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Predictors of Longitudinal Psychosocial Functioning in Bipolar Youth Transitioning to Adults

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Abstract

Objectives: In a sample of participants diagnosed with Bipolar Disorder (BD) in youth, we aim: 1) to examine longitudinal psychosocial functioning; 2) to determine whether psychosocial

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impairment remains in those who remitted from mood disorders during later periods of follow-up; 3) to examine predictors of psychosocial impairment despite symptomatic remission.

Method: A Course and Outcome of Bipolar Youth subsample of 367 (4 years follow-up data) were grouped into mood trajectories: Class 1 *Predominantly Euthymic*; Class 2 *Moderately Euthymic*; Class 3 *Ill with Improving Course*; Class 4 *Predominantly Ill*. Psychosocial functioning was assessed via Children's Global Assessment Scale (C-GAS) for those under age 22; Global Assessment of Functioning (GAF) scale after 22. Current school, employment, and disability status were examined. Established predictors of symptomatic impairment were analyzed.

Results: The *Predominantly Euthymic* Class had better psychosocial functioning, and were more likely to be in school/employed. The *Persistently Ill* Class had worse psychosocial functioning, and were more likely to receive disability. However, 44% of *Predominantly Euthymic* and 93% of *Ill with Improving Course* participants continued to experience current psychosocial impairment. Early BD onset, low Socioeconomic Status (SES), and current comorbidity, predicted poor psychosocial functioning. Low SES, and current comorbidity, predicted no school enrollment/ unemployment.

Limitations: The study does not have a healthy control group to compare functioning findings.

Conclusions: In general, youth with persistent mood symptoms had worse psychosocial functioning, moreover, those with remitted symptoms still exhibited current psychosocial functioning deficits. High risk individuals with predictors of impairment should be targeted for functioning interventions.

1. Introduction

While the Diagnostic and Statistical Manual of Mental Disorders-IV and 5 (DSM-IV/5) criteria for depression, mania, and hypomania episodes require that symptoms be associated with marked psychosocial impairment or change in psychosocial functioning (Association, 2004), little is known about how psychosocial functioning may evolve longitudinally from youth through young adulthood in Bipolar Disorder (BD) youth. Studies that have examined psychosocial functioning during this transitional period have been limited by their recruitment of adults reporting retrospectively on past functioning, and the use of a cross-sectional design (Ernst and Goldberg, 2004; Leverich et al., 2007; Suominen et al., 2007; Tasha, 2003).

The Course and Outcome of Bipolar Youth (COBY) study, a multi-site longitudinal research study of youth with BD followed into adulthood, provides a unique opportunity to examine longitudinal psychosocial functioning outcomes. Early findings from the COBY study sample at intake suggest significant psychosocial functional impairment (Goldstein et al., 2009). Prospectively assessed psychosocial impairment has not yet been examined in this sample of BD, however.

The Collaborative Depression Study (CDS), which used similar instruments to COBY's, identified an increase in poor functioning emerging in the third decade in participants whose BD onset before age 20 (Coryell et al., 2013; Fiedorowicz et al., 2012; Judd, 2008; Solomon et al., 2004), highlighting the importance of examining longitudinal changes in psychosocial functioning into adulthood, as well as predictors of poor functioning. CDS also found that functional impairment persisted after symptom remission (Judd, 2008; Solomon et al., 2004), which suggests that the trajectories of mood symptomatology and psychosocial functioning do not necessarily correspond.

There is good support in the literature to indicate that there is also psychosocial functional impairment in other severe psychiatric disorders. Further, this impairment has similarly been shown to persist after symptomatic remission. For example, studies on schizophrenia have found that participants experience poor psychosocial functioning, which is constant after their "positive" symptoms have remitted (Harvey, 2013, 2014; Harvey et al., 2012; Strassnig et al., 2018). Similarly, studies on personality disorders have noted that participants have substantial deficits in psychosocial functioning, remaining significantly impaired after behavioral improvement (Gunderson et al., 2011; Skodol et al., 2005a; Skodol et al., 2005b; Zanarini et al., 2007).

Thus, based upon these findings, we hypothesized that psychosocial functioning impairment may persist even after mood symptoms remit. This persistence of poor functioning may have several important clinical implications. It highlights the importance of early intervention to directly and aggressively target areas of functional impairment (e.g., vocational rehabilitation, increasing supportive networks) and continuing the assessment of functional impairment even after symptoms remit.

In order to assess longitudinal psychosocial functioning, and specifically whether those who experience symptomatic remission continue to have functional impairment, we utilized mood symptom morbidity Classes derived from Latent Class Growth Analyses (LCGA) from a prior COBY report (Birmaher et al., 2014). This sample included 367 participants (≥ 4 years follow-up), and were grouped into Class 1 *Predominantly Euthymic* (n=98/357; 27.5%); Class 2 *Moderately Euthymic* (n=117/357; 32.8%); Class 3 *Ill with Improving Course* (n=53/357; 14.8%); and Class 4 *Predominately Ill* (n=89/357; 24.9%).

Given the above, the aims of this study were as follows: 1) to investigate longitudinal psychosocial functioning in each of these four Classes; 2) to examine psychosocial impairment in those who are symptomatically euthymic; and 3) to examine predictors of psychosocial impairment despite symptomatic remission. We predicted that: (1) participants with more symptomatic mood trajectories would have greater psychosocial impairment in functioning; (2) *Predominantly Euthymic* (Class 1) and *Ill with Improving Course* (Class 3) participants would remain impaired in psychosocial functioning, despite recent symptomatic remission; and (3) *Predominantly Euthymic* (Class 1) and *Ill with Improving Course* (Class 3) participants would have several significant predictors of poor functioning.

2. Method

2.1 Participants

Methods for COBY are described in detail elsewhere (Axelson et al., 2006; Birmaher et al., 2006). Briefly, the original study included 446 youths, ages 7–17.11 years at intake (enrollment October 2000-July 2006), with DSM-IV diagnosis of BD-I, BD-II, or operationally defined BD not otherwise specified (BDNOS) (Axelson et al., 2006; Birmaher et al., 2006). Because the DSM-IV definition of BD-NOS is vague, COBY BD-NOS was operationalized such that participants were required to have a minimum of elated mood plus two DSM-IV symptoms or irritable mood plus three DSM-IV symptoms, change in the level of functioning, minimum of 4 hours within a 24-hour period duration, and at least four cumulative lifetime days meeting the criteria (Birmaher et al., 2006).

Participants in the current analysis included 367 BD youths (BD-I, n=218; BD-II, n=26; BD-NOS, n=123); 47% were female, 82.1% were self-reported White (93.7% were self-reported non-Hispanic, 7.3% of the sample described themselves as Black, 1.2% Asian, 0.2% Native American, 8.5% Biracial, and 0.7% Other), 41.5% lived with both biological parents (vs 58.5% had other arrangements, including living with only one biological parent, one biological parent and one step-parent, adoptive parents, another relative, or in a residential treatment facility), and they had an average Socioeconomic Status (SES) score of 3.4 +/− 1.2, indicating Hollingshead class III (middle class) at intake (Hollingshead, 1982). This subsample was previously grouped through LCGA into the four mood trajectories noted above: Class 1 *Predominantly Euthymic* (n=88; 24.0%); Class 2 *Moderately Euthymic* (n=127; 35.0%); Class 3 *Ill with Improving Course* (n=70; 19.1%); and Class 4 *Predominately Ill* (n=82; 22.3%) (Birmaher et al., 2014). We analyzed COBY data over a median of 11.5 years of follow-up. Participants were interviewed a mean of 10.0 times (SD = 3.2), on average every 8.7 months (SD = 5.2), on clinician administered measures of psychosocial impairment, objective "real world" functioning, and established predictors of systematic impairment in BD youth, as noted below.

2.2 Procedure

The Institutional Review Board for each study site reviewed and approved the study protocol before enrollment of participants. Informed consent and assent were obtained from the participants and parents at intake. COBY research staff administered youth assessments to participants and parents in a semi-structured interview format. At 18, participants chose whether to include reports from parents or secondary informants (e.g., spouse). The research staff reviewed the participant's symptomatic and psychosocial course with a study investigator, who was ultimately responsible for the clinical ratings. The consensus scores obtained after interviewing parents, secondary informants, and participants were used for the current analyses.

2.2.1 Measures

Functional Assessments: We assessed psychosocial impairment at each follow-up interview using the widely clinically administered Children's Global Assessment Scale (C-GAS) for those under age 22 years old (Shaffer et al., 1983), and the Global Assessment of

Functioning (GAF) when 22 years old or older (Jones et al., 1995) for comparability across studies. Both are scored on a scale of 1 (extremely poor functioning) - 100 (superior functioning) by the clinical rater, and reviewed in consensus case meetings. A clinical cut off score of 70 was used to discriminate functional impairment based on prior research (Jones et al., 1995; Shaffer et al., 1983; Steinhausen, 1987).

School, Employment, and Disability Status Assessments: To describe the objective "real-world" functioning of the four Classes at the most recent follow-up interview, School Status (enrolled in College or Trade/Technical school [all participants > 18]), Employment Status (Working Full-Time [>30 hours/week]/Part-Time [30 hours/week]), and Disability Status (receiving any type of Local, State, and/or Federal benefits for Psychiatric and/or Physical Disability, and/or Low-Income Assistance; not expected by self or others to be enrolled in school and/or employed due to their psychiatric and/or physical disability) were ascertained via the most recent Demographic Follow-Up form. School enrollment, full-time employment, part-time employment, and disability were assessed for all four Classes. In one set of analyses, we operationalized our "real-world" functioning based on whether participants were either in school or working full-time. In another set of analyses, we considered whether participants were enrolled in school, or had full-time employment, or had part-time employment, as participants may work part time for reasons other than impairment (e.g., also caring for children, under-employed, but seeking full-time work).

Mood Trajectory Assessments: The weekly rating of symptoms to determine the mood trajectory Classes was ascertained using Psychiatric Status Rating (PSR) scales of the Adolescent Longitudinal Interval Follow-Up Evaluation (A-LIFE) (Keller et al., 1987) via a procedure similar to the timeline follow-back (TLFB) method. At each interview, there is a retrospective recall of weekly symptomatology from the previous interview to the current interview (M = 8.7 months, SD = 5.2 months), utilizing a calendar and several memory aids) (Sobell, 2008b). As previously reported, the reliability of the PSR in COBY is good/very good (Axelson et al., 2011). The PSR reliability of percentage of time meeting full DSM-IV diagnostic threshold for a syndromal mood episode yielded an Intraclass Correlation (ICC) = 0.85. The ICC for percentage of time without significant mood symptoms was 0.82. Reliability for PSR mood disorder ratings over the course of COBY was an average Kendall's W of 0.8.

Demographic and Clinical Assessments: Demographic data at intake examined as predictors included: age at intake, sex, race, living with both biological parents (ascertained via Youth Self-Report for Ages 11–18 at intake) (Achenbach, 1991), and SES (Hollingshead scale at intake/follow-up) (Hollingshead, 1982). Clinical variables at intake included: age of BD onset, BD subtype, family psychopathology, history of physical and sexual abuse (all assessed via K-SADS-PL (Kaufman et al., 1997)), and comorbidity at the most recent follow-up (current); meeting criteria for any Anxiety Disorder (AD), ADHD, Oppositional Defiant Disorder (ODD), Conduct Disorder (CD), Substance Use Disorder (SUD), psychosis (hallucinations and/or delusions), and suicidal ideation, all assessed via ALIFE-PSR (Keller et al., 1987). Intelligence Quotient (IQ) was assessed at intake via the Wechsler Abbreviated Scale of Intelligence (WASI) Vocabulary and Matrix Reasoning subtests (Wechsler, 1999).

These predictors have previously been established in the literature as associated with impairment in BD youth (Axelson et al., 2006; Birmaher et al., 2009; Birmaher et al., 2006; Birmaher et al., 2014; Goldstein et al., 2008; Goldstein et al., 2013; Goldstein et al., 2005; Hower et al., 2013; Romero et al., 2009a; Romero et al., 2009b; Sala et al., 2010; Sala et al., 2012; Sala et al., 2014).

2.2.2. Statistical analyses—Statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS) Version 22.

We conducted Analysis of Variance (ANOVA) (Fisher, 1921) to determine whether psychosocial functioning scores (C-GAS/GAF) averaged over follow-up differed by the four Classes. We had highlighted several sociodemographic variables that had been previously identified in COBY (Birmaher et al., 2014; Goldstein et al., 2009; Siegel et al., 2015) and other studies (Biffin et al., 2009; Forcada et al., 2011; Judd et al., 2005; Martino et al., 2017; Sbrana et al., 2007; Wilens et al., 2014) as significant predictors of clinical outcomes, and subsequently tested them in a series of univariate analyses. Variables that were significant in predicting fair/poor functioning (C-GAS/GAF < 70), including age of BD onset, IQ, and family history of substance use disorder (SUD), were subsequently incorporated into the ANOVA models as covariates. We also utilized chi-square analyses to compare the four Classes on current objective "real-world" functioning (enrolled in school, employed at work, receiving disability).

To examine functional impairment in those who have symptomatic remissions, we limited our analyses to those in Class 1 *Predominantly Euthymic* and Class 3 *Ill with Improving Course*). We further selected those participants in these Classes who reported psychosocial fair/poor functioning operationalized as C-GAS/GAF <70 (Jones et al., 1995; Shaffer et al., 1983; Steinhausen, 1987). Given that this symptomatic remission did not occur until the later years of follow-up for Class 3 *Ill with Improving Course*, we focused on the most recent follow-up, as this was a proxy for the current functioning status, when both Classes were in remission. Logistic regression analyses were used to examine predictors of psychosocial functional impairment, as well as current objective "real-world" poor functioning status (not enrolled in school, unemployed) in these two Classes.

3. Results

3.1 Intake Demographic/Clinical Characteristics of the Four LCGA Mood Trajectory Classes

As noted above, these results are based on the prospective evaluation of 367 BD participants with at least 4 years of follow-up data (median follow-up of 11.5 years) who were assigned to the four LCGA Classes (Table 1) (Birmaher et al., 2014). After intake, participants were interviewed a mean of 10.0 times (SD = 3.2), on average every 8.7 months (SD = 5.2). The age range of the participants at the final interview was 18.5–28.61 years. Attrition analyses revealed no significant differences in demographic, clinical, or functioning characteristics at intake.

Demographic differences between the four Classes are shown in Table 1 (Birmaher et al., 2014). *Predominantly Euthymic* participants were significantly older than *III with Improving Course* participants and *Predominantly III* participants. They also had higher SES than the other Classes, and were more frequently living with both biological parents than *Predominantly III* participants. There were no other significant demographic differences among Classes.

Clinical variables for the four Classes are also noted in Table 1 (Birmaher et al., 2014). *Predominantly Euthymic* participants and *Moderately Euthymic* participants had a significantly older age of BD onset than *Predominantly III* participants. *Predominantly Euthymic* participants were less likely to have experienced childhood sexual abuse (compared to *Moderately Euthymic* and *Persistently III* participants), and had a higher IQ. There were no other clinical differences among Classes, including BD subtypes.

3.2 Longitudinal Functioning of the Four LCGA Mood Trajectory Classes

Psychosocial functioning scores (C-GAS/GAF) averaged over follow-up by the four Classes were assessed (Table 2). The *Predominantly Euthymic* Class had the best psychosocial functioning (C-GAS/GAF M = 71.48, SD = 10.03), followed by the *Moderately Euthymic* Class (C-GAS/GAF M = 59.95, SD = 6.79), the *III with Improving Course* Class (C-GAS/GAF M = 59.36, SD = 8.19), and then finally the *Predominantly III* Class had the worst psychosocial functioning (C-GAS/GAF M = 53.28, SD = 6.72). There was a significant difference in psychosocial functioning between the four Classes (F = 78.80, df = 3, p < .01). This significant difference was maintained even with covariates of age of BD onset, IQ, and family history of SUD (F = 31.61, df = 6, p < .01).

3.3. Most Recent School/Employment/Disability Status of the Four LCGA Mood Trajectory Classes

School, Employment, and Disability Status by the four Classes at most recent follow-up, when all participants >18 years old (mean age 26.3 [18.7–33.7]), is depicted in Table 2. *Predominantly Euthymic* participants were significantly more likely to be enrolled in College or a Trade/Technical school, or working Full-Time, compared to participants in the other Classes. Including Part-Time Employment indicated similar results. Correspondingly, *Predominantly Euthymic* participants were significantly less likely to receive any type of Disability or Public Assistance compared to participants in the other Classes. Post-hoc comparisons of the remitted Classes (1 and 3) vs. unremitted Classes (2 and 4) indicated significant differences between groups. The remitted Classes of *Predominantly Euthymic* (Class 1) and *III with Improving Course* (Class 3) participants were significantly more likely to be in enrolled in College or a Trade/Technical school, or working Full-Time (X^2=13.55, p<.001), or Part-Time (X^2=13.92, p<.001), and were significantly less likely to receive any type of Disability or Public Assistance (X^2=13.77, p<.001) compared to *Moderately Euthymic* (Class 2) and *Predominantly III* (Class 4) participants. Additional analyses indicated that *Predominantly Euthymic* (Class 1) participants were significantly more likely to be in enrolled in College or a Trade/Technical school, or working Full-Time (X^2=10.74, p<.001), or Part-Time (X^2=4.70, p<.001), and were significantly less likely to receive any

type of Disability or Public Assistance (X^2=2.53, p<.001) compared to *III with Improving Course* (Class 3) participants.

3.4 Most Recent Functioning of Symptomatic Remission Classes

3.4.1 Most Recent Functioning—At most recent follow-up, 35.2% of the *Predominantly Euthymic* participants still demonstrated some level of current psychosocial impairment (i.e., C-GAS/GAF <70 (Jones et al., 1995; Shaffer et al., 1983; Steinhausen, 1987)). Five percent of these participants had severe impairment (C-GAS/GAF <51), 9.0% had moderate impairment (C-GAS/GAF + 51–60), and 21.1% had mild impairment (C-GAS/GAF = 61–70). A majority of *III with Improving Course* participants (60%) scored <70 on the C-GAS/GAF at most recent follow-up, with 22% of these participants reporting severe impairment, 15.7% moderate impairment, and 22.2% mild impairment. In combining the *Predominantly Euthymic* and *III with Improving Course* participants, at most recent follow-up, 49% scored <70 on the C-GAS/GAF.

3.4.2 Most Recent School/Employment Status—The majority of *Predominantly Euthymic* participants (84%) were either enrolled in school (college, technical/trade school) or had full-time employment (>30 hours/week) at most recent follow-up. For *III with Improving Course* participants, only 59% were enrolled in school or had full-time employment at most recent follow-up, despite current symptomatic remission. Fifteen percent of participants in either Class 1 or Class 3 were not enrolled in school or were unemployed at the most recent follow-up.

3.5 Poor Functioning Predictors of the Two Current Remission LCGA Mood Trajectory Classes

Predictors of psychosocial fair/poor functioning at most recent follow-up (C-GAS/GAF <70), as well as current objective "real-world" poor functioning status (not enrolled in school, unemployed), were examined for the *Predominantly Euthymic* and *III with Improving Course* participants (Table 3). Early age of BD onset, intake low SES, and most recent follow-up disability, SI, and comorbidity (AD, ADHD, DBD, SUD), predicted poor psychosocial functioning. Intake low SES, and most recent follow-up disability, SI, DBD, and SUD, predicted current non-enrollment in school and unemployment in these two Classes. Lifetime history of physical/sexual abuse, current psychosis, and family history of mania or SUD, were not significant predictors of impairment for the psychosocial C-GAS/GAF functioning, or for poor school and employment status.

4. Discussion

There were three major findings. First, consistent with our hypotheses, we observed that participants with more symptomatic mood trajectories had a greater percentage of follow-up time with poor psychosocial functioning. This difference remained despite accounting for age of BD onset, IQ, and family history of SUD. Additionally, participants with more symptomatic mood trajectories were also more likely to receive disability and less likely to be employed. Second, as hypothesized, *Predominantly Euthymic* (Class 1) and *III with Improving Course* (Class 3) participants experienced functional impairment, despite

symptomatic remission at the most recent follow-up. Third, we identified several variables (low SES at intake, SI, DBD, and SUD) that predicted poor subjective psychosocial functioning as well as objective "real-world functioning at most recent follow-up. Results of these analyses provide what we believe to be the first study to show how change in psychosocial functioning (as well as objective "real-world" school, employment, and disability status) does not correspond to prospective symptom morbidity trajectories in pediatric onset BD. These findings support initial research which suggest that, even during predominant euthymia, impairment persists (Axelson et al., 2006).

A similar set of predictors of psychosocial impairment (early BD onset, low SES, comorbidity) emerged in our study that is consistent with other studies (Carlson et al., 2010; Coryell et al., 1998; Ernst and Goldberg, 2004; Judd et al., 2003; Keller et al., 1993; Leboyer et al., 2005; Leverich et al., 2007; Perlis et al., 2004; Post et al., 2010; Suominen et al., 2007; Tasha, 2003; Turvey et al., 1999). Indeed, these factors seem to contribute to impairment throughout the life course of BD. In particular, comorbid disorders (in this study, SI, AD, ADHD, DBD, SUD) had a pervasive impact in all Classes and across psychosocial functioning, indicating that they should be high priority targets in clinical interventions.

Similar findings of predictors related to objective "real-world" functioning of enrollment in school and employment (low SES, comorbidity) reaffirm that these factors significantly affect the ability of individuals to further their education, and maintain employment. Vocational support programs (including components related to career exploration, resume building, job searching, interview preparation, supported employment, as well as executive functioning skills [e.g., time management, organizing, prioritizing]), can thus be an important component of comprehensive treatment during the transitional ages. Encouragingly, more distal variables, such as 1st and 2nd degree family history (which are not modifiable), did not seem to exert an effect on most recent functioning.

Our findings of psychosocial functional impairment persisting despite symptomatic recovery converge with those of prior research (Harvey et al., 2012; Skodol et al., 2005b; Solomon et al., 2004). However, our study is unique in that it is the first to examine psychosocial functioning over ten years of follow-up in BD youths, and examine functioning in relation to specific psychiatric morbidity trajectories. Taken together with the prior research, the results of the current study suggest that psychosocial functioning impairment begins in youth, persists through adulthood, and lags behind symptom remission.

There are many potential reasons why functional impairment may persist beyond symptomatic remission. As indicated, symptoms do drive impairment to a certain degree, and perhaps the cumulative effect of years spent in full mood episodes cause functional "scars" that cannot be easily improved. Predictors of psychosocial poor functioning (early BD onset, low SES, comorbid SI, AD, ADHD, DBD, SUD) also have a pervasive impact, and seem to contribute to psychosocial functional impairment throughout the life course of BD. Perhaps those individuals with any combination of the predictors are genetically and/or environmentally predisposed to experience enduring impairment in psychosocial functioning, and may have early deficits that are too complex to overcome without early, targeted interventions.

Increasing our knowledge of the psychosocial impairments experienced by people with BD has valuable implications for treatment. Indeed, our findings highlight the importance of early (secondary) intervention in the BD course if possible, not only to ameliorate acute initial symptomatic presentations, but also to lessen, or possibly prevent, lifelong functional impairment. Given that most treatment is provided during later (tertiary) intervention, and that functioning can change over time, it is also imperative to have ongoing assessments of psychosocial adjustments. For example, during follow-up medical and therapeutic appointments, providers should inquire as to how the person is functioning, and address any areas of intervention. This could include treatments such as medication adjustments, individual, family, and group therapy, vocational rehabilitation, life skills coaching, and cognitive rehabilitation, which has become a standard treatment for the functional impairments of schizophrenia, as well as adolescents and young adults with BD (Deckersbach et al., 2010; Torrent et al., 2013; Vieta and Torrent, 2016).

4.1   Limitations

The results of this study need to be taken in the context of the following limitations. First, the majority of participants were self-reported White (reflecting the race distribution of the general population in the metropolitan areas surrounding each study site at the time of original enrollment), and were recruited from clinical settings, which may limit the generalizability of the results. Nonetheless, course/morbidity in non-clinically referred BD youth have been shown to be similar to those in referred populations (Lewinsohn et al., 2000). Second, as a longitudinal phenomenology study of BD youth, COBY did not recruit a cohort of control youth, so we cannot draw conclusions on functioning relative to healthy controls. Third, despite efforts to obtain precise information, the data collected through the A-LIFE (via a method similar to TLFB) are subject to retrospective recall bias. Nevertheless, TLFB has been used extensively for > 30 years in clinical and nonclinical research studies (Sobell, 2008a). Fourth, the C-GAS/GAF are based upon subjective clinician ratings of psychosocial functioning at a single point in time (at each follow-up assessment for this study). However, they were chosen as the primary outcome measures given their wide clinical administration, validated clinical cut-off scores, and comparability across many different studies. Fifth, there are limitations to our cognitive assessments. At intake, the WASI was administered, but there was a large number of missing data; thus while we controlled for IQ as assessed by WASI, this was only based on a subset of the sample. A more comprehensive IQ evaluation should be examined in other studies. Finally, the examination of treatment effects was beyond the scope of the current study, particularly as COBY is a naturalistic study in which treatment was highly variable and interdependent with symptomatic and functioning outcomes. Nevertheless, our results indicate psychosocial functional impairment, even among those with predominantly euthymic or improved symptoms.

5.   Conclusions

In summary, youth with persistent mood symptoms had poorer psychosocial functioning, moreover, those with predominantly euthymic or those with improved symptoms still exhibited current psychosocial functioning deficits. These results have several clinical

implications, including the importance of targeting high risk individuals (e.g., those with above noted predictors of poor functioning, including early age of BD onset, low SES, disability, comorbidity) for early and ongoing assessment of psychosocial adjustment, and providing functioning treatment interventions which are applicable over the life course, regardless of symptomatic remission.

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Highlights:

- Youth with persistent mood symptoms had worse psychosocial functioning

- Youth with persistent mood symptoms were more likely to receive disability

- Youth with remitted symptoms still exhibited current psychosocial functioning deficits

- Several variables predicted psychosocial impairment in youth with remitted symptoms

- Similar variables predicted no school/unemployment in youth with remitted symptoms

Table 1

Intake Demographic and Clinical Characteristics of Youths with Bipolar Disorder of the four Latent Class Growth Analyses (LCGA) Mood Trajectory Classes.

	Class 1 Predominantly Euthymic (n=88)	Class 2 Moderately Euthymic (n=127)	Class 3 Ill with Improving Course (n=70)	Class 4 Predominantly Ill (n=82)	Statistic	p-value
Demographics						
Age at Intake	13.6 ± 3.4 [3,4]	12.8 ± 3.1	12.3 ± 3.3[1]	11.7 ± 3.3 [1]	F=5.39	0.001
Sex (% Female)	48.9	43.3	47.1	48.8	χ^2=0.90	0.8
SES	3.9 ± 1.2 [2,3,4]	3.4 ± 1.1 [1]	3.3 ± 1.1 [1]	3.0 ± 1.3 [1]	F=8.36	<.001
Race (% Self-Reported White)	83.0	84.3	82.9	79.3	χ^2=0.88	0.8
Living with Both Biological Parents (%)	52.3 [4]	43.3	38.6	31.7 [1]	χ^2=7.81	0.05
Clinical Factors						
BD (%)					χ^2=7.42	0.3
BD-I	63.6	59.8	55.7	57.3		
BD-II	9.1	7.9	1.4	8.5		
BD-NOS	27.3	32.3	42.9	34.2		
Age Onset of Mood Symptoms	10.4 ± 4.3 [2,3,4]	8.3 ± 4.0 [1,4]	7.7 ± 3.9 [1]	6.9 ± 3.2 [1,2]	F=13.05	<.001
Age Onset First Manic	12.1 ± 4.0 [4]	10.4 ± 4.2	11.4 ± 4.1	9.1 ± 3.8 [1]	F=3.64	0.01
Age Onset First MDE	12.4 ± 3.4 [2,3,4]	10.3 ± 3.8 [1]	10.3 ± 3.7 [1]	9.3 ± 3.8 [1]	F=4.85	0.003
Physical/Sexual Abuse [*]	6.8 [2,4]	24.4 [1]	20.0	24.4 [1]	χ^2=12.29	0.006
Physical Abuse	6.8	12.6	15.7	18.3	χ^2=5.45	0.1
Sexual Abuse	1.1[2,4]	16.5 [1]	8.6	14.6 [1]	χ^2=14.4	0.003
C-GAS at Intake	54.0 ± 14.8	56.0 ± 11.4	54.7 ± 11.7	54.4 ± 10.7	F=0.54	0.7
C-GAS Most Severe Past	39.1 ± 9.0	36.9 ± 11.6	38.9 ± 10.1	36.5 ± 11.2	F=1.37	0.3
WASI IQ+	112.0 ± 16.7	105.2 ± 13.8	105.6 ± 15.8	103.1 ± 14.4	F=36.67	<.001

[*] These variables were present at intake and/or prior to intake.

[**] Superscripts denote significant between class differences with p values 0.05 after Bonferroni corrections.

+WASI data is based upon a subset of the study sample.

These analyses were conducted in a prior Course and Outcome of Bipolar Youth study (Birmaher et al, 20014).

SES: Socio-Economic Status

BD: Bipolar Disorder; BD-NOS: Bipolar Disorder Not Otherwise Specified

MDE: Major Depressive Episode

C-GAS: Children's Global Assessment Scale

WASI: Wechsler Abbreviated Scale of Intelligence (including Vocabulary and Matrix Reasoning Subtests)

IQ: Intelligence Quotient

Table 2

Chi-Square Analyses of Most Recent Follow-Up School, Employment, and Disability Status by the four Latent Class Growth Analyses (LCGA) Mood Trajectory Classes.

	Class 1 Predominantly Euthymic (n=88)	Class 2 Moderately Euthymic (n=127)	Class 3 Ill with Improving Course (n=70)	Class 4 Predominantly Ill (n=82)	X^2	p-Value
School Enrollment/ or Full-Time Employment	74 (84.1%)	70 (55.1%)	41 (58.6%)	47 (57.3%)	χ^2=23.46	**<.001**
School Enrollment/ or Full-Time Employment/ or Part-Time Employment	77 (87.5%)	86 (67.7%)	52 (74.3%)	53 (64.6%)	χ^2=17.50	**<.001**
Disability/Public Assistance	7 (8.0%)	30 (23.6%)	13 (18.6%)	30 (36.6%)	χ^2=20.44	**<.001**

School Enrollment = College, or Trade/Technical School (at most recent follow-up, all participants > 18).

Full-Time Employment (> 30 hours/week)

Part-Time Employment (30 hours/week)

Table 3

Logistic Regression Analyses of Predictors of Overall Fair/Poor Functioning at Most Recent Follow-Up by the two Latent Class Growth Analyses (LCGA) Mood Trajectory Classes with Current Symptomatic Remission.

	C-GAS/GAF < 70		Not Enrolled in School/Unemployed	
	Wald X^2	OR (95% CI)	Wald X^2	OR (95% CI)
Age Onset BD	**11.91**[**]	1.165 (1.07–1.27)	0.55	1.04 (0.95–1.13)
Lifetime PA/SA	0.18	0.81 (0.31–2.16)	3.71	0.37 (0.14–1.02)
1st Hypo/Mania	3.92	1.18 (1.00–1.139	1.30	0.85 (0.64–1.21)
1st Sub/Alc Abuse	4.64	1.19 (1.02–1.39)	1.24	0.87 (0.68–1.11)
1st Sub/Alc Dep	2.74	1.14 (0.98–1.34)	0.90	1.08 (0.71–1.14)
2nd Hypo/Mania	4.82	1.25 (1.02–1.51)	1.51	0.70 (0.40–1.23)
2nd Sub/Alc Abuse	2.50	1.18 (0.96–1.44)	1.44	0.68 (0.36–1.28)
2nd Sub/Alc Dep	2.56	1.16 (0.97–1.39)	3.60	0.46 (0.21–1.03)
Disability	**4.37**[*]	0.36 (0.14–0.94)	**16.90**[**]	0.12 (0.04–0.33)
SES Scores	**8.01**[**]	1.03 (1.01–1.06)	**9.13**[**]	1.04 (1.01–1.07)
SES Total	**8.25**[**]	1.46 (1.13–1.89)	**9.03**[**]	1.55 (1.16–2.06)
Recent F/U AD	**10.68**[**]	0.32 (0.16–0.63)	2.62	0.53 (0.25–1.44)
Recent F/U Suicide	**8.89**[**]	0.24 (0.10–0.62)	**12.97**[**]	0.18 (0.07–0.46)
Recent F/U Psychosis	0.02	1.07 (0.45–2.52)	1.68	0.55 (0.22–1.36)
Recent F/U ADHD	**19.58**[**]	0.18 (0.08–0.38)	1.21	0.65 (0.30–1.41)
Recent F/U DBD	**26.41**[**]	0.13 (0.06–0.28)	**12.20**[**]	0.20 (0.08–0.49)
Recent F/U SUD	**4.50**[*]	0.47 (0.23–0.94)	**7.64**[**]	0.33 (0.15–0.72)

C-GAS: Children's Global Assessment Scale; GAF: Global Assessment of Functioning

School Enrollment = College, or Trade/Technical School (at most recent follow-up, all participants > 18);

FTE: Full-Time Employment (> 30 hours/week)

BD: Bipolar Disorder; PA/SA: Physical Abuse/Sexual Abuse

1st/2nd: Hypo/Mania: Any 1st Degree Relative/Any 2nd Degree Relative with Hypo/Mania

1st/2nd: Sub/Alc Abuse: Any 1st Degree Relative/Any 2nd Degree Relative with Substance/Alcohol Abuse

1st/2nd: Sub/Alc Dep: Any 1st Degree Relative/Any 2nd Degree Relative with Substance/Alcohol Dependence

Disability: Receiving any form of local/state/federal compensation for physical/psychological disability status

SES: Socio-Economic Status, Scores: Raw Scores, Total: Hollingshead Classes 1–1V

Recent F/U AD: Most Recent Follow-Up Any Anxiety Diagnosis

Recent F/U Suicide: Most Recent Follow-Up Any Suicidal Ideation

Recent F/U Psychosis: Most Recent Follow-Up Any Psychosis (Hallucinations and/or Delusions)

Recent F/U ADHD: Most Recent Follow-Up Attention Deficit Hyperactivity Disorder Diagnosis

Recent F/U DBD: Most Recent Follow-Up Any Disruptive Behavior Disorder Diagnosis (encompasses Oppositional Defiant Disorder [ODD], and Conduct Disorder [CD])

Recent F/U SUD: Most Recent Follow-Up Any Substance Use Disorder (encompasses Alcohol Abuse, Alcohol Dependence, Substance Abuse, and Substance Dependence, excluding Nicotine Dependence)

*
 p < 0.05;

**
 p < 0.01