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## Developmental Level and Psychopathology: Comparing Children with Developmental Delays to Chronological and Mental Age Matched Controls

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### Abstract

Children with developmental delays (DD) are at heightened risk for developing clinically significant behavioral and emotional difficulties as compared to children with typical development (TD). However, nearly all studies comparing psychopathology in youth with DD employ TD control groups of the same chronological age (CA). It is unclear, then, whether the heightened symptomology found in age-matched children with DD is beyond what would be expected given their developmental level. The present study assessed rates of behavior problems and mental disorder in 35 children with DD at age 9 years. These were compared with rates from 35 children with TD matched for CA at age 9 and also earlier rates for these same children at age 6, when matched for mental age (MA). Children with DD had significantly more behavior problems in 7 of the 17 scales of the CBCL when compared to TD children matched for CA, and 6 of 17 scales when compared to the MA-matched group. Rates of meeting DSM-IV criteria for a psychiatric disorder were significantly higher in the DD group than both the CA- and MA-matched TD groups for three and four, respectively, of the seven diagnoses examined. Descriptively, the mean ratings for all variables assessed were higher for the DD group than both TD comparison groups, with the exception of the Anxious/Depressed scale of the CBCL. These findings validate the heightened risk for clinically significant behavior problems and mental disorders in youth with DD above and beyond their developmental functioning.

### Keywords

child psychopathology; developmental delays; dual diagnosis; mental age

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## 1. Introduction

Children with developmental delays (DD) are at substantially higher risk for developing clinically significant behavioral and emotional difficulties than children with typical cognitive development. This comorbidity of DD and a mental disorder is often referred to as *dual diagnosis*. Epidemiological studies indicate that 30-50% of youth with DD meet the clinical cutoff for behavioral and emotional problems and/or diagnosable mental disorder (see Einfeld, Ellis & Emerson, 2011 for review). Studies that include comparison samples of children with typical development (TD) highlight the considerable difference in risk for psychopathology, with the relative risk for youth with DD (to youth with TD) ranging from 2.8-4.1 to 1 (Baker, Neece, Fenning, Crnic & Blacher, 2010; Dekker, Koot, van der Ende & Verhulst, 2002; Emerson & Hatton, 2007).

For the purposes of the current study, the term developmental delay refers specifically to children with cognitive delay, one of the six areas of developmental delay recognized by the *Individuals with Disabilities Act* (IDEA, 2004). It is estimated that 13.4% of children in the United States meet criteria for cognitive developmental delay (Rosenberg, Zhang & Robinson, 2008). This developmental (cognitive) delay is associated with diverse impairments in multiple domains, including social competence (Guralnick, 1999), adaptive behavior (e.g., Green, Caplan & Baker, 2013) and the focus of the current study, clinically significant behavioral and emotional problems (i.e. dual diagnosis; Baker et al., 2010).

Dual diagnosis is a concern for families, service providers, and researchers alike, as the presence of mental disorder in individuals with DD contributes substantially to the burden of disability. Dual diagnosis has been found to have deleterious effects on families, including increased parenting stress (Neece, Green, Baker, 2012), increased burden on the family (Izrazábal, Marsa, Garcia, Gutierrez-Recacha, Martorell et al., 2012) and decreased parental well-being (Tonge & Einfeld, 2003) beyond the presence of DD alone. Additionally, psychopathology in youth with DD often limits participation in the community, as severity of psychopathology relates to unsuccessful adaptation to independent living (Fotheringham, 1999), reduced occupational opportunities (Anderson, Lakin, Hill & Chen, 1992) and restrictions in recreational and educational programs (Parmenter, Einfeld, Tonge & Dempster, 1998).

The substantially increased risk for psychopathology in youth with DD, coupled with the implications of dual diagnosis for the affected individual and family, highlight the need for early assessment and treatment of behavior problems and mental disorders. However, there has been some debate regarding the validity of diagnosable mental disorders in youth with DD. The Diagnostic and Statistical Manual for Mental Disorders (DSM) has consistently referenced developmental level in defining many childhood mental disorders (e.g. APA, 2000), making it difficult for clinicians and researchers to determine whether the presence of symptomatology in youth with DD is attributable to their developmental level, or to a distinct, comorbid condition. This practice continues in the recently released DSM-5 (APA, 2013), which states that to meet criteria for certain childhood mental disorders, an individual must present with symptoms: “inconsistent with developmental level” (Attention Deficit Hyperactivity Disorder; ADHD), “outside the range that is normative for the individuals

developmental level” (Oppositional Defiant Disorder; ODD) or that are “developmentally inappropriate” (Separation Anxiety).

Despite these developmental criteria, nearly all studies comparing rates of psychopathology in youth with or without DD implement comparison groups of TD children matched for chronological age (CA; e.g., Baker et al., 2010; Emerson & Hatton, 2007), thereby comparing groups that by definition operate at different developmental levels. A more nuanced approach rooted in developmental theory is to match targeted groups on an indicator of developmental functioning, such as mental age (MA; Flanagan, Russo, Flores & Burack, 2008). By comparing the behaviors and symptoms of children with DD to MA-matched controls, one can determine whether children with DD are truly at heightened risk for developing psychopathology beyond what would be expected given each child's cognitive level.

The goal of comparison group matching is to rule out “non-central,” or extraneous, explanations of group differences (Jarrold & Brock, 2004). Using control groups matched by MA is a longstanding method for controlling for developmental level in comparing the functioning of children with and without developmental disabilities. This methodology largely stems from the *developmental* (e.g., Zigler, 1969) and *difference* (e.g., Ellis & Cavalier, 1982) approaches to intellectual disability, through which researchers sought to illuminate the similarities or fundamental differences, respectively, in developmental processes exhibited by children with or without intellectual disability when controlling for developmental level. More recently, the approach has been used to demonstrate differences in many behavioral and cognitive processes, such as adaptive behavior (Fidler, Hepburn & Rogers, 2006), social communication (Strid, Heimann, Gillberg, Smith & Tjus, 2013) and joint attention (Wong & Kasari, 2012) between individuals with or without developmental disabilities.

The few studies that have implemented MA-matching to study behavior problems or psychopathology in children with or without DD have primarily focused on children with specific disorders, such as Down syndrome. Evans and Gray (2000) examined compulsive behaviors in children with Down syndrome and MA-matched TD controls, finding that children with Down syndrome were rated to have the same number of different compulsive behaviors, but higher frequency and more intensity of these behaviors. Evans, Canavera, Kleinpeter, Macubbin and Taga (2005) assessed differences in the fears, phobias, and anxieties of children with autism spectrum disorder (ASD), Down syndrome (matched for MA), or MA- and CA-matched children with TD. Children with ASD were reported to have more situational and medical fears than any of the other groups, regardless of CA or MA matching. More recently, van Gameren-Oosterom and colleagues (2011) examined eight year-old children with Down syndrome and MA-matched controls, finding that children with Down syndrome exhibited more emotional and behavioral problems. Additionally, Evans, Kleinpeter, Slane and Boomer (2014) found that repetitive behavior predicted poor adaptive functioning for children with Down syndrome, but not MA-matched controls. Together these findings substantiate the increased risk for psychopathology in children with DD beyond developmental level. However, there is a need to replicate such findings across

heterogeneous samples of children with DD, rather than only those with specific disorders such as Down syndrome or autism.

The present study expanded on prior work by comparing a broad range of behavior problems in children with DD to these same problems in CA- and MA-matched TD comparisons. Additionally, we sought to determine whether children with DD met DSM-IV criteria for the most prevalent childhood mental disorders, including ADHD, ODD, anxiety disorders and mood disorders (Merikangas et al., 2010), at a higher rate than CA- and MA-matched TD controls.

We addressed the following questions: (1) How do rates of behavior problems and mental disorder compare between children with DD and children with *TD matched for chronological age (CA)*? Consistent with previous studies cited, we expected that children with DD would exhibit higher rates of behavior problems and psychopathology than children with TD matched for CA. (2) How do rates of behavior problems and mental disorders compare between children with DD and these same children with *TD matched for MA*? We anticipated that even when controlling for developmental level, children with DD would demonstrate elevated rates of behavior problems and psychopathology as compared to children with TD. Such findings would support the claim that variables related to the developmental disability beyond developmental level may be contributing to the development of behavior problems and psychopathology.

## 2. Material and methods

### 2.1 Participants

Participants were drawn from an ongoing longitudinal study of children with or without DD and their families (blinded for review). Of the 194 families who participated in the 9-year assessment, 70 were selected for the current study based on the criteria for our matching procedures (described below). The larger project was a collaborative effort between (blinded for review). Families of children with DD had been recruited at child age 3 years primarily through agencies that provide and purchase diagnostic and intervention services for persons with intellectual and developmental disabilities, while families of children with TD were recruited through daycare facilities and preschools.

DD group (n=35) participants were selected if they had complete data at the 9-year assessment and IQ scores within the range of 60-84. This IQ range was chosen to allow for the closest MA-matching to TD children. Children within the DD group exhibited cognitive developmental delays (IDEA, 2004) as evidenced by IQ scores greater than one standard deviation below the population mean (IQ<85) using appropriate diagnostic instruments. Fifteen participants in the DD group (42.8%) demonstrated IQ scores that fell in the range of intellectual disability (IQ < 70; APA, 2013), though, it should be noted that a diagnosis for intellectual disability could not be confirmed as measures of adaptive behavior were not considered. Within the DD group, the majority of children had undifferentiated developmental delay (i.e., did not have a specific syndrome), while a smaller subset of the sample were reported to have an autism spectrum disorder (n=5), Cerebral Palsy (n=6), Down syndrome (n=1), or another syndrome or multiple syndromes (n=5). TD group

participants (n=35) were selected if they had complete data at the 6-year and 9-year assessments, had IQ scores ranging from 90-125 and matched a selected DD participant for MA at age 6. Children in the TD group were not born prematurely and did not have any disability diagnosis.

Table 1 shows DD and TD group demographic characteristics at age 9. The combined sample was 57.4% male and 59% White, non-Hispanic. Other race/ethnicities included Hispanic (13.4%), African American (7.5%), Asian American (2.2%), and “other” (17.9%). Most participating mothers were married (79.3%). The majority of families (66.7%) had an annual household income above \$50,000, and mothers' average years of education was 15.6 years. While mothers in the TD group completed significantly more years of education and were more likely married relative to the DD group, these variables were not related to the dependent variables and thus they were not covaried in analyses.

## 2.2 Procedures

Research procedures were reviewed and approved by Institutional Review Boards at the three participating universities and informed consent was obtained from all participating families. At both the age 5 and age 9 assessments, families visited the research center for child cognitive testing. To assess for the presence of cognitive developmental delay, trained graduate students and research staff administered the Stanford Binet IV (SB-IV; Thorndike, Hagen, & Satter, 1986) at child age 5 and the Wechsler Intelligence Scales for Children, Fourth Edition (WISC-IV; Wechsler, 2003) at child age 9. Within the broader sample from this longitudinal study, the correlation between IQ at age 5 (SB-IV) and IQ at age 9 (WISC-IV) was  $r = .90$ . Given this stability of cognitive performance, IQ assessed at age 5 was used as a proxy for IQ at age 6 to calculate MA. At assessment ages 6 and 9, mothers completed a battery of questionnaires about child and family functioning, and were administered an interview regarding family demographic and child diagnostic information, as well as a structured diagnostic interview about child mental health.

## 2.3 Measures

### 2.3.1 Assessment of IQ

**Stanford-Binet IV (SB-IV):** The SB-IV (Thorndike, Hagen, & Satter, 1986), a widely used assessment instrument of cognitive ability, yields an IQ score with a normative mean of 100 and a standard deviation of 15; it has sound psychometric properties and is particularly suited to the evaluation of children with delays, given that the examiner adapts starting points to developmental level. This test has strong test-retest stability ( $\alpha = .91$  for 5 year-olds) and high internal consistency for the composite score ( $\alpha = .95-.99$  across ages; Thorndike et al., 1986).

**The Wechsler Intelligence Scales for Children, Fourth Edition (WISC-IV):** Child cognitive level was reassessed at age 9, using the WISC-IV (Wechsler, 2003), a widely used assessment of cognitive functioning for children ages 6 to 16. The scores from the Vocabulary, Matrix Reasoning, and Arithmetic WISC-IV subtests were used to derive an estimated full-scale IQ and to confirm status group classification (TD or DD). The selection

of the three subtests was based on the high correlation ( $r=.91$ ) of their composite score to the full-scale IQ from the full administration of the WISC-IV (Sattler & Durmont, 2004).

### 2.3.2 Assessment of Child Behavior Problems/Mental Disorders

**Child Behavior Checklist for ages 6-18 (CBCL):** The CBCL (Achenbach & Rescorla, 2001), completed by mothers at child ages 6 and 9, contains 113 items that describe behavioral and emotional problems. For each item, the respondent indicates whether the behavior is (0) *not true*, (1) *somewhat or sometimes true*, or (2) *very true or often true* of her child. The CBCL yields a total problem score, broadband externalizing and internalizing scores, eight narrowband syndrome scores and six DSM-oriented scores.

**Diagnostic Interview Schedule for Children (DISC):** The DISC (Costello, Edelbrock & Costello, 1985), administered to mothers at child ages 6 and 9 years, is a structured diagnostic interview targeting criteria for child psychiatric disorders as defined in the *Diagnostic and Statistical Manual of Mental Disorders* (4<sup>th</sup> ed., text rev. [DSM-IV-TR]; APA, 2000). We employed an alternative method of administering the DISC (Edelbrock, Crnic & Bohnert, 1999; Baker et al., 2010) in which six modules appropriate for young children (Social Phobia, Separation Anxiety, Major Depressive Disorder, Dysthymic Disorder, ADHD and ODD) were targeted. The interviewer began by providing a brief summary of each diagnosis and asked the mother to select the first diagnostic area to be covered. Standard administration of the module was followed. After the first module, the interviewer asked the mother to select the next diagnostic area. This continued until the mother said that there were no other areas relevant to her child. The interviewer then reviewed the remaining areas to confirm further that the child did not have problems represented in any remaining module. This alternate administration procedure has been found to increase reliability, decrease attenuation (reporting fewer symptoms later in the interview), and decrease administration time as compared to the standard procedure (Edelbrock et al., 1999; Jensen et al., 1999). This administration procedure has been successfully implemented to assess mental health in children with or without DD (Edelbrock et al., 1999; Baker et al., 2010; Neece, Baker, Crnic, & Blacher, 2013).

## 2.4 Data Analysis

**2.4.1 Matching Procedure—**To determine whether rates of behavior problems and mental disorders differed between children with DD and TD controls of equivalent MA, participants were individually matched according to MA. The mental age for each participant was calculated using the following formula:  $MA = (IQ/100 \times CA)$ . IQs for the DD group were determined using the WISC-IV scores obtained at age 9 and for the TD group using the SB-IV scores obtained at age 5. After calculating MAs, each participant in the DD group at age 9 was individually matched to the participant in the TD group at age 6 with the closest MA. The resulting IQ range for the TD participants was 90 to 125. The difference in MA between matched pairs ranged from .00 to .24 years. The two matched groups did not differ in MA ( $t=0.06$ ,  $p=.95$ ); this p-value is well above the recommended level to consider groups matched on a target variable ( $p > .50$ ; Mervis & Klein-Tasman, 2004). To validate prior findings indicating elevated rates of behavior problems and mental



disorders in children with DD as compared to CA-matched controls, the same participants were compared using data collected at the same assessment time (age 9).

**2.4.2 Analysis of Group Differences**—Independent samples t-tests were conducted on CBCL scale scores to determine group differences in ratings of DSM-oriented behaviors, syndrome-related behaviors, as well as internalizing, externalizing and total problems. To compare rates of mental disorders, as measured by meeting diagnostic criteria for disorders according to the DISC, chi-square statistics were utilized. The CA-match analyses examined group differences (TD vs. DD) at child age 9, while the MA-match analyses compared the TD sample at age 6 to the DD sample at age 9.

### 3. Results

#### 3.1 Preliminary Analyses

The distributions of the behavior problems variables were examined within each group (DD, CA-Match Control, and MA-Match Control). Five data points that were more than three standard deviations above the mean of a variable were considered to be outliers and as recommended by Cohen, Cohen, West and Aiken (2002), these were set equal to plus or minus 3 standard deviations from the mean.

#### 3.2 Analyses Using Chronological Age-Match Control Group

**3.2.1 Rates of behavior problems: DD vs. TD samples**—Table 2 shows the rates of *behavior problems* for the DD and CA-matched control groups. Children with DD were rated as having significantly more total problems as well as marginally significantly more externalizing problems than the CA-matched control group. With CBCL syndrome scales, there were significant group differences (DD > TD) on the Social Problems, Attention Problems and Aggression subscales as well as a marginally significant difference in Rule Breaking behavior. With the DSM-oriented subscales of the CBCL, children with DD were reported to have higher levels of ADHD, ODD and Conduct Disorder behaviors. All significant group comparisons demonstrated medium to large effect sizes according to the conventions for Cohen's *d* (Cohen, 1988).

**3.2.2 Rates of mental disorder: DD vs. TD samples**—Table 3 depicts the prevalence of *DSM-IV diagnoses* assessed in the DD and CA-matched control groups. The proportion of children with DD meeting criteria for any mental disorder assessed was marginally significantly higher than that of children with TD. The prevalence of any type of ADHD was significantly higher in the DD than the TD sample, with the Inattentive sub-type over two times as prevalent in the DD group. Separation Anxiety Disorder was significantly more prevalent in the DD sample as well, with 11.4% of children in the DD sample meeting diagnostic criteria; however, risk and odds ratios could not be calculated for Separation Anxiety due to empty cells (i.e., no children in the TD sample met criteria). No significant group differences were found for ADHD- Hyperactive/Impulsive subtype, ODD and Social Phobia, although prevalence rates for these disorders were all greater in the DD group than the CA-Matched TD group.

### 3.3 Analyses Using Mental Age-Match Control Group

**3.3.1 Rates of behavior problems: DD vs. TD samples**—Table 2 also shows findings using the MA-matched control group. These were highly similar to results when matched by CA. Children with DD were reported to have significantly more total problems and marginally significantly more externalizing problems. Here too, Social Problems and Attention Problems were significantly higher in the DD group than the MA-matched control sample. While the increased risk for Rule Breaking in the DD group was marginally significant in the CA-match analyses, this difference was significant in the MA-match analyses. On the other hand, Aggression was significantly higher in the DD group for the CA-match analyses and marginally significant in the MA-match analyses. In examining the DSM-oriented subscales, the DD sample received significantly higher ratings for ADHD and Conduct Disorder behaviors than the TD comparisons. As with the CA-matched analyses, significant group differences for the DD and MA-matched samples on the CBCL subscales demonstrated medium to large effect sizes (Cohen, 1988). Additionally, ADHD, Attention Problems, Social Problems and Rule Breaking had higher effect sizes and lower p-values in the MA-matched analyses than the CA-matched analyses, noting stronger group differences in these areas.

**3.3.2 Rates of mental disorder: DD vs. TD samples**—Table 3 also shows the prevalence rates of DSM-IV diagnoses in the DD and MA-matched control groups. The proportion of children who met criteria for any mental disorder was marginally significantly greater in the DD sample than the MA-matched control sample. Significant group differences were found for ADHD, most notably the inattentive subtype, which was over three times as prevalent in the DD group. In contrast to the CA-match analyses, in the MA-match analyses, the DD group demonstrated significantly higher rates of the hyperactive subtype. Additionally, the prevalence of Social Phobia was significantly higher in the DD than the TD sample for the MA-match analyses. Risk and odds ratios for Social Phobia could not be calculated due to empty cells. Conversely, no group differences were found for Separation Anxiety in the MA-matched analyses.

In sum, the DD group was rated to have more problems than both TD comparison groups for all of the scales of the CBCL assessed except for the Anxious/Depressed scale. Of 16 scales, these group differences were significant for six scales in the CA-matched analyses, and seven scales in the MA-match analyses. Of note, no significant group differences were found for the Internalizing, Affective Problems, Anxiety, Anxious/Depressed, Withdrawn/Depressed and Somatic Problems scales of the CBCL in either set of analyses. In addition, a larger proportion of the DD group than the TD groups met criteria for all mental disorders assessed and group differences for most DSM diagnoses (with the exception of Separation Anxiety) were stronger (i.e., higher chi-square values, greater relative risk for DD group) in the MA-matched than the CA-matched analyses. While group differences were found for Separation Anxiety in the CA-, but not MA-matched analyses, the opposite was true for Social Phobia, which was significant in the MA-, but not CA-matched analyses. Neither the CA- nor MA-matched analyses revealed significant group differences for ODD, though descriptively, the proportion of children that met criteria was higher in the DD group in both sets of analyses.



## 4. Discussion

We examined rates of behavior problems and the prevalence of psychopathology among children with DD compared to both CA and MA-matched comparison groups in order to obtain a more complete picture of the heightened risk for psychopathology among children with DD. To our knowledge, this is the first study to use a MA-matched comparison group to assess the relative risk of children with DD for developing a range of behavior problems and mental disorders. Additionally, the design is unique in that we utilized select data from a longitudinal investigation to simultaneously compare children with DD to the *same* comparison children with TD, matched for both MA and CA. This matching procedure allowed us to assess the risk for psychopathology in children with DD relative to CA- and MA-matched comparisons, controlling for individual differences in the TD sample other than developmental level that might contribute to the relative risk in one DD-TD comparison versus another.

Consistent with previous findings, children with DD were reported to have more behavior problems and mental disorder diagnoses compared to their same-aged peers. Importantly, we also found that this elevated risk for behavior problems and psychopathology in children with DD was maintained, or even accentuated, when contrasted with an MA-matched control group. These findings substantiate the increased risk for psychopathology and problem behaviors in youth with DD, above and beyond mental age. But if mental age does not account for the increased risk, what does? There is some evidence to suggest that variables related to DD other than mental age, such as regulatory abilities, could play a key role in the development of psychopathology.

Children's regulatory capacities, specifically those involving emotional regulation, have long been implicated in the emergence of children's behavior problems and mental disorders (Crnic, Hoffman, Gaze & Edelbrock, 2004). Emotion regulation involves the ability of an individual to control, modify, change and direct emotional reactions and expression to achieve one's goals and effectively manage interpersonal relationships (e.g., Cole, Martin, & Dennis, 2004), a set of abilities likely to be less developed in children with DD (Crnic et al., 2004). The few studies examining emotion regulation in children with DD consistently report deficits in these skills among this group (e.g., Berkovits & Baker, 2013; Wilson, 1999).

Furthermore, studies increasingly have suggested that emotion dysregulation may serve as one mechanism through which early developmental delays influence later behavior and social problems. Gerstein et al. (2011) found children's regulatory abilities mediated the relation between early developmental status and later behavior problems. Additionally, Baker et al. (2007) found that global emotion dysregulation at age four not only predicted children's social skills at age six, but also partially mediated the association between children's developmental risk and later social skills. These findings suggest that the high rate of behavior problems in populations of children who experience some degree of early DD may not simply reflect factors endogenous to the disability itself, but may rather reflect indirect effects that operate through emerging regulatory capacities that are multiply influenced (Crnic & Neece, in press).

Parents also play a key role in the development of early emotion regulation abilities (Cole & Deater-Deckard, 2009). Parental mood and affective behavior (Dagne & Snyder, 2011), parenting styles (Betts, Gullone, & Allen, 2009), and various aspects of parental well-being (Maughan, Cicchetti, Toth, & Rogash, 2007) have all been implicated. For example, studies suggest that high levels of parental stress and depression may disrupt the process of socializing emotion regulation (Silk, Shaw, Skuban, Oland & Kovacs, 2006), placing the child at increased risk for emotional and behavioral problems (Heller and Baker, 2000). Given the high levels of parental stress documented among families of children with DD (e.g., Neece et al., 2012), these children may be at increased risk for disruptions in the developmental of emotion regulation and as a result, manifest high levels of behavior problems and psychopathology.

In addition, executive functioning deficits may disrupt regulation and are associated with increased risk for a range of mental disorders (Weyandt et al., 2014). Children with DD show deficits in executing functioning as compared to TD children, even when matched for MA (e.g., Carretti, Belacchi & Cornoldi, 2010; Danielsson, Henry, Messer & Rönnerberg, 2012), which may partially explain the increased risk for psychopathology in this group. Future research should further delineate these internal and external factors that place children with DD at increased risk for psychopathology.

The findings of the present study suggest that mental age alone does not account for the increased rates of psychopathology in children with DD; however, these findings must be considered within the context of several study limitations. First, the sample is small, limiting the detection of smaller effects if they were present. Additionally, a methodological limitation of the current investigation is that the diagnostic classifications for the various mental disorders assessed were based on information gathered from a single reporter. Also, our measurements of IQ varied across the DD and MA-matched groups, limiting our ability to use scores of the same cognitive battery to match our groups. Lastly, the present DD group was chosen to have a heterogeneous ontogeny of cognitive delay and this may limit generalizability to specific developmental disorders.

The present study further validates children with DD as a group at high risk for psychopathology and clinically significant problem behaviors. Yet, it is often difficult for these children to access mental health services, as the label of DD may “overshadow” other comorbid conditions. Moreover, there is minimal empirical evidence available concerning intervention for individuals with DD and mental health problems (Hatton, 2002). This study further affirms the public health need to target this service disparity for youth with DD and direct efforts toward appropriately assessing and treating this at-risk group.

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### Highlights

- We examined psychopathology and behavior problems in children with DD and TD.
- Two TD groups matched the DD: one on age and one on mental age.
- Children with DD had more behavior and mental disorders than either TD group.
- Findings validate the heightened risk for psychopathology in children with DD.



**Table 1**  
**Demographic Information**

	Developmentally Delayed (Age 9)	Typically Developing (Age 9)	X <sup>2</sup> or t
Child			
Sex (% Male)	68.6	57.1	X <sup>2</sup> = .98
Race (% Caucasian)	54.3	65.7	X <sup>2</sup> = .95
IQ [mean(SD)]	72.1 (7.9)	111.2 (10.3)	t= 17.6***
Mental Age	6.5 (.7)	10.0 (.9)	t= 17.3***
Parent/Family			
Marital Status (% Married)	71.4	91.4	X <sup>2</sup> =4.63*
Mother's Race (% Caucasian)	57.1	68.6	X <sup>2</sup> = .98
Mother's Education (Highest grade completed)	14.3 (2.3)	16.6 (2.4)	t= 4.19***
Family Income (% above \$50,000)	60.0	85.3	X <sup>2</sup> =5.53*

\*\*  
p< .01,

\*\*\*  
p<.001

<sup>a</sup>IQ scores used to determine group classification and mental age for the age 6 typically developing group were calculated at child age 5.

Table 2

Child behavior problems

CBCL Scale	C-A-Match Comparison			M-A-Match Comparison			
	DD Sample <sup>a</sup>	TD Sample <sup>a</sup> (age 9)	t-value	Cohen's d	TD Sample <sup>a</sup> (age 6)	t-value	Cohen's d
<i>Broad band</i>							
Internalizing	52.7	50.2	1.35	.25	50.2	1.07	.25
Externalizing	54.5	50.1	1.93 <sup>†</sup>	.46	50.3	1.76 <sup>†</sup>	.42
Total Problems	56.3	49.8	2.66 <sup>*</sup>	.63	50.2	2.59 <sup>*</sup>	.62
<i>DSM-Oriented</i>							
ADHD	58.1	54.4	2.17 <sup>*</sup>	.52	53.8	2.69 <sup>**</sup>	.64
Oppositional Defiant Disorder	57.1	54.1	2.07 <sup>*</sup>	.50	55.0	1.56	.37
Conduct Disorder	57.4	53.4	2.55 <sup>*</sup>	.61	53.7	2.44 <sup>*</sup>	.58
Affective Problems	54.8	54.5	0.23	.06	54.4	0.29	.07
Anxiety Problems	55.7	54.7	0.64	.15	54.5	0.76	.18
Somatic Problems	55.0	53.4	1.17	.28	54.2	0.53	.13
<i>Other</i>							
Social Problems	59.3	53.7	3.37 <sup>**</sup>	.83	53.4	3.98 <sup>***</sup>	.97
Attention Problems	60.6	55.2	2.98 <sup>**</sup>	.71	54.0	4.21 <sup>***</sup>	1.00
Rule Breaking	56.1	53.7	1.69 <sup>†</sup>	.40	52.8	2.83 <sup>**</sup>	.68
Aggression	57.4	53.7	2.32 <sup>*</sup>	.55	54.4	1.78 <sup>†</sup>	.43
Anxious/Depressed	54.0	54.7	0.46	.11	54.4	0.27	.06
Withdrawn/Depressed	55.9	54.1	1.15	.27	54.4	0.93	.22
Thought Problems	56.7	56.1	0.34	.08	54.9	1.14	.27

<sup>†</sup> p<10,

\* p<.05,

\*\* p<.01,

\*\*\* p<.001

<sup>a</sup> n= 35

<sup>b</sup> ADHD = Attention Deficit Hyperactivity Disorder

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Table 3

Child mental disorder

DISC Modules	CA-Match Analyses				MA-Match Analyses				
	DD Sample <sup>a</sup>	TD Sample <sup>a</sup> (age 9)	X <sup>2</sup>	Relative Risk (DD:TD)	OR	TD Sample <sup>a</sup> (age 6)	X <sup>2</sup>	Relative Risk (DD:TD)	OR
Any Mental Disorder	57.1	37.1	2.81 <sup>†</sup>	1.54:1	2.26	34.3	3.68 <sup>†</sup>	1.66:1	2.56
ADHD (Any Subtype)	42.9	20.0	4.24 <sup>*</sup>	2.14:1	3.00	14.3	7.00 <sup>**</sup>	3.00:1	4.50
ADHD- Inattentive Subtype	40.0	17.1	4.48 <sup>*</sup>	2.34:1	3.22	11.4	7.48 <sup>**</sup>	3.50:1	5.17
ADHD- Hyperactive Subtype	25.7	14.3	1.43	1.80:1	2.08	5.7	5.29 <sup>*</sup>	4.50:1	5.71
Oppositional Defiant Disorder	31.4	20.0	1.20	1.57:1	1.83	20.0	1.20	1.57:1	1.83
Separation Anxiety Disorder	11.4	0	4.24 <sup>*</sup>	-	-	8.6	0.16	1.32:1	1.38
Social Phobia	17.1	8.6	1.15	1.99:1	2.21	0	6.56 <sup>*</sup>	-	-

<sup>†</sup> p<10,

<sup>\*</sup> p<.05,

<sup>\*\*</sup> p<.01

<sup>a</sup> n=35

<sup>b</sup> Not listed due to empty cells: Major Depressive Disorder, Dysthymia Disorder

<sup>c</sup> ADHD = Attention Deficit Hyperactivity Disorder