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Disruptive Mood Dysregulation Disorder Symptoms and Association with Oppositional Defiant and Other Disorders in a General Population Child Sample

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Abstract

Objective: The new *Diagnostic and Statistical Manual of Mental Disorders,* 5th ed. (DSM-5) diagnosis, disruptive mood dysregulation disorder (DMDD), has generated appreciable controversy since its inception, primarily in regard to its validity as a distinct disorder from oppositional defiant disorder (ODD). The goal of our study was to determine if the two DSM-5 DMDD symptoms (persistently irritable or angry mood and severe recurrent temper outbursts) occurred independently of other disorders, particularly ODD. Other DSM-5 DMDD criteria were not assessed.

Methods: Maternal ratings of the two DMDD symptoms, clinical diagnosis of ODD using DSM-5 symptom criteria, and psychological problem scores (anxiety, depression, oppositional behavior, conduct disorder, and attention-deficit/hyperactivity disorder [ADHD]) on the Pediatric Behavior Scale were analyzed in a population sample, 6–12 years of age ($n = 665$).

Results: The prevalence of DMDD symptoms (irritable-angry mood and temper outbursts both rated by mothers as *often or very often* a problem) was 9%. In all, 92% of children with DMDD symptoms had ODD, and 66% of children with ODD had DMDD symptoms, indicating that it is very unlikely to have DMDD symptoms without ODD, but that ODD can occur without DMDD symptoms. Comorbid psychological problems (anxiety, depression, conduct disorder, and ADHD) in addition to ODD did not increase the risk of having DMDD symptoms beyond that for ODD alone. Only 3% of children with psychological problems other than ODD had DMDD symptoms.

Conclusions: Our general population findings are similar to those for a psychiatric sample, suggesting that DMDD cannot be differentiated from ODD based on symptomatology. Therefore, it is important to assess all DSM criteria and to examine for comorbid psychopathology when considering a diagnosis of DMDD. Our results support the recommendation made by the World Health Organization's International Classification of Diseases, 11th Revision (ICD-11) panel of experts that DMDD symptoms may be more appropriately classified as an ODD specifier than a separate diagnosis.

Introduction

The *Diagnostic and Statistical Manual of Mental Disorders,* 5th ed. (DSM-5) created the new diagnosis of disruptive mood dysregulation disorder (DMDD) ''to address the considerable concern about appropriate classification and treatment of children who present with chronic, persistent irritability relative to children who present with classic (i.e., episodic) bipolar disorder'' (American Psychiatric Association 2013, p. 157). DSM-5 DMDD diagnostic criteria are severe recurrent temper outbursts that are out of proportion to the situation, inconsistent with developmental level, and occurring on average three or more times per week, plus persistently irritable or angry mood for most of the day nearly every day. Additional criteria include the presence of symptoms for at least 12 months (without a symptom-free period of ≥3 consecutive months) in two or more settings (at home, at school, or with peers) with onset before age 10.

DMDD is a controversial diagnosis for several reasons. First, the symptoms of persistently irritable or angry mood and severe recurrent temper outbursts overlap with those for oppositional defiant disorder (ODD), whereas irritability is a criterion for multiple disorders (Safer 2009; Mayes et al. 2011; Stringaris 2011; Leibenluft et al. 2012; Roy et al. 2014). Even though the DSM-5 definition for ODD includes the two core DMDD symptoms, it specifies that DMDD but not ODD can be diagnosed if a child meets criteria for both, therefore failing to acknowledge the additional symptoms seen with ODD such as argumentative, defiant, or vindictive behavior. Second, DMDD diagnostic reliability was

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poor in DSM-5 field trials (Regier et al. 2013). Third, the evidence base for DMDD was derived primarily from studies of the construct of ''severe mood dysregulation'' (SMD), which differs from DMDD. Considering the absence of ''peer-reviewed research prior to the DSM-5 proposal…limited reliability, a lack of psychiatric consensus, and very high rates of overlap with other disorders,'' the World Health Organization's International Classification of Diseases, 11th Revision (ICD-11) task group ''recommended that WHO not accept DMDD as a diagnostic category in ICD-11.…Specifically, the group has proposed that ICD-11 include a specifier to indicate whether or not the presentation of ODD includes chronic irritability and anger'' (Lochman et al. 2015, pp. 31–32). Further, research supports separating irritability and the behavioral components of ODD, in part because behavioral symptoms are more likely to predict later antisocial problems, and irritability is more likely to predict later depression and anxiety (Stringaris 2011; Burke 2012; Leibenluft et al. 2012; Leadbeater and Homel 2015).

Little is known about the prevalence of DMDD symptoms and their comorbidity with other disorders. Previous studies investigated SMD, which requires hyperarousal and allows for a sad rather than only an irritable interval mood. In a study of 6-year-olds, only 47% meeting criteria for DMDD had SMD, and 58% of those with SMD had DMDD (Dougherty et al. 2014). Therefore, research findings cannot be generalized across these two constructs. Copeland et al. (2013, 2014) analyzed temper outbursts and ''negative mood'' (''the frequency of depressed, sad, irritable, or angry mood or low frustration threshold,'' 2013, p. 173), which, according to this definition, also differs from DMDD because of its inclusion of sadness and depression. One study of 6-year-olds in a community sample (Dougherty et al. 2014) assessed ''anger, irritability, annoyance, or low frustration tolerance'' (p. 3) without mention of sadness and depression, consistent with DMDD symptoms as currently defined by the DSM-5. Dougherty et al. (2014) found that 8% met criteria for DSM-5 DMDD. The majority (60%) of these children had a comorbid emotional or behavioral disorder, most often ODD (55%). In a large psychiatric sample of 6–12-year-olds, 26% had DMDD symptoms and almost all children (96%) with DMDD had ODD or conduct disorder (CD) (Axelson et al. 2012). This redundancy and the finding that DMDD did not have a distinct course, outcome, long-term stability, or associated family history of mood or anxiety disorders led the authors to conclude that DMDD cannot be differentiated from disruptive behavior disorders.

Given the potential overlapping symptoms between DMDD and ODD as well as other disorders, the purpose of our study was to determine if the DSM-5 DMDD symptoms of irritable-angry mood and temper outbursts occurred independently of other disorders in a general population sample of 6–12-year-olds. Other DSM-5 DMDD criteria regarding duration, onset, and cross-domain impairment were not assessed. Our study expands the age range of the Dougherty et al. (2014) community sample that was limited to 6-year-olds, and matches the age range of the Axelson et al. (2012) psychiatric sample, allowing us to determine if our findings are similar to those for a younger community sample and similar to a same-age psychiatric sample. Based on the limited research available, we hypothesize that DMDD symptoms do not occur independently of other established disorders, particularly ODD.

Methods

Sample

The sample comprised 665 children, 6–12 years of age (mean age 8.7, SD 1.7) who participated in a population-based epidemiologic study of the prevalence of sleep disorders in children (Bixler et al. 2009). Intelligence quotients (IQs) ranged from 71 to 147 (mean 106.3, SD 13.1). In all, 52.6% were male, 80.5% were white, and 48.9% had a parent with a professional or managerial occupation. Questionnaires were sent home to the parents of every elementary school student in 18 public schools in three school districts ($n = 7312$), with a 78.5% response rate. From the 78.5% completing the questionnaires, 1000 children were invited for further evaluation in the sleep laboratory using stratified random sampling so that the sample matched the original survey group in age, gender, race, and risk of sleep-disordered breathing. Seventy percent of the invited families ($n = 700$) agreed to participate. Parent consent and child assent were obtained. The 665 children in our study were those from the original sample of 700 who were 6–12 years of age and had complete IQ and Pediatric Behavior Scale (PBS) (Lindgren and Koeppl 1987) data.

Instrument and variables

Mothers rated their children's behavior during the past 2 months on a four point scale (0 = not at all or almost never a problem, 1 = sometimes a problem, 2 = often a problem, and 3 = very often a problem) on the two PBS (Lindgren and Koeppl 1987) items that assess the two DSM-5 DMDD symptoms. The PBS items are ''irritable, gets angry or annoyed easily'' and ''loses temper, has temper tantrums.'' Ratings on these items were combined to obtain a total DMDD irritable-angry mood plus temper outburst score. Children were classified as to whether or not irritable-angry mood and temper outbursts were both rated by mothers as *often or very often* a problem and if both were rated as *very often* a problem. A formal DSM-5 diagnosis of DMDD could not be ascertained in individual cases because symptom onset, setting, and duration were not assessed.

Independent variables were raw scores on the PBS subscales measuring attention-deficit/hyperactivity disorder (ADHD), CD, anxiety disorders, depressive disorder, and oppositional behavior. The oppositional behavior score does not include the DMDD irritable-angry mood and temper outburst items and, instead, consists of only four items: Disobedient, uncooperative, argumentative, and defiant (similar to the oppositional behavior dimension of ODD). Children were considered to meet DSM-5 symptom criteria for ODD if four or more of the eight PBS items corresponding with the eight DSM-5 ODD symptoms (which by definition included the irritable-angry and temper outburst items) were rated by mothers as *often or very often* a problem, matching the number of symptoms and severity level specified by the DSM-5 for ODD ($n = 85$). Other ODD criteria (6 months' duration and symptoms occurring at least once per week) were not assessed. This ODD definition has been used to classify children with ODD in previous publications (Mayes et al. 2012a, 2015a, 2015b). Also identified were children with PBS subscale T scores >65 (more than 1.5 SDs above the mean) on oppositional behavior without the two overlapping DMDD irritable-angry mood and temper outburst symptoms ($n = 80$), ADHD ($n = 152$), CD ($n = 40$), anxiety disorder ($n = 78$), and depressive disorder ($n = 82$).

The 165 item PBS has been used to diagnose and measure psychological problems in several published studies, and validity studies show that the PBS differentiates diagnostic groups (Wolraich et al. 1994; Nichols et al. 2000; Conrad et al. 2010; Mayes et al. 2011; Mattison and Mayes 2012; Mayes et al. 2012a,b). Internal consistency for the PBS subscale scores is high, with a median coefficient of 0.91 (Lindgren and Koeppl 1987). The PBS corresponds well with established measures. In a general population study (Bixler et al.

2009), the correlation between the anxiety-depression subscale score on the Child Behavior Checklist (Achenbach 1991) and on the PBS was 0.72 ($p < 0.001$), and the correlation between the Child Behavior Checklist and PBS ADHD score was 0.78 ($p < 0.001$). In another study, children whose mothers rated short attention span or distractibility as *often* to *very often* a problem on the PBS scored significantly lower on the Gordon Diagnostic System (Gordon 1983) Vigilance and Distractibility subtests ($t = 3.7$ and 3.3, $p < 0.001$) than did children who were not rated as often inattentive or distractible (Mayes et al. 2014). Norms (raw scores and T scores) are available for 600 children 6–12 years in the standardization sample (Lindgren and Koeppl 1987).

Data analyses

Descriptive statistics were used to summarize the data. Differences in DMDD symptom frequencies between children with and without psychological problems were analyzed using Fisher's exact test and risk ratios. The relationship between the DMDD score and scores on the oppositional behavior (ODD symptoms without the two overlapping DMDD symptoms of irritable-angry mood and temper outbursts), ADHD, CD, anxiety, and depression subscales were determined using Spearman correlations and explained variance. All tests of significance were two tailed.

Results

The prevalence of DMDD symptoms (irritable-angry mood and temper outbursts both rated as *often or very often* a problem by mothers) was 9.2% (61 of the 665 children). Of the 61 children with DMDD symptoms at this level, 91.8% met symptom criteria for DSM-5 ODD and all but one (98.4%) either met DSM-5 ODD symptom criteria or had a T score >65 on the PBS ADHD, depression, CD, or anxiety subscale (Table 1). This sole child had a depression T score of 62 (1.2 standard deviations above the mean). Using a DMDD symptom threshold of *very often*, nine children (1.4%) had DMDD symptoms. All of these children had additional psychopathology, which, in all but one case, was ODD combined with ADHD (with or without CD, anxiety, or depression).

Among the 238 children who had symptoms of ODD, ADHD, CD, anxiety, and/or depression, 25.2% had DMDD symptoms *often or very often* and 3.8% had them *very often*. In contrast, only one of the 427 children (0.2%) without symptoms of ODD, ADHD, CD, anxiety, or depression had DMDD symptoms *often or very often*, and none had symptoms *very often* (Fisher's $p < 0.001$). The risk of having DMDD symptoms *often or very often* was 126.0 times greater in children with than without other psychological problems. The majority of the 85 children with ODD had DMDD symptoms *often or very often* (65.9%), as did 52.5% of children with a T score >65 on the PBS oppositional subscale that did not include the two overlapping DMDD items of irritable-angry mood and temper outbursts (Table 2).

Only 18 children met symptom criteria for ODD and scored at or below a T score of 65 on the ADHD, depression, CD, and anxiety subscales. Of these 18 children with ODD symptoms only, 12 (66.7%) had DMDD symptoms *often* and none had them *very often* (Table 3). For the 67 children who had ODD with other psychological problems, 65.7% had DMDD symptoms *often or very often* and 11.9% had DMDD symptoms *very often*. Only 4 of the 153 children (2.6%) with psychological problems other than ODD had DMDD symptoms *often or very often* and only 1 (0.7%) had DMDD symptoms *very often.* These children all had anxiety and/or depression. Therefore, the risk of having DMDD symptoms was far greater for ODD than for other psychological problems (25.3 times greater for DMDD symptoms *often or very often* and 17.0 times greater for DMDD symptoms *very often*).

All Spearman correlations between the DMDD score (irritable-angry mood plus temper outbursts) and each of the psychological problem scores were significant ($p < 0.001$). The strongest relationships were between the DMDD score and the PBS oppositional behavior score (i.e., ODD symptoms without the two overlapping DMDD symptoms of irritable-angry mood and temper outbursts) and the PBS CD score, with correlations of 0.63 and 0.56, respectively (explaining 39.6% and 31.4% of the variance). Correlations between DMDD scores and depression (0.49), ADHD (0.48), and anxiety (0.36) were lower, explaining 23.7%, 22.6%, and 13.0% of the variance, respectively.

Discussion

In our general population sample, 9% of the 6–12-year-olds had DMDD symptoms *often or very often* and 1% had DMDD symptoms *very often*. Dougherty et al. (2014) found that 8% of 6-year-olds in a community sample met DSM-5 DMDD criteria. The DSM-5 estimates that 2–5% of children and adolescents meet DMDD criteria. Our results suggest that variation in the frequency threshold leads to appreciable differences in the prevalence of DMDD symptoms. Using the *very often* threshold yields symptom frequencies less than the Dougherty et al. (2014) findings and the DSM-5 estimate. More research is needed to determine the most appropriate threshold for diagnosing DMDD. This is important not only to evaluate information provided by parents during the diagnostic interview, but also to interpret scores on rating scales, which are used by most clinicians in diagnostic evaluations. Unfortunately, diagnostic reliability for existing DMDD criteria is poor. The degree to which two clinicians agreed on a DMDD diagnosis in DSM-5 field trials was unacceptably low at two of the three sites, in contrast to good to very good agreement on diagnoses of autism, ADHD, and ODD at all sites (Regier et al. 2013).

Table 1. Frequency of Psychological Problems in the 61 Children with Disruptive Mood Dysregulation Disorder Symptoms (Irritable-Angry Mood and Temper Outbursts Rated *Often or Very Often* a Problem by Mothers)

	Pediatric Behavior Scale[a] *T score >65*					
DSM-5 ODD diagnosis	*Opposition*	*ADHD*	*Depression*	*CD*	*Anxiety*	*Any psychological problem*[b]
91.8%	68.9%	65.6%	37.3%	29.5%	26.2%	98.4%

[a]None of the Pediatric Behavior Scale (PBS) subscale scores included irritable-angry mood or temper outbursts as items.
[b]*Diagnostic and Statistical Manual of Mental Disorders,* 5th ed. (DSM-5) oppositional defiant disorder (ODD) diagnosis or T score >65 on the PBS attention-deficit/hyperactivity disorder (ADHD), depression, conduct disorder (CD), or anxiety subscale.

Table 2. Frequency of Disruptive Mood Dysregulation Disorder Symptoms (Irritable-Angry Mood and Temper Outbursts Rated *Often or Very Often* a Problem by Mothers) in Children with Psychological Problems

	Pediatric Behavior Scale[a] *T score >65*					
DSM-5 ODD diagnosis	*Opposition*	*CD*	*Depression*	*ADHD*	*Anxiety*	*Any psychological problem*[b]
65.9%	52.5%	45.0%	28.0%	26.3%	20.5%	25.2%

[a]None of the Pediatric Behavior Scale subscale scores included irritable-angry mood or temper outbursts as items.
[b]*Diagnostic and Statistical Manual of Mental Disorders,* 5th ed. (DSM-5) oppositional defiant disorder (ODD) diagnosis or T score >65 on the Pediatric Behavior Scale (PBS) attention-deficit/hyperactivity disorder (ADHD), depression, conduct disorder (CD), or anxiety subscale.

In both our community sample and that of Dougherty et al. (2014), the majority of children with DMDD symptoms had ODD. Our percentage of children with DMDD symptoms *often or very often* who met the symptom criteria for ODD (92%) was consistent with the 96% with ODD/CD reported in a psychiatric sample of 6–12-year-olds (Axelson et al. 2012) but was higher than the ODD percentage in the Dougherty et al. (2014) study, perhaps because our children were 6–12 years and not only 6 years of age. In the Axelson et al. (2012) study, 26% of the psychiatric referrals had DMDD symptoms. Likewise, in our study, 25% with ODD symptoms or a T score >65 on the PBS CD, depression, ADHD, or anxiety subscale had DMDD symptoms *often or very often*. All children in our study whose mothers rated irritable-angry mood and temper outbursts as *very often* a problem had ODD or an elevated score on the PBS CD, depression, ADHD, or anxiety subscales, and all but one child with irritable-angry mood and temper outbursts *often or very often* a problem had ODD or an elevated score on the PBS CD, depression, ADHD, or anxiety subscales. Therefore, our general population study suggests that DMDD symptoms do not exist in isolation from other established disorders, particularly ODD, consistent with findings for a psychiatric sample (Axelson et al. 2012).

Irritable-angry mood and temper outbursts are commonly reported by parents of children with a variety of disorders, including autism (Mayes and Calhoun, 1999, 2011) and ADHD (Waxmonsky et al. 2008). Therefore, it is important to consider comorbidity when assessing for DMDD. Comorbid ODD accounted for the co-occurrence of DMDD symptoms with other psychological problems in our general population sample, as did ODD and CD in a clinical sample (Axelson et al. 2012). The most common diagnosis in a sample of 5–9-year-olds referred with severe and frequent temper outbursts (Roy et al. 2013), was ODD (88%). In contrast, a high rate of co-occurring depression, in addition to ODD, was reported in the Copeland et al. (2013) study. However, the Copeland et al. (2013) definition of DMDD included sad and depressed mood, whereas the DSM-5 requires the interval mood be only irritable or angry, which may explain the discrepancy in findings.

Table 3. Frequency of Disruptive Mood Dysregulation Disorder Symptoms (Irritable-Angry Mood and Temper Outbursts Rated *Often or Very Often* a Problem by Mothers) in the Total Sample

DSM-5 ODD diagnosis only (n = *18*)	*DSM-5 ODD with other psychological problems*[a] (n = *67*)	*Psychological problems*[a] *with no ODD* (n = *153*)	*No ODD or other psychological problems*[a] (n = *427*)
66.7%	65.7%	2.6%	0.2%

[a]T score >65 on the Pediatric Behavior Scale (PBS) attention-deficit/hyperactivity disorder (ADHD), depression, conduct disorder (CD), or anxiety subscale.
DSM-5, *Diagnostic and Statistical Manual of Mental Disorders,* 5th ed.; ODD, oppositional defiant disorder.

Given these combined results, all children presenting with DMDD symptoms should be evaluated for the presence of other clinical disorders, especially ODD, that may underlie the DMDD symptoms and require treatment. However, the DSM-5 prohibits a diagnosis of ODD if a child meets criteria for both ODD and DMDD, which is counterintuitive. A diagnosis should not stop at DMDD, as this would fail to recognize the argumentative, defiant, or vindictive behaviors that are commonly a part of ODD and impact the prognostic course (Stringaris and Goodman, 2009). Moreover, little is known about DMDD treatment in contrast to ODD and other disorders that commonly present with DDMD symptoms. For children with disruptive behavior, empirical evidence supports parent training programs for preschool children and parent training and child training cognitive-behavior interventions for school-age children, as well as multicomponent treatment approaches for delinquent adolescents (Eyberg et al. 2008). For children with autism and ADHD, behavioral interventions are effective in decreasing tantrums, irritability, and aggression (Waxmonsky et al. 2008; Matson 2009; Waxmonsky et al. 2013). Further, stimulant medication has been shown to reduce irritability in children with ADHD (Waxmonsky et al. 2008; Fernandez de la Cruz et al. 2015) and atypical antipsychotics are effective in decreasing irritability in children with autism (Arnold et al. 2003; Shea et al. 2004; Marcus et al. 2009; Owen et al. 2009;).

Limitations

The purpose of our study was to determine if the two DSM-5 DMDD symptoms (irritable or angry mood and temper outbursts) occurred independently of other disorders, particularly ODD. Other DSM-5 DMDD criteria including frequency (temper outbursts occurring an average of three or more times per week), chronicity (symptoms present for at least 12 months without a symptom-free period for ≥3 consecutive months), settings (present in at least two of three settings: At home, at school, and with peers), and age at onset (before 10 years of age) were not assessed. Therefore, we can only report on symptom frequency (based on ratings by mothers of their child's DMDD symptoms during the past 2 months) and not diagnostic prevalence. In addition, this study only examined symptom prevalence at a single time point; therefore, we cannot comment on the stability of reported symptoms. In a follow-up study of 376 children in our general population sample (Mayes et al. 2015c), only 29% with DMDD symptoms at baseline had DMDD symptoms at follow-up 8 years later, and only 45% with DMDD symptoms at follow-up had DMDD symptoms at baseline (55% new cases). Axelson et al. (2012) also reported low stability for DMDD symptoms in a psychiatric sample. Of those with baseline

DMDD symptoms, 53% continued to have DMDD symptoms at 12 month follow-up, and only 19% had DMDD symptoms at 12 and at 24 month follow-ups. Given the poor agreement among clinicians on DMDD diagnoses as currently defined by the DSM-5 (Regier et al. 2013), future research needs to consider all of the DSM-5 DMDD criteria across multiple assessment points using an array of measurement procedures to identify the most appropriate methods for measuring DMDD symptoms and objectifying the diagnosis.

Conclusions

In our study, DMDD symptoms did not exist independently of other psychological problems, with ODD explaining the majority of the association between DMDD symptoms and comorbid psychopathology. The lack of evidence for a unique and separate DMDD symptom cluster does not support the DSM-5 conceptualization of DMDD as a distinct disorder. Our study showed that it is very unlikely to have DMDD symptoms without ODD, but 34% of children with ODD did not have DMDD symptoms. These results concur with the suggestion to conceptualize DMDD as a diagnostic specifier for ODD (Lochman et al. 2015).

Clinical Significance

Our findings argue against the DSM-5 rule prohibiting a diagnosis of ODD and allowing only a diagnosis of DMDD when a child meets criteria for both ODD and DMDD. Strict adherence to this rule may lead to clinically significant behavior concerns not being identified or targeted for intervention. The majority of children in our study with disobedient, uncooperative, argumentative, and defiant behavior had DMDD symptoms. If these children met full DMDD criteria, their clinically significant oppositional behavior would not be recognized diagnostically, according to DSM guidelines. Therefore, it seems prudent to note the presence of both the ODD and DMDD symptoms, as is done for the presence of comorbid conditions in other DSM-5 disorders.

Disclosures

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