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Emotional reactivity in referred youth with disruptive behavior disorders: The role of the callous-unemotional traits

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ABSTRACT

Deficits in emotional reactivity are frequently reported in Disruptive Behavior Disorders (DBDs). A deficit in prosocial emotions, namely the callous unemotional traits (CU), may be a mediator of emotional reactivity. Our aim is to investigate subjective emotional reactivity towards visual stimuli with different affective valence in youths with DBDs and healthy controls. The clinical sample included 62 youths with DBDs (51 males, 8 to 16 years, mean 11.3 ± 2.1 years), the control group 53 subjects (36 males, 8 to 16 years, mean 10.8 ± 1.5 years). The groups were compared using the Child Behavior Checklist (CBCL), the Inventory of Callous-Unemotional Traits (ICU), and the International Affective Picture System (IAPS), which explores the affective (pleasant/unpleasant emotional reaction) and arousal (low/high intensity of emotion) dimensions. The DBD group presented higher scores in externalizing and internalizing CBCL scores, and in ICU callous and indifferent subscales. At the IAPS, DBD patients differed from controls in the affective valence of the images, rating less unpleasant neutral and negative images. The CU traits were the only predictor of emotional reactivity in the DBD sample. A less aversive way to interpret neutral and negative stimuli may explain why DBD patients are less responsive to negative reinforcements.

1. Introduction

Disruptive Behavior Disorders (DBDs), including Conduct Disorder (CD) and Oppositional Defiant Disorder (ODD), are among the most common reasons for youth referrals to mental health clinics (Steiner and Remsing, 2007) and can be associated with psychosocial impairment, poor prognosis and antisocial outcomes (Fergusson et al., 2005). A major goal in clinical research is to discover possible predictors of negative social outcome of DBDs, according to specific clinical, personality and temperamental variables on one side, and social and environmental variables on the other. These factors may allow further subtyping of the broad category of DBDs into more specific and homogeneous groups, improving intervention strategies (Mason et al., 2004; Vaughn et al., 2011). According to the recent DSM-5, DBDs are classified into a new cluster, named Disruptive, Impulse-control and Conduct disorders, including disorders characterized by difficulties in emotional and behavioral self-control (American Psychiatric Association, 2013).

Among the clinical specifiers for a high-risk antisocial pattern, the DSM-5 has included limited pro-social emotions (Pardini et al., 2010; Burt et al., 2011). This proposed specifier is diagnosed if the patient meets full criteria for CD, and shows two or more of the following characteristics persistently over at least 12 months in more than one relationship setting: lack of remorse or guilt, callous-lack of empathy, unconcerned about performance, shallow or deficient affect. Individuals with callous-lack of empathy are cold and uncaring, and unconcerned about the feelings of others, even when their behavior results in harm to others. They do not express feelings and do not show emotions to others, or their emotions are insincere and used to manipulate others. These features were previously included in the concept of Callous Unemotional (CU) traits (Frick et al., 2003; Frick and White, 2008), and are also considered core elements in the clinical descriptions of adult psychopathy (Blair et al., 2006b). An additional feature of the CU traits is their stability from childhood to adolescence (Burke et al., 2007) and adulthood (Lynam et al., 2007). Previous research has

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shown that CU traits in childhood and adolescence have been related concurrently and prospectively with a higher rate of conduct problems (Rowe et al., 2010; López-Romero et al., 2011, 2012), aggressive behaviors (Marsee and Frick, 2007), and lower levels of pro-social behavior and social skills (Viding et al., 2009).

A significant body of research has been devoted to understanding temperamental and biological underpinnings of CU traits and psychopathy (Marsh et al., 2008; Viding et al., 2008, 2013; Jones et al., 2009), and also emotional reactivity to external stimuli has been explored in youth with high CU traits, as recently reviewed in Herpers et al. (2014). Children, adolescents and adults with psychopathic-like traits show some deficits in processing of negative emotional stimuli, or are less accurate in identifying sad facial expression (Kimonis et al., 2006; Woodworth and Waschbusch, 2008). A deficit in subjective arousal to fear and distress may lead youths to experience a lower impact of the negative consequences due to their own behaviors (Blair et al., 1997, 2001, 2006a, 2006b). The same emotional feature may also be associated with a reduced sensitivity to behavioral interventions (i.e., punishment) (Blair et al., 1997, 2001, 2006a, 2006b). A lower fear of social punishment may explain why youth with high CU traits are less responsive to treatment than peers with conduct problems, but low CU traits (Hawes and Dadds, 2005; Masi et al., 2013). A better understanding of the nature of CU traits can thus target more efficient treatment strategies specifically geared to the specific needs of the patients.

The International Affective Picture System (IAPS) is one of the most reliable and valid instruments for the experimental investigation of emotions based on a set of visual stimuli for the exploration of the relationships between the affective valence of the emotional stimuli (from pleasant to unpleasant), and the individuals' reaction in terms of arousal to emotional stimuli (from excited to calm) (Lang et al., 1999). Recently, IAPS has been applied to youths, based on norms by Lang et al. (1999). Early studies support the validity of IAPS for use in young samples from the community (McManis et al., 2001), as well its utility the exploration of psychopathic-like traits and conduct problems (Sharp et al., 2006, 2008). Following McManis et al. (2001) work with pre-adolescent children, words like happy, pleased, good, and unhappy, scared, angry, bad or sad were used in the instructions to describe the endpoints of the pleasure (valence) scales. Words like calm, relaxed, bored, or sleepy and excited, nervous or wide-awake described the endpoints for the arousal scale. Sharp et al. (2006) selected 27 IAPS pictures to explore a wide range of affective content in a large unselected community cohort of 659 children aged 7–11, while concurrent symptoms of DBDs and psychopathy were collected from multiple sources. According to this study, children above the cut-off on measures of antisocial behavior presented lower arousal to unpleasant picture, but higher arousal to pleasant picture.

A recent article by Herpers et al. (2014) reviewed the current literature on neurocognitive aspects of CU traits in youths. A lower emotional responsivity to distressing stimuli was found in the majority of studies, as well as a reduced response of the amygdala and a weaker connectivity between amygdale and the ventromedial prefrontal cortex, suggesting impaired emotional reactivity over and beyond conduct problems. These findings are in line with other studies, suggesting that specific emotion processing deficits, namely in the response to sad or fear stimuli, are related to changes in brain structure and function (Fairchild et al., 2013; Frick et al., 2014). These issues support the interest in using IAPS pictures in CD, as they comprise a various set of different emotions.

The current study on referred Italian children and adolescents with DBDs, is aimed at further exploring emotional reactivity associated with the presence of CU traits. Our hypothesis is that youth with DBDs that may show a different emotional subjective experience, evaluated on a self-report clinical scale, compared to healthy subjects. Based on previous neurobiological and psychophysiological studies (Patrick et al., 1993; Fowles, 2000; Van Goozen et al., 2007; De Wied et al., 2009), the presence of CU traits could be associated with reduced arousal and increased valence subjectively perceived against negative visual stimuli. The questions addressed in this study are therefore the following: 1) is there a specific pattern of emotional response, in terms of valence, arousal, or both in referred youth with DBDs, compared to healthy controls? 2) is there any relationship between arousal/valence facing emotional engaging stimuli and high level of CU traits?

2. Material and method

2.1. Participants

The clinical sample consisted of 62 children and adolescents with DBDs (ODD and/or CD), (51 males, age-range 8 to 16 years, mean age 11.3 ± 2.1 years), consecutively referred to two third-level Italian departments of Child and Adolescent Psychiatry, settled in the Scientific Institute "Stella Maris" in Pisa and the Scientific Institute "Bambino Gesù" in Rome from January 2012 to February 2013. Our clinics are research hospitals with a national catchment for children and adolescents presenting a wide range of neuropsychiatric disorders. The children were referred by community-based child psychiatrists or pediatricians, or family members. All patients were diagnosed according to a systematic evaluation, including historical information, prolonged observation of interactions with peers, parents and/or examiners, and a structured clinical interview according DSM-IV criteria, the Schedule of Affective Disorders and Schizophrenia for School-Age Children - Present and Lifetime Version (K-SADS-PL) (Kaufman et al., 1997), administered by trained child psychiatrists. All the patients with current or past diagnosis of autism spectrum disorder, psychotic disorder, or with a Full Scale IQ below 75 according to Wechsler Intelligence Scale for Children-III (WISC-III), were excluded from the study. The control group consisted of 53 normal subjects (36 males, age-ranged 8 to 16 years, mean age 10.8 ± 1.5). The clinical and the control groups did not differ according to both age and gender ratio (Table 1).

2.2. Procedures

The study design consisted in a multicenter, cross-sectional evaluation of children and adolescents, aged from 8 to 16 years, admitted tour clinics. The clinical sample was compared with a healthy control group, matched for age and gender ratio.

The control group was drawn from public elementary and junior high schools in the area of Pisa and Rome, all following regular education programs. The schools were selected randomly, and agreed to participate in the study. Handicapped children (i.e., intellectual disabilities, neurological disorders, autism spectrum disorders, or any other impairing condition identified during the school years) were excluded. After obtaining informed consent from school directors and teachers, the parents of the students were asked to complete the Italian version of Child Behavior Check List (CBCL) (Achenbach, 1991), and the participants were screened for behavioral and emotional problems.

All subjects participated voluntarily in the study after a written informed consent was obtained from parents or legal caregivers. The entire study protocol, which includes a wide range of neuropsychological tasks and psychopathological questionnaires, was approved by the Ethical Committee of both Hospitals.

2.3. Measures

Both the clinical and the control samples were assessed with the CBCL, a 118-item scale, completed by parents, which is one of the most frequently used instruments for epidemiological and clinical studies. Items are scored on a 3-step response scale, and grouped in 8 different syndromes (Withdrawn, Somatic Complaints, Anxious/Depressed, Social Problems, Thought Problems, Attention Problems, Delinquent Behavior and Aggressive Behavior). The CBCL provides a Total Problem Score, two broad-band scores designated as Internalizing Problems (including Withdrawn, Somatic Complaints and Anxious/Depressed syndromes) and Externalizing Problems (including Delinquent Behavior and Aggressive Behavior). CBCL inattention scale was more specifically considered, given the high ADHD comorbidity in the clinical sample.

The clinical sample was assessed with the K-SADS for the diagnosis of DBDs and comorbidities. The K-SADS was administered individually to the adolescents and their parents by trained child psychiatrists with specific experience in child and adolescent psychiatric disorders. To improve the reliability and validity of the diagnoses, after each interview, clinical data from each subject-parent pair were reviewed by the research clinicians for the purpose of consensus.

The Children's Global Assessment Scale (C-GAS) (Shaffer et al., 1983) was used to assess the functional impairment in both the clinical and control groups. The

Table 1
Comparison between the clinical group and the control group.

	Clinical group ($N=62$)		Control group ($N=53$)		F/χ^2 (d.f.)	p
Males, n (%)	51 (82)		36 (68)		2.5 (1)	0.117
Mean age	11.3 ± 2.1		10.8 ± 1.5		2.2 (113)	0.151
Diagnosis (*N*, %)						
Oppositional-defiant disorder	43 (68)		–			
Conduct disorder	19 (32)					
Comorbidity (N,%)						
ADHD	42 (67)	–	–	–	–	–
Mood disorders	5 (8)	–	–	–	–	–
Anxiety disorders	3 (5)	–	–	–	–	–
Obsessive-compulsive disorder	2 (3)	–	–	–	–	–
Enuresis	1 (1)	–	–	–	–	–
Inventory of callous unemotional traits (Youth v.)	Clinical group ($N=62$)		Control group ($N=53$)		F/χ^2 (d.f.)	p
Callous (mean, S.D.)	9.95	6.38	6.63	3.79	10.54 (113)	0.00**
Indifferent (mean, S.D.)	10.36	6.40	6.71	3.84	12.65 (113)	0.00**
Unemotional (mean, S.D.)	7.04	3.71	6.13	2.77	2.02 (113)	0.158
Total (mean, S.D.)	27.34	11.00	19.48	7.52	18.50 (113)	0.00**
Child behavior checklist	Clinical group ($N=62$)		Control group ($N=53$)		F/χ^2 (d.f.)	p
Tot. problems (mean, S.D.)	68.26	7.56	43.75	10.21	186.16 (113)	0.00**
Int. problems (mean, S.D.)	62.44	9.15	47.95	9.79	57.11 (113)	0.00**
Ext. problems (mean, S.D.)	67.96	8.64	44.32	8.13	191.32 (113)	0.00**
Anxiety problems (mean, S.D.)	62.70	8.70	53.45	5.13	37.82 (113)	0.00**
Withdrawal (mean, S.D.)	61.80	8.74	53.66	5.13	29.72 (113)	0.00**
Somatic complaints (mean, S.D.)	58.76	8.08	53.36	4.29	15.93 (113)	0.00**
Social problems (mean, S.D.)	64.72	8.28	52.73	3.85	78.43 (113)	0.00**
Thought problems (mean, S.D.)	62.94	9.52	51.59	3.29	56.91 (113)	0.00**
Breaking rules (mean, S.D.)	65.37	8.60	51.02	1.58	118.90 (113)	0.00**
Attention problems (mean,S.D.)	69.81	8.71	52.20	2.72	166.42 (113)	0.00**
Rule breaking (mean, S.D.)	65.37	8.60	51.02	1.58	118.90 (113)	0.00**
Aggressive behavior (mean, S.D.)	69.61	10.43	51.93	3.17	117.30 (113)	0.00**
C-GAS (mean, S.D.)	42.05	9.84	89.73	0.9	254.00 (113)	0.00**

C-GAS: Children- Global Assessment Scale; * $p < 0.05$.

** $p < 0.001$.

C-GAS is a widely used, clinician rated measure describing the severity of functional impairment on a scale from 0 (severe impairment) to 100 (superior functioning). It was designed for use with children from 4 to 16 years of age; scores above 70 indicate normal functioning.

After the diagnostic and screening procedures, all participants were assessed with the following measures:

International Affective Picture System (IAPS), a set of visual stimuli for use in experimental investigations of emotion and attention (Lang et al., 1999). According to McManis et al. (2001), 60 images were selected from the IAPS full set (over 700 photographs), 20 pictures with pleasant images (for example, babies or young lovers), 20 pictures with unpleasant images (for example, snakes, violent death or weapons), and 20 neutral pictures (everyday objects) (see footnote for details) [a]. Data were collected using Self-Assessment Manikin (SAM) (Lang et al., 1999), an affective rating-scale system based on a graphical figure that depicts the dimensions of arousal (from an excited to a relaxed figure) and valence (from a smiling to a frowning figure) on a 9-point visual analog scale. Previous studies support the SAM as a valid instrument for dimensional ratings of valence and arousal in children and adolescents (Sharp et al., 2006). Regarding valence, low scores were indicative of unpleasant emotional reaction, and high scores were indicative of pleasant reactions. For arousal, low scores were indicative of low intensity of emotion, and high scores of strong emotional activation. The IAPS colored images were shown as slides using an electronic device, throughout an experimental package created on the Superlab psychological software version 4.1, occupying the entire screen, in a well lit room. Images were set in a fixed random sequence (the same for all participants). Each slide was presented for 6 s, followed by a blank screen for 6 s. Pressing the space bar, the subject advanced to the next slide. Subjects were asked to evaluate arousal and valence for each image, using the SAM, with the supervision of a child psychiatrist or a clinical psychologist. After the experiment, subjects were questioned on the content of some of the images, to confirm that they had fully attended to the stimuli. After subjects completed the task, they were rewarded with a certificate of completion and a small gift (a small toy).

[a] The following pictures from the IAPS were used:1040, 1120, 1280, 1300, 1710, 1750, 1920, 1930, 2070, 2120, 2130, 2190, 2280, 2320, 2650, 2660, 2780, 2810, 2890, 2920, 3230, 3280, 3500, 3530, 5020, 5030, 5450, 5480, 5910, 5950, 6230, 6300, 6370, 7000, 7010, 7030,7040, 7080, 7090, 7100, 7130, 7150, 7170, 7250, 7330, 7380, 7390, 7400, 7410, 7430, 7510, 8260, 8490, 8510, 8620, 9050, 9421, 9450, 9461, 9480.

Inventory of Callous-Unemotional Traits (ICU) (Frick, 2004), is a 24-item self-report questionnaire, completed by the children or adolescents, designed to assess the CU traits in three dimensions: callousness, indifferent, unemotional. Answers are recorded on four-point Likert scale. The ICU has been previously used in children aged 8 years or more (Muñoz, 2009; Feilhauer et al., 2012, 2013), and has been shown to be a reliable measure in children and adolescents (Kimonis et al., 2008; Feilhauer et al., 2013). The reliability of the ICU scores across studies has been proven to be acceptable (Neal and Sellbom, 2012).

2.4. Statistical analysis

All analysis were performed using SPSS 9 for Windows. Chi square and-one way analysis of variance (ANOVA) were used for categorical and continuous demographic variables. After controlling for normal distribution of variables, to test the group differences on IAPS scores, one-way ANOVA between groups were performed. For all tests, significance was set at $p < 0.05$. To test the relationship between CU traits and IAPS scores in the clinical group, six hierarchical multiple regressions were conducted, examining CU trait as predictors of scores on the IAPS dimension (valence/positive, arousal/positive, valence/neutral, arousal/neutral, valence/negative, arousal/negative). In all regression models, age and gender (demographic covariates) were entered at step 1, CBCL inattention symptoms and C-GAS clinical impairment (clinical covariates, selected because of the high ADHD comorbidity and functional impairment of the clinical sample) were entered at step 2, and CU main effects (assessed with the ICU subscales) were entered at step 3.

3. Results

3.1. Comparison between groups according to CBCL and ICU

As expected, significant group differences resulted in all total scores and subscales (both externalizing and internalizing) at CBCL, as well as ICU callous and indifferent subscales. ICU unemotional subscale did not differ between clinical and control groups (Table 1).

3.2. Comparisons between groups according to IAPS

In the valence dimension, a group difference was found for neutral ($F=11.46$, d.f.$=113$, $p=0.01$) and negative images ($F=16.6$, d.f.$=113$, $p<0.001$), but not for positive stimuli ($F=0.33$, d.f.$=113$, $p=0.565$). No group difference was found in evaluating positive ($F=0.40$, d.f.$=113$, $p=0.527$), neutral ($F=0.47$, d.f.$=113$, $p=0.49$) and negative ($F=1.3$, d.f.$=113$, $p=0.24$) images for the arousal dimension. In summary, the children in clinical sample, when faced with neutral and negative set of stimuli, tended to evaluate them as less unpleasant, compared with the control sample. Data are summarized in Table 2.

Table 2
Mean and standard deviations of valence and arousal ratings at positive, neutral and negative images of International Affective Picture System (IAPS).

	Clinical group ($N=62$)		Control group ($N=53$)		Anova	
	Mean	S.D.	Mean	S.D.	F (d.f.)	p
Positive						
Valence ratings (H/U)	7.56	1.12	7.60	0.85	0.332 (113)	0.565
Arousal ratings (A/C)	2.97	1.35	2.80	1.40	0.402 (113)	0.527
Neutral						
Valence ratings (H/U)	5.70	1.03	5.12	0.74	11.463 (113)	0.01*
Arousal ratings (A/C)	3.74	1.24	3.57	1.26	0.479 (113)	0.490
Negative						
Valence ratings (H/U)	3.75	1.63	2.65	1.18	16.663 (113)	0.00**
Arousal ratings (A/C)	6.13	1.75	6.50	0.22	1.349 (113)	0.248

* $p<0.05$.
** $p<0.001$.

3.3. Multiple regression analysis

Multiple regression analysis was performed on the clinical group for each dimension of IAPS score as the dependant variable. Results of regression analysis predicting IAPS negative valence score show that R^2 accounts for 26% of variance at step 3. Relatively to the predictors in the full model at step 3, ICU-callousness ($B=0.355$, $p<0.01$) and ICU-unemotional ($B=0.231$, $p<0.05$) accounted independently for significant proportions of the variance. Thus, the callousness and unemotional dimensions of CU-traits resulted to predict a pleasant judgement to negative images.

Results of regression analysis predicting IAPS neutral valence score show that R differed significantly from zero at step 1 ($R^2=0.170$), and improved model fit at step 3 ($R^2=0.309$). Regarding the predictors in the full model at step 3, age ($B=-0.379$, $p=<0.01$) and ICU-unemotional ($B=0.358$, $p<0.01$) independently accounted for significant proportions of variance. Thus, the unemotional dimension of CU-traits predicts a pleasant judgement to neutral images.

Results of regression analysis predicting IAPS negative arousal/calm score, IAPS neutral arousal/calm score, IAPS positive arousal/calm score and IAPS positive valence score show a lack of improvement model fit at all three steps. Data are shown in Table 3.

In summary, multiple regression analyses indicate that the distorted emotional processing in DBDs are related to the CU traits, but not to age, gender, ADHD inattentive symptoms and functional impairment.

4. Discussion

In present paper, we aimed at further exploring emotional reactivity in a sample of DBDs youths, and its possible relationship with CU traits. In this study we used well validated self-report measures, such as IAPS and ICU. Scheepers et al. (2011) pointed out the importance of self-reports for the assessment of CU traits in youth, as it is related to interpersonal thoughts and feelings, which may be hardly recognized and reported by parents.

Consistently with the existing literature (Frick et al., 2013; Herpers et al., 2014), we have found a distorted emotional reactivity in DBDs group, associated to higher CU traits. According to the IAPS, patients with DBDs differed from controls in the affective valence of the images, that is the degree of pleasure/ happiness or unpleasure/ sadness experienced by the subjects observing the emotional pictures, while no differences between groups were found for the self-reported arousal dimension, that is the excitement or activation degree produced by emotional images. Our patients rated both neutral and negative images as less unpleasant, whereas they did not differ from healthy controls in evaluating the positive images. In other words, images belonging to negative or neutral categories are less aversive for DBDs patients than for controls. Furthermore, the multiple regression analyses showed that the callousness and unemotional dimensions of CU-traits predict a non-negative judgement to negative images. This issue may help to understand why some DBDs patients are less responsive to negative reinforcements and punishments, and consequently more resistant to treatments (Van Bokhoven et al., 2005; Hawes and Dadds, 2005; Sharp et al., 2006; Masi et al., 2011; Kumsta et al., 2012). This may be relevant for treatment programs, such as psychotherapy and psycho-educational rehabilitation, and it may be a specific target of these interventions. It might be true that improvement of subjective emotional reactivity may improve prosocial behaviors, and overall prognosis. Our findings provide further support that an emotion recognition training (ERT) in early phase of conduct problems may improve several outcomes (such as affective empathy and behavior), as recently pointed out by Dadds et al., (2012). According to these authors, children with high CU traits responded less well to a treatment-as-usual, while ERT produced significant improvements in affective empathy and conduct problems in these children, regardless of their diagnostic status.

Of note, no differences between groups have been found for the self-reported arousal dimension, suggesting that patients with DBDs do not have an increased emotional activity facing both positive or negative stimuli. A different pattern has been found in (adult) patients with borderline personality disorder (BPD), who present a similar pattern of affective valence (images belonging to negative or neutral categories are less aversive than for controls, while no difference are found for pleasant images), but an increased arousal and more activation than controls (Jayaro et al., 2011). This finding further contributes to define specific emotional and behavioral features of DBDs, compared to BPD, although phenomenological similarities, as well as longitudinal association, has been reported (Belsky et al., 2012, Burke and Stepp, 2012). This is consistent with psychobiological models, showing that subjects with high CU traits present under-arousal, particularly facing negative stimuli and distress cues, according to several measures, such as heart rate, skin conductance and blood pressure (Blair et al., 1997).

A dissociation between self-reported responses and psycho-physiological reactions to negative IAPS stimuli in adult and adolescents with psychopathic traits has been previously reported by Patrick et al. (1993) and Blair (1999). Previous studies have also found a significant relationship between self-reported subjective under-arousal and antisocial measures assessed by parents and teachers (Sharp et al., 2006; Michonski and Sharp, 2010). It may be hypothesized that the psycho-biological subjective under-arousal of youths with high CU traits may affect the subjective feelings of emotional states, such as excitation, distress and arousal, which are reported differently from normal youths. As hypothesized by Jayaro et al. (2011) for BPD patients, further studies should determine whether patients with DBDs may respond differently

Table 3
Summary of hierarchical regression analyses predicting International Affective Picture System scores ($N=62$)

DV	Predictor	Model 1				Model 2				Model 3			
		R^2	Δ R^2	F	B	R^2	Δ R^2	F	B	R^2	Δ R^2	F	β
Neg. valence		0.044	0.011	0.348		0.045	−0.023	0.664		0.265*	0.169*	2.775*	
	Gender				−0.177				−0.182				−0.193
	Age				0.117				0.118				0.075
	C-GAS								0.029				0.082
	CBCLA-A								0.003				−0.016
	ICU_CAL												0.355**
	ICU_IND												0.025
	ICU_UNE												0.231*
Neg. arousal		0.034	0.001	1.030		0.040	−0.028	0.591		0.173	0.066	1.613	
	Gender				0.088				0.065				0.080
	Age				−0.164				−0.162				−0.068
	C-GAS								0.002				−0.052
	CBCLA-A								0.082				0.137
	ICU-CAL												−0.203
	ICU-IND												−0.235
	ICU-UNE												−0.141
Neu. valence		0.170**	0.142**	6.047**		0.201*	0.145*	3.583*		0.309**	0.220**	3.455**	
	Gender				−0.152				−0.089				−0.082
	Age				−0.379**				−0.386**				−0.414**
	C-GAS								−0.106				−0.049
	CBCLA-A								−0.166				−0.153
	ICU-CAL												−0.057
	ICU-IND												−0.057
	ICU-UNE												0.358**
Neu. arousal		0.013	−0.020	0.397		0.025	−0.044	0.361		0.128	0.015	1.133	
	Gender				−0.002				−0.009				0.005
	Age				−0.115				−0.117				−0.011
	C-GAS								−0.079				−0.131
	CBCLA-A								0.064				0.124
	ICU-CAL												−0.059
	ICU-IND												−0.288*
	ICU-UNE												−0.116
Pos. valence		0.046	0.014	1.434		0.050	−0.017	0.743		0.148	0.038	1.343	
	Gender				−0.138				−0.149				−0.131
	Age				−0.161				−0.158				−0.064
	C-GAS								0.058				0.043
	CBCL-A								0.010				0.082
	ICU-CAL												−0.078
	ICU-IND												−0.349*
	ICU-UNE												0.124
Pos. arousal		0.017	−0.017	0.502		0.102	0.039	1.627		0.159	0.050	1.456	
	Gender				−0.068				0.031				0.032
	Age				−0.108				−0.122				−0.060
	C-GAS								-0.231				−0.275*
	CBCL-A								−0.234				−0.212
	ICU-CAL												0.093
	ICU-IND												−0.126
	ICU-UNE												−0.185

C-GAS: Children- Global Assessment Scale; CBCL-A: Child Behavior Checklist, Attention problems; ICU-CAL: Inventory of Callous-Unemotional Traits, Callous; ICU-IND: Inventory of Callous-Unemotional Traits, Indifferent; ICU-UNE: Inventory of Callous-Unemotional Traits, Unemotional.

* $p < 0.05$.
** $p < 0.01$.

to different kinds of unpleasant pictures, such as those including a more evident social dimension (Sloan et al., 2010).

Our patients with DBDs presented higher scores in all the CBCL scales. Although it might be expected that the clinical sample presents more severe symptoms in the externalizing domain compared to the control group, as well as in CU traits, it is relevant that all the internalizing syndrome scores were higher as well, as high internalizing scores are not fully consistent with high CU features. It may be hypothesized that our patients, recruited from a psychiatric cohort, present a specific quality of emotional dysregulation, consisting of a complex combination of both callousness, and anxiety/depression, with low self-awareness and uncommon help-seeking behavior. This association may represent a meaningful feature in youths with DBDs,. It should also be noted that the CBCL questionnaire was scored by the parents who, gave the impact of disruptive behaviors, may have overestimated the psychopathological meaning of their children's behaviors.

A limitation of our study is its cross-sectional design. An important issue to further explore is the stability of the emotional reactivity over time, particularly from childhood to adulthood, both in referred and in healthy youths. A second limitation is the wide age range of both samples, although no age effect emerged, except for one regression model (neutral valence). We found that valence ratings to neutral pictures decrease with age, whereas, contrary to findings of Sharp et al. (2006), the age does not affect the arousal ratings. This developmental component is intriguing and could be an interesting aim for future research works. Third, the high prevalence of males is an unavoidable limit, considering the epidemiology of DBDs; however, no gender effect emerged from analysis. However, the gender effect on emotional reactivity

on youths with DBDs needs to be further explored with specific study design addressing possible specificities. For example, elevated CU traits in girls may have been associated with different comorbidity patterns (i.e. in anxiety disorders), compared to boys.

In summary, we propose that emotional dysregulation is a central psychopathological issue in youths with DBDs, and this characteristic should be carefully considered in the assessment of these patients. The literature on this kind of emotional dysregulation in the presence of CU traits is still sparse and (much) more research is needed in this field. The improvement of emotional reactivity may become an important goal of the treatment procedure, and it may be associated with enhanced improvements even on conduct problems, in terms of intensity and stability over time.

Conflict of interest

Dr. Masi was in the advisory boards for Eli Lilly and Shire, has received research grants from Eli Lilly and Shire, and has been speaker for Eli Lilly, Shire, Lundbeck, Otsuka and Novartis. Dr. Vicari was in the advisory boards for Shire, has received research grants from Eli Lilly and Shire, and has been speaker for Eli Lilly, Shire. Dr. Mazzone has received travel grant from Shire and has been speaker for Eli Lilly. All the other authors do not have conflicts of interest to declare.

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