that girls would show elevated rates of a range of mental health disorders.^{39,40}

In earlier reports using data from CPMHJJ's Archive, we found that girls endorsed higher rates of ODD, anxiety, mood disorders, including major depressive disorder, and social and specific phobia, than did their male counterparts.^{27,41} Because our retrofitting of DSM-IV elements to define DMDD drew completely upon ODD symptoms, it would be expected that females would also be more likely to meet criteria for DMDD. We noted with interest that, compared with youths with DBD, those with DMDD were less likely to report substance use disorders. It is possible that although youths with DMDD were irritable, they were less likely to self-medicate with substances than were their DBD peers. Recognizing the co-occurrence of irritability and depression in girls with juvenile justice contact, treatment approaches for them that address this profile have been used⁴² for several years.

Comorbidities in DMDD

As a new disorder in the DSM-5, DMDD's expected comorbid psychiatric diagnoses are beginning to be described. In our sample, justice-involved youths with DMDD reported higher rates of SUDs than did those with mood disorders other than

DMDD. Compared with those with DBD, youths with DMDD were more likely to meet criteria for PTSD. About 21 percent of those adolescents with DMDD had comorbid PTSD; similarly, 20 percent of those with mood disorders reported comorbid PTSD. This result is in stark contrast to those with DBD, fewer than two percent of whom reported comorbid PTSD. This further similarity with mood disorders adds support to DMDD's classification as a mood disorder. These novel associations add to the clinical understanding of this diagnosis.

Overlap Between Irritability and DMDD

Irritability (usually a key feature of the DMDD profile) has a stronger phenotypic relationship with depression than with delinquency in adolescents.⁴³ Conversely, headstrong or hurtful behaviors in adolescents have been shown to be more strongly related to delinquency than to depression.⁴⁰ Clinicians and other staff working in juvenile justice settings need to recognize that the symptoms of DMDD, including irritable mood, are likely to be indicative of a mood disorder, rather than aggression or authority-challenging behavior. Changing clinicians' and staff's thinking about these behaviors may be a substantial challenge, given that service providers, teachers, and parents have all been found to under-recognize the symptoms of mood disorders in children and adolescents who also present with externalizing symptoms.^{44–46} The risks associated with not recognizing these behaviors as mood symptoms are even more considerable, given the increased risk of a history of attempted suicide in those meeting retrofitted criteria for DMDD.

Effective treatments for youths in secure care have been described.⁴⁷ A systematic review of treatment studies relying on randomized controlled trials among incarcerated youths offered recommendations for those youths who diagnosed mood disorders or anxiety disorders, or risk of self-harm⁴⁷: in those secure settings, group-based cognitive behavior therapy has been found to be efficacious.⁴⁷ Further research is needed to clarify whether, given their shared diagnostic category, the treatment for MDD is similar to that for DMDD. There are National Institute of Mental Health (NIMH)–funded studies (Clinicaltrials.gov identifiers: NCT00794040 and NCT01714310) that are investigations of the combination of SSRI plus stimulant to treat severe mood dysregulation.⁴⁸

DMDD Predicts Adult Diagnostic and Functional Outcomes

In addition to understanding the epidemiology and comorbid psychiatric diagnoses of DMDD, it may be important clinically to consider the long-term correlates and outcomes of youths with DMDD. A single, prospective, population-based study has examined whether those meeting criteria for DMDD in childhood are at increased risk of adult diagnostic and functional outcomes.⁵ In that study, compared with those with a non-DMDD diagnosis or with no childhood diagnosis, young adults with a history of childhood DMDD reported increased rates of anxiety and depression and were more likely to meet criteria for one or more adult disorders than their counterparts with no DMDD or no childhood diagnoses.⁵ In addition, those with a history of DMDD were more likely to have higher self-reported rates of sexually transmitted diseases, tobacco smoking, and susceptibility to contagious illness.⁵ Furthermore, those with childhood DMDD experienced higher rates of poverty, had elevated risk for risky or illegal behaviors, and had lower educational attainment over their lifetimes, suggesting that they may carry a worse prognosis than those with other childhood psychiatric disorders. By providing treatment for those with DMDD, we may be able to intervene on a trajectory that likely includes poverty and lower educational attainment. An externalizing behavior of some sort may have led an adolescent to juvenile justice contact, but underlying symptoms of internalizing disorder may be present and treatable.

Study Limitations

One limitation of our study is that, in retrofitting a DMDD diagnosis, we were unable to map symptoms exactly onto the DSM-5 diagnosis. We were unable to capture the DMDD symptom of “severe, recurrent, temper tantrums that are grossly out of proportion to the situation (Ref. 1, p 156). In basing our diagnostic category on ODD-based proxies (e.g., “about how often do you lose your temper”), our criteria likely reflect a less intense condition than DMDD. Our method for retrofitting was comparable, however, with the most stringent previously published work in this area.^{7,8,23}

Drawing a DMDD proxy diagnosis completely from ODD diagnostic criteria may also have overestimated the true comorbidity of DMDD and DBD. Included in our retrofit DMDD diagnosis are its

hallmark symptoms (temper outbursts and angry or irritable mood). Although we captured duration of symptoms longer than six months, DSM-5 criteria describe symptom duration longer than 12 months. Our DMDD proxy diagnosis was also unable to capture setting, age at onset, or exclusionary criteria. Despite these limitations, DMDD shares more commonality with depressive disorder diagnoses than with DBD.

Finally, reduced statistical power may have weakened our ability to detect significant differences between those with DMDD and those with mood disorders (without DBD or DMDD), because of the relatively smaller sample sizes (although both were above $n = 200$) of these two groups. The absence of significant differences between these groups does not necessarily imply equivalence.

Conclusion

This article helps characterize the new DSM-5 diagnosis of DMDD, supports its current classification in DSM-5 as a mood disorder, considers how it can be distinguished from DBD, and highlights a novel current DMDD comorbidity, SUD. The findings suggest the importance of considering underlying mood symptomatology, specifically irritability, in DMDD in adolescents with externalizing or oppositional behaviors.

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