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Research report

Child behavior checklist dysregulation profile in children with disruptive behavior disorders: A longitudinal study

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ABSTRACT

Background: A Child Behavior Checklist (CBCL) profile defined as Dysregulation Profile (DP) (scores 2 standard deviations or more in anxiety/depression, aggression, attention subscales) has been correlated to poor emotional and behavioral self-regulation. The clinical meaning and the prognostic implications of CBCL-DP are still debated, although it seems associated with severe psychopathology and poor adjustment.

Method: In the present study, we used the CBCL-DP score to examine the adolescent outcomes (psychiatric diagnosis, substance use, psychiatric hospitalization) in 80 referred children with disruptive behavior disorders –DBD- (Oppositional Defiant Disorder or conduct disorder), aged 8–9 years, 72 males (90%) and 8 females (10%), followed-up until the age of 14–15 years.

Results: Children with higher score on the CBCL-DP profile were at increased risk for presenting ADHD and mood disorders in adolescence. While ADHD in adolescence was predicted also by an ADHD diagnosis during childhood, CBCL-DP score was the only significant predictor of a mood disorder at 14–15 years. On the contrary, CBCL-DP score was not associated with a higher risk of conduct disorder, substance use and hospitalizations in adolescence. A cost-effective and reliable diagnostic measure such as the CBCL may be a part of the diagnostic procedure aimed to capture these at-risk children, to monitor their natural history up to adolescence, and to prevent the risk of a full-blown mood disorder.

Limitations: The small sample size and a selection bias of severe patients with DBD limit the generalization of the findings.

1. Introduction

Children with severe dysregulation of emotions and behavior, including mood instability, severe irritability, aggression, temper outburst, and hyper-arousal have become a diagnostic challenge in the last two decades. They do not completely fit any of the current clinical categories, including Disruptive Behavior Disorders (DBD) or Mood Disorders (MD), although they share features of all these domains. The comorbidity between mood and disruptive behaviors is currently a core element of discussion in the literature, as evident in the debated role of irritability in the Disruptive Mood Dysregulation Disorder and its inclusion among the Depressive Disorders in the DSM 5 (APA, 2013). In a cross-sectional community study, mood lability, a concept closely related to emotional dysregulation, resulted strongly associated with comorbidity between internalizing and externalizing disorders, suggesting that it could be a shared risk factor for both disorders (Stringaris and Goodman, 2009).

One of the most troublesome aspects in the assessment of dysregulated children is the availability of cost-effective and reliable diagnostic measures. The Child Behavior Checklist (CBCL), one of the most used instruments for assessment of developmental psychopathology (Achenbach and Rescorla, 2001), has been considered a possible diagnostic tool for identifying children with these features. The CBCL-Dysregulation Profile (CBCL-DP), characterized by simultaneous high values (above two Standard Deviations) in three syndrome scales (anxious/depressed, attention problems, and aggressive behavior), was firstly more closely related to the pediatric bipolar disorder, and named CBCL-Pediatric Bipolar Disorder profile (CBCL-PBD) (Faraone et al., 2005). Further research has questioned this relationship (Youngstrom et al., 2005; Volk and Todd, 2007; Holtmann et al., 2011; Mbekou et al., 2014), while CBCL-DP it has been considered a reliable indicator of co-occurring Attention Deficit Hyperactive Disorder (ADHD),

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Oppositional Defiant Disorder (ODD) and Mood Disorder (MD) (Althoff, 2010).

In normative youth and in at-risk subjects, CBCL-DP resulted associated with severe psychopathology and poor adjustment (Ayer et al., 2009; Hudziak et al., 2005; Volk and Todd, 2007). A previous study with an at-risk sample showed that young adults with a higher CBCL-DP score in childhood were at increased risk for substance use disorders, suicidality and poorer overall functioning at age 19, but it was neither a precursor of a specific pattern of comorbidity nor of a diagnosis in general (Holtmann et al., 2011).

A longitudinal study including children with ADHD followed-up to late adolescence indicated that a CBCL-DP score above 180 at baseline predicted impaired psychosocial functioning, a higher risk for psychiatric hospitalization, and diagnoses of conduct disorder, depression and bipolar disorder at the follow-up (Biederman et al., 2009). Furthermore, a study that used a typological approach to examine how the CBCL-DP in children predicted pathological personality traits across a time span of 4 years, showed that children with the CBCL-DP were at-risk for elevated scores on a wide range of personality pathological features, including higher scores on hostility, risk taking, deceitfulness, callousness, grandiosity, irresponsibility, impulsivity and manipulativeness (De Caluwè et al., 2013).

These longitudinal studies suggest that mood and behavioral dysregulation in childhood, as assessed with the CBCL-DP, may be a putative predictor of future overall psychopathology and maladjustment, rather than rather than an early manifestation of a specific disorder (Ayer et al., 2009; Meyer et al., 2009; Diler et al., 2009). It may be considered an early developmental trait characterized by an impaired self-regulation of affect and behavior leading children to respond emotionally to the environmental stimuli, and a common key factor in the development of later psychopathology (Caspi, 2000; Lahey et al., 2008; Holtmann et al., 2011).

Although previous studies investigated CBCL-DP in DBD (ODD and CD) (Volk and Todd, 2007; Masi et al., 2015), longitudinal studies in children with these disorders are still lacking. The exploration of the developmental course of the CBCL-DP in DBD domains and the timely detection of possible abnormal pathways may be helpful in distinguishing specific subgroups of patients with poorer prognosis and greater needs of intervention.

In the present study, we used the CBCL-DP to examine the adolescent outcomes (psychiatric diagnosis, substance abuse, psychiatric hospitalization) in a sample of referred children with DBD. Based on the findings of the three previous longitudinal studies with different populations (Holtmann et al., 2011; Meyer et al., 2009; Biederman et al., 2009), we hypothesized that children with the highest levels in CBCL-DP score at the baseline would exhibit an increased risk for psychopathology and substance use, and more frequent psychiatric hospitalization at the follow-up in adolescence.

2. Method

2.1. Participants and procedure

A consecutive sample of children firstly referred for behavioral problems to our Unit of Psychiatry and Psychopharmacology, settled in a tertiary care hospital, received a systematic evaluation. Trained child psychiatrists administered separately to parents and youth a diagnostic clinical interview, the Schedule for Affective Disorders and Schizophrenia for School- Age Children- Present and Lifetime Version (K-SADS-PL) (Kaufman et al., 1997), while parents completed the CBCL. Cognitive abilities in all the participants were assessed with the Wechsler Intelligence Scales for Children – 3rd Ed (WISC-III) (Wechsler, 1991).

A consecutive sample of 85 children aged 8–9 year-old satisfied the following inclusion criteria: (1) diagnosis of ODD or CD according to K-SADS-PL and DSM-IV-TR criteria; (2) a Full Scale IQ greater than 85; (3) a CBCL externalizing score above 63. Five patients were lost in the follow-up, and the final sample included 80 patients, 72 males (90%) and 8 females (10%), 52 with ODD (65%) and 28 with CD (35%), 82% Caucasian, with a low (35%) or medium (65%) family socio-economic status (SES) according to Hollingshead and Redlich (1958). All the participants received a multi-component treatment using cognitive behavioral practices. The treatment was organized in once-a-week four-hour sessions, lasting one year, including individual psychotherapy for children and individual parent training (see Masi et al., 2014). During the cognitive behavioral treatment, 25 patients (30%) received a pharmacotherapy, 12 an antipsychotic, 10 methylphenidate and 3 a mood stabilizer. All the patients were followed-up to the age of 14–15 years, using parent and child measures.

Written consent was obtained from parents at the initial enrollment and in each of the following assessments throughout the course of the study. The Ethical Committee of our Hospital approved the study.

2.2. Baseline measures

2.2.1. Categorical diagnosis

Three child psychiatrists administered separately to the patients and their parents the clinical interview K-SADS PL (Kaufman et al., 1997), which explores the presence or absence of each symptom according to DSM-IV. Mean rate of inter-rate agreement was .81 *k* of Cohen.

2.2.2. Emotional dysregulation

All patients were assessed with the CBCL (Achenbach and Rescorla, 2001), a 118-item scale, completed by parents, with 8 different syndromes scales, a Total Problem Score, and two broad-band scores designated as Internalizing Problems and Externalizing Problems. In the current study the emotional dysregulation (CBCL-DP) was assessed using the sum of *t*-scores of the following subscales, anxious/depression, attention problems and aggressive behaviors. The reliability coefficients (Cronbach's alpha) were 0.82, 0.81 and 0.82, respectively.

2.2.3. Level of functioning

Children's Global Assessment Scale (C-GAS) (Shaffer et al., 1983) was used to describe the severity of functional impairment. The clinician coded the C-GAS on the basis of the patient's worst level of functioning in the last three months, on a hypothetical continuum of health-illness; scores above 70 indicate normal functioning.

2.2.4. Family socioeconomic status

SES was assessed with the Hollingshead and Redlich scale (Hollingshead and Redlich, 1958).

2.2.5. Intellectual functioning

Cognitive abilities were assessed with the Wechsler Intelligence Scales for Children – 3rd Ed (WISC-III) (Wechsler, 1991).

2.3. Distal outcomes

2.3.1. Clinical improvement at the end of the treatment

Two psychiatrists evaluated the patient's improvement through the CGI-Improvement Score-CGI-I – (Guy, 1976). This measure is a single item, recorded at the end of the treatment period, that rates

behavior from 1 ("Very Much Improved") to 7 ("Very Much Worsened"). The inter-rater agreement was .81 *k* of Cohen.

2.3.2. Categorical diagnosis

At the last follow-up visit, child psychiatrists separately administered to the parents and to the patients the clinical interview K-SADS-PL (Kaufman et al., 1997). The psychiatrists were aware of the objectives of the current study. **T**he mean rate of inter-rater agreement was .80 *k* of Cohen. The diagnoses of CD, ADHD, Mood Disorders (MD) and Anxiety Disorders (AD) were used as negative distal outcomes.

2.3.3. Psychiatric hospitalization

At the follow-up, clinicians interviewed parents about the frequency they had used mental health services: "How many times during the last 12 months did you refer to a hospital or day treatment for an over day stay for behavioral or emotional problems?"

2.3.4. Substance use

The CSAP (Center for Substance Abuse Prevention) Student Survey, a 14-item child-report questionnaire adapted from the California Student Survey (Pentz et al., 1989), was administered at the last follow-up to assess substance use. The CSAP Student Survey explores students' attitudes toward, and use of, alcohol, tobacco and substances of abuse, with good reliability and validity in youth (MacKinnon and Dwyer, 1993). The items assessing the use of alcohol, tobacco, or marijuana in the past months were aggregated in this study to produce the Substance Use score.

2.4. Data analysis

Correlation analysis was used to determine the associations between CBCL-DP score at age 8–9 and other clinical and socio-demographic variables. Logistic and linear regression models were used to examine the association between CBCL-DP score at age 8–9 and psychiatric outcomes, substance use and hospitalizations in adolescence. To clarify the specific effect of CBCL-DP score, these models were adjusted in a second step for baseline level of functioning (C-GAS), family SES and the same homotypic diagnosis at baseline. The level of significance for all analyses was 5%. Gender and age were introduced as covariates to estimate their independent effect on the CBCL-DP score.

3. Results

Table 1 shows correlations between baseline variables and distal outcomes.

Table 2 shows unstandardized b coefficients of the second step of regression models. The CBCL-DP score at 8–9 years significantly predicted mood disorders and ADHD at 14–15 years, even after adjustment for poorer level of functioning (C-GAS), family SES and homotypic diagnoses at age 8–9.

The Table 3 shows that the CBCL-Total Score at 8–9 years did not predict mood disorders and ADHD at 14–15 years, after adjustment for the same variables.

The higher was children's CBCL-DP score, the grater was the risk for ADHD and mood disorders in adolescence. In contrast, there were no significant associations between CBCL-DP score and CD, anxiety disorders, substance use, rate of hospitalizations at 14–15 years and improvement after treatment. An ADHD and an anxiety disorder at 8–9 years were associated with the homotypic diagnoses in adolescence. Family SES was unrelated to all distal outcomes, while a lower C-GAS in childhood was a predictor of CD, hospitalizations and substance use in adolescence.

The CBCL-DP (> 210 *t*-score) in anxious/depression, attention problems and aggressive behaviors CBCL subscales, was presented at the baseline in 24 patients (30% of the total sample), 18 with ODD (75%) and 6 with CD (25%), 6 with comorbid ADHD (25%), and 3 with comorbid mood disorder (12%). Regarding patients without CBCL-DP at the baseline, 44 (78%) presented an ODD and 12 (22%) a CD, 11 (20%) an ADHD and 4 (8%) a mood disorder (no patients presented a bipolar diagnosis at the baseline). At the follow-up (14–15 years), 42 (52.0%) patients from the overall sample met criteria for at least one DSM-IV disorder, 20 (25%) a CD, 11 (14%) an ODD, 20 (25%) an ADHD, 18 (24%) a mood disorder (only 2 patients presented a bipolar diagnosis), and 4 an anxiety disorder. Finally, at the follow-up evaluation, 14 patients (18%) were referred at least once in the past 12 months for a hospitalization as inpatients

Table 1
Correlations, means and standard deviations of the measures of the study.

	1	2	3	4	5	6	7	8	9	10	12	13	14	15	16
1. DP s															
2. SES	.183														
3. CGAS	.105	.016													
4. CGI-I	.014	−.37	−.503**												
5. ODD1	.150	.177	.188	−.093											
6. CD1	−.150	−.177	−.188	.93	−										
7. ADHD1	.239	.113	−.087	−.208	.021	−.021									
8. MD1	.109	−.129	−.182	.104	−.165	.165	−.191								
9. ANX1	−.120	.038	−.007	.016	.094	−.094	.036	.069							
10. CD2	.202	.122	−.303*	.414**	−.026	.026	−.179	.179	−.111						
11. ADHD2	.365*	−.043	−.128	−.101	. 013	−.013	.433**	−.117	−.202	−.085					
12. MD2	.375*	−.081	−.113	.201	−.203	.203	−.145	.135	.003	.239	.078				
13. ANX2	−.069	−.158	−.031	−.013	.128	−.128	−.165	-.015	.316*	−.151	−.051	.035			
14. HOSP	.249	.140	−.451**	. 359**	−.026	.026	−.025	.149**	−.029	. 289*	.083	.108	.010		
15. SUBSTANCE	.165	−.024	−.318*	.336*	−.060	.060	.130	.219	−.111	.489**	.104	.113	.112	.171	
Means	203.80	2.89	42.6491	2.4561	.89	.11	1.19	1.16	1.07	1.14	.35	.25	.92	1.30	2.16
SD	18.88	.77	6.0871	.7808	.31	.31	.44	.37	.26	.35	.48	.43	.33	.46	1.01

Legenda: DP= CBCL-Dysregulation Profile score; SES=Socio-Economic Status; C-GAS=Children-Global Assessment Scale; CGI-I=Clinical Global Impression-Improvement score; ODD1=Oppositional Defiant Disorder at baseline; CD1=Conduct Disorder at baseline; ADHD1=Attention Deficit Hyperactivity Disorder at baseline; MD1=Mood Disorder at baseline; ANX1=Anxiety Disorder at baseline; CD2=Conduct Disorder at the follow-up; ADHD2=Attention Deficit Hyperactivity Disorder at the follow-up; MD2=Mood Disorder at the follow-up; ANX2=Anxiety Disorder at the follow-up; HOSP=Hospitalizations at the follow-up; SUBSTANCE=substance use at the follow-up; All analyses are controlled for gender and age.

* $p < .05$.
** $p < .01$.

Table 2
Predictions of adolescents' outcomes from CBCL-DP score, controlled for family socio-economic status (SES), presence of the homotypic diagnosis at the baseline, and level of functioning (C-GAS).

Outcomes at 14–15 years	DP	SES	Diagnosis at 8–9 years	CGAS
Mood disorders	1.51(.80)**	−.27 (.52)	.02 (.02)	.27 (.11)
ADHD	.80 (.01)*	−.44 (.44)	2.00 (.78)**	.00 (.05)
Anxiety disorders	.01(.02)	−.11(.63)	2.01(.63)*	−.01 (.07)
Conduct disorder	.03 (.02)	.33 (.56)	.10 (1.1)	−.23 (.11)*
Hospitalizations	.20 (.01)	.32 (.40)	–	−3.22 (.01)**
CGI at post-treatment	.62 (.01)	−2.02 (.09)	–	−7.12 (.01)**
Substance use	.41 (.07)	−.63 (.14)	–	−5.15 (.23)*

Legenda:
Unstandardized b coefficient (S. E.), all analyses are controlled for gender and age.
* $p < .05$.
** $p < .01$.

Table 3
Predictions of adolescents' outcomes from CBCL-Total score, controlled for family socio-economic status (SES), presence of the homotypic diagnosis at the baseline, and level of functioning (C-GAS).

Outcomes at 14–15 years	CBCL-TOT
Mood disorders	.63 (.07)
ADHD	.50 (.06)
Anxiety disorders	−.02 (.07)
Conduct disorder	.04 (.08)
Hospitalizations	.05 (.05)
CGI at post treatment	.52 (.01)
Substance use	.51 (.04)

Unstandardized *b* coefficient (S. E.), analyses is controlled for gender and age.

for psychiatric disorders.

4. Discussion

At the best of our knowledge, this is the first study exploring the longitudinal course and the distal outcome of the CBCL-DP score in a population of children aged 8–9 years with ODD/CD followed-up to adolescence. The main result of our study is that children with higher score on the CBCL-DP profile were at increased risk for presenting ADHD and mood disorders in adolescence, whereas a higher CBCL Total Score was not associated with an increased risk of having an ADHD or a mood disorder in adolescence. While ADHD in adolescence was predicted also by an ADHD diagnosis during childhood, CBCL-DP score was the only significant predictor of a mood disorder in adolescence.

Our findings also suggest that a greater functional impairment (in term of C-GAS score) in childhood, but not a low SES were associated with a worse outcome in terms of CD, hospitalizations and substance abuse. Of note, a CD in childhood was not associated with a higher risk of CD in adolescence. Regarding the diagnostic stability, ADHD and anxiety disorders in adolescence were predicted by the homotypic disorders in childhood, while neither CD nor mood disorders in adolescence were predicted by the homotypic disorders in childhood

A high CBCL-DP score is mostly and specifically related to a higher risk of developing a mood disorder in adolescence. The prediction remains significant even when controlled for baseline mood disorders diagnoses. It may be noteworthy that the CBCL-DP is not co-related with a current diagnosis of ADHD or mood disorders during childhood. These prognostic implication underlines the importance of including the CBCL-DP evaluation in the diagnostic process. Furthermore, the CBCL-DP score dis not affect the response to treatment, that may have significantly improved the global functioning of the patients; on the contrary, the treatment did not protect the patients from developing a mood disorder, when patients presented a high CBCL-DP score, supporting the notion of a direct link between this profile and mood disorders.

A similar longitudinal study in an ADHD sample (Biederman et al., 2009) indicated that the CBCL-DP score predicted a bipolar disorder diagnosis, as well as major depression, CD and poor social outcome at a 7.4-year follow-up. Our study is consistent with these results in terms of increased risk of mood disorders, while the risk for other markers of poor outcome (CD diagnosis, rate of hospitalizations, substance use, CGI-I) in our study is not associated with the CBCL-DP score. A possible explanation is that the severity at the baseline of our sample of DBD children may be greater than the Biederman et al.' sample of ADHD patients. In fact, according to our previous study, (Masi et al., 2015), 90.7% of patients with DBD presented a score of CBCL-DP score above 180 (52.7% between 180 and 210, and 37.9% a score above 210), compared with 44% of patients in an ADHD study (Biederman et al., 2012).

Recently, we pointed out the importance of assessing CBCL-DP in ODD/DC patients, as emotional dysregulation seems a key feature in their psychopathology, and DP a marker of greater clinical severity (Masi et al., 2015). As in the ADHD sample, also in our study including DBD patients, the relationship between CBCL-DP score and mood disorders is still evident, but without discriminating between unipolar depression and bipolar disorder. It is possible that, being emotional dysregulation much more prevalent in DBD than in ADHD, the DP profile fails to identify those who will develop a bipolar disorder. However, it cannot be ruled out that major depression in adolescence may represent the onset of a future bipolar disorder.

Our results are consistent with those from the study by Holtmann et al. (2011), including biologically and psychosocially at-risk children. In this study, young adults with higher CBCL-DP scores in childhood resulted at increased risk for ADHD, mood disorders, substance use disorders, suicidality, and poorer overall functioning, but not bipolar disorder, anxiety disorders, eating disorders, CD and somatoform disorder. Our results are very consistent with Holtmann et al., except for the relationship with substance abuse.

The main strengths of the current study are the longitudinal prospective design, the low attrition rate, and the use of a widely used, standardized measure with excellent psychometric properties. On the other hand, the current study has to be view in the light of several limitations, and it should be considered exploratory. The small sample size precludes strong conclusions regarding the natural history of the CBCL-DP profile. Furthermore, a selection bias limiting the generalization of the findings may be the severity of our sample, as our third-level university hospital may have selected the more severe and help-seeking patients.

However, if replicated in a wider DBD sample, identifying high

risk patients with associated ODD/CD and higher CBCL DP score may have several clinical implications. A first implication is the need, during the clinical follow-up, of specific diagnostic measures focused on mood disorders. If there is large consensus about the need of monitoring co-occurring ADHD and other externalizing symptoms in patients with DBD, less attention is usually devoted to depressive or (hypo)manic symptoms. A second implication is the need of a more frequent monitoring during development in at-risk patients with high CBCL-DP score. It should include assessing if higher familial load for mood disorders is co-occurring, so as to detect early signs of mood disorders, and to prevent a full-blown disease. A third implication is in terms of increased intensity of treatments, including psychosocial, psychotherapeutic and pharmacological interventions.

A mixed phenotype of attention and behavior problems and anxious-depressed symptoms may be a clinically significant antecedent of a mood disorder. A cost-effective and reliable diagnostic measure such as the CBCL may be a part of the diagnostic procedure aimed to capture these at-risk children, to monitor their natural history up to adolescence, in order to timely detect a full-blown mood disorder.

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