A 3-year longitudinal study of risk for bipolar spectrum psychopathology.

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Abstract:

Current clinical and epidemiological research provides support for a continuum of bipolar psychopathology: a bipolar spectrum that ranges from subthreshold characteristics to clinical disorders. The present research examined risk for bipolar spectrum psychopathology at a 3-year follow-up assessment in a nonclinically ascertained sample of 112 young adults identified by the Hypomanic Personality Scale (HPS). Participants completed diagnostic interviews assessing bipolar psychopathology, borderline personality traits, substance use disorders, impulsivity, and psychosocial functioning. At the original assessment, 18 of the 112 participants met criteria for a bipolar spectrum disorder. At the follow-up, an additional 13 had developed bipolar spectrum disorders. A total of 58% of participants scoring in the upper quartile of the HPS qualified for bipolar spectrum disorders at the follow-up, including 27% with DSM–IV–TR disorders. The HPS predicted new cases and total number of cases of bipolar spectrum disorders, as well as total number of DSM–IV–TR bipolar disorders. The HPS also predicted hyperthymic temperament or history of hypomania, grandiose traits, impulsivity, substance use disorders, psychosocial impairment, and borderline traits. The majority of these effects were significant after removing participants with DSM–IV–TR bipolar disorders from the analyses, suggesting that the results were not driven by a subset of participants with clinical disorders. Overall, these results offer further support for the bipolar spectrum construct and the predictive validity of the HPS as a measure of bipolar spectrum psychopathology.

Keywords: Bipolar Disorder | Psychopathology | Risk Factors | Epidemiology | Hypomania

Article:

Current clinical and epidemiological research provides support for a broad spectrum of bipolar psychopathology (e.g., Akiskal et al., 2000; Alloy, Urošević, et al., 2012; Angst et al., 2003;

Paris, 2009; Phelps, Angst, Katzow, & Sadler, 2008; Vieta & Phillips, 2007). The bipolar spectrum includes, but extends beyond, the boundaries of the Diagnostic and Statistical Manual of Mental Disorders, 5th Edition (DSM-5; American Psychiatric Association, 2013). The Hypomanic Personality Scale (HPS; Eckblad & Chapman, 1986) appears to offer a promising point of entry for studying the bipolar spectrum construct. The present research involved a 3-year follow-up assessment of risk for bipolar spectrum psychopathology in young adults who completed the HPS at a comprehensive cross-sectional assessment (see Walsh, Royal, Brown, Barrantes-Vidal, & Kwapil, 2012; Walsh, Royal, Barrantes-Vidal, & Kwapil, 2012).

The Bipolar Spectrum

Bipolar disorder has been ranked by the World Health Organization (2008) as one of the top 10 causes of disability worldwide and is associated with premature mortality, largely resulting from suicide and accidental death (Ösby, Brandt, Correia, Ekborn, & Sparen, 2001). Traditionally, bipolar disorders are estimated to affect approximately 1–2% of the population (Pini et al., 2005). However, epidemiological studies suggest that this estimate is conservative and discounts the growing evidence for a continuum of bipolar spectrum psychopathology (Angst, 1998; Angst et al., 2003, 2010; Hoertel, Le Strat, Angst, & Dubertret, 2013; Merikangas et al., 2007; Zimmermann et al., 2009). Akiskal and colleagues (2000) estimated that the bipolar spectrum characterizes approximately 5% of the general population. Furthermore, epidemiological studies report prevalence ranges from 4–14% in community samples (Angst et al., 2010; Hoertel et al., 2013; Merikangas et al., 2007; Zimmermann et al., 2009), depending on how the bipolar spectrum is defined. There is considerable support that subthreshold bipolar psychopathology precedes the development of clinical bipolar disorders, with evidence from community samples (Beesdo et al., 2009; Zimmermann et al., 2009), high-risk college samples (Alloy, Urošević, et al., 2012; Kwapil et al., 2000), and clinical samples (Akiskal, Djenderedjian, Rosenthal, & Khani, 1977; Birmaher et al., 2009; Kochman et al., 2005). Moreover, several studies (Angst et al., 2003, 2010; Hoertel et al., 2013; Merikangas et al., 2007; Zimmermann et al., 2009) found that subthreshold bipolar disorders were associated with maladaptive consequences (e.g., role impairment, suicide risk, substance use disorders)—suggesting that the consequences of bipolarity apply to subthreshold presentations.

The Diagnostic and Statistical Manual of Mental Disorders, 4th Edition, Text Revision (DSM–IV–TR; American Psychiatric Association, 2000) included four bipolar disorders: bipolar I disorder, bipolar II disorder, cyclothymic disorder, and bipolar disorder not otherwise specified. In light of the growing evidence for clinically relevant subthreshold bipolar presentations, the task force for the DSM-5 added several bipolar spectrum presentations. Furthermore, numerous alternative categorical formulations have been proposed (e.g., Akiskal, 1983, 1996, 2004; Akiskal & Akiskal, 1988; Akiskal & Mallya, 1987; Akiskal & Pinto, 1999; Angst et al., 2003; Klerman, 1987). One of the most widely considered has been Akiskal's (2004) model, which includes affective temperaments. In addition to bipolar I and II disorders, Akiskal proposed bipolar II-1/2 (major depression superimposed on cyclothymic temperament), bipolar III (major depression plus hypomania occurring in association with antidepressant or other somatic treatment), and bipolar IV (major depression superimposed on hyperthymic temperament). Consistent with the DSM-5, Akiskal's conditions represent discrete diagnostic categories. Expanding the diagnostic criteria beyond categorical boundaries, however, has important

implications for understanding the etiology, potential developmental trajectories, and treatment of mood disorders. For example, examining subthreshold characteristics of bipolar disorder may identify individuals at risk for clinical disorders, promote early interventions and monitoring, and increase the likelihood of patients receiving appropriate treatment (Angst & Cassano, 2005). Furthermore, increased research on these subthreshold characteristics may elucidate specific risk and protective factors. Greater attention to subclinical bipolarity in clinical practice should also encourage focus on minimizing the severity and frequency of episodes, and treating symptoms and impairment, rather than specific diagnoses. In summary, we define the bipolar spectrum as a continuum of clinical and subclinical expression that includes traditional DSM disorders, Akiskal's expanded diagnoses, and subthreshold forms of hypomanic symptoms.

Regardless of how they are defined, bipolar disorders are characterized by changes in mood, energy, cognition, and behavior. Impulsivity is also considered to be a core feature of bipolar psychopathology (American Psychiatric Association, 2000). Individuals with bipolar disorders often have elevated rates of impulsivity, regardless of whether they are in a depressed (Peluso et al., 2007), manic (Swann, Pazzaglia, Nicholls, Dougherty, & Moeller, 2003), or euthymic mood. However, the role of impulsivity in the broader bipolar spectrum is less understood.

Assessment of Bipolar Spectrum Psychopathology

Several measures have been developed to screen for risk for bipolar disorders, including the self-report Temperament Evaluation of Memphis, Pisa, Paris, and San Diego-Autoquestionnaire (TEMPS-A; Akiskal, Akiskal, Haykal, Manning, & Connor, 2005) and the General Behavior Inventory (GBI; Depue et al., 1981). The TEMPS-A is based on interview evaluations of affective temperaments and has been validated in both clinical (Evans et al., 2005) and nonclinical samples (Morvan et al., 2011). The GBI successfully identifies subclinical and clinical bipolar symptoms in psychiatric outpatient (Depue & Klein, 1988) and nonclinical (Depue et al., 1981; Klein, Depue, & Slater, 1985) populations; however, the scale focuses primarily on dysthymic and cyclothymic symptoms (Mallon, Klein, Bornstein, & Slater, 1986) and may fail to detect individuals at risk for bipolar disorders who exhibit hypomanic characteristics.

Eckblad and Chapman (1986) developed the self-report HPS to tap traitlike hypomanic functioning. They assessed the validity of the HPS in a cross-sectional study of college students. Approximately 77% of high HPS scorers met criteria for a hypomanic episode, whereas no control participants received the diagnosis. High HPS scorers also exceeded the control group on week-long depressive episodes, diagnoses of cyclothymic disorder, and treatment of psychopathology, and reported significantly higher alcohol and drug use. Kwapil et al. (2000) conducted a 13-year follow-up of this sample and found that the HPS group surpassed the control group on rates of hypomania within the past two years, lifetime bipolar disorders, major depressive episodes, substance use disorders, and borderline personality traits.

Numerous other studies have contributed to the construct validation of the HPS. For example, research has further examined the association of the HPS with bipolar disorders (Meyer & Hautzinger, 2003), development of bipolar symptoms (Blechert & Meyer, 2005), mood fluctuations in daily life (Hofmann & Meyer, 2006), impulsivity (Johnson, Carver, Mulé, &

Joorman, 2013), alcohol use (Meyer & Wolkenstein, 2010), and the behavioral activation system (Johnson, Ruggero, & Carver, 2005; Jones & Day, 2008). Few studies, however, have focused specifically on the relation of the HPS with the broader bipolar spectrum.

Walsh, Royal, Brown, et al. (2012) examined the construct validity of the HPS as a measure of bipolar spectrum psychopathology in the laboratory and in daily life using experience sampling methodology (ESM) in a sample of 145 college students oversampled for elevated HPS scores. HPS scores were associated with interview-based diagnoses of DSM–IV–TR bipolar disorders, Akiskal's (2004) bipolar spectrum disorders, and hyperthymic temperament or history of hypomania. Fifteen (10%) of the participants met criteria for a DSM–IV–TR bipolar disorder (three with bipolar I, six with bipolar II, one with cyclothymic, and five with bipolar NOS disorders). Seven additional participants qualified for bipolar spectrum disorders. Note that 20 of the 22 participants with diagnosable bipolar spectrum disorders scored at least 1.5 SD above the mean on the HPS. HPS scores were not significantly associated with history of major depressive episodes (despite the fact that major depressive episodes were part of many of the cases of bipolar disorders), suggesting that the HPS was specifically associated with bipolar psychopathology and not broadly with any mood impairment. HPS scores were associated with current depressive symptoms, psychosocial impairment, cyclothymic temperament, impulsivity, and borderline personality traits. In daily life, HPS scores predicted negative affect, thought disturbance, risky behavior, and measures of grandiosity. These findings remained independent of DSM–IV–TR bipolar disorders, suggesting that the results were not due simply to a subset of participants with clinical conditions. However, Walsh, Royal, Brown, et al.'s (2012) findings were limited to cross-sectional comparisons. Longitudinal assessment is needed to more fully understand risk for development of bipolar spectrum psychopathology.

Goals and Hypotheses

The present research continued the validation work of Walsh, Royal, Brown, et al. (2012) by examining risk for bipolar spectrum psychopathology in a 3-year longitudinal study of their original sample. This work also built on Kwapil et al.'s (2000) longitudinal study by examining a broader range of bipolar spectrum psychopathology. It was hypothesized that the HPS would predict DSM–IV–TR bipolar disorders, bipolar spectrum disorders, and hyperthymic temperament or hypomania. It was expected that these associations would remain significant after removing participants who had been diagnosed with the predicted criterion at the initial assessment (to allow for examination of new cases). For example, it was expected that the HPS would predict bipolar spectrum disorders in the total sample and after removing individuals who met criteria for bipolar spectrum disorders at the initial assessment. The HPS was also expected to predict hyperthymic temperament characteristics, psychosocial impairment, grandiose traits, impulsivity, borderline personality traits, as well as substance use and impairment. These predictions were expected to remain significant after removing participants with DSM–IV–TR bipolar disorders, consistent with a spectrum model. The HPS was not hypothesized to predict major depressive disorder.

Method

Participants

Selection of participants at the initial assessment

All of the candidate participants for the present study took part in Walsh, Royal, Brown, et al.'s (2012) cross-sectional assessment. Approximately 1,200 students enrolled in psychology courses completed the HPS in mass-screening sessions. All of the mass-screening participants who scored at least 1.5 SD above the mean on the HPS and a comparable number of randomly selected participants who scored less than 1.5 SD above the mean were invited to participate in the initial assessment. This recruitment strategy was designed to ensure that a sufficient number of participants with elevated HPS scores (and risk for bipolar spectrum psychopathology) were included in the study, while maintaining a continuous distribution of HPS scores. A final sample of 100 women and 45 men completed the initial assessment. Mean age was 19.5 years (SD = 2.3 years). Neither age nor sex was correlated with HPS scores (r = −.09 and −.02, respectively).

Participation in the follow-up assessment

All 145 original participants were invited to take part in the follow-up assessment and were offered $25 for their participation. One-hundred twelve participants were reassessed (77% of the original sample; 76 women, 36 men; mean age = 22.6 years, SD = 2.6 years). The mean interval between assessments was 3.1 years (SD = 0.5 years, range 1.7 to 4.8 years). Of the 33 participants who were not reassessed, 12 declined to participate, 11 were not located, and 10 expressed interest but never completed the reassessment. There were no significant differences between participants who were reassessed and those lost to attrition on HPS score, bipolar spectrum diagnoses, psychosocial functioning, or demographic variables, as measured at the initial assessment (see Table 1).

Table 1
Comparison of Ratings and Demographic Information From The Initial Assessment for the Total, Followed, and Nonfollowed Samples

Initial assessment criterion	Total sample (n = 145)	Follow-up (n = 112)	Nonfollowed (n = 33)
HPS score (*M, SD*)	20.1 (10.1)	20.5 (10.5)	18.5 (8.7)
Bipolar spectrum disorder (no. and %)	22 (15.2)	18 (16.1)	4 (12.1)
GAF—global functioning (*M, SD*)	76.1 (12.8)	75.9 (12.7)	77.0 (13.1)
Female participants (%)	69.0	67.9	72.7
Age (*M, SD*)	19.5 (2.3)	19.5 (2.5)	19.5 (1.5)
Caucasian (%)	64.8	64.3	66.7
African American (%)	15.9	17.9	9.1
Hispanic (%)	4.1	4.5	3.0
Asian (%)	4.1	4.5	3.0
Other (%)	4.1	3.6	6.1
Unspecified (%)	6.9	5.4	12.1

Comparison of Ratings and Demographic Information From The Initial Assessment for the Total, Followed, and Nonfollowed Samples

Materials and Procedures

Measures at the initial assessment

As described in Walsh, Royal, Brown, et al. (2012), participants completed interview, questionnaire, and ESM assessments at the initial evaluation. Interrater reliability (κ) was good at the initial assessment for dichotomous measures: DSM–IV–TR bipolar diagnoses, 1.00; bipolar spectrum diagnoses, 1.00; interview-rated hyperthymia, .83; and major depressive episodes, .92. Note that the interview at the initial assessment was comparable to the interview administered at the follow-up (described below).

Participants completed the HPS at the mass-screening and at the cross-sectional assessment (2–12 weeks apart, M = 5.5 weeks). HPS scores correlated highly across the two time points (ICC = .85, $p < .001$); therefore, mean HPS scores were used for all analyses. Coefficient alphas for the HPS completed at the mass-screening and cross-sectional assessments were .83 and .93, respectively. Note that consistent with Walsh, Royal, Brown, et al. (2012), the results were unchanged whether the average or individual HPS score was used as a predictor. Participants also completed the UPPS Impulsivity Scale (Whiteside, Lynam, Miller, & Reynolds, 2005), which assesses four domains of impulsive behavior: negative urgency, lack of premeditation, lack of perseverance, and sensation seeking.

Measures at the follow-up assessment

The present study included a structured interview that assessed DSM–IV–TR mood disorders, bipolar spectrum disorders, grandiose traits, substance use, impulsivity, borderline personality traits, and psychosocial functioning. Eighty-one percent of the interviews were conducted by an advanced graduate student in clinical psychology who had previously conducted interviews and ratings as part of the initial assessment. A licensed clinical psychologist and a trained undergraduate research assistant completed the remaining interviews. The undergraduate interviewer underwent extensive training, all of her interviews were supervised and reviewed by the first author, and she had excellent interrater reliability with the last author. All interviews were tape-recorded and took approximately 2 hours. Interviewers and raters at both assessments were unaware of participants' HPS scores.

The Structured Clinical Interview for DSM–IV (SCID-I; First, Spitzer, Gibbon, & Williams, 1996) was used to assess lifetime mood episodes and disorders. Bipolar spectrum disorders were diagnosed following criteria in Akiskal (2004) and Angst et al. (2003), using information obtained from the SCID-I interview. The SCID-I was appropriate for diagnosing DSM–IV–TR bipolar disorders and bipolar III (major depression plus treatment-induced hypomania). Participants were interviewed for the presence of cyclothymic disorder based on DSM–IV–TR criteria. This assessment was also appropriate for making diagnoses of bipolar II-1/2 (major depression superimposed on cyclothymic temperament). Participants were interviewed for the presence of hyperthymic temperament, using Akiskal's criteria, to determine diagnoses of bipolar IV (major depression superimposed on hyperthymic temperament). The interviews for cyclothymic disorder and hyperthymic temperament are presented in the supplementary materials. Participants were coded with "other bipolar spectrum disorder" if they reported hyperthymic temperament or hypomania and subthreshold depression (e.g., depressive episode not meeting DSM–IV–TR symptom or duration threshold or recurrent brief depression), history

of both hyperthymic temperament and hypomania, or major depression and subthreshold hypomania. Following Angst et al. (2003), subthreshold hypomania was defined as a hypomanic episode lasting at least two days and characterized by at least three hypomanic symptoms, including elevated or irritable mood, or overactivity (e.g., increased goal-directed behavior, psychomotor activation, increased talkativeness, and/or decreased need for sleep,). Episodes represented a departure from one's usual functioning, were observable to others, and could not be the result of a normative life experiences, alcohol or drug use, or general medical condition.

Substance use disorders were diagnosed using DSM–IV–TR criteria. Quantitative ratings of current and lifetime heaviest substance use and impairment were made based on the scoring system reported in Kwapil (1996). Psychosocial functioning was rated using the global assessment of functioning (GAF), described in the DSM–IV–TR. Borderline personality traits were assessed using the International Personality Disorder Examination (IPDE; Loranger et al., 1994). Following Eckblad and Chapman (1986), the interview included an 8-item assessment of grandiosity. Using a Likert scale, participants rated the likelihood that they would become famous or be featured on the cover of a magazine, as well as their level of ambition, creativity, and extent to which they felt that they were odd or different from their peers. Participants were also questioned about whether they had done things to call attention to themselves or considered themselves to be leaders or followers. Impulsivity was assessed by readministering the UPPS Impulsivity Scale and administering the Impulsive-Nonconformity Scale (Chapman et al., 1984). The latter assesses lack of concern for others, lack of respect for social and ethical standards, lack of remorse, lack of empathy, and unrestrained pursuit of self-gratification. Two measures of impulsivity were included to provide a comprehensive assessment of the construct.

Results

Relation of the HPS With Bipolar Spectrum Disorders

Table 2 provides a summary of diagnostic outcomes at the follow-up relative to diagnostic status at the initial assessment. Of the 123 participants who did not receive a bipolar diagnosis at the initial assessment, 94 were reassessed at the follow-up. Thirteen of these 94 participants (14%) presented with new cases of bipolar spectrum disorders at the follow-up. Three participants received a DSM–IV–TR bipolar diagnosis and 10 participants received a non-DSM bipolar diagnosis. Twelve of the 15 participants diagnosed with a DSM–IV–TR bipolar disorder at the initial assessment were reassessed at the follow-up. Eight of these participants retained DSM–IV–TR bipolar diagnoses, three were given a non-DSM bipolar diagnosis, and one no longer met criteria for a bipolar diagnosis. The latter participant qualified for cyclothymic disorder at the initial assessment; however, she exhibited prominent borderline personality traits at the follow-up, and no longer exhibited cyclothymia. Of the seven participants diagnosed with a non-DSM bipolar disorder at the initial assessment, six were reassessed at the follow-up. Four of these participants retained non-DSM bipolar diagnoses, one transitioned to a DSM–IV–TR bipolar disorder, and one no longer met criteria for a bipolar diagnosis. This participant met criteria for bipolar IV at the initial assessment, but did not exhibit hyperthymic temperament at the follow-up. A total of 29 of the 112 reassessed participants (26%) met criteria for a bipolar spectrum disorder at the follow-up. Twelve participants qualified for a DSM–IV–TR bipolar disorder and 17 qualified for a non-DSM bipolar disorder.

Table 2
Summary of Follow-Up Assessment Diagnostic Outcomes by Diagnostic Status at the Initial Assessment

Initial assessment diagnostic status	Diagnostic status at the initial assessment		Diagnostic status of reassessed participants at the follow-up assessment		
	All participants (n = 145)	Participants reassessed (n = 112)	*DSM–IV–TR* bipolar disorder	Non-DSM bipolar disorder	No bipolar disorder
No bipolar disorder	123	94	3	10	81
DSM–IV–TR bipolar disorder	15	12	8	3	1
Non-DSM bipolar disorder	7	6	1	4	1

Summary of Follow-Up Assessment Diagnostic Outcomes by Diagnostic Status at the Initial Assessment

Prediction of bipolar spectrum diagnoses

HPS scores predicted total number of lifetime DSM–IV–TR bipolar and bipolar spectrum disorder cases at the follow-up (Table 3). As seen in Figure 1, rates of DSM–IV–TR and bipolar spectrum disorders increased across HPS quartiles. The HPS predicted new cases of bipolar spectrum disorders at the reassessment, odds ratio (OR) = 1.13, p < .01, 95% CI [1.04, 1.21]. Excluding the 18 participants who qualified for any bipolar disorder at the initial assessment, 13 participants (14% of the remaining 94 participants) transitioned to a bipolar spectrum disorder. Thus, the HPS did not simply identify participants who qualified for bipolar spectrum disorders at the initial assessment, but also predicted development of new cases. However, the HPS did not specifically predict new cases of DSM–IV–TR bipolar disorders, OR = 1.11, p = .10, 95% CI [0.98, 1.27]. Excluding the 12 participants who met criteria for a bipolar disorder at the initial assessment, four participants (4% of the remaining 100 participants) transitioned to a DSM–IV–TR bipolar disorder.

Table 3
Binary Logistic Regressions of the HPS Predicting Lifetime Mood Psychopathology and Substance Use Disorders

Criterion	Percentage of sample	Prediction by the HPS	
		Odds ratio	Confidence interval (95%)
DSM–IV–TR bipolar disorder	11	3.25**	1.52–6.96
Bipolar spectrum disorder	26	3.51***	2.05–6.00
Hypomania or hyperthymic temperament	34	6.52***	3.27–12.98
Major depressive episode	44	1.22	0.90–1.65
Major depressive disorder	22	0.64*	0.44–0.95
Alcohol abuse or dependence	13	2.07**	1.20–3.58
Drug abuse or dependence	18	1.77*	1.14–2.74

* $p < .05$. ** $p < .01$. *** $p < .001$.

Binary Logistic Regressions of the HPS Predicting Lifetime Mood Psychopathology and Substance Use Disorders

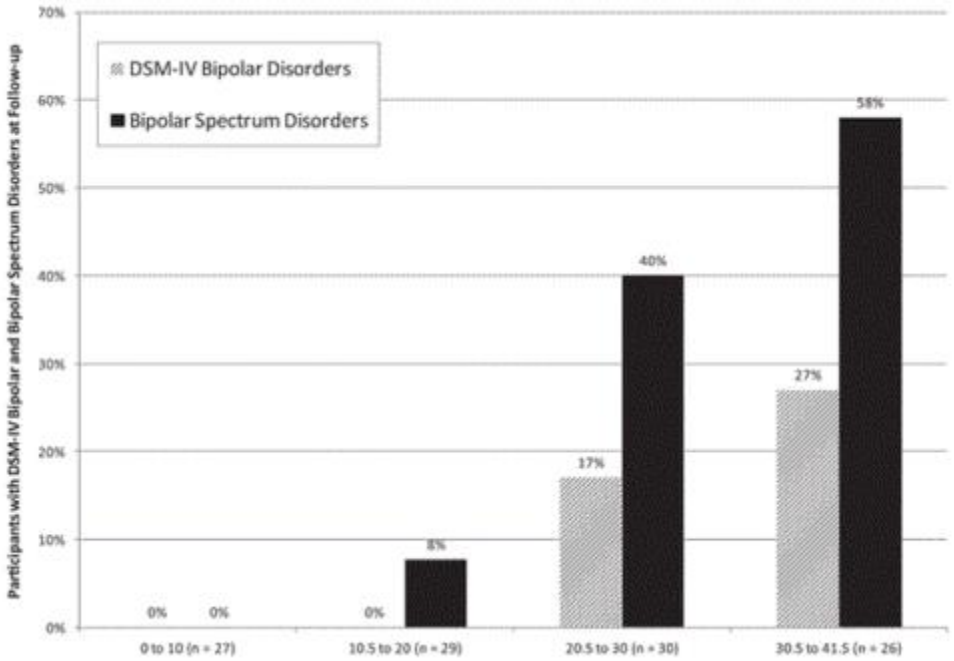

Figure 1. Percentage of participants with bipolar spectrum disorders at the follow-up assessment by HPS score.

Prediction of mood episodes and hyperthymic temperament

The HPS predicted current hyperthymic temperament or history of hypomania, with 34% of participants qualifying for one or both conditions. As seen in Figure 2, 81% of the upper HPS quartile reported hyperthymic temperament or history of hypomania at the follow-up assessment. The HPS also predicted current hyperthymic temperament or history of hypomania among participants who did not qualify for either condition at the initial assessment, OR = 1.29, $p < .001$, 95% CI [1.13, 1.47]. The HPS was not associated with history of major depressive episodes, and was associated with a decreased likelihood of lifetime major depressive disorder. The latter presumably indicates that high HPS scorers are specifically at risk for bipolar, not unipolar, mood disorders. The fact that high HPS scores were associated with bipolar disorders was not due to the fact that HPS scores were selectively associated with depression, as major depressive episodes occurred at comparable rates across the HPS quartiles. The HPS did not predict new major depressive episodes, OR = 1.02, $p = .44$, 95% CI [0.97, 1.09], or new cases of major depressive disorder at the follow-up, OR = 1.00, $p = .97$, 95% CI [0.94, 1.07].

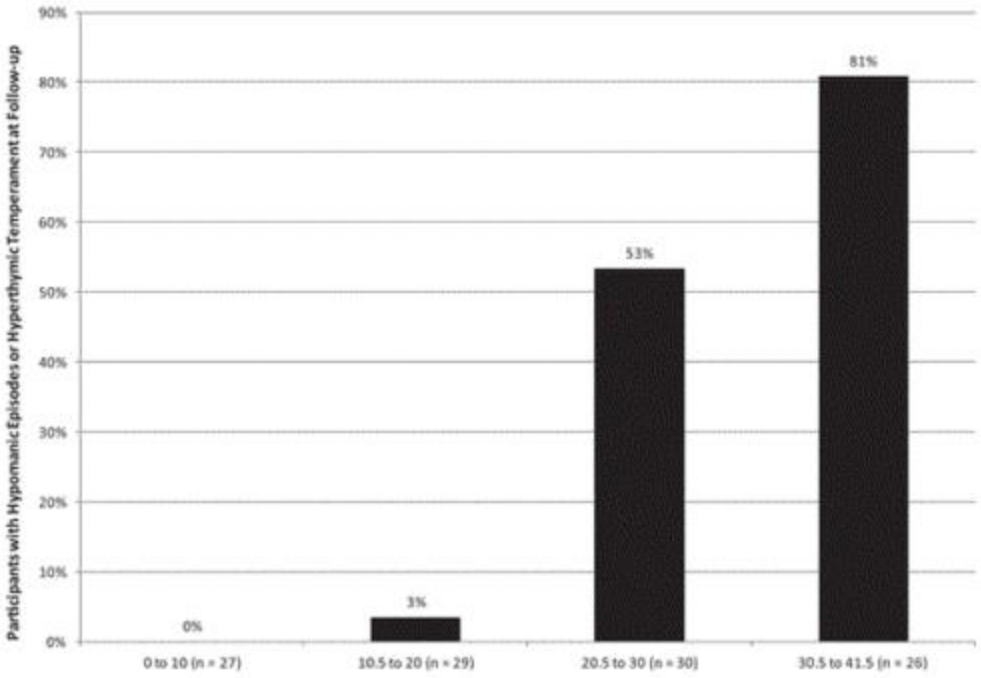

Figure 2. Percentage of participants with hypomania or hyperthymic temperament at the follow-up assessment by HPS score.

Prediction of substance use disorders

The HPS predicted alcohol use diagnoses at the follow-up assessment and predicted the development of alcohol use disorders in participants who did not qualify for alcohol use disorders at the initial assessment, OR = 1.08, $p < .05$, 95% CI [1.01, 1.16]. Of note, 43% of participants with current or past alcohol use disorders were also diagnosed with a bipolar spectrum disorder, and all of these cases fell in the upper two quartiles of HPS scores. Similarly, the HPS predicted drug use diagnoses at the follow-up assessment, with 18% of participants meeting criteria. The HPS also predicted new cases of drug use disorders, OR = 1.08, $p < .05$, 95% CI [1.00, 1.15]. Furthermore, 40% of cases with current or past drug use disorders were diagnosed with bipolar spectrum disorders, and the majority of these cases (75%) fell in the upper quartile of HPS scores and all cases fell within the upper two quartiles.

Relation of the HPS With Continuous Measures of Psychopathology at the Follow-Up Assessment

Table 4 presents the zero-order correlations of the HPS with continuous measures of psychopathology in the total follow-up sample and after removing participants with DSM–IV–TR bipolar disorders. The HPS predicted interview-assessed hyperthymic temperament characteristics in the full sample, as well as in participants without DSM–IV–TR bipolar disorders. HPS scores were inversely associated with psychosocial functioning as assessed by the GAF in the total sample (Figure 3) and the nondisordered subsample. Given that GAF was rated

at both assessments, the regression analysis was recomputed partialing out GAF score at the initial assessment. Not surprisingly, functioning at the initial assessment was significantly associated with functioning at the follow-up ($\beta = .570$, $p < .001$). However, the HPS significantly predicted impairment at the follow-up, over-and-above baseline GAF ($\beta = -.188$, $p < .05$).

Table 4
Zero-Order Correlations of the HPS Predicting Continuous Measures of Psychopathology

Criterion	Follow-up sample (n = 112)				*DSM–IV–TR* bipolar disorders removed (n = 100)
	M	*SD*	Coefficient α	Pearson correlation (2-tailed) with the HPS	Pearson correlation (2-tailed) with the HPS
Hyperthymic temperament total score	5.89	3.85		***.68*****	***.69*****
GAF—global functioning	74.02	11.56		**−.35*****	−.28**
IPDE—borderline dimensional score	1.50	2.21		**.32****	.21*
Impulsive-Nonconformity	10.79	7.27	0.87	***.59*****	***.54*****
UPPS impulsivity					
Urgency	2.00	0.57	0.88	**.43*****	**.36*****
Lack of premeditation	1.88	0.49	0.85	**.35*****	**.33****
Lack of perseverance	1.73	0.45	0.78	.14	.12
Sensation seeking	2.81	0.62	0.85	**.36*****	**.39*****
Grandiosity questions					
Famous	1.99	1.49		***.54*****	***.55*****
Odd/different	2.54	1.22		**.48*****	**.44*****
Attention	0.39	0.49		**.45*****	**.42*****
Magazine	1.83	1.49		**.35*****	**.36*****
Creative	2.70	1.23		**.36*****	**.34*****
Ambition	2.99	0.87		.27**	.28**
Leadership	0.69	0.47		.21*	.21*
Alcohol use and impairment					
Current alcohol use	3.23	3.75		.17	.18
Heaviest alcohol use	7.47	6.73		.27**	.28**
Current alcohol impairment	0.79	0.63		.25**	.25*
Heaviest alcohol impairment	1.29	1.04		**.40*****	**.41*****
Drug use and impairment					
Current drug use	0.67	1.80		.20*	.23*
Heaviest drug use	3.04	5.48		.28**	.29**
Current drug impairment	0.29	0.72		.23*	.26*
Heaviest drug impairment	0.90	1.22		.24*	.26**
Legal problems					
Misdemeanor arrest	0.10	0.30		.09	.12
Stopped for speeding	1.50	2.19		.20*	.24*
Underage drinking citation	0.07	0.26		**.30****	**.36*****

Note. Medium effect sizes in bold, large effect sizes in bold and italics.
* $p < .05$. ** $p < .01$. *** $p < .001$.

Zero-Order Correlations of the HPS Predicting Continuous Measures of Psychopathology

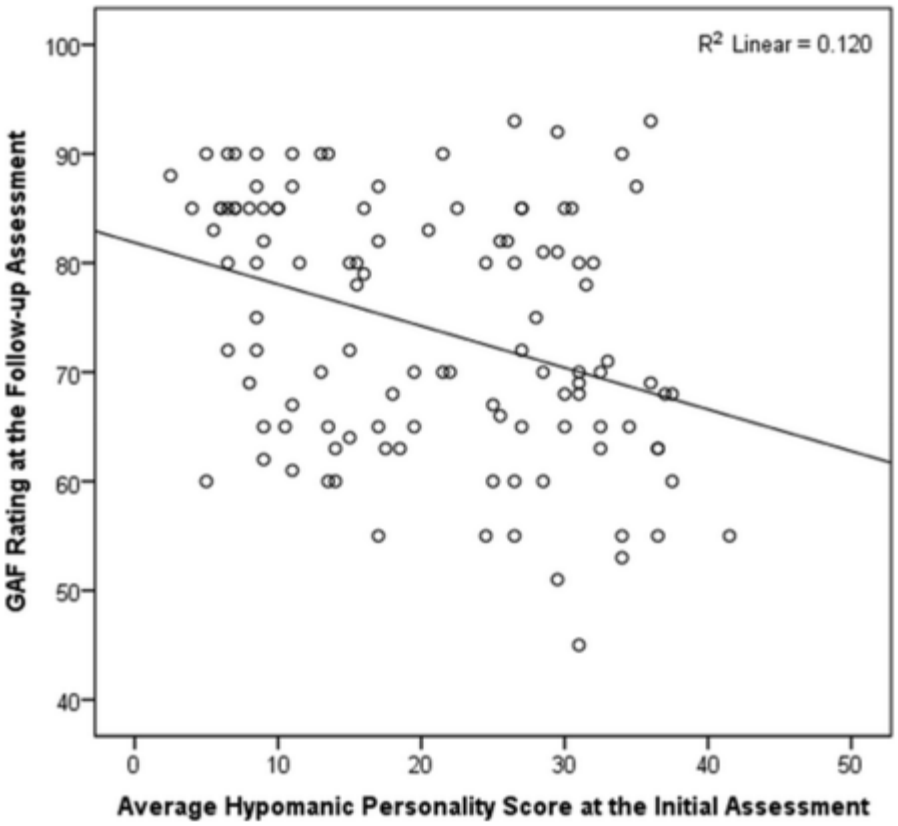

Figure 3. Association of the HPS at the initial assessment with global functioning at the follow-up assessment.

As hypothesized, the HPS predicted borderline personality disorder traits, although none of the participants met full criteria for the diagnosis at the follow-up. Analysis of the individual traits indicated that the HPS predicted unstable self-image and relationships, impulsivity, transient paranoia/dissociation, and suicidal gestures, but not affective instability, emptiness, fear of abandonment, or inappropriate anger. There was good stability of borderline personality ratings across the initial and follow-up assessments. The number of borderline criteria met correlated .65 and dimensional scores correlated .71 across the two assessments. However, these associations must be interpreted in light of the fact that the majority of the participants (75%) did not meet any borderline personality disorder criteria at either assessment, although the correlation of number of criteria met at the two assessments was .37 (a medium effect size) when limited to the 28 participants who met at least one criterion at either assessment.

The HPS predicted impulsivity symptoms, specifically impulsive-nonconformity, negative urgency, lack of premeditation, and sensation seeking. Additionally, the HPS predicted grandiose traits, including predictions of future fame or being on the cover of a magazine, as well as appraisals of ambition, leadership, creativity, oddness, and tendency to draw attention to oneself. Consistent with substance use diagnoses, the HPS predicted heaviest alcohol use and impairment, and current and heaviest drug use and impairment. With respect to legal problems, the HPS predicted history of speeding and underage drinking tickets, but not arrests. All of these associations were significant after removing individuals diagnosed with DSM–IV–TR bipolar

disorders at the follow-up assessment. Thus, the results overall do not appear to be driven by a subset of participants with clinical disorders.

Zero-order correlations also examined the extent to which the HPS predicted hyperthymic temperament characteristics across participants with and without bipolar spectrum disorders (Table 5). The HPS predicted the total score for hyperthymic temperament characteristics across participants in three groups: (a) total follow-up sample, (b) reduced sample with DSM–IV–TR bipolar disorders removed, and (c) reduced sample with all bipolar spectrum disorders removed. With the exception of the short sleeper characteristic, the HPS predicted hyperthymic temperament characteristics in the total and reduced follow-up samples. This suggests that, in general, the HPS taps hyperthymic temperament characteristics independent of bipolar spectrum diagnoses.

Table 5
Zero-Order Correlations of the HPS Predicting Hyperthymic Temperament Characteristics Across Participants With and Without Bipolar Spectrum Disorders

Criterion	Pearson correlation (2-tailed) with the HPS in the follow-up sample (n = 112)	Pearson correlation (2-tailed) with the HPS after removing DSM bipolar disorders (n = 100)	Pearson correlation (2-tailed) with the HPS after removing bipolar spectrum disorders (n = 83)
Hyperthymic temperament total score	***.68***	***.69***	***.62***
Upbeat/exuberant mood	**.44**	**.49**	**.42**
Overinvolved and meddlesome	***.58***	***.53***	**.48**
Broad interests	**.43**	**.43**	**.39**
Overconfident and boastful	**.33**	**.39**	**.37**
Articulate and jocular	**.48**	**.46**	**.32**
High energy level/full of plans	**.40**	**.41**	**.33**
Uninhibited and risk-taking	**.36**	**.36**	**.31**
Overoptimistic and carefree	.27	**.35**	.28
Short sleeper (<6 hr)	.21	.24	.10

Note. Medium effect sizes in bold; large effect sizes in bold and italics.
$^{*}p < .05$. $^{**}p < .01$. $^{***}p < .001$.

Zero-Order Correlations of the HPS Predicting Hyperthymic Temperament Characteristics Across Participants With and Without Bipolar Spectrum Disorders

Discussion

The present research examined risk for bipolar spectrum psychopathology in a nonclinically ascertained sample of young adults at a 3-year follow-up assessment. The HPS predicted new cases of bipolar spectrum disorders, with a 14% transition rate over the follow-up period. The HPS appears to specifically predict bipolar mood disorders, since it was not a significant predictor of unipolar mood disorders. Additionally, the HPS predicted a range of symptoms and impairment expected to be associated with the bipolar spectrum, including grandiose traits, substance use disorders, borderline personality traits, and measures of impulsivity. Furthermore, the HPS predicted bipolar spectrum psychopathology after removing participants with DSM–IV–TR bipolar disorders, suggesting that the results were not driven solely by a subset of participants with clinical disorders.

At the follow-up assessment, the HPS predicted both total cases and new cases of bipolar spectrum disorders that developed since the initial assessment. The results are notable given that participants were drawn from a nonclinically ascertained sample. These findings add to the growing body of evidence for a broader bipolar spectrum, confirm that this spectrum is

observable in young adults, and support the predictive validity of the HPS as a measure of the bipolar spectrum. Moreover, the study suggests that a young adult sample offers an ideal window through which to examine risk for bipolar psychopathology.

As illustrated in Figure 1, the rate of DSM–IV–TR bipolar disorders was highest (27%) in the upper quartile of HPS scorers. Note that this rate is comparable to the 25% rate of bipolar disorders reported for high HPS scorers in Kwapil et al.'s (2000) 13-year prospective study. The HPS did not significantly predict new cases of DSM–IV–TR bipolar disorders in the present study. However, the overall rate of bipolar disorders and the transition rate to bipolar spectrum disorders are striking, given that the majority of participants in this sample have not yet reached the peak age of onset for clinical bipolar disorders. Using a large clinical sample of adults with bipolar I and II disorders across six international sites, Baldessarini et al. (2010) reported the median age of onset across disorders to be 25.2 years. As noted, the mean age of participants in the present research was 22.5 years. Therefore, we would expect continued transition to clinical bipolar disorders among the high HPS scorers. Of note, the mean age of participants in Kwapil et al.'s prospective study was 31.8 years, well beyond the median age of onset for bipolar disorders.

The HPS was associated with a decreased likelihood of major depressive disorders and was not associated with major depressive episodes. This suggests that the HPS differentiates between bipolar and unipolar psychopathology, with the HPS predicting the former, but not the latter (in fact, only two participants in the upper quartile of HPS scores developed [unipolar] major depressive disorder). Note that high HPS scorers did experience major depressive episodes, but so did low and moderate HPS scorers. However, high HPS scorers tended to experience depression as part of a bipolar illness, whereas lower HPS scorers tended to experience depression as part of a unipolar disorder. It is important to consider that if we had not assigned broad bipolar spectrum disorders (especially bipolar IV diagnoses), some of these individuals would have been incorrectly classified with unipolar depressive disorders. Major depressive episodes were reported by participants across the entire range of HPS scores. However, participants with low HPS scores exhibited unipolar major depression (with 80% of cases of major depressive disorder falling in the lower two quartiles of HPS scores), whereas participants with high HPS scores exhibited depressive episodes as part of a bipolar presentation. Overall, these findings provide additional evidence that the HPS is a valid measure of risk for bipolar spectrum psychopathology, not simply a measure of broad risk for mood disorders. Furthermore, the findings do not seem to be driven by neuroticism since Walsh, Royal, Brown, et al. (2012) indicated that the HPS was only modestly associated with neuroticism in the present sample ($r = .18$).

The HPS predicted hyperthymic temperament or history of hypomania. Eighty-one percent of participants in the upper quartile of HPS scores met criteria for either condition. The HPS also predicted hyperthymic temperament characteristics irrespective of bipolar diagnosis. Specifically, the HPS captured traitlike upbeat mood and high energy among individuals with bipolar spectrum disorders and individuals without a bipolar diagnosis. These results suggest that the HPS identifies a broad range of bipolar spectrum psychopathology that includes individuals with hyperthymic characteristics who may exhibit adaptive functioning, as well as individuals with hyperthymic characteristics who exhibit psychosocial impairment within the context of bipolar spectrum disorders. For example, the upbeat mood, sociability, versatility, decreased

need for sleep, and high energy associated with the temperament are likely adaptive, whereas the aspects of the temperament associated with engagement in risky behaviors, overinvolvement in activities, grandiose confidence, and carefree optimism may be maladaptive.

The HPS predicted measures of grandiosity, including perceptions of future fame or being on the cover of a magazine, and perceptions of current ambition, leadership, creativity, oddness, and tendency to draw attention to oneself. Participants who endorsed future fame were also questioned regarding how they would become famous, with anecdotal responses ranging from becoming a talk show host to a millionaire filmmaker. These findings replicate and expand upon Eckblad and Chapman's (1986) cross-sectional results. Specifically, they suggest that the HPS predicts grandiose traits over time, and that grandiose traits are present across clinical and subthreshold bipolar presentations. Furthermore, these results build on Johnson and Carver's (2006) findings that the HPS is associated with ambitious goals—and are consistent with findings that bipolar disorders are associated with ambitions for fame (Alloy, Bender, et al., 2012; Johnson, Carver, & Gotlib, 2012; Johnson, Eisner, & Carver, 2009). Following Alloy, Bender, et al. (2012), future research should examine whether grandiose traits at this assessment predict the onset of bipolar spectrum disorders.

The HPS predicted new cases of substance use disorders, as well as alcohol and drug use and impairment. These findings are consistent with studies that have documented an association between bipolar spectrum disorders and substance use (Angst et al., 2003, 2010; Hoertel et al., 2013; Zimmermann et al., 2009), as well as Kwapil et al.'s (2000) finding that high HPS scorers had significantly higher rates of substance use disorders in comparison to a control group. It is worth noting that the HPS was not associated with substance use disorders at the initial assessment, and was generally unassociated with ratings of substance use.

Consistent with Kwapil et al. (2000), the HPS predicted borderline personality traits at the follow-up. This finding is not surprising, given the phenomenological overlap across borderline and bipolar psychopathology with regard to affective instability and impulsivity (Antoniadis, Samakouri, & Livaditis, 2012; Coulston, Tanious, Mulder, Porter, & Malhi, 2012; Paris, Gunderson, & Weinberg, 2007). The HPS predicted borderline personality traits in the total sample and after removing participants with DSM–IV–TR bipolar disorders, although none of the participants met full diagnostic criteria at the follow-up for borderline personality disorder. This finding lends support for the HPS' ability to differentiate between bipolar and borderline psychopathology, given that the HPS readily predicted bipolar spectrum disorders, but not borderline personality disorder. Moreover, recent research challenges the notion that borderline personality disorder belongs on the bipolar spectrum (Zimmerman & Morgan, 2013). The finding that the HPS did not predict the borderline trait of affective instability may at first seem surprising, but is consistent with the conjecture that affective dysregulation is different in borderline and bipolar spectrum disorders (Antoniadis et al., 2012; Coulston et al., 2012; Paris et al., 2007). For example, bipolar disorder is associated with mood changes from euthymia to elation or depression, whereas borderline personality disorder is associated with switches from euthymia to anger or anxiety (Henry et al., 2001). Additionally, environmental stressors appear to play a stronger role in affective responses in borderline personality disorder than bipolar disorders (Antoniadis et al., 2012; Paris et al., 2007).

The present study reflects "results in progress" with respect to understanding risk for bipolar spectrum psychopathology and the HPS. Ideally, reassessing this sample in approximately five years would allow for examination of risk for bipolar spectrum psychopathology at the peak age of onset of bipolar disorders. Furthermore, more frequent reassessments would be optimal, given the cyclical and changing nature of bipolar psychopathology. Future longitudinal research could expand upon these findings and Kwapil et al.'s (2000) research to better elucidate risk and protective factors associated with the development of clinical bipolar disorders. There was tremendous variation in the present study with respect to mood symptoms and functioning associated with high scores on the HPS, ranging from participants with clinical bipolar disorders to participants with hyperthymic characteristics without a bipolar diagnosis. This is consistent with the idea that the HPS taps a spectrum of bipolar psychopathology; thus, not everyone with a high HPS score is expected to develop a clinical bipolar disorder. It is important to note that findings regarding the predictive value of the HPS may differ according to context and base rates of mania in the population; thus, future research should also examine validity in other populations (including cross-cultural validation).

Affective temperaments provide a potential vehicle for examining the heterogeneity of high HPS scorers. Walsh, Royal, Brown, et al. (2012) reported that HPS scores were associated with hyperthymic and cyclothymic/irritable, but not dysthymic temperament in this sample. Furthermore, cyclothymic/irritable temperament predicted bipolar disorders and impairment, whereas hyperthymic was associated with a mix of adaptive and dysfunctional characteristics in the present sample (DeGeorge, Walsh, Barrantes-Vidal, & Kwapil, 2014; Walsh, Brown, Barrantes-Vidal, & Kwapil, 2013; Walsh, Royal, Barrantes-Vidal, et al., 2012). Note that future studies could examine the extent to which affective temperaments, and specific characteristics of these temperaments, serve as risk or protective factors for the development of bipolar disorders. For example, in the present research, the HPS only uniquely predicted the short sleeper characteristic of hyperthymic temperament in the full sample, including individuals with bipolar spectrum disorders. Future research could examine whether traitlike decreased need for sleep serves as a specific risk factor for bipolar disorders, as suggested by Gruber et al. (2009). Likewise, future assessments should more fully examine adaptive functioning in high HPS scorers and specific factors (e.g., upbeat mood) that may predict adaptive outcomes.

Implications and Challenges of a Bipolar Spectrum

The present findings offer support for the construct of a bipolar spectrum that extends beyond existing diagnostic boundaries. Identifying individuals who fall on the bipolar spectrum should help us better understand risk and protective factors, as well as opportunities for early intervention. There are challenges, however, associated with the initial step of identifying individuals with bipolar spectrum psychopathology. Specifically, there are contrasting opinions with regard to how to define the bipolar spectrum (Kuiper, Curran, & Malhi, 2012; Mazza, Di Nicola, Janiri, & Bria, 2013; Strakowski, Fleck, & Maj, 2011). The present study included Akiskal's (2004) bipolar spectrum disorders; however, epidemiological studies of subthreshold bipolarity have generally excluded assessment of affective temperaments. Rather, epidemiological research has attempted to validate a subthreshold bipolar disorder using inconsistent definitions. We are ultimately left with evidence for a broader bipolar spectrum, but its boundaries remain quite murky. This lack of consensus on an operational definition for the

bipolar spectrum has only increased the controversy surrounding the construct—and makes the discussion of early interventions challenging and only speculative. The present research adds to the evidence-base for a bipolar spectrum that extends beyond existing diagnostic nomenclature, and offers support for the validity of the HPS as a tool for identifying individuals at risk at the group level. Ultimately, accurate identification of individuals who fall on the bipolar spectrum will aid understanding of risk and protective factors, as well as the underlying etiology of bipolar disorders. Future research should specifically examine the role of moderating factors such as impulsivity and substance use that may increase risk of transition into clinical disorders.

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