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# Physical and Sexual Abuse and Early-Onset Bipolar Disorder in Youths Receiving Outpatient Services: Frequent, but Not Specific

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**Abstract** The objective of this study was to determine if physical and sexual abuse showed relationships to early-onset bipolar spectrum disorders (BPSD) consistent with findings from adult retrospective data. Participants ($N$=829, $M$= 10.9 years old±3.4 $SD$, 60 % male, 69 % African American, and 18 % with BPSD), primarily from a low socio-economic status, presented to an urban community mental health center and a university research center. Physical abuse was reported in 21 %, sexual abuse in 20 %, and both physical and sexual abuse in 11 % of youths with BPSD. For youths without BPSD, physical abuse was reported in 16 %, sexual abuse in 15 %, and both physical and sexual abuse in 5 % of youths. Among youth with BPSD, physical abuse was significantly associated with a worse global family environment, more severe depressive and manic symptoms, a greater number of sub-threshold manic/hypomanic symptoms, a greater likelihood of suicidality, a greater likelihood of being diagnosed with PTSD, and more self-reports of alcohol or drug use. Among youth with BPSD, sexual abuse was significantly associated with a worse global family environment, more severe manic symptoms, a greater number of sub-threshold manic/hypomanic symptoms, greater mood swings, more frequent episodes, more reports of past hospitalizations, and a greater number of current and past comorbid Axis I diagnoses. These findings suggest that if physical and/or sexual abuse is reported, clinicians should note that abuse appears to be related to increased severity of symptoms, substance use, greater co-morbidity, suicidality, and a worse family environment.

**Keywords** Bipolar disorder · Sexual abuse · Physical abuse · Children · Adolescents

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Although historically it was believed that bipolar spectrum disorders (BPSD) were found almost exclusively among adults (e.g., Hall 1952), there is now consensus that BPSD are not the sole domain of adult psychopathology, as cases of adolescent and even childhood onset BPSD have consistently been documented (Issac 1991; Post and Kowatch 2006; Tillman et al. 2008; Youngstrom et al. 2005). Additionally, despite the highly heritable nature of bipolar disorders (Edvardsen et al. 2008), it is clear that psychosocial factors may influence the developmental course of this disorder (Alloy et al. 2006; Althoff et al. 2005; Carlson and Meyer 2006). However, study of social and environmental factors lags behind investigations of genetic and neurophysiological factors (Alloy et al. 2005, 2006).

Various psychosocial factors, including negative self-perception, negative cognitive style, negative parenting, low socioeconomic status, and maltreatment history are linked with BPSD in youth (Alloy et al. 2005, 2006; Birmaher et al. 2006; Petti et al. 2004). Early experiences of physical and sexual abuse may lead to lasting alterations in the hypothalamic-pituitary-adrenal axis, hippocampus, and norepinephrine and cortisol systems (Bremner et al. 1997), which can lead to increased stress sensitivity and emotion regulation difficulties (Cook et al. 2005). Childhood maltreatment also has been linked to differences in timing, course, and associated features of BPSD (Alloy et al. 2005; Maniglio 2013a).

Rates of maltreatment among individuals diagnosed with a bipolar disorder are higher than rates of maltreatment found in the general population (Maniglio 2013b) or in samples of individuals with unipolar depression (Maniglio 2010; Weiss et al. 1999) or externalizing disorders such as conduct disorder (Maniglio 2013c). About half of youths (Marchand et al. 2005) or adults (Garno et al. 2005) receiving outpatient treatment for bipolar disorder report histories of abuse or neglect when asked. However, excluding neglect makes the estimates lower (Maniglio 2013b), more in the range of 20 % for youths (Romero et al. 2009; Goldstein et al. 2010).

Specific subtypes of abuse sometimes differentiate individuals with BPSD from those with BPSD. Results have found significantly more childhood sexual abuse (Hyun et al. 2000), or more physical abuse but not sexual abuse (Levitan et al. 1998) in adults with bipolar depression compared to unipolar depression. Still others have found relatively higher rates of childhood abuse among adults with unipolar depression (Wexler et al. 1997).

Retrospective reports of childhood abuse have been linked to an earlier onset of bipolar disorder in some (Garno et al. 2005; Leverich et al. 2002) but not other (Brown et al. 2005; Hammersley et al. 2003) studies. Inconsistent results may partly be due to issues of retrospective recall and reporting about abuse over a lag reaching into decades. The relation between childhood abuse and age at onset of bipolar disorder is of particular interest considering the relatively worse outcomes associated with early versus later onset BPSD. Pediatric onset has been associated with increased hospitalization, more prolonged episodes, and a more severe course of the disorder (Carlson et al. 2000; Goldstein and Levitt 2006; Schulze et al. 2002).

Childhood abuse also has been linked to faster *cycling* frequencies – sometimes meaning frequent relapse, and other times greater affective lability, increased comorbidity, increased suicidality, and higher rates of substance misuse among adult patients with bipolar disorder. Adult outpatients with a history of either childhood physical or sexual abuse showed more frequent episodes, suicide attempts, comorbid Axis I, II, and III conditions (including substance abuse and PTSD), and greater illness severity than those who reported no childhood abuse (Leverich et al. 2002). Increased rates of lifetime suicidality are especially striking in adult patients with bipolar disorder and a history of abuse (McIntyre et al. 2008).

Adults with abuse histories may show a worse course of illness, including greater percent time ill during prospective follow-up (Leverich et al. 2002) as well as retrospective recall (Garno et al. 2005). Specific abuse subtypes may differentially relate to certain adverse outcomes. Physical abuse, emotional abuse, and neglect correlated with more mood instability and frequent mood episodes, whereas childhood sexual abuse correlated with increased suicide attempts (Garno et al. 2005). Abuse status also predicts more severe manic symptoms at current assessment (Brown et al. 2005; Garno et al. 2005). History of any sexual or physical childhood abuse predicted higher rates of substance abuse and anxiety disorders, including PTSD, and combined physical and sexual abuse was associated with frequent relapse (Brown et al. 2005). Adult patients with bipolar disorder who spontaneously reported childhood sexual abuse during treatment also reported significantly higher rates of auditory hallucinations compared to those without such a disclosure (Hammersley et al. 2003).

Although evidence suggests that childhood abuse is associated with worse outcomes for adults diagnosed with a BPSD, the research to this point typically has been retrospective in nature, comparing groups of adult patients having bipolar disorders with and without self-reported histories of childhood abuse. Although this is a good first step, several methodological limitations point to the importance of alternative approaches. There are well-established limitations to relying exclusively on retrospective self-report, and it is especially contentious to use retrospective report about child history of abuse (cf. Loftus et al. 1994; Williams 1994).

The present study attempts to address the limitations of prior research on this clinically important topic by: (a) using information about abuse status and diagnosis that are gathered concurrently–versus comparing current diagnoses to retrospective self-reports of abuse, (b) using clinically documented reports of abuse rather than solely using self-report, and (c) drawing participants from an unselected cohort of youths presenting for clinical services. This last feature is important because it involves a possible risk factor for early onset of bipolar disorder among youths, but also because it allows comparisons to determine if abuse increases risk specifically for bipolar disorder.

In the present study our first aim was to determine if abuse showed relationships to early-onset bipolar spectrum disorders (BPSD) consistent with findings from adult retrospective data. Specifically, we hypothesized that abuse would be significantly associated with bipolar spectrum disorders more strongly than other clinical diagnoses. We chose to focus on the bipolar spectrum, including cyclothymic disorder as well as bipolar not otherwise specified – characterized by episodic

changes of mood and energy that lasted less than a week for mania, less than 4 days for hypomania (Leibenluft et al. 2003; Youngstrom 2009)—for three reasons. First, growing evidence indicates that cyclothymia and NOS show clinical correlates and family histories consistent with them being bipolar disorders (Van Meter et al. 2011, 2012). Second, data indicate that mania, depression, and mood dysregulation are likely expressed along a continuum, rather than having naturally occurring categories (Haslam et al. 2012; Prisciandaro and Roberts 2011). Third, and perhaps most importantly, pediatric cyclothymia and bipolar NOS have demonstrated high rates of progression to full blown bipolar I or II disorder (Axelson et al. 2011; Findling et al. 2007, 2013), suggesting that these might be prodromal or early manifestations. Our second aim was to examine the extent to which abuse was associated with a worse clinical presentation within cases having BPSD. We hypothesized that abuse would predict an earlier age of onset of mood disorders, and BPSD in particular. We also expected to find more severe episodes of depression and mania, more frequent mood episodes, and greater mood instability among youth with BPSD who have been maltreated compared to non-maltreated youth. Axis I comorbidity–particularly PTSD–should be greater for the maltreated youth with BPSD, and this group was expected to also endorse hallucinations at a higher rate than non-maltreated youth with BPSD and youth not meeting criteria for a BPSD. Our third aim was to specifically investigate associations with suicidality and substance misuse within the bipolar subsample, as those have been among the most consistent findings in studies of retrospectively reported abuse (Maniglio 2013b). Maltreated youth with BPSD were expected to have the highest rates of suicidal ideation and substance misuse. We also explored relations between specific subtypes of childhood abuse and variations in onset, course, and comorbidities.

## Method

### Procedure

The institutional review boards for human investigation (IRB) of the University Hospitals of Cleveland, Case Western Reserve University, Applewood Centers, and the University of North Carolina at Chapel Hill approved procedures used in this research study. Participants were recruited through either a community mental health center where all families were invited to participate in the study at intake or an enriched sample drawn from a university research center where families were referred by a study coordinator based on the family's interest in a mood disorders assessment. More than two thirds of the sample consisted of families presenting to the Midwest urban community mental health center. Youth with a pervasive developmental disorder were screened out of the sample. Families were included so long as members could provide consent and complete the assessment in English. All guardians provided written consent and youths provided written assent prior to completing study procedures. Data were collected between 2003 and 2008. The present paper is a secondary analysis of a subset of the variables.

### Participants

Participants were 829 youths who ranged in age from 4 years 11 months to 18 years 0 months ($M$=10.9, $SD$=3.4). Approximately 60 % were male; 69 % were African American, 22 % Caucasian, 2 % Hispanic, and 6 % other racial/ethnic minorities or biracial groups. The median family annual income, assessed by the Hollingshead Four Factor Index of Social Status (Hollingshead 1975), in this sample was $12,500. The sample included 152 participants (18 %) who met criteria for bipolar spectrum disorders. Of those, 34 % met criteria for bipolar not otherwise specified (BPNOS), 34 % for cyclothymia, 20 % for bipolar I, and 12 % for bipolar II disorder. In the overall sample 11 % endorsed physical abuse only, 10 % sexual abuse only, and 5 % reported both types of abuse based on consensus assessment methods described below. Table 1 presents means and standard deviations for key variables as a function of bipolar spectrum and abuse status. Independent samples $t$-test were conducted to determine whether there were group differences among bipolar versus non-bipolar cases in the key areas of functioning. On almost all variables assessed, youth with bipolar spectrum disorders demonstrated worse functioning than youth without bipolar spectrum disorders.

### Measures

*General Behavior Inventory (GBI; Depue et al. 1981)* The General Behavior Inventory is a self-report instrument that contains 73 questions rating depressive, hypomanic, and mixed mood symptoms on a scale of 0–3 (Danielson et al. 2003). The GBI has been adapted for parent report (PGBI) as well (Youngstrom et al. 2001). This study used both versions. Youth between 11 and 17 years of age completed the self-report version, and primary caregivers completed the parent-version for youth 5–17 years of age. The instrument yields hypomanic/biphasic and depression scales that have excellent reliability and validity, with all alphas>0.90 in the present sample.

*Achenbach System of Empirically Based Assessment (Achenbach and Rescorla 2001)* Primary caregivers completed the 2001 version of the Child Behavior Checklist (CBCL) and youths age 11 and older completed the Youth Self Report (YSR). Present analyses were based on the age- and sex-normed $T$-scores.

**Table 1** Descriptive statistics stratified by bipolar and abuse status

| | Bipolar status | | | | | Abuse status | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Bipolar spectrum diagnosis | | No bipolar diagnosis | | | Sexually abused only | | Physically abused only | | Sexually and physically abused | | Not abused | |
| | *n*=152 | | *n*=667 | | | *n*=82 | | *n*=87 | | *n*=49 | | *n*=592 | |
| Variables | *M* | *SD* | *M* | *SD* | *t* | *M* | *SD* | *M* | *SD* | *M* | *SD* | *M* | *SD* |
| General Functioning | | | | | | | | | | | | | |
| CGAS-Current | 47.6 | 6.5 | 53.7 | 8.6 | 9.9*** | 52.0 | 9.0 | 50.7 | 89 | 48.8 | 10.0 | 53.2 | 8.2 |
| CGAS-Worst Past Year | 43.6 | 7.3 | 49.9 | 9.1 | 8.0*** | 48.1 | 9.7 | 46.7 | 7.6 | 42.4 | 9.7 | 49.5 | 8.9 |
| CGAS-Best Past Year | 57.8 | 9.9 | 62.5 | 10.9 | 5.1*** | 63.9 | 12.7 | 59.8 | 10.9 | 57.7 | 11.3 | 61.8 | 10.4 |
| Number of Axis I Dxs | 4.4 | 1.8 | 3.6 | 1.7 | −5.6*** | 4.3 | 2.1 | 4.0 | 1.8 | 4.8 | 2.1 | 3.5 | 1.6 |
| Global Family Environ. | 65.6 | 13.1 | 68.5 | 11.2 | 2.5* | 65.7 | 12.8 | 62.3 | 12.3 | 60.4 | 13.9 | 69.7 | 10.7 |
| *Mood Severity* | | | | | | | | | | | | | |
| KSADS Mania | 36.5 | 8.9 | 16.5 | 4.5 | −26.6*** | 21.4 | 10.6 | 19.9 | 8.4 | 23.9 | 13.0 | 19.9 | 9.2 |
| KSADS Depression | 29.3 | 9.1 | 19.9 | 8.0 | −12.7*** | 25.5 | 10.3 | 23.2 | 9.0 | 25.6 | 10.2 | 20.6 | 8.5 |
| Mood Lability (KMRS Item #13) | 3.0 | 1.4 | 1.5 | 0.9 | −16.9*** | 1.8 | 1.2 | 1.7 | 1.1 | 2.0 | 1.5 | 1.8 | 1.2 |
| PGBI Hypomanic-Biphasic | 32.4 | 15.1 | 18.5 | 13.4 | −11.2*** | 19.1 | 12.0 | 23.4 | 16.0 | 24.8 | 13.6 | 20.5 | 14.9 |
| PGBI Depression | 42.2 | 23.7 | 24.3 | 21.2 | −9.1*** | 29.6 | 22.4 | 32.4 | 24.0 | 35.8 | 26.6 | 25.6 | 22.2 |
| AGBI Depression | 44.3 | 29.2 | 39.8 | 28.1 | 1.4 | 50.4 | 31.1 | 39.2 | 28.3 | 53.5 | 27.0 | 37.4 | 27.4 |
| Substance Use | 0.5 | 1.2 | 0.4 | 1.1 | −0.3 | 0.3 | 0.9 | 0.7 | 1.3 | 1.1 | 1.8 | 0.4 | 1.1 |
| Suicidality | 0.7 | 0.7 | 0.5 | 0.6 | 4.8** | 0.7 | 0.7 | 0.7 | 0.7 | 0.9 | 0.7 | 0.4 | 0.6 |
| Socioeconomic Status | 4.5 | 1.2 | 4.3 | 1.2 | −2.4* | 4.2 | 1.2 | 4.3 | 1.1 | 4.2 | 1.2 | 4.3 | 1.2 |

*CGAS* Child Global Assessment Scale, *P-GBI* Parent General Behavior Inventory, *A-GBI* Adolescent General Behavior Inventory, *KSADS* Kiddie Schedule for Affective Disorders and Schizophrenia, *KMRS* KSADS Mania Rating Scale

Socioeconomic status was assessed via caregiver educational attainment on the Hollingshead (1975) measure and ranged from 1=elementary school education to 8=completed graduate school. *$p \leq 0.05$, **$p \leq 0.01$, ***$p \leq 0.001$

*Schedule for Affective Disorders and Schizophrenia for Children and Adolescents (KSADS-PL; Kaufman et al. 1997)* The KSADS is a semi-structured clinical interview designed to assess DSM-IV criteria for Axis I mood disorders. The PL-Plus version incorporates additional questions about mood symptoms drawn from the WASH-U mood modules of the KSADS (Geller et al. 2001). For this project, the entire depression and mania modules were administered to all participants; there were no "skip outs." This insured that information would be available about subthreshold presentations and that information about suicidality was systematically gathered from all participants regardless of diagnosis. For symptoms to be coded in the depression or mania section, they had to involve an episodic presentation with a clear change in functioning from the youth's baseline (Youngstrom 2009). If the same symptom, such as poor concentration, was chronically present but showed episodic worsening, then it was possible to code the symptom in both mood and non-mood sections of the KSADS, but it required additional probing in both sections. This procedure emphasized the episodic presentation of mood disorders, including bipolar NOS, and reduced the "double counting" of symptoms, generating lower estimates of diagnostic comorbidity than have been reported in other samples (Kowatch et al. 2005).

Clinicians administered the interview to parents and youth sequentially. Raters included doctoral-, predoctoral-, master's-, and bachelor's- level researchers and research assistants trained in administering the KSADS. Inter-rater reliability exceeded kappa=0.85 among all raters. Final diagnoses were based on a consensus conference involving at least one doctoral level clinician and the KSADS rater, but excluding the screening questionnaires. The present analyses used severity scores based on the KSADS Mania Rating Scale and KSADS Depression Rating Scale (Axelson et al. 2003), which provide more complete coverage of the DSM-IV symptom criteria and are more developmentally appropriate than older versions of mood rating scales. The KSADS interview also captured information about affective lability and mood changes within the same day (Item #13 on the KSADS Mania Rating Scale), as well as information about the number of Axis I diagnoses, number of episodes of hypomania, mania, and depression, along with the duration of the episodes. Suicidality and non-suicidal self-injury were also rated based on the KSADS interview of both caregiver and youth. The interviewer also made a global rating of the youth's level of functioning from a low of 1 to a high of 100 using the Children's Global Assessment Scale (CGAS; Shaffer et al. 1983) and a global

rating of the family environment using a 1 to 90 scale (GFES; Rey et al. 1997); in both cases high scores indicate better functioning.

*Child Abuse History* Physical and/or sexual abuse history was determined by using the KSADS-PL-PLUS interview of both parents and youth as well as a review of the medical record and Department of Child and Family Services (DCFS) records. The operational definition was not limited to "founded" or prosecuted cases, but also included cases where there was a clinical diagnosis of "rule out abuse."

*Substance Use* KSADs interviews directly assessed substance use. Because people may under-report substance use in an interview (Lucas et al. 1999), the operational definition also included responses on parent and youth checklists asking separately about alcohol, tobacco, and other drugs (Achenbach and Rescorla 2001). Present analyses used the higher score from either the youth or caregiver report, maximizing the sensitivity based on prior research indicating that informants are more likely to report substance issues on a checklist or to a computer than in a face-to-face interview (Lucas et al. 1999).

Analytic Plan

Aim 1: Chi-squared assessed whether higher rates of abuse occurred in youth with BPSD than youth without BPSD. Examination of the adjusted standardized residuals isolated cells with significant effects (Agresti 2002).

Aim 2: Cox regression analyses, which allow for prediction of the time to a specific event, assessed whether abuse predicted age of onset of any mood disorder in youth, as well as BPSD in particular. Tests of association between abuse status and symptom severity, course, and duration of disorder used regression analyses for variables measured continuously, and chi-squared tests for categorically distributed variables. Square root transformations improved the normality of variables with skewness>2, and the natural log was used for skewness>5 (Tabachnick and Fidell 2007). We present correlations for the full sample as well as the BPSD subsample.

Aim 3: Regression analyses and chi-squared determined whether abuse in youth with BPSD was associated with greater comorbidity and suicidality. Nominal regression tested whether abuse remained associated with suicidality after controlling for age and gender, which have previously been associated with suicidality within this sample of youths with bipolar disorders (Algorta et al. 2011).

Sensitivity Analyses: To evaluate the robustness of findings and unique associations with bipolar status, we repeated analyses using covariates to adjust for family SES and any other demographic variables that differed significantly between the bipolar spectrum and non-bipolar groups. Nominal regression analyses replaced chi-squared analyses to incorporate covariates. Although SES was significantly associated with some of the dependent variables (GFES, P-GBI Hypomanic/Biphasic variables only), it was not related to most of the dependent variables and inclusion SES as a covariate did not alter the overall pattern of findings. Therefore, separate results are not presented for these additional analyses.

## Results

Aim 1: Is Abuse Related to BPSD?

Results revealed that more than 30 % of youth with BPSD experienced childhood abuse: 10 % of youth with BPSD experienced sexual abuse only, 9 % experienced physical abuse only, and 11 % experienced both (see Table 2). Rates of overall abuse, physical abuse, and sexual abuse were not significantly different between youths with BPSD versus those without. However, youths with bipolar illness were significantly more likely to have experienced both kinds of abuse together: 11 % versus only 5 % of the youths without a bipolar diagnosis, $X^2$ (2)=6.46, $p$=0.040.

Aim 2: Do Youth with BPSD and Histories of Abuse Have More Severe Symptoms, Course and Duration of Episode?

In Cox regressions, physical and sexual abuse status did not significantly predict age of onset for any mood disorder (Bipolar or Depression spectrum) or age of onset for depression or hypomanic episodes. Regression analyses conducted on youth with BPSD to determine the unique contributions of physical and sexual abuse in predicting youth functioning and symptomatology revealed many significant findings. Table 3 presents the correlation between abuse status and each criterion. It also includes the multiple $R$ from regressions testing how much of the variance the two types of abuse could explain together, and part correlations indicating the unique

**Table 2** Abuse rates in youths with versus without bipolar spectrum disorders

| | Bipolar status | |
|---|---|---|
| | No bipolar diagnosis | Bipolar spectrum diagnosis |
| Abuse Status (KSADS) | *n (%)* | *n (%)* |
| Sexually Abused Only | 66 (10 %) | 15 (10 %) |
| Physically Abused Only | 72 (11 %) | 14 (9 %) |
| Sexually and Physically Abused | 32 (5 %) | 16 (11 %) |
| Not Abused | 480 (74 %) | 106 (70 %) |

**Table 3** Correlations, unique effects (part correlations) and combined effects (multiple R) of physical and sexual abuse on general functioning and mood variables

| | Bivariate correlation | | Part correlation | | |
|---|---|---|---|---|---|
| Variable | Physical | Sexual | Physical | Sexual | *R* (Physical & Sexual) |
| *FULL SAMPLE (N= 796)* | | | | | |
| Current Functioning CGAS | -0.13** | -0.09* | -0.12* | -0.06 | 0.15*** |
| Best Past Year Functioning CGAS | -0.10** | 0.00 | -0.11** | 0.03 | 0.11* |
| Worst Past Year Functioning CGAS | -0.17*** | -0.13** | -0.15*** | -0.09* | 0.19*** |
| Number of Axis I Diagnoses | 0.14** | 0.20*** | 0.10** | 0.17*** | 0.22*** |
| Global Family Environment Scale | -0.25*** | -0.16** | -0.21*** | -0.11** | 0.27*** |
| Alcohol or Drug Use | 0.15*** | 0.07 | 0.13*** | 0.03 | 0.15*** |
| Non-Suicidal Self Injury | 0.13** | 0.08 | 0.11** | 0.05 | 0.14** |
| P-GBI Hypomanic/Biphasic | 0.09** | 0.01 | 0.09** | -0.01 | 0.10* |
| A-GBI Hypomanic/Biphasic ($n$=456) | 0.08 | 0.14** | 0.04 | 0.13* | 0.15* |
| P-GBI Depression | 0.12** | 0.09* | 0.09** | 0.06 | 0.14** |
| A-GBI Depression ($n$=456) | 0.08 | 0.19*** | 0.03 | 0.18*** | 0.19*** |
| *Bipolar Subsample (n= 150)* | | | | | |
| KSADS-Mania (KMRS) | 0.10 | 0.19* | 0.03 | 0.17* | 0.20 |
| P-GBI Hypomanic/Biphasic | 0.13* | -0.09 | 0.18* | -0.15 | 0.20 |
| A-GBI Hypomanic/Biphasic ($n$=95) | 0.09 | 0.06 | -0.10 | -0.16 | 0.09 |
| KSADS-Depression (KDRS) | 0.29** | 0.10 | 0.27** | -0.01 | 0.29** |
| P-GBI Depression | 0.23** | -0.02 | 0.26** | -0.12 | 0.26* |
| A-GBI Depression ($n$=95) | 0.10 | 0.12 | 0.05 | 0.08 | 0.02 |
| Mood Changes within Same Day (KSADS) | 0.07 | 0.28** | -0.01 | 0.27** | 0.28** |
| Mood Lability (KSADS) | 0.04 | 0.05 | 0.02 | 0.04 | 0.10 |
| Number of mood episodes (LN) (KSADS) | 0.12 | 0.13 | 0.09 | 0.10 | 0.15 |

*CGAS* Child Global Assessment Scale, *P-GBI* Parent General Behavior Inventory; *A-GBI* Adolescent General Behavior Inventory, *KSADS* Kiddie Schedule for Affective Disorders and Schizophrenia, *LN* the natural log transformation of the number of mood episodes was used for the regressions

* $p<0.05$, ** $p<0.005$, *** $p<0.0005$, two-tailed

relationship of each type of abuse when controlling for exposure to the other type of abuse. Finally, Table 3 provides additional detail about mood status for the subset of bipolar cases. The effects of physical and sexual abuse appeared to be largely distinct. There was little difference between the bivariate and part correlations, showing that most of the relationship was unique and not shared between physical and sexual abuse. When both types of abuse were present, the effect was additive, with the possible exception of substance use being markedly higher in the group with combined exposure to physical and sexual abuse, $p<0.01$ for the interaction term.

Physical abuse predicted lower CGAS scores and worse ratings on the Global Family Environment Scale, all $p<0.005$. Physical abuse also predicted increased non-suicidal self injury, $r=0.13$, $p<0.005$. Within the BPSD subsample, physical abuse showed a stronger relationship to increased depressive symptoms than to manic symptoms, with significant correlations with the interview-rated depression and PGBI Depression scores, but not youth AGBI scores or interview mania scores.

Sexual abuse also made an incremental contribution to the prediction of family environment and worst past year functioning (all $p<0.050$). In the full sample, sexual abuse showed significant associations with youth-reported AGBI Depression, $r=0.19$, $p<0.001$, AGBI Hypomanic/Biphasic scores, $r=0.14$, $p<0.005$; and PGBI Depression, $r=0.09$, $p<0.05$. Within the BPSD subsample, sexual abuse correlated with KSADS Mania Scores and reports of mood changes within the same day, but not depression scores from any informant. Neither physical nor sexual abuse showed a significant relationship to the number of mood episodes, to the duration of the mood episode, to interview-based ratings of mood lability, or to the number of psychiatric hospitalizations for the youth. Additional analyses explored correlations with the CBCL and YSR scales, but no correlations were significant except for YSR Externalizing and Delinquent Behavior showing a positive correlation with physical abuse, $r=0.30$, $p<0.001$ (supplemental tables available upon request from the author).

Aim 3: Are Greater Suicidality, Co-Morbidity, and Substance Misuse Found among Youth with BPSD Who Have Been Abused?

There was a significant association between abuse history and suicidality, both within the full sample, $X^2(6\ df)=42.45$, $p<0.001$, and when limited to the smaller subsample with BPSD, $X^2(6\ df)=14.63$, $p<0.050$ (see Table 4). The adjusted standardized residuals (Agresti 2002) indicated that the no abuse group was over-represented in the "non-suicidal" group. Conversely, those youth with BPSD with a combined history of physical and sexual abuse had significantly higher rates of suicide attempts. In the BPSD subsample, a nominal regression found that physical abuse tended to triple the odds of suicidal ideation ($p=0.066$), and more than quadrupled the odds of a suicide attempt ($p=0.019$), even after controlling for sexual abuse history. A similar pattern held in the full sample: Physical abuse doubled the odds of ideation ($p=0.001$), and both physical and sexual abuse each incrementally tripled the odds of suicide attempt (both $p<0.001$). The effects of abuse remained significant even after controlling for age and gender, which themselves were also significant predictors of suicidality.

In both the full sample, and the BPSD subgroup, both types of abuse were associated with the youth meeting criteria for significantly more Axis I diagnoses. Table 3 shows the correlations and part correlations for the abuse variables with the count of diagnoses. Regression analyses within the BPSD subgroup found that physical abuse correlated 0.17 with count of diagnoses, sexual abuse correlated 0.27, and the two together correlated $R=0.28$, $p=0.002$. However, only sexual abuse made a significant unique contribution within the BPSD subsample, predicting an additional 1.1 diagnoses among cases with a history of abuse, $p=0.005$.

PTSD was significantly associated with abuse status in youth with BPSD, $X^2(3df)=8.70$, $p<0.050$. A comorbid PTSD diagnosis was made in 20 % of youth with physical abuse, 7 % of youth with sexual abuse, 19 % of youth with both types of abuse, and 4 % in youth without any abuse. PTSD was significantly more likely in youths with physical abuse or both physical and sexual abuse, and it was less likely in youths with no abuse. No significant associations were found between abuse status and either acute stress disorder or psychotic symptoms.

Finally, physical abuse was associated with significantly higher levels of substance use within the BPSD subsample, $F(1,129)=10.26$, $p=0.002$, corresponding to a medium effect size of $d=0.56$, although rates of abuse were low overall, perhaps due to the age range. Sexual abuse was not associated with substance use, nor did it interact with physical abuse in the BPSD subsample (although it did in the larger sample, as mentioned above).

**Table 4** Cross-tabulations of abuse status by suicidality for youth with bipolar disorder

| Abuse Status (KSADS) | Non-suicidal | Suicidal ideation | Suicide attempts |
|---|---|---|---|
| Not Abused | 48 (45 %)* | 48 (45 %) | 9 (20 %)** |
| Sexually Abused Only | 6 (40 %) | 6 (40 %) | 3 (20 %) |
| Physically Abused Only | 3 (21 %) | 8 (57 %) | 3 (21 %) |
| Sexually and Physically Abused | 3 (19 %) | 7 (44 %) | 6 (38 %)** |

$X^2$ (6 $df$)=14.63, $p<0.05$. The cells with significant discrepancies between the observed and expected frequencies are: more non-abused cases than expected in the non-suicidal group, fewer non-abused cases in the suicide attempts group, and more of the "both physically and sexually abused" among the suicide attempters than expected, *$p<0.05$, **$p<0.005$

## Discussion

Advancing previous research on associations between BPSD and childhood abuse, the current study utilized state-of-the-art assessment procedures for BPSD and mood symptomatology in youth to examine rates of physical and sexual abuse, comorbidity, symptom severity, duration and course of mood episodes, suicidality, and substance misuse in youth with BPSD. Addressing significant limitations in prior research, the current study concurrently gathered information on both abuse and current diagnosis, utilized clinically documented reports of abuse, and enrolled a broad, unselected sample of youth presenting for clinical services, allowing for determination of specificity of risk for BPSD. We concentrated on correlates identified by prior studies (Maniglio 2013a; Sugaya et al. 2012); and rather than testing unadjusted correlations, we used regression analyses to test for incremental effects of abuse.

Our study found near equal abuse rate in patients with BPSD (30 %) and without BPSD (26 %), with no difference in the rates of physical or sexual abuse, but with the BPSD group being significantly more likely to have experienced the combination of both forms of abuse, consistent with adult bipolar findings by Etain et al. (2010). These results confirm the clinical observation that there is a high rate of abuse among cases with bipolar disorder, but also replicate the conclusion from a recent systematic review that abuse is not a specific risk factor limited to bipolar disorder (Maniglio 2013b). A large epidemiological study found that childhood abuse was associated with significantly increased odds of PTSD and ADHD as well as bipolar disorder (Sugaya et al. 2012). The prevalence of PTSD was similar to BPSD, and the prevalence of ADHD far more common, in the present sample. Prior studies finding an association between abuse and risk of bipolar illness often did not systematically assess for or rule out

ADHD, especially in evaluations of adult patients. Thus an artifact of undetected ADHD might have created the impression that abuse showed a more specific relation to bipolar disorder in prior studies.

Neither physical nor sexual abuse history predicted age of onset for BPSD or any mood-related episodes or disorders in this pediatric sample seeking outpatient services. Rates of abuse were substantially lower than some prior research (e.g., Garno et al. 2005; Marchand et al. 2005), but consistent with other previous studies utilizing similar stringent, concurrent, clinically-documented reports of abuse rather than retrospective self-reports utilized in many other previous studies. For example, Romero et al. (2009) also assessed abuse with the KSADS and found 20 % of youth with BPSD had experienced physical or sexual abuse. The more stringent assessment procedures may be presenting a more accurate picture of frequency of clinically significant abuse occurring in youth with BPSD. Furthermore, our findings suggest a general association between abuse and pathology, rather than a specific risk factor for BPSD.

Although physical and sexual abuse were not significantly more common in youths with BPSD than in other youths seeking outpatient mental health services, nor did they appear associated with an earlier age of onset in a pediatric sample, they were associated with a more severe and complex clinical presentation (Maniglio 2013a). Both physical and sexual abuse in youth with BPSD were associated with poorer general functioning and more disrupted family environments. Sexual abuse was significantly associated with greater severity of KSADS manic symptoms and mood lability; and physical abuse was significantly associated with a greater severity of parent-reported depressive and manic symptoms as well as KSADS Depression scores among youth with BPSD. The effect between physical abuse and the severity of depression within bipolar spectrum makes sense in light of the strong relationship unipolar depression has with childhood physical abuse (Fergusson and Lynskey 1997) and the finding that childhood physical abuse is significantly related to a family history of depression (Leverich et al. 2002). Furthermore, our findings are consistent with previous work suggesting that sexually abused youth with BPSD are more likely to have emotional instability or rapid relapse (Garno et al. 2005; Hammersley et al. 2003; Leverich et al. 2002). Interestingly, neither physical nor sexual abuse showed significant associations with other syndrome scales on the CBCL or YSR within the BPSD subsample. These results suggest that within BPSD, abuse is more specifically associated with mood dysregulation than other aspects of social or behavioral problems, consistent with recent findings using laboratory performance measures of affective processing in a sample of youths with BPSD (Russo et al. 2013).

Consistent with past studies, abuse was significantly associated with greater psychiatric comorbidity. Physical abuse in particular was associated with greater incidence of PTSD diagnosis in youth with BPSD and in the overall sample (Sugaya et al. 2012). Contrary to previous work, however, we did not find greater prevalence of psychosis in abused youth with BPSD. This may be due in part to the low rates of psychosis found in our sample. Estimates of psychosis rates within bipolar disorder vary widely depending on the operational definitions used (cf. Findling et al. 2001; Kowatch et al. 2005; Tillman et al. 2008).

Consistent with some prior work (Garno et al. 2005), suicidal ideation was not correlated with either physical or sexual abuse in our sample. Suicide attempts, however, were associated with both sexual and physical abuse in the bipolar sample, with physical abuse more than quadrupling the odds of an attempt even when controlling for sexual abuse history as well as demographic features previously found to be associated with attempts (Algorta et al. 2011). Similarly, physical abuse correlated with greater reports of non-suicidal self-harming behaviors in youth with BPSD as well as in the full sample.

Physical abuse in particular, was significantly related to current alcohol/drug use by the youth in our sample, whereas Garno et al. (2005) found that emotional abuse/neglect influenced substance misuse. These may be loosely consistent findings, as our study did not have a direct measure of emotional abuse or neglect. Furthermore, this was the one instance where there was a statistically significant interaction between physical and sexual abuse: physical abuse correlated with increased substance use, but the combination of sexual and physical abuse correlated at even higher rates. Garno et al. did not report test results for interaction effects. Other possible factors contributing to the difference with regard to the role of sexual abuse could include the fact that our data were more concurrent instead of long-term retrospective. Another possibility is that our younger participants had not yet developed substance misuse issues that could occur in adulthood, potentially still as delayed sequelae of the abuse. Our sample was also different demographically, with lower SES and higher participation by African American families, who have lower rates of substance use in childhood and adolescence (SAMSHA 2012). Finally, these findings should be considered preliminary due to the low number of abused youths with BPSD who used substances.

Limitations of the study include the potential confounding of race and SES due to drawing participants from a low-income community mental health setting. Additionally, our methods for coding abuse had high specificity and few false positives by virtue of requiring clinical confirmation, but they may also have lowered sensitivity to abuse. Finally, consideration of abuse severity and frequency was not assessed; previous research suggests a dosage effect may be in play regarding abuse's impact on bipolar disorder (Etain et al. 2010). Our reliance on a pediatric sample seeking mental health services

was a strength in that it avoided problems with long-term retrospection and provided a strong test of whether abuse showed specific relations to bipolar disorder, but it also meant that cases with adult onset bipolar disorder had not yet displayed the condition (e.g., they were "right censored" in the parlance of event history models) and may not even have sought services yet.

Based on our findings suggesting that abuse may be fairly common in treatment seeking samples, clinicians should screen children for abuse (e.g. The UCLA-PTSD; Steinberg et al. 2013) when considering a bipolar spectrum diagnosis, and pay particularly close attention to reports of physical and sexual abuse. If the clinician learns first about the abuse, then assessment should probe for PTSD and ADHD as well as bipolar disorder (Sugaya et al. 2012), recognizing that many of the symptoms may overlap between the disorders.

A history of abuse, especially physical abuse, may be associated with an increased risk for self-harm, suicide attempts, substance use, and greater severity of illness for youth not just with BPSD, but in general with any clinical diagnosis. Furthermore, given the worse course and severity of mood disturbance found in youths with BPSD who have been abused, it is plausible that these youths may not respond as well to treatment or may be at greater risk for needing intensive services. Trauma-Focused Cognitive Behavioral Therapy (Cohen et al. 2004), which is designed to decrease interpersonal stress associated with abuse and to improve family functioning, may be warranted. These associations appear to manifest even in childhood and adolescence in a treatment seeking sample, underscoring the need for early identification and intervention.

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**Conflict of Interest** The authors declare that they have no conflict of interest.

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