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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 the predictive validity of the Hypomanic Personality Scale (HPS) as a measure of bipolar spectrum psychopathology in a nonclinically ascertained sample of young adults at a 3-year follow-up assessment. Thus far, 100 of the original 145 participants have been re-interviewed for bipolar psychopathology, borderline and schizotypal personality disorder symptoms, substance use, treatment history, family history, and psychosocial functioning. At the original assessment, 15 of the 100 participants met criteria for a bipolar spectrum disorder. At the follow-up assessment, an additional 13 had developed bipolar spectrum disorders. A total of 26% of participants met criteria for bipolar spectrum disorders at the follow-up, including 10% 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 at the follow-up assessment. The HPS also predicted current hyperthymic temperament or history of hypomania, grandiose traits, impulsivity, substance use disorders, global impairment, and borderline and schizotypal 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. Contrary to hypotheses, impulsivity did not

moderate the predictive validity of the HPS. 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.

A 3-YEAR LONGITUDINAL STUDY OF RISK FOR BIPOLAR SPECTRUM PSYCHOPATHOLOGY

by

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To my family

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CHAPTER I

INTRODUCTION

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, 4th Edition, Text Revision* (DSM-IV-TR; American Psychiatric Association, 2000). The Hypomanic Personality Scale (HPS; Eckblad & Chapman, 1986) offers a promising point of entry for studying the bipolar spectrum construct. The present research involved a 3-year follow-up assessment of young adults who completed the HPS and a comprehensive cross-sectional assessment (see Walsh, Royal, Brown, Barrantes-Vidal, & Kwapil, 2012). Specifically, the present research examined the predictive validity of the HPS as a measure of bipolar spectrum psychopathology, as well as the moderating role of impulsivity on the relation of the HPS with psychopathology and impairment. Additionally, the present study included a preliminary examination of the validity of a continuous rating system for measuring bipolar spectrum characteristics.

The Bipolar Spectrum

Bipolar disorder has been ranked by the World Health Organization (2008) as one of the top ten causes of disability worldwide and is associated with premature mortality,

largely resulting from suicide and accidental death (Calabrese et al., 2003; Osby, Brandt, Correia, Ekborn, & Sparen, 2001). The DSM-IV-TR recognizes four bipolar disorders: bipolar I disorder, bipolar II disorder, cyclothymic disorder, and bipolar disorder not otherwise specified (bipolar NOS). Traditionally, bipolar disorders have been estimated to affect approximately 1-2% of the general population (Bauer & Pfennig, 2005; Pini et al., 2005). However, recent epidemiological studies suggest that this estimate is conservative and discounts the growing evidence for a continuum of bipolar spectrum psychopathology (e.g., 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. Akiskal (2004) proposed a spectrum of bipolar disorders that extends beyond the DSM-IV-TR diagnoses. In addition to bipolar I and II disorders, Akiskal proposed bipolar II ½ (major depression superimposed on cyclothymic temperament), bipolar III (major depression plus hypomania occurring solely in association with antidepressant or other somatic treatment), and bipolar IV (major depression superimposed on hyperthymic temperament). Note that other authors have suggested six or more variations of bipolar disorder (Akiskal & Pinto, 1999; Klerman, 1987). Consistent with the categorical nature of the DSM-IV-TR, 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 a specific diagnosis.

Evidence for a Broader Bipolar Spectrum

Epidemiology. Several large epidemiological studies provided evidence of milder bipolar psychopathology that extends beyond the current diagnostic boundaries. Using data collected from 4,547 young adults identified as high risk for psychiatric disorders from the longitudinal Zurich Cohort Study, Angst (1998) demonstrated high rates of subclinical hypomania. Angst classified hypomanic syndromes as follows: hypomania lasting at least 4 days and meeting criteria defined in the *Diagnostic and Statistical Manual, 4th Edition* (DSM-IV; American Psychiatric Association, 1994), brief hypomania (hypomania syndromes meeting DSM-IV symptomatic criteria but lasting only 1-3 days), and isolated hypomanic symptoms that do not meet the requirements of the other categories. Angst reported that 6% of the sample met criteria for DSM-IV hypomania or mania, 3% experienced brief hypomanias (and half of this group reported experiencing brief hypomania at least once per month), and 11% of the sample reported experiencing subthreshold hypomanic symptoms.

Using the same high risk sample, Angst et al. (2003) examined the validity of several bipolar spectrum conditions as follows:

- Bipolar I disorder: mania requiring hospitalization plus major depressive episode(s) (MDE)
- Hard bipolar II disorder: ≥ three hypomanic symptoms with consequences plus MDE
- Soft bipolar II disorder: ≥ three hypomanic symptoms plus MDE
- Hard minor bipolar disorder: ≥ three hypomanic symptoms with consequences plus dysthymia, subthreshold depression, or recurrent brief depression (less than 2 weeks duration)
- Soft minor bipolar disorder: ≥ three hypomanic symptoms plus dysthymia, subthreshold depression, or recurrent brief depression
- Pure hypomania: ≥ three hypomanic symptoms with consequences without depressive symptoms
- Hypomanic symptoms: ≥ three hypomanic symptoms without depressive symptoms

Note that the authors eliminated any duration requirement across all conditions, and euphoria, irritability, or *overactivity* was required for all hypomanic conditions. Overactivity was defined as a transient increase in physical or social activity associated with increased energy, activity, traveling, talking, being busier, decreased "fatiguableness," and/or decreased need for sleep. Hypomanic symptoms with consequences referred to a change in functioning that was observable by others and/or causing problems for the participant. Angst et al. (2003) reported that 5% of participants met criteria for hard bipolar II disorder and an additional 6% reported symptoms of soft

bipolar II disorder. Six percent of participants reported symptoms consistent with soft minor bipolar disorder, and 3% of participants met criteria for the harder definition. There were higher rates of hypomanic symptoms (9%) in comparison to pure hypomania (3%). The authors also compared the hard and soft bipolar groups within bipolar II disorder and minor bipolar disorder and reported no between-group differences with respect to any external clinical validators, including number of days per year experiencing hypomanic or depressive symptoms, age of onset, suicide attempts, treatment for depression, anxiety disorders, substance abuse or dependence, conduct problems, or criminal offenses. Additionally, the combined group of individuals who met criteria for a hard or soft bipolar disorder exceeded individuals with major depressive disorder with regard to history of substance abuse or dependence and conduct problems. Note that this analysis was not completed with minor bipolar disorders. Taken together, Angst et al. (2003) reported a strikingly high prevalence rate of 24% for the bipolar spectrum, including individuals with bipolar I disorder and excluding individuals with isolated hypomanic symptoms without consequences (although note that this was a high risk sample, not an epidemiological sample).

In addition to examining the rates of bipolar spectrum conditions, Angst and colleagues (2003) also examined the validity of the symptom and duration thresholds required for DSM-IV hypomania. The authors found no differences between groups reporting a history of 2-3 symptoms, 4-5 symptoms, or 6-7 symptoms with regard to clinical variables, including age of onset, history of depression, depression treatment, criminal offenses, suicide attempts, and duration of hypomanic or mixed symptoms

within a 1-year period. Experiencing 6-7 hypomanic symptoms was, however, associated with increased number of days depressed over a 1-year period. Angst et al. (2003) also tested the validity of the inclusion of individuals with a history of overactivity in the absence of euphoria or irritability. They reported no differences between groups exhibiting mood symptoms and overactivity versus overactivity alone. Angst et al. (2003) concluded that these results support the addition of overactive behavior as a criterion for hypomania. With regard to duration of hypomania, the authors compared participants who experienced brief hypomanic episodes (1-3 days) with those meeting DSM-IV duration criteria (at least 4 days). As expected, individuals reporting threshold duration for hypomania experienced more hypomanic days within a 1-year period; however, comparisons on the remainder of the clinical variables were non-significant. The authors indicated that their findings were in agreement with the 2-day duration requirement for hypomania recommended by an expert group (Akiskal et al., 2000; Cassano, Akiskal, Savino, Musetti, & Perugi, 1992; Manning, Haykal, Connor, & Akiskal, 1997) and often used in clinical practice (Akiskal et al., 2000; Benazzi, 2001).

Merikangas and colleagues (2007) examined the prevalence of subthreshold bipolar disorder as part of the US National Comorbidity Replication Study (NCS-R; Kessler & Merikangas, 2004). Subthreshold bipolar disorder was defined as any of the following: a) at least two episodes of DSM-IV hypomania without major depression, b) recurrent subthreshold hypomania plus major depression, or c) recurrent subthreshold hypomania without major depression. Note that subthreshold hypomania was defined just below the DSM-IV threshold: euphoria or irritability lasting at least 4 days with at least

two additional symptoms. Of the 9,282 adults surveyed, 2% met criteria for subthreshold bipolar disorder in their lifetime, with 4% of participants qualifying for a subthreshold or DSM-IV bipolar disorder. The authors reported that 46% of adults with subthreshold bipolar disorder experienced severe role impairment during the previous year associated with hypomanic symptoms.

Using data from the prospective longitudinal Early Development Stages of Psychopathology study in Munich (EDSP; Lieb, Isensee, von Sydow, & Wittchen, 2000; Wittchen, Perkonigg, Lachner, & Nelson, 1998), Zimmermann and colleagues (2009) examined the incidence of the following disorders in a community sample at a 10-year follow-up assessment:

- Subthreshold bipolar disorder: major depression with history of subthreshold hypomania
- Minor subthreshold bipolar disorder: dysthymia, minor depression, or recurrent brief depression with history of subthreshold hypomania
- Minor bipolar disorder: DSM-IV hypomania with or without history of dysthymia, minor depression, or recurrent brief depression

Subthreshold hypomania was defined as a period of at least 4 days with the following: 1) elevated or expansive mood that created problems or was noticed by others, but not meeting symptom threshold for DSM-IV hypomania, or 2) unusually irritable mood expressed as starting arguments, shouting at or hitting people, and having at least three hypomanic symptoms, but symptoms were not observable by others. Minor depression

referred to depressive symptoms that did not meet criteria for a DSM-IV depressive episode. Of the 2,210 participants, Zimmermann et al. reported that 9% qualified for subthreshold bipolar disorder, 6% qualified for minor subthreshold bipolar disorder, and 3% qualified for minor bipolar disorder. In comparison to a control group, the authors reported higher rates of suicide attempts, substance use disorders, and nicotine dependence in participants with subthreshold bipolar disorder. They reported a combined prevalence rate of 14% for the bipolar spectrum, which included bipolar I and II disorders and subthreshold bipolar disorder, and excluded the minor disorders. This is consistent with Angst et al. (2003), who reported a prevalence rate of 12% for bipolar I and II disorders and softly defined bipolar II disorder (major depression plus subthreshold hypomania).

Angst et al. (2010) examined the prevalence of major depression with subthreshold hypomania using data from the US NCS-R (Kessler & Merikangas, 2004). Criteria for subthreshold hypomania included failure to meet full diagnostic criteria for hypomania and endorsement of at least one of two screening questions:

1) "Some people have periods lasting several days or longer when they feel much more excited and full of energy than usual. Their minds go too fast. They talk a lot. They are very restless or unable to sit still and they sometimes do things that are unusual for them, such as driving too fast or spending too much money. Have you ever had a period like this lasting several days or longer?"

2) "Have you ever had a period lasting several days or longer when most of the time you were so irritable that you either started arguments, shouted at people, or hit people?"

Of the 5,692 participants, Angst et al. (2010) reported that 7% qualified for major depression with subthreshold hypomania. Moreover, 67% of these participants reported experiencing severe role impairment over the previous year, and another 25% reported experiencing moderate role impairment. Additionally, 41% of participants with major depression and subthreshold hypomania endorsed at least one suicide attempt during their lifetime and 35% qualified for a substance use disorder. Rates of substance use disorders among participants with major depression and subthreshold hypomania exceeded rates among participants with only major depression. Including bipolar I and II disorders and subthreshold bipolar disorder, the authors reported a 9% prevalence rate for the bipolar spectrum.

Most recently, Hoertel et al. (2013) assessed the prevalence of major depression with subthreshold hypomania in a sample of 43,093 individuals who took part in the 2001-2002 National Epidemiologic Survey on Alcohol and Related Conditions (NESARC). Subthreshold hypomania was defined as failure to meet the full DSM-IV diagnostic criteria for hypomania and the presence of at least one of the following three criteria: 1) 1-week period of elevated mood that others noticed, 2) 1-week period of elevated mood that resulted in others being concerned, and/or 3) 1-week period of irritable mood (e.g., shouting at others, throwing or breaking objects, or starting fights or arguments). Under these diagnostic guidelines, Hoertel and colleagues reported that 3%

of participants met criteria for major depression with subthreshold hypomania. The authors also reported that these participants had higher 12-month psychiatric comorbidity rates of any Axis I disorder, substance use disorder, nicotine dependence, and dysthymia in comparison to participants with unipolar depression. The authors reported a combined prevalence of 6% for bipolar I and II disorders and subthreshold bipolar disorder.

Overall, these studies suggest that the traditional lifetime prevalence rate for bipolar disorders of 1-2% is conservative and excludes individuals who experience subthreshold bipolar psychopathology and characteristics. Additionally, 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, etc.). Taken together, these epidemiological studies offer evidence that the boundaries of bipolar psychopathology extend beyond those of the current diagnostic system. However, as is demonstrated by these studies, there is not a consensus regarding the exact conceptualization of broader bipolar disorders or whether these conditions are best considered within a categorical or dimensional framework.

The relation of subthreshold symptoms with clinical disorders. There is considerable evidence that subthreshold bipolar psychopathology precedes the development of DSM bipolar disorders. Akiskal, Djenderedjian, Rosenthal, and Khani (1977) reported that nearly one-third of their sample of outpatients with cyclothymia developed bipolar I or II disorders within a 2-3 year period. More recently, Beesdo et al. (2009) examined the incidence patterns of mood episodes and conversion rates to bipolar

disorders in a sample of 3,021 community participants (aged 14-24 years at baseline) over a 10-year period. Among individuals with pure hypomania (no history of major depression at or prior to baseline), 16% subsequently experienced major depression and thus transitioned into bipolar II disorder. An additional 28% of individuals subsequently developed subthreshold depressive symptoms (i.e., "soft" bipolar II disorder).

Using data from The Longitudinal Investigation of Bipolar Spectrum Disorders (LIBS) Project, Alloy, Urošević, et al. (2012) examined the course of bipolar spectrum disorders over a 4.5-year follow-up period in a sample of 206 college undergraduates with early onset (mean age of onset for first hypomanic or depressive episode or cyclothymic pattern was 13 years old). The authors reported that 42% of the participants initially identified as cyclothymic or bipolar NOS transitioned to bipolar II disorder and that 15% of participants with bipolar NOS, cyclothymic, or bipolar II disorders subsequently developed bipolar I disorder. In a younger sample of 413 youths (aged 7-17 years) with bipolar spectrum disorders, Birmaher et al. (2009) reported that 25% of youths with bipolar II disorder converted to bipolar I disorder and 38% of youths with bipolar NOS converted to either bipolar I or bipolar II disorder over a 4-year period. Kochman et al. (2005) found that 64% of youth (mean age 13 years) with cyclothymic temperament and history of depression transitioned to bipolar II disorder over a 2-4 year follow-up period. Additionally, Zimmermann et al.'s (2009) 10-year prospective study found that individuals with a history of major depression and subthreshold hypomania were more likely to develop DSM-IV bipolar disorders in comparison to individuals

diagnosed with unipolar depression. Taken together, these studies indicate that subthreshold bipolarity often precedes the development of clinical disorders.

Family studies. Family history has been described as an important external validator of psychopathology (Akiskal, 2003; Kraepelin, 1921; Robins & Guze, 1970). Akiskal et al. (1977) found nearly identical histories of first-degree relatives with bipolar disorders in bipolar I and cyclothymic probands (26% vs. 30%, respectively), with a control group of "pseudocyclothymic" participants reporting a rate of only 2%. Gershon et al. (1975) reported higher rates of cyclothymia in the relatives of bipolar I probands. Across participants with either DSM-IV or "soft" bipolar II disorder, Angst et al. (2003) reported comparable rates of mania (12% vs. 18%, respectively) and depression (60% vs. 59%, respectively) among first-degree relatives. The combined family history of mania across both bipolar II groups was significantly higher than that of patients with major depressive disorder. Additionally, family history of mania among participants with pure hypomania (19%) was higher than in a control group (4%)—comparable to Angst (1998) who reported a 2-fold higher rate of family history of mania in participants with history of subthreshold hypomania in comparison to a control group. Cassano et al. (1992) found significantly higher rates of familial bipolarity among individuals with history of major depression and hyperthymic temperament (Akiskal's bipolar IV) as compared to individuals with unipolar depression. Similarly, Zimmermann et al. (2009) found higher rates of mania in the family members of individuals with major depression and subthreshold hypomania in comparison to relatives of patients with unipolar depression and control group members.

Dimensional Models of the Bipolar Spectrum

In light of the growing body of evidence for a broader bipolar spectrum, there is also growing support for dimensional models of bipolar psychopathology. Dimensional approaches are currently being considered for a range of psychological disorders, most notably personality disorders (e.g., Krueger, Derringer, Markon, Watson, & Skodol, 2012; Widiger, Costa, & McCrae, 2012; Widiger, Livesley, & Clark, 2009), but also anxiety (e.g., Shear, Bjelland, Beesdo, Gloster, & Wittchen, 2008; Watson, 2009), substance use (e.g., Helzer, Bucholz, & Gossop, 2008), psychotic (e.g., Allardyce, Suppes, & van Os, 2008), and depressive (Andrews et al., 2008) disorders. Dimensional models provide rich, specific descriptions at the level of the individual that are more valid and consistent with the nature of psychopathology (Simonsen, 2010; Widiger, 2005). Specifically, dimensional models may avoid the "misleading, unstable, and illusory efforts to carve psychological functioning at nonexistent discrete joints" (Widiger & Samuel, 2005, p. 500). A dimensional profile of several clinical features will likely be more informative and representative of an individual's presentation than a positive diagnosis, especially when one considers the heterogeneity within diagnostic categories. Furthermore, a dimensional model can easily be converted to a categorical diagnosis; however, the latter cannot be converted into dimensional scores (Widiger & Mullins-Sweatt, 2007).

Using dimensions in diagnosis allows for better exploration of differences between patients and improved representation of unusual cases (Simonsen, 2010). Within a categorical diagnostic system, drastically different symptom presentations may result in

the same diagnosis. Dimensional approaches offer the advantage of preserving differences across patients. Specifically, dimensional models offer gradations of illness along a continuum and allow for improved monitoring of changes in symptoms over time (Helzer, Kraemer, & Krueger, 2006; Simonsen, 2010).

Dimensional approaches to psychopathology may also help elucidate the specific and nonspecific factors that comprise mental disorders. Within such a framework, individual disorders are represented as combinations of different symptoms, with some symptoms applying to a broad range of disorders (i.e., nonspecific factors), and other symptoms necessary for the diagnosis itself (i.e., specific factors), with few symptoms unique to a specific diagnosis. For example, neuroticism serves as a nonspecific factor for a range of disorders, including depression and anxiety (see Watson, O'Hara, & Stuart, 2008), whereas anxious arousal serves as a specific factor for panic disorder (see Brown, Chorpita, & Barlow, 1998). As research in dimensional approaches progresses, Widiger and Clark (2000, p. 954) argue that it may make more sense conceptually to consider "symptom-cluster building blocks" with which to construct diagnoses—in contrast to a categorical set of diagnoses. Additionally, if specific symptom clusters are found to co-occur at a high rate, future research may be able to identify an etiological basis for the co-occurrence, and provide a meaningful categorical diagnosis. In summary, Widiger and Clark offer a bottom-up approach to diagnostic classification that may better map onto psychopathology as it exists in nature, and allow for increased understanding of etiology.

Several researchers have attempted to characterize the bipolar spectrum using dimensional approaches. Katzow, Hsu, and Ghaemi (2003) proposed a dimensional

model that encompasses DSM-IV-TR bipolar disorders, subthreshold hypomania, and unipolar depression. Specifically, the authors (p. 439) offered a "smooth continuum" ranging from mania at the left pole and psychotic depression at the right, with hypomania, cyclothymia, subthreshold hypomania, euthymia, and mild, moderate, and severe depression falling in between. The authors stated that patients can cycle from any two points on the spectrum, including cyclicity confined to the depressive range, and argued that the "key" to bipolarity may be mood cycling in general, as opposed to polarity (i.e., cycling between mania and depression). Note that the notion of eliminating the requirement of polarity from the bipolar spectrum has been met with controversy (Phelps et al., 2008).

Angst (2007) offered a comprehensive, two-dimensional model of the bipolar spectrum. Angst posited that the term 'bipolar spectrum' is used primarily to refer to two complementary ideas—a spectrum of severity and a spectrum of proportionality. Angst described each of these spectra as dimensional in nature, with no natural categorical subgroups, although Angst included categorical disorders within the model for descriptive purposes. Angst claimed that the spectrum of severity incorporated (from extreme to benign): psychotic major mood disorders, non-psychotic major mood disorders, minor bipolar disorders (e.g., hypomania with brief or mild depression), cyclothymic disorder, affective personality disorders (e.g., borderline personality disorder), affective temperaments (e.g., dysthymic, cyclothymic, and hyperthymic temperaments), "normal" ranges of functioning (i.e., isolated symptoms of hypomania and/or depression), and supernormal functioning (i.e., no mood symptoms). However,

Angst noted that the relationship between personality disorders and the bipolar spectrum remained unclear. Angst posited that the proportionality spectrum included the domains of depression and mania. Specifically, at the severity level of major mood disorders, it included: major depressive disorder, depression and hypomania (bipolar II), depression and mania (bipolar I), mild depression and mania, and pure mania. At the subthreshold level, Angst proposed that this spectrum included mild depression, minor bipolar disorders, and hypomania. In summary, Angst proposed a two-dimensional model of the bipolar spectrum that includes a range of clinical and subclinical experiences relevant to major depressive and bipolar disorders.

Characteristics of Bipolar Spectrum Psychopathology

Whether defined narrowly (e.g., DSM-IV-TR) or broadly, bipolar spectrum psychopathology involves dysregulation in affect, cognition, behavior, sense of self, as well as somatic disturbances. With regard to affect, bipolar spectrum psychopathology is characterized by euphoria and irritability, as well as lability of affect (American Psychiatric Association, 2000). Affective lability often includes shifts in both mood and energy (e.g., from energized euphoria to fatigue and dysphoria). Disruptions in cognition include changes in the form of thought, such as racing thoughts, fullness of thought, loosened associations, and distractibility, as well as changes in the content of thought, such as numerous (and often unrealistic) plans and goals. Changes in one's sense of self may range from increased self-esteem to delusions of grandeur. Behavioral changes include increased energy and goal-directed behavior (e.g., socially, occupationally, and/or sexually), behavioral disinhibition and impulsivity, as well as pressured speech and

flights of ideas. Lastly, somatic changes include decreased need for sleep and psychomotor activation (e.g., restlessness and/or increased physical activity).

Grandiosity. Grandiosity is often associated with episodes of mania and hypomania at the more severe end of the bipolar spectrum. However, recent literature has also examined the extent to which more subtle expressions of grandiosity, such as overinflated expectations of success, are associated with the bipolar spectrum. Using a sample of college undergraduates psychometrically identified as at-risk for bipolar disorder by the HPS, Johnson and Carver (2006) examined the association of the HPS with highly ambitious life goals. They found that the HPS was positively associated with expectancies for popular fame (e.g. being friends with celebrities) and was modestly associated with aspirations for financial wealth (e.g., running a fortune 500 company), and political influence (e.g., being president of the country). The authors also noted small, but significant associations with goals related to creativity, world well-being (e.g., stopping world hunger), and idealized relationships with family and friends. The authors concluded that individuals at risk for bipolar disorder are likely to be sensitive to potential reward and have high ambition. Similarly, Eckblad and Chapman (1986) reported that high scorers on the HPS reported higher levels of ambition, artistic interests, and leadership, as well as increased likelihood of wealth and fame in comparison to a control group. Participants with elevated HPS scores were also more likely to endorse purposefully calling attention to themselves and to describe themselves as odd or different, compared to the control group.

Research has also examined the extent to which highly ambitious expectations contribute to risk for bipolar disorder. Using a sample of adolescents (aged 14-19 years) who scored in the moderate to high range on a measure of behavioral approach system sensitivity, Alloy, Bender, et al. (2012) reported that expectations for popular fame and wealth predicted shorter time to first onset of bipolar spectrum disorders. The authors argued that setting highly ambitious goals may reflect the same underlying traits of grandiosity observed in hypomania and mania.

Similar findings have also been observed in clinical samples. Johnson, Eisner, and Carver (2009) found that lifetime history of a clinical bipolar disorder was associated with elevated expectations of popular fame and wealth. At the extreme end of the bipolar spectrum, Johnson, Carver, and Gotlib (2011) reported elevated ambitions of popular fame among individuals with bipolar I disorder in comparison to a control group.

Impulsivity. Impulsivity is considered a core feature of bipolar psychopathology (American Psychiatric Association, 2000). In addition to impulsivity characteristic of manic episodes, such as substance use, spending sprees, reckless driving, and sexual indiscretions (American Psychiatric Association, 2000), trait-like impulsivity has also been reported to be higher among individuals with bipolar disorder. Specifically, individuals with bipolar disorder were found to have elevated rates of impulsivity, regardless of whether they were in a depressed (Peluso et al., 2007), manic (Swann, Pazzaglia, Nicholls, Dougherty, & Moeller, 2003), or euthymic mood state. Trait impulsivity has also been shown to be higher in the unaffected relatives of patients with bipolar I disorder (Lombardo et al., 2012). Alloy, Urošević, and colleagues (2012) found

that impulsivity (as measured by the Impulsive-Nonconformity Scale; Chapman et al., 1984) predicted transition to bipolar I disorder among college students with early onset bipolar spectrum disorders, when controlling for family history and other covariates.

Whiteside, Lynam, Miller, and Reynolds (2005) offered a multidimensional model of impulsivity based upon distinct personality pathways: urgency, lack of premeditation, lack of perseverance, and sensation seeking. Urgency refers to the tendency to act impulsively in the presence of negative affect. Impulsive behavior may serve as a way to cope with negative affect, despite its potential long-term negative consequences (Whiteside et al., 2005). Lack of premeditation refers to difficulty reflecting on a behavior and its potential consequences prior to engaging in it. Lack of perseverance refers to an inability to maintain focus on a task that one finds difficult or boring. Lastly, sensation seeking refers to a preference for activities that are exciting, and openness to experiences that may be dangerous. Walsh et al. (2012) found that HPS scores were positively associated with urgency, lack of premeditation, and sensation seeking, but not lack of perseverance in a sample of college students oversampled for elevated HPS scores

Borderline personality disorder. Borderline personality disorder has also been examined in relation to bipolar spectrum psychopathology. Three recent reviews of the phenomenology of borderline personality and bipolar disorders indicated they are overlapping, yet distinct constructs (Antoniadis, Samakouri, & Livaditis, 2012; Coulston, Tanious, Mulder, Porter, & Malhi, 2012; Paris, Gunderson & Weinberg, 2007). Specifically, both borderline personality disorder and mood disorders are associated with

high neuroticism and low conscientiousness, although they are differentiated by harm avoidance, which is elevated in borderline personality disorder (Paris et al., 2007). Affective dysregulation is central to both bipolar and borderline personality disorders; however, the mood changes differ across the disorders (Antoniadis et al., 2012; Coulston et al., 2012; Paris et al., 2007). Bipolar disorder is associated with mood changes from depression to elation, whereas borderline personality disorder is associated with switches from euthymia to anxiety and anger, but rarely to elation, and depressive symptoms are experienced more intensely (Antoniadis et al., 2012). In addition, environmental stressors, particularly interpersonal events, appear to play a stronger role in the affective response among individuals with borderline personality disorder, compared to bipolar disorders (Antoniadis et al., 2012; Paris et al., 2007). All three reviews noted that impulsivity is associated with bipolar and borderline psychopathology; however, impulsivity associated with borderline personality disorder is more likely to involve frequent efforts to relieve psychological pain and include suicide attempts or gestures (Coulston et al., 2012; Paris et al., 2007). Additionally, impulsivity associated with bipolar disorder is likely to be influenced by cognitive disturbances, such as racing thoughts and distractibility (Coulston et al., 2012). Lastly, Antoniadis and colleagues found that several symptoms, including fear of abandonment, hostile behavior, and dependent relationships, are more prominent in borderline personality disorder.

Schizotypy. There is also evidence to suggest that there is phenomenological overlap across bipolar disorders and schizotypy. Schizotypy is defined as a broad phenotype that encompasses schizophrenia, schizophrenia-spectrum disorders, the

prodrome, as well as subclinical characteristics (Claridge, 1997; Kwapil & Barrantes-Vidal, 2012; Lenzenweger, 2010; Meehl, 1962). Schizotypy is conceptualized as a multidimensional construct, with positive and negative dimensions being the most replicated factors. Positive schizotypy is characterized by magical thinking, referential ideas, unusual perceptual experiences, as well as negative affect and affective dysregulation. Positive schizotypy has been shown to be associated with mood disorders (Kwapil, Barrantes-Vidal, & Silvia, 2008) as well as risk for bipolar disorder using the HPS (Kwapil et al., 2000). Additionally, several studies reported elevated rates of schizotypal personality disorder or schizotypal traits within relatives of patients with schizophrenia and relatives of patients with affective disorders (Coryell & Zimmerman, 1989; Kety et al., 1994; Squires-Wheeler, Skodol, Basset, & Erlenmeyer-Kimling, 1989; Squires-Wheeler, Skodol, Friedman, & Erlenmeyer-Kimling, 1988). At the extreme end of the schizotypy continuum, family studies have suggested that schizophrenia and bipolar disorder may share some of the same susceptibility factors (e.g., Potash, 2006; for review, see Bramon & Sham, 2001), and Jones and Tarrant (1999) suggested there are shared developmental precursors across schizophrenia and affective disorders.

Assessment of Bipolar Spectrum Psychopathology

Eckblad and Chapman (1986) developed the self-report HPS to identify individuals who may be at risk for bipolar disorder. Specifically, the scale was designed to pick up mild, manic, trait-like functioning. Eckblad and Chapman assessed the validity of the HPS in a cross-sectional study of college students. High scorers (HPS group; n = 40) and control participants (n = 40) were recruited and interviewed for the presence of

manic episodes, hypomanic episodes, depressive episodes, affective personality disorders, and substance use. Approximately 77% of the HPS group met criteria for a hypomanic episode, using the Schedule for Affective Disorders and Schizophrenia—Lifetime Version (SADS-L; Spitzer & Endicott, 1977), whereas no control participants received the diagnosis. Furthermore, six of the nine individuals in the HPS group who did not receive a hypomanic diagnosis reported usually feeling euphoric or energetic. The HPS group also exceeded the control group on week-long depressive episodes, diagnoses of cyclothymic personality disorder and treatment of psychopathology, and reported significantly higher alcohol and drug use. Additionally, the HPS group endorsed significantly more schizotypal indicators and psychotic and psychotic-like experiences than the control group. Overall, these findings supported the relation of the HPS with bipolar spectrum psychopathology.

A 13-year follow-up of this sample revealed similar group differences (Kwapil et al., 2000). At the follow-up assessment, participants were assessed for bipolar spectrum psychopathology, borderline personality disorder, schizotypal personality disorder, as well as impulsive-nonconformity. Twenty-eight percent of the HPS group met criteria for a DSM-IV hypomanic episode within the past two years, compared to 3% of the control group. Furthermore, 25% of the HPS group and none of the control group met criteria for DSM-IV bipolar disorders; two participants in the HPS group met criteria for bipolar I disorder and seven participants met criteria for bipolar II disorder. Thirty-six percent of the HPS group, compared to 10% of the control group, experienced a major depressive episode during the follow-up period. Forty-four percent of the HPS group, compared to

13% of the control group, met criteria for a substance use disorder during the follow-up period. Additionally, the HPS group exceeded the control group on dimensional scores of borderline personality disorder. The HPS group also exhibited elevated ratings of psychotic-like experiences or psychotic deviancy in comparison to the control group, and demonstrated a trend toward higher dimensional scores of schizotypal personality disorder. None of the participants met criteria for full diagnosis of borderline or schizotypal personality disorder. The groups did not differ with respect to treatment.

The authors reported that HPS participants who scored highly on the Impulsive-Nonconformity Scale (Chapman et al., 1984) at the time of the initial assessment (HPS-impulsive group) had especially poor outcomes at the follow-up compared to participants who only experienced hypomanic personality. The Impulsive-Nonconformity Scale assesses an unwillingness to conform to society's norms, a lack of empathy toward others' suffering, as well as a tendency toward impulsive and self-gratifying behaviors (Chapman et al., 1984). Participants within the HPS-impulsive group experienced more bipolar disorder diagnoses than the remaining 27 individuals in the HPS group (67% compared to 11%). In addition, 22% of the HPS-impulsive group experienced manic episodes, compared to none of the individuals in the non-impulsive HPS group. Furthermore, 56% of the HPS-impulsive group reported being arrested compared to 15% of the non-impulsive HPS group. This group also exceeded the control group on borderline characteristics and alcohol use, and experienced lower overall psychosocial functioning. The authors suggested that the overlap between bipolar spectrum and borderline personality features could be attributed to affective dysregulation associated

with both constructs. Overall, the authors concluded that poor behavioral gating in combination with bipolar spectrum psychopathology contributed to an especially heightened risk for behavioral and social impairment, and the experience of clinical bipolar disorders.

Walsh 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. The authors reported that HPS scores were significantly associated with interview ratings 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. The relation of the HPS with history of major depressive episodes was not significant (despite the fact that major depressive episodes were part of many of the cases of bipolar disorders). HPS scores were positively associated with current depressive symptoms, poor psychosocial functioning, cyclothymic temperament, impulsivity (i.e., urgency, lack of premeditation, and sensation seeking), and symptoms of borderline personality disorder. In daily life, HPS scores were associated with 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 severely impaired participants with clinical bipolar disorders. However, Walsh et al.'s findings were limited to cross-sectional comparisons. Longitudinal assessment is needed to more fully assess the predictive validity of the HPS.

Goals and Hypotheses

The present research continued the validation work of Walsh et al. (2012) by examining the predictive validity of the HPS as a measure of bipolar spectrum psychopathology in a 3-year longitudinal study of their original sample. Specifically, this study examined whether the HPS predicts DSM bipolar disorders and bipolar spectrum psychopathology, as well as alcohol and drug use and impairment, borderline and schizotypal personality disorder symptoms, and psychosocial impairment over a 3-year period. This study also attempted to replicate and expand upon Kwapil et al.'s (2000) longitudinal findings that impulsivity moderates the relation of the HPS with adverse outcomes. Finally, this study provides a preliminary examination of the validity of a continuous rating system of bipolar spectrum psychopathology. Specific goals, hypotheses, methods, and analytic strategies are described in the subsequent sections.

Relation of the HPS with Bipolar Spectrum Psychopathology

The present study examined the relation of the HPS with: 1) DSM-IV-TR bipolar disorders, 2) bipolar spectrum disorders, 3) hypomanic episodes and hyperthymic temperament, 4) major depressive episodes, 5) grandiosity, 6) impulsivity, 7) alcohol and drug use and impairment, 8) borderline and schizotypal personality disorder symptoms, and 9) psychosocial functioning. In order to examine the extent to which the HPS predicted new cases of bipolar and bipolar spectrum disorders, major depressive

episodes, as well as hyperthymic temperament or history of hypomania at the follow-up assessment, these analyses were also computed after omitting participants diagnosed at the initial assessment. Specific hypotheses are outlined below.

1a The HPS will predict DSM-IV-TR bipolar disorders in the follow-up sample and among participants who did not meet criteria for a bipolar disorder at the initial assessment.

1b The HPS will predict bipolar spectrum disorders (including DSM-IV bipolar disorders) in the follow-up sample and among participants who did not meet criteria for a bipolar spectrum disorder at the initial assessment.

1c The HPS will predict current hyperthymic temperament or history of hypomania in the follow-up sample and among participants who did not meet criteria for hypomania or hyperthymic temperament at the initial assessment. Similarly, the HPS is expected to predict hyperthymic temperament characteristics.

1d The HPS will predict lifetime history of major depressive episodes in the follow-up sample and among participants who did not meet criteria for a lifetime major depressive episode at the initial assessment. The HPS is not expected to predict major depressive disorder.

1e The HPS will predict grandiose characteristics.

1f The HPS will predict impulsivity traits, specifically impulsive-nonconformity, urgency, lack of premeditation, and sensation seeking.

1g The HPS will predict symptoms of borderline and schizotypal personality disorders. Given the relatively low base rate of these personality disorders and the young age

range of the participants, the HPS is not expected to predict elevated rates of full-blown personality disorders.

1h The HPS will predict current and heaviest alcohol use and impairment. Additionally, the HPS will predict current and heaviest drug use and impairment. These hypotheses are rather tentative, given that the HPS was not associated with alcohol or drug use in the cross-sectional study (Walsh et al., 2012); however, previous research (Eckblad & Chapman, 1986; Kwapil et al., 2000) supports a relation between the HPS and substance use, and bipolar spectrum disorders are often comorbid with substance use disorders (Angst et al., 2003, 2010; Hoertel et al., 2013; Zimmermann et al., 2009).

1i The HPS will predict impairment in global, role, and social functioning.

Relation of the HPS with Family History and Treatment History of Psychopathology

The present study examined the relation of the HPS with interview measures of family history and treatment history of psychopathology. Specific hypotheses are outlined below.

2a The HPS will predict family history of mood disorders. This hypothesis is rather tentative, given that the HPS was not associated with family history in the cross-sectional (Walsh et al., 2012) or previous longitudinal research (Kwapil et al., 2000). However, a number of studies (e.g., Akiskal et al., 1977; Akiskal & Benazzi, 2006; Angst et al., 2003, Zimmermann et al., 2009) support the relation of bipolar spectrum psychopathology with family history of mood disorders.

2b The HPS will predict lifetime history of mental health treatment. This hypothesis is also rather tentative, given that the HPS was not associated with treatment history in the cross-sectional study (Walsh et al., 2012) or previous longitudinal research (Kwapil et al., 2000); however, the initial cross-sectional study of the HPS (Eckblad & Chapman, 1986) and epidemiological research (Angst et al., 2003) support the relation of bipolar spectrum psychopathology with treatment history.

Relation of the HPS with Bipolar Spectrum Characteristics

The present research offered a preliminary examination of the validity of a continuous rating system of bipolar spectrum characteristics. Specifically, bipolar spectrum characteristics were assessed across five domains, including disturbances in affect, behavior, cognition, sense of self, as well as somatic disturbances. In order to examine the extent to which the HPS was associated with a bipolar spectrum, the analyses were computed twice: first with the total sample and then with participants with DSM-IV-TR bipolar disorders omitted (identified either at the initial or follow-up assessment). The aim of this analytic strategy was to examine the hypotheses that 1) the HPS is associated with a spectrum of bipolar psychopathology, and that, 2) consistent with the notion that the spectrum includes subclinical manifestations, these associations will remain statistically significant after the participants with DSM-IV-TR bipolar disorders are omitted from the analyses. This allowed for the examination of whether the main effects predicted are largely driven by a subset of participants with bipolar disorders (and are no longer significant when these participants are omitted), or whether these effects remain even after these participants are excluded. It was hypothesized that the

HPS would predict lifetime history of disturbances in affect, behavior, cognition, sense of self, and somatic disturbances relevant to the bipolar spectrum both in the total sample and after removing participants with bipolar disorders.

Moderating Effect of Impulsivity

The present research examined the moderating effects of impulsivity on the relation of the HPS with adverse outcomes. All analyses were computed with the total follow-up sample. Urgency, sensation seeking, and risky behavior in daily life (as measured at the initial assessment) were expected to moderate the relation of the HPS with bipolar spectrum disorders and global functioning.

CHAPTER II

METHOD

Participants

Selection of Participants at the Initial Assessment

All of the candidate participants for the present study took part in Walsh et al.'s (2012) cross-sectional assessment. Approximately 1,200 students enrolled in psychology courses at the University of North Carolina at Greensboro completed the HPS in mass-screening sessions during three consecutive semesters, beginning in the spring of 2008. A total of 191 students were invited to participate in Walsh et al.'s study. Specifically, 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. This recruitment strategy was designed to ensure that a sufficient number of individuals with bipolar spectrum psychopathology were included in the study, while maintaining a continuous distribution. A total of 147 participants were enrolled. Two participants were dropped due to invalid questionnaire measures. The final sample included 100 women and 45 men. Mean age was 19.5 years (*SD* = 2.3 years). Neither age nor sex was significantly correlated with HPS scores (*r* = -.09 and -.02, respectively). The sample was 65% Caucasian, 16% African American, 4% Hispanic, 4% Asian/Pacific Islander, 4% other, and 7% unspecified.

Participation in the Follow-Up Assessment

All 145 participants were invited to participate in the present study. The reassessment began in spring 2011 and is ongoing. Participants received $25 for their participation. Thus far, 100 participants (69% of the original sample) have completed the follow-up assessment, including 66 women and 34 men. Mean age was 22.5 years (*SD* = 2.7 years).[1] The mean time between assessments was 3.0 years (*SD* = 0.4 years, range = 1.7 to 4.2 years). Of the 45 participants who were not reassessed thus far, 17 expressed interest but had not yet been scheduled, 13 declined to participate, 13 were not located, and 2 did not respond to recruitment efforts. There were no significant differences between the initial sample, follow-up sample, and non-followed sample with respect to HPS score, bipolar spectrum diagnoses, global functioning, or demographic variables, as measured at the initial assessment (see Table 1).

Materials and Procedures

Measures Administered at the Initial Assessment

As described in Walsh et al. (2012), participants completed interview, questionnaire, and ESM assessments at the initial evaluation. Note that the interview at the initial assessment was comparable to the interview administered at the follow-up (described below). Participants completed the HPS (Eckblad & Chapman, 1986), which consists of 48 true-false items that were worded to reflect either stable characteristics or recurrent experiences. The HPS was administered on two occasions: at a mass-screening session and at the time of the cross-sectional assessment (2 to 12 weeks apart, mean = 5.5

[1] At the time of the submission of the dissertation to committee members, an additional 10 participants had been interviewed (for a total of 110).

weeks). The scores were examined at both time points (mass-screening HPS: mean = 22.6, *SD* = 11.0, range = 3 to 42; interview HPS: mean = 17.5, *SD* = 10.0, range = 0 to 41). The lower mean HPS score at the second time point likely reflected regression to the mean (especially given the selection procedure). HPS scores were strongly correlated across the two time points (intraclass correlation coefficient = .85, $p < .001$); therefore, participants were assigned an average HPS score for all analyses (simply referred to as the HPS score). Coefficient alphas for the HPS completed at mass-screening and at the time of the cross-sectional assessment were .83 and .93, respectively.

Participants completed the UPPS Impulsivity Scale (Whiteside & Lynam, 2001; Whiteside et al., 2005) during the initial and follow-up assessments. The UPPS is a 46-item scale designed to measure four distinct personality pathways to impulsive behavior: urgency, lack of premeditation, lack of perseverance, and sensation seeking. Each item is rated on a 4-point scale ranging from 1 = "agree strongly" to 4 = "disagree strongly." Coefficient alphas for the UPPS completed at the initial assessment were .89, .83, .87, and .87 for urgency, lack of premeditation, lack of perseverance, and sensation seeking, respectively.

During the initial assessment, experience sampling methodology (ESM) was used to assess risky behavior in daily life. Participants carried a Palm Pilot PDA that administered three questions tapping risky behavior (as part of a 31-item protocol) for 7 days. The ESM protocol was based upon work by Kwapil et al. (2010). Items assessing risky behavior included, "I am doing something risky right now," "I am doing something right now that I might regret later," and "My behavior right now could get me into

trouble." All of the items were scored on a 7-point scale from "not at all" to "very much." The PDAs signaled the participants, administered the questionnaires, and time-stamped and recorded the participants' responses. Participants were signaled to complete the ESM questionnaire eight times daily between noon and midnight during their study participation. The three risky behavior items correlated highly (mean r = .86) and a composite variable was formed by computing the mean of the aggregate score (the mean of all time points) across the three items for each participant.

Measures Administered at the Follow-Up Assessment

The present study included a structured interview that assessed DSM-IV-TR mood disorders, bipolar spectrum disorders, bipolar spectrum characteristics, alcohol and drug use, grandiose traits, borderline and schizotypal personality disorder symptoms, psychosocial functioning, lifetime history of mental health treatment, and family history of psychopathology. Ninety-one percent of the interviews were conducted by an advanced graduate student in clinical psychology who had previously conducted 95 interviews and ratings as part of the initial assessment reported in Walsh et al. (2012). A licensed clinical psychologist completed 5% of the interviews and a trained undergraduate research assistant completed 4% of the interviews. All interviews were tape-recorded and took approximately 1-2 hours.

Mood disorders. The Structured Clinical Interview for DSM-IV (SCID-I; First, Spitzer, Gibbon, & Williams, 1996) was used to assess mood episodes and disorders. Bipolar spectrum disorders were diagnosed based upon criteria reported in Akiskal (2004) and Angst et al. (2003) using information obtained from the SCID-I interview.

The SCID-I was appropriate for diagnosing clinical bipolar disorders, as well as bipolar II ½ (major depression superimposed on cyclothymic temperament) and bipolar III (major depression plus treatment-induced hypomania). Using Akiskal's criteria, participants were interviewed for the presence of hyperthymic temperament to determine diagnoses of bipolar IV (major depression superimposed on hyperthymic temperament). Participants received scores of 0 (not present), 1 (subthreshold), or 2 (threshold) across 9 items measuring hyperthymic characteristics: upbeat/exuberant mood, articulate/jocular, overoptimistic and carefree, overconfident and boastful, high energy level/full of plans, versatile with broad interests, overinvolved and meddlesome, uninhibited and risk-taking, and short sleeper (<6 hours/night). Participants with hyperthymic temperament and subthreshold depression (e.g., depressive episode not meeting DSM-IV-TR symptom or duration threshold or recurrent brief depression), as well as participants with past hyperthymic temperament and hypomania received a diagnosis of "other bipolar spectrum disorder." Following Angst et al. (2003), participants were also coded with "other bipolar spectrum disorder" if they endorsed hypomania and subthreshold depression (e.g., depressive episode not meeting DSM-IV-TR symptom or duration threshold or recurrent brief depression), or major depression and subthreshold hypomania. Subthreshold hypomania was defined as a hypomanic episode lasting at least 2 days and characterized by affective disturbance or overactivity (e.g., increased goal-directed behavior, psychomotor activation, increased talkativeness, decreased need for sleep, and/or racing thoughts) that did not meet DSM-IV-TR duration and/or symptom threshold.

Bipolar spectrum characteristics. The interview also assessed subclinical bipolar spectrum psychopathology using a continuous rating system. Additional prompts were incorporated into the SCID-I to obtain dimensional information regarding bipolar psychopathology. The rating system provided quantitative ratings of current and lifetime most severe episodic bipolar spectrum characteristics across five domains: disturbances in affect, behavior, cognition, sense of self, and somatic disturbances. Episodes in these domains had to have a minimum duration of 2 days, represent a departure from one's usual functioning, and could not be the result of a normative life experience, alcohol or drug use, or general medical condition. Note that episodes induced by antidepressant medications were rated. In order for an episode to qualify for a rating, affective disturbance or overactivity had to be present. Following the recommendations of Angst et al. (2003, 2012), participants who reported at least one overactivity symptom without a disturbance in affect were rated. Note that each of the five domains consisted of several underlying bipolar spectrum characteristics. Specifically, disturbances in affect included episodes of euphoria, irritability, and cyclothymia. Disturbances in behavior referred to increased goal-directed activity, increased talkativeness, and risky behavior. Disturbances in cognition included racing thoughts and distractibility. Disturbance in sense of self referred to increased self-esteem, and somatic disturbances included decreased need for sleep and psychomotor activation. Participants received a rating according to the severity of their experiences for each characteristic using the following scale: 0 (not present), 1 (mild, subclinical), 2 (moderate, consistent with hypomania), 3 (severe, consistent with hypomania/mania with impairment), and 4 (extreme, consistent with severe mania

including psychotic features). All items included a description for each anchor point. Participants received a lifetime rating for each domain that was based on the most severe lifetime rating they received across all characteristics within each domain.

Grandiosity. Following Eckblad and Chapman (1986), the interview included an 8-item assessment of grandiosity. Using a Likert scale, participants were asked to rate 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. In addition to re-administering the UPPS, the Impulsive-Nonconformity Scale (Chapman et al., 1984) was administered at the follow-up assessment. The scale includes 51 true-false items designed to measure stable traits, specifically lack of concern for others' rights or feelings, lack of respect for social norms and ethical standards, hostility and lack of remorse for others' injuries, lack of empathy, and unrestrained pursuit of self-gratification. Chapman and colleagues reported coefficient alphas of .84 for males and .83 for females and test-retest reliability across six weeks of .84 across both sexes.

Substance use. The interview assessed participants for DSM-IV-TR substance abuse and dependence using the system reported in Kwapil (1996). In addition to providing DSM-IV-TR substance use disorder diagnoses, the rating system provided quantitative ratings of the current and lifetime heaviest frequency and quantity of

substance use and impairment related to use and abuse. Participants were rated on the frequency of current and heaviest alcohol usage on a scale from 0 (none) to 5 (more than 3 times per week), and on the quantity of alcohol consumed per day on a scale from 0 (none) to 4 (more than 8 beers, glasses of wine, or shots of liquor). The product of frequency and quantity (score of 0 to 20) produced measures of current and heaviest usage of alcohol. Participants were also rated on current and highest impairment in functioning caused by alcohol use on a scale from 0 (none) to 5 (major life disruptions). Participants were rated on current and heaviest drug use separately on scales ranging from 0 (none) to 4 (excessive use) for cannabis, amphetamines, sedatives, and inhalants; from 0 (none) to 6 (excessive use) for cocaine, phencyclidine (PCP), and hallucinogens; and from 0 (none) to 8 (at least twice per month with stronger drugs) of opioids. The rating scales reflect frequency and quantity of use, and they differ to reflect the seriousness of the substances. The ratings for each substance were summed to produce measures of current and heaviest drug use (scores of 0 to 42). Likewise, the participants were rated on current and highest impairment in functioning caused by drug use on a scale from 0 (none) to 5 (major life disruptions).

Psychosocial functioning. Participants' current psychosocial functioning was examined using the global assessment of functioning (GAF), as described in the DSM-IV-TR. GAF scores, which range from 1 (grossly impaired functioning) to 100 (superior functioning) are based on an individual's psychological, social, and occupational functioning. Additionally, participants' functioning was measured using Cornblatt et al.'s (2007) global functioning scales. The scales were designed to measure social and role

functioning in the prodromal phase of psychosis; however, Cornblatt et al. suggested that the scales are applicable to comparable at-risk populations. Average intraclass correlation coefficients reflecting cross-site interrater reliability for current social and role functioning were .85 and .93, respectively. Social functioning scores range from 1 (extreme social isolation) to 10 (superior social/interpersonal functioning). Similarly, role functioning scores range from 1 (severe role dysfunction) to 10 (superior role functioning).

Borderline and schizotypal personality disorders. Borderline and schizotypal personality disorders were assessed using the International Personality Disorder Examination (IPDE; Loranger et al., 1994). The IPDE is a widely used personality disorder interview and the only one based on worldwide field trials. The overall interrater reliability kappas of the borderline and schizotypal personality disorder sections of the IPDE are reported to be .89 and .82 for the number of criteria met, and .93 and .87 for the dimensional score, respectively. The overall temporal stability coefficients for borderline and schizotypal personality disorders are reported to be .84 and .69 for the number of criteria met, and .87 and .81 for the dimensional score, respectively (Loranger et al., 1994).

CHAPTER III

RESULTS

Statistical analyses were computed using SPSS 19.0 (IBM Corp., 2010). Binary logistic regression was used to examine the relation of the HPS with dichotomous measures, such as diagnoses of psychopathology. Pearson correlations were used to analyze the relation of the HPS with quantitative variables. Binary logistic and linear regression analyses were used to examine the moderating role of impulsivity assessed at the initial assessment (using UPPS and ESM ratings) on the relation of the HPS with adverse outcomes. The moderator (e.g., urgency) and HPS scores were entered simultaneously into the regression equation at the first step, so the effects of each were assessed with the other partialled out of the equation. Their interaction term was entered at a second step to examine its effect over-and-above the partialled main effects. Consistent with the recommendations of Aiken and West (1991), the moderator and HPS scores were centered by subtracting the sample mean from all participants' scores.

Relation of the HPS with Bipolar Spectrum Disorders and Dichotomous Measures of Psychopathology at the Follow-up Assessment

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, 85 were reassessed at the follow-up. Thirteen of these 85 participants (15% of the participants without bipolar disorders at the initial

assessment) presented with new cases of bipolar spectrum disorders at the follow-up. Specifically, three participants received a DSM bipolar diagnosis and 10 participants received a non-DSM bipolar diagnosis. Nine of the 15 participants diagnosed with a DSM bipolar disorder at the initial assessment were reassessed at the follow-up. Six of these participants retained DSM bipolar diagnoses, two were given a non-DSM bipolar diagnosis, and one no longer met criteria for a bipolar diagnosis. This participant endorsed cyclothymic temperament, past depression, and borderline personality traits at the initial assessment (and was diagnosed with both cyclothymic disorder and bipolar II ½). At the follow-up, she exhibited borderline personality traits (qualifying for 4 of 9 criteria), but no longer exhibited cyclothymic temperament and therefore did not meet criteria for a bipolar spectrum diagnosis. 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 bipolar disorder, and one no longer met criteria for a bipolar diagnosis (the participant noted above).

A total of 26 of the 100 reassessed participants met criteria for a bipolar spectrum disorder at the follow-up. Ten participants qualified for a DSM bipolar disorder and 16 qualified for a non-DSM bipolar disorder. The 10 participants who met criteria for DSM bipolar disorders included two with bipolar I disorder, five with bipolar II disorder, and three with bipolar NOS disorder. Participants classified as bipolar NOS all exhibited current hyperthymic temperament and history of hypomania. Among the 16 participants diagnosed with non-DSM bipolar disorders at the follow-up, 12 qualified for bipolar IV

disorder and four qualified for "other bipolar spectrum disorder." The four participants classified as "other bipolar spectrum disorder" included two participants with current hyperthymic temperament and history of subthreshold depression, one participant with history of subthreshold hypomania characterized by overactivity and major depression, and one participant with past hyperthymic temperament and history of hypomania. As noted, 13 of the 26 cases of bipolar spectrum disorder represented new cases. Of these cases, one participant qualified for bipolar II disorder, two qualified for bipolar NOS, seven qualified for bipolar IV disorder, and three qualified for "other bipolar spectrum disorder."

Table 3 presents the prediction of dichotomous indicators of bipolar psychopathology at the follow-up by HPS scores at the initial assessment. The HPS significantly predicted total number of DSM bipolar and bipolar spectrum disorder cases at the follow-up. Figure 1 presents the percentage of cases across HPS score quartiles. As seen in the figure, rates of DSM and broad bipolar disorders increased across these quartiles.

The HPS predicted new cases of bipolar spectrum disorders at the reassessment, $OR = 1.13$, $p < .01$, 95% CI [1.05, 1.22]. Excluding the 15 participants who qualified for a bipolar spectrum disorder at the initial assessment, 13 participants (15% of the remaining 85 participants) transitioned to a bipolar spectrum disorder. Thus, the HPS did not simply identify deviant 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 bipolar disorders, $OR = 1.11$, $p = .10$, 95%

CI [0.98, 1.27]. Excluding the nine participants who met criteria for a bipolar disorder at the initial assessment, four participants (4% of the remaining 91 participants) transitioned to a DSM bipolar disorder.

Table 3 also presents the association of the HPS with current hyperthymic temperament or history of hypomania, major depressive episodes, substance use disorders, mental health treatment, and family history of mood disorders in the follow-up sample. The HPS predicted current hyperthymic temperament or history of hypomania, with 34% of participants qualifying for one or both conditions (see Figure 2). The HPS also predicted current hyperthymic temperament or history of hypomania among participants who did not qualify for either condition at the initial assessment, $OR = 1.26$, $p < .001$, 95% CI [1.13, 1.40]. The HPS was not associated with history of major depressive episodes, and was associated with a *decreased* likelihood of development of 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, $OR = 1.01$, $p = .80$, 95% CI [0.94, 1.08], or new cases of major depressive disorder at the follow-up, $OR = 0.98$, $p = 0.64$, 95% CI [0.91, 1.06]. The HPS predicted diagnoses of alcohol abuse or dependence at the follow-up assessment, with 12% qualifying for an alcohol use disorder. Additionally, the HPS predicted the development of alcohol abuse or dependence in participants who did not qualify for either condition at

the initial assessment, *OR* = 1.08, $p < .05$, 95% CI [1.01, 1.15]. Of note, 50% percent of participants with alcohol use disorders were also diagnosed with a bipolar spectrum disorder, and all of these cases fell in the upper 2 quartiles of HPS scores. Similarly, the HPS predicted drug abuse or dependence at the follow-up assessment, with 18% of participants meeting criteria for one of the conditions. The HPS also predicted new cases of drug abuse or dependence, *OR* = 1.09, $p < .05$, 95% CI [1.01, 1.17]. Furthermore, 44% of cases with history of drug abuse or dependence were diagnosed with bipolar spectrum disorders, and the majority of these cases (75%) fell in the upper quartile of HPS scores.

HPS scores at the initial assessment were not associated with history of mental health treatment. However, 60% of participants with DSM bipolar disorders and 58% of participants with bipolar spectrum disorders reported a history of mental health treatment. HPS scores did not predict the report of a family history of mood disorder.

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 bipolar disorders. The HPS predicted hyperthymic temperament characteristics in the full sample, as well as in participants without DSM bipolar disorders. HPS scores were inversely associated with psychosocial functioning as assessed by the GAF in the total sample (see Figure 3) and the non-disordered subsample. Given that GAF was rated at both assessments, the regression analysis was recomputed partialling out GAF score at the initial assessment. Not surprisingly, functioning at the initial assessment was

significantly associated with functioning at the follow-up ($\beta = .551$, $p < .001$). However, the HPS significantly predicted impairment at the follow-up, over-and-above baseline GAF ($\beta = -.181$, $p < .05$). The HPS was not significantly associated with impairment in role functioning or social functioning. However, these measures were designed to be most sensitive to marked impairment seen in psychotic patients and may not have been sufficiently discriminant for a relatively high functioning sample.

As hypothesized, the HPS predicted borderline and schizotypal personality disorder traits, although none of the participants met full criteria for either personality disorder diagnosis. Analysis of the individual traits indicates that the HPS significantly predicted the borderline traits of unstable self-image and relationships, impulsivity, and transient paranoia/dissociation, but not the items associated with affective instability, suicidal gestures, emptiness, fear of abandonment, or inappropriate anger. There was good stability of ratings of borderline personality criteria met and dimensional scores across the initial and follow-up assessments. The number of borderline criteria met at the two assessments correlated .75 and dimensional scores correlated .68 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 .52 (a large effect size) when limited to the 25 participants who met at least one criteria at either assessment.

In terms of schizotypal traits, the HPS significantly predicted odd beliefs, unusual perceptual experiences, and oddities of thought, speech, behavior and appearance, but not

the negative schizotypal traits. The HPS predicted impulsivity symptoms, specifically impulsive-nonconformity, 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. The HPS predicted current and heaviest alcohol use and impairment, and current and heaviest drug use and impairment. With the exception of borderline personality traits, all of these associations were significant after removing individuals diagnosed with DSM bipolar disorders at the follow-up assessment. Thus, the results overall do not appear to be driven by a subset of deviant participants.

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: 1) total follow-up sample, 2) reduced sample with DSM bipolar disorders removed, and 3) 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 overall the HPS taps hyperthymic temperament characteristics independent of bipolar spectrum diagnoses.

Table 6 illustrates the associations of the HPS with lifetime history of bipolar spectrum characteristics, as assessed by the dimensional rating system. The HPS predicted lifetime history of disturbance in affect, behavior, cognition, and sense of self

in the total sample. However, these associations were not significant after removing participants who met criteria for a clinical bipolar disorder at the follow-up assessment. Additionally, the HPS did not predict somatic disturbances in the total or reduced sample.

Moderating Role of Impulsivity

Tables 7 and 8 present the moderating effect of urgency, sensation seeking, and risky behavior in daily life measured at the initial assessment on the relation of the HPS with bipolar spectrum disorders and global functioning, respectively, at the follow-up assessment. Although there were significant main effects, none of the interactions were significant, indicating that contrary to hypotheses, impulsivity did not moderate the effects of the HPS.

CHAPTER IV

DISCUSSION

Predictive Validity of the HPS

The present research examined the predictive validity of the HPS as a measure of 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 striking 15% transition rate over the follow-up period (nearly doubling the number of cases reported at the initial assessment). The HPS appears to specifically predict bipolar mood disorders, as it was not a significant predictor of unipolar mood disorders. Additionally, the HPS predicted clinical bipolar disorders and a range of bipolar spectrum psychopathology, including hyperthymic temperament characteristics, measures of grandiosity and impulsivity, substance use disorders, as well as borderline and schizotypal personality traits. Overall, the HPS predicted bipolar spectrum psychopathology even after removing participants with DSM bipolar disorders, suggesting that the results were not driven solely by a subset of participants with clinical disorders.

The HPS identified 13 new cases of bipolar spectrum disorders—15% of participants who did not qualify for a bipolar diagnosis at the initial assessment. Thus, the HPS identified new cases of bipolar spectrum psychopathology and did not simply re-classify deviant participants identified at the initial assessment. The HPS primarily

identified bipolar spectrum cases characterized by mood episodes combined with hyperthymic temperament. Therefore, these results offer support for Akiskal's (2004) inclusion of hyperthymic temperament within the bipolar spectrum, as well as the construct of a bipolar spectrum that extends beyond the current diagnostic boundaries. Furthermore, the results provide support for the predictive validity of the HPS as a measure of the broader bipolar spectrum.

The HPS predicted hyperthymic temperament characteristics irrespective of bipolar diagnosis. Specifically, the HPS captured trait-like 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 exhibit adaptive functioning, as well as individuals with hyperthymic characteristics who exhibit psychosocial impairment within the context of bipolar spectrum disorders. Furthermore, these results offer support for the notion that hyperthymic temperament is associated with both adaptive and maladaptive characteristics (Akiskal et al., 2000). For example, the upbeat mood, sociability, versatility, decreased need for sleep, and high energy associated with the temperament are likely adaptive qualities, whereas the aspects of the temperament associated with engagement in risky behaviors, over-involvement in activities, grandiose confidence, and carefree optimism may be maladaptive. In the present study, maladaptive aspects of the temperament were not unique to participants with bipolar spectrum disorders, nor were adaptive qualities specific to patients without them. Overall, these findings suggest that hyperthymic characteristics are distributed

across participants with and without bipolar disorders—and that the HPS identifies both groups.

The HPS predicted DSM bipolar disorders. Overall, 10% of the sample met criteria for a bipolar disorder. However, this was limited to participants with elevated HPS ratings and the rate was the highest (29%) in the upper quartile of HPS scorers, as illustrated in Figure 1. Note that this rate is actually higher than the 25% rate of DSM 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 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 DSM 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 onset-age 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 present study's 29% rate of bipolar disorder (across the upper quartile of HPS scorers) therefore is striking given that it exceeds the rate reported in Kwapil et al. using a considerably younger sample that has not yet reached the peak age of onset.

The HPS was associated with a decreased likelihood of major depressive disorder and was not associated with major depressive episodes. The present research suggests

that the HPS differentiates between bipolar and unipolar psychopathology, with the HPS predicting the former, but not the latter (in fact only one participant in the upper quartile of HPS scores developed [unipolar] major depressive disorder). Specifically, 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 over 93% of cases of major depressive disorder falling in the lower 2 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.

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 not specific to individuals with clinical bipolar disorders. The HPS was associated with grandiosity in the total sample, as well as in a reduced sample with DSM bipolar disorders removed. Therefore, grandiose traits seem to be apparent across the bipolar spectrum. These results also build on Johnson and Carver's (2006) findings, which documented the association of the HPS with highly ambitious goals,

including popular fame. Following Alloy, Bender, et al. (2012), future research could examine the extent to which specific grandiose traits assessed at this follow-up predict or moderate the onset of bipolar spectrum disorders or other deleterious outcomes.

The HPS predicted new cases of substance use disorders, as well as alcohol and drug use and impairment. These findings are consistent with a number of studies that have documented an association between bipolar spectrum disorders and substance use (e.g., Angst et al., 2003, 2010; Hoertel et al., 2013; Zimmermann et al., 2009), and are consistent with Kwapil and colleagues' (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 and was generally unassociated with ratings of substance use at the initial assessment. Overall, the results offer further validation of the association between substance use and the broader bipolar spectrum, as well as the use of the HPS as a measure of bipolar spectrum psychopathology.

Consistent with Kwapil et al. (2000), the HPS predicted borderline personality disorder 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 et al., 2012; Coulston et al., 2012; Paris et al., 2007). The HPS did not predict borderline personality traits in a reduced sample after removing participants with DSM bipolar disorders, however, suggesting that the symptom overlap across borderline personality and bipolar psychopathology may be especially prominent at the extreme end of the bipolar spectrum. This finding

contradicted results from the initial assessment (Walsh et al., 2012), which found that the HPS was associated with borderline personality traits even after removing participants with DSM bipolar disorder. Thus, the extent to which borderline traits are present across the bipolar spectrum remains unclear. No participants met full diagnostic criteria at the follow-up for borderline personality disorder. Although this may be due in part to the young age range of the participants, 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. 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).

Following Kwapil et al. (2000), the HPS predicted schizotypal personality disorder traits. Schizotypal personality disorder is included within the multidimensional construct of schizotypy (Kwapil & Barrantes-Vidal, 2012), and includes the positive symptoms of odd beliefs or magical thinking, strange perceptual experiences, and tangential speech or loose associations. The HPS predicted schizotypal personality symptoms both in the total sample and among participants without DSM bipolar disorders, suggesting that schizotypal traits are distributed across the bipolar spectrum and are not exclusive to DSM bipolar disorders. These results are also consistent with previous research documenting an association between positive schizotypy and mood

disorders (Kwapil et al., 2008), and support the notion of overlap across the affective and schizophrenia spectrums (Jones & Tarrant, 1999).

Impulsivity and the HPS

The present study replicates previous research (Walsh et al., 2012) suggesting that bipolar spectrum psychopathology is associated with impulsivity. Consistent with hypotheses, the HPS predicted urgency, lack of premeditation, sensation seeking, as well as impulsive-nonconformity at the follow-up assessment. Kwapil et al. (2000) found that high scorers on both the HPS and impulsive-nonconformity had higher rates of bipolar disorders and other maladaptive outcomes, in comparison to participants with high scores on the HPS alone. The present research attempted to expand these findings by examining the moderating role of impulsivity, as measured by UPPS urgency and sensation seeking, and ESM ratings of risky behavior in daily life, on the relation of the HPS with bipolar spectrum disorders and global functioning. The results of the present research were non-significant. This may be due in part to the fact that there is considerable shared variance between the HPS and the impulsivity moderators (Walsh et al., 2012). Additionally, neither of the UPPS moderators (urgency and sensation seeking), nor the ESM measure of risky behavior adequately taps the construct of impulsive-conformity. Urgency characterizes a tendency to act impulsively in the face of negative affect, but does not capture the unwillingness to conform to society's norms or lack of empathy associated with impulsive-nonconformity. Similarly, sensation seeking fails to tap the construct as it measures a preference for exciting activities and openness to danger. Unfortunately, the Impulsive-Nonconformity Scale was administered at the follow-up, but not the initial

assessment, and therefore was inappropriate to use as a moderator of risk for bipolar spectrum disorders and other adverse outcomes, as the results would be confounded by present symptoms. Future reassessment of the sample, however, would provide an opportunity to attempt to replicate the findings of Kwapil et al. (2000) and examine impulsive-nonconformity's effect on transition to bipolar spectrum disorders. It is also worth noting that the moderating effects of impulsivity were identified when participants were almost a decade older than the present sample on average. It may be that the deleterious moderating effects of impulsivity are not as readily detectable in early adulthood as compared to later stages of life.

Dimensional Assessment of Bipolar Spectrum Psychopathology

Epidemiological research (Angst et al., 2003, 2010; Hoertel et al., 2013; Merikangas et al., 2007; Zimmermann et al., 2009) has examined the identification of bipolar spectrum disorders characterized by subthreshold mood episodes, such as depression with subthreshold hypomania. If the bipolar spectrum is dimensional, one would expect to find DSM mood episodes at the extreme right end of the spectrum, and to find evidence of subthreshold mood episodes as one moves further to the left along the dimension. Following recommendations from one of these epidemiological studies (i.e., Angst et al., 2003), the present research included a preliminary examination of the validity of a continuous rating system for measuring bipolar spectrum characteristics. The rating system provided quantitative ratings of current and lifetime most severe episodic bipolar spectrum characteristics across five domains: disturbances in affect, behavior, cognition, sense of self, and somatic disturbances.

The HPS predicted episodic disturbances in affect, behavior, cognition, and sense of self in the total sample. However, in contrast to expectations, it did not predict these ratings among participants without DSM bipolar disorders. This suggests that the HPS predicts episodic disturbances in these domains, but only at the extreme end of the bipolar spectrum. Given previous epidemiological studies documenting bipolar spectrum disorders characterized by subthreshold mood episodes (Angst et al., 2003, 2010; Hoertel et al., 2013; Merikangas et al., 2007; Zimmermann et al., 2009), it is unclear why the HPS did not identify subclinical episodic bipolar characteristics. In contrast, the HPS identified bipolar spectrum disorders characterized by hyperthymic temperament, which was *not* captured by the continuous rating system. Nine of the 13 new cases of bipolar spectrum disorder (69%) identified by the HPS were characterized by hyperthymic temperament and history of clinical mood episode(s). Thus, the continuous rating scale used in the present study did not capture the symptoms experienced by these individuals. In hindsight, it may be the case that there was not enough measurement sensitivity in the subclinical range of symptoms.

The results of the present research naturally raise concern regarding whether the continuous rating scale should have included a measure of trait-like functioning. Considering the epidemiological support for bipolar spectrum disorders characterized by subthreshold mood episodes in conjunction with the present findings, it seems reasonable that a rating scale that assesses clinical and subclinical episodic bipolar characteristics, *as well as* affective temperaments (e.g., hyperthymic, cyclothymic, dysthymic temperaments) would best capture the bipolar spectrum. This would allow for further

validation of Akiskal's (2004) constructs of bipolar II ½, III, and IV, as well as bipolar spectrum disorders characterized by subthreshold mood episodes (e.g., major depression and subthreshold hypomania, hypomania and subthreshold depression). Moreover, the present results offer support for the exploration of the role of affective temperaments, especially hyperthymic temperament, within the bipolar spectrum.

Future Study of the HPS and the Bipolar Spectrum

The present study reflects results in progress with respect to the predictive validity of the HPS. Ideally, reassessing participants in approximately 7 years would allow for examination of the HPS' prediction of bipolar spectrum psychopathology well beyond the peak age of onset of bipolar disorders. Furthermore, more frequent reassessments would be ideal 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 further elucidate risk and protective factors associated with the development of DSM 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 DSM bipolar disorder. Regarding individuals who only exhibit hyperthymic characteristics, some of these participants likely displayed healthy, adaptive functioning, whereas others (especially those exhibiting risky behavior) likely exhibited impairment. Future studies therefore could examine the extent to which specific aspects

of hyperthymic temperament serve as risk or protective factors for the development of bipolar disorders. Specifically, in the present research, the HPS only uniquely predicted the short sleeper characteristic of hyperthymic temperament among individuals with DSM bipolar disorders. Future research could examine whether trait-like decreased need for sleep serves as a specific risk factor for DSM bipolar disorders, as suggested by Gruber et al. (2009). Similarly, future follow-up studies could examine whether the supposedly adaptive aspects of hyperthymic temperament, such as upbeat mood and high energy, are protective with respect to the development of clinical bipolar disorders.

The present research was limited with respect to its assessment of adaptive functioning and protective factors. Consistent with previous studies of the HPS (e.g., Kwapil et al., 2000; Walsh et al., 2012), this research focused on the HPS' prediction of impairment. However, as noted, individuals with hyperthymic temperament may exhibit superior functioning to their peers. Reducing participants' functioning to a single GAF score based on the past month fails to account for the cyclical nature of bipolar spectrum disorders—and the potential for participants to exhibit different levels of functioning within a brief time period and within different contexts. Future research could include measures of current functioning, as well as best and worst psychosocial functioning (e.g., in the past six months).

Future assessments could also examine the cyclical nature of bipolar spectrum disorders using ESM. At the present time, there are two snapshots of participants' functioning: at the initial assessment and the 3-year follow-up. These assessments were limited to the extent that they could examine fluctuations in mood, functioning, and

impairment associated with bipolar spectrum disorders. Although the initial assessment employed ESM, the assessment took place over a brief 1-week period (Walsh et al., 2012). Future research could utilize ESM over longer assessment periods or administer ESM protocols at specific intervals over longer periods of time. For example, Trull et al. (2008) employed ESM measures for 1 month to examine affective instability in patients with borderline personality and depressive disorders. Prolonged assessment of participants in daily life would better capture the dynamic nature of mood and functioning associated with bipolar spectrum disorders. Additionally, ESM may also further elucidate risk and protective factors associated with daily life functioning, such as social contact.

Practical Implications and Challenges

The present findings offer support for the construct of a bipolar spectrum that extends beyond the 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). 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. Therefore, we are left with evidence for a broader bipolar spectrum, but its boundaries remain quite murky.

Following Nusslock and Frank's (2011) review, the benefits of identifying individuals with bipolar spectrum disorders are also met with challenges. For example, even if we can successfully identify individuals with subthreshold bipolarity, when is it reasonable to intervene? And by what means? Nusslock and Frank (2011) argue in favor of modifying existing psychosocial interventions for individuals with subsyndromal hypomania on the grounds that subsyndromal hypomanic presentations are associated with impairment. Specifically, they support offering individuals and family members education regarding the early warning signs of hypomania and mania and on life events that may trigger mood episodes, as well as strategies for maintaining consistent social and circadian rhythms. The authors argue against the use of mood stabilizers or antipsychotic medications for individuals with subthreshold bipolarity, specifically major depression and subthreshold hypomania, on the basis that there is no clinical or scientific evidence to support it. Furthermore, antidepressant medications should be used judiciously given that some classes of these medications can actually precipitate hypomanic and manic episodes. Analogous debates are occurring in regard to precursor or prodromal signs of schizophrenia. For example, DSM-5 considered the inclusion of an at-risk mental state diagnosis, but subsequently opted to include it in the criteria for further study due in large part to concerns that clinicians would not be able to discriminate between a risk state and disorder. Bipolar disorder is even more complex because many of the risk features can be associated with adaptive functioning.

Considering the nature of the bipolar spectrum disorders in the present study, even the rather benign treatment of psychoeducation carries risks. Presuming that a subset of individuals with bipolar spectrum disorders will never develop clinical bipolar disorders, there is potential harm in informing individuals of their at-risk status. Providing such information could result in unnecessary stress and anxiety, promote stigma, and result in discrimination. Furthermore, if impairment is used as a basis for offering interventions, this can become quite complicated given that bipolar spectrum psychopathology may be characterized by adaptive functioning. These concerns are even more pronounced when considering identification and intervention for individuals who do not exhibit bipolar spectrum disorders, but simply exhibit affective temperaments or subsyndromal symptoms. Although Nusslock and Frank's (2011) recommendations seem well-intended, and may be appropriate for individuals with subsyndromal hypomania and impairment, until we have a better understanding of the benefits of psychosocial interventions across the bipolar spectrum, they should be used with caution.

Although there is growing evidence for a broader bipolar spectrum, there continues to be controversy regarding how to define it. The lack of consensus on a definition for the bipolar spectrum 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.

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APPENDIX A

TABLES & FIGURES

Table 1. Comparison of Ratings and Demographic Information from the Initial Assessment for the Total, Follow-Up, and Non-Followed Samples

Initial Assessment Criterion	Total Sample (*n* = 145)	Follow-Up (*n* = 100)	Non-Followed (*n* = 45)
HPS score (mean, *SD*)	20.1 (10.1)	20.5 (10.6)	19.1 (9.0)
Bipolar spectrum disorder (*no. and %)*	22 (15.2%)	15 (15.0%)	7 (15.6%)
GAF – Global functioning (mean, *SD*)	76.1 (12.8)	76.1 (12.6)	76.2 (13.1)
% female participants	69.0%	66.0%	75.6%
Age (mean, *SD*)	19.5 (2.3)	19.5 (2.6)	19.4 (1.3)
% Caucasian	64.8%	64.0%	66.7%
% African American	15.9%	18.0%	11.1%
% Hispanic	4.1%	4.0%	4.4%
% Asian	4.1%	5.0%	2.2%
% Other	4.1%	4.0%	4.4%
% Unspecified	6.9%	5.0%	11.1%

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

	Diagnostic Status at the Initial Assessment		Diagnostic Status of Reassessed Participants at the Follow-Up Assessment		
Initial Assessment Diagnostic Status	All Participants (*n* = 145)	Participants Reassessed (*n* =100)	DSM Bipolar Disorder	Non-DSM Bipolar Disorder	No Bipolar Disorder
No bipolar disorder	123	85	3	10	72
DSM bipolar disorder	15	9	6	2	1
Non-DSM bipolar disorder	7	6	1	4	1

Table 3. Binary Logistic Regressions of the HPS Predicting Mood Psychopathology, Substance Use Disorders, Treatment History, and Family History

		Prediction by the HPS	
Criterion	% of sample	Odds Ratio	95% Confidence Interval
DSM bipolar disorder	10%	1.16**	1.05-1.29
Bipolar spectrum disorder	26%	1.17***	1.09-1.26
Hypomania or hyperthymic temperament	34%	1.27***	1.16-1.39
Major depressive episode	44%	1.02	0.98-1.05
Major depressive disorder	22%	0.93**	0.89-0.98
Alcohol abuse or dependence	12%	1.08*	1.01-1.15
Drug abuse or dependence	18%	1.07*	1.01-1.13
Mental health treatment	30%	1.02	0.98-1.06
Family history of mood disorder	55%	0.98	0.95-1.02

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

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

	Follow-Up Sample (n = 100)				DSM Bipolar Disorders Removed (n = 90)
Criterion	Mean	*SD*	Coefficient α[a]	Pearson Correlation (2-tailed) with the HPS	Pearson Correlation (2-tailed) with the HPS
Hyperthymic temperament total score	5.95	4.01	-	***.68*****	***.69*****
Psychosocial Functioning					
GAF – Global functioning	73.94	11.58	-	**-.32****	-.25*
Role functioning	8.41	1.04	-	-.03	-.11
Social functioning	8.03	1.01	-	-.16	-.15
IPDE					
Borderline dimensional score	1.56	2.21	-	**.32****	.21
Schizotypal dimensional score	1.05	1.51	-	**.34*****	.28**
Impulsive-Nonconformity	10.71	7.18	0.87	***.59*****	***.54*****
UPPS Impulsivity					
Urgency	2.00	0.55	0.88	**.42*****	**.34****
Lack of premeditation	1.87	0.47	0.85	**.35*****	**.33****
Lack of perseverance	1.73	0.44	0.78	.13	.13
Sensation seeking	2.83	0.61	0.85	**.38*****	**.40*****
Grandiosity Questions					
Famous	2.01	1.49	-	**.52*****	**.52*****
Odd/Different	2.54	1.22	-	**.49*****	**.45*****

Table 4 (continued)

Criterion	Follow-Up Sample (n = 100) Mean	*SD*	Coefficient α[a]	Pearson Correlation (2-tailed) with the HPS	DSM Bipolar Disorders Removed (n = 90) Pearson Correlation (2-tailed) with the HPS
Magazine	1.82	1.51	-	**.42*** **	**.43*** **
Attention	0.40	0.49	-	**.44*** **	**.38*** **
Creative	2.68	1.25	-	**.37*** **	**.35** **
Ambition	2.98	0.89	-	.29**	**.31** **
Leadership	0.67	0.47	-	.20*	.21*
Alcohol Use and Impairment					
Current alcohol use	3.28	3.80	-	.23*	.24*
Heaviest alcohol use	7.17	6.54	-	.27**	.28**
Current alcohol impairment	0.83	0.64	-	**.30** **	**.32** **
Heaviest alcohol impairment	1.29	1.01	-	**.37*** **	**.37*** **
Drug Use and Impairment					
Current drug use	.68	1.85	-	.22*	.26*
Heaviest drug use	3.04	5.69	-	.25*	.28**
Current drug impairment	0.29	0.73	-	.25*	.30**
Heaviest drug impairment	0.86	1.17	-	.22*	.25*

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

[a] coefficient α reported for questionnaire measures
Medium effect sizes in bold, large effect sizes in bold and italics

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 = 100)	Pearson Correlation (2-tailed) with the HPS after removing DSM bipolar disorders (n = 90)	Pearson Correlation (2-tailed) with the HPS after removing bipolar spectrum disorders (n = 74)
Hyperthymic temperament total score	***.68****	***.69****	***.60****
Upbeat/exuberant mood	**.48****	***.52****	**.45****
Overinvolved and meddlesome	***.56****	***.51****	**.44****
Broad interests	**.45****	**.45****	**.40****
Overconfident and boastful	**.35****	**.41****	**.39****
Articulate and jocular	**.50****	**.49****	**.34****
High energy level/full of plans	**.41****	**.41****	**.32****
Uninhibited and risk-taking	**.36****	**.36****	**.30****
Overoptimistic and carefree	.26**	**.34****	.26*
Short sleeper (<6 hrs)	.26*	.29**	.14

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

Medium effect sizes in bold, large effect sizes in bold and italics

Table 6. Zero-Order Correlations of the HPS Predicting Lifetime Measures of Bipolar Spectrum Characteristics

Criterion	Mean	*SD*	Pearson Correlation (2-tailed) with the HPS in the follow-up sample (*n* = 100)	Pearson Correlation (2-tailed) with the HPS after removing DSM bipolar disorders (*n* = 90)
Affective disturbance	.27	.78	**.37*** **	.07
Behavioral disturbance	.29	.82	.29**	.00
Cognitive disturbance	.29	.86	**.35*** **	.06
Disturbances in sense of self	.21	.66	**.31****	.07
Somatic disturbance	.10	.52	.19	-.04

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

Medium effect sizes in bold

Table 7. Binary Logistic Regressions Examining the Moderating Effect of Impulsivity on the Relation of the HPS with Bipolar Spectrum Disorders

	Step 1				Step 2	
	Urgency		HPS		Urgency x HPS interaction	
Criterion	Odds ratio	95% CI	Odds ratio	95% CI	Odds ratio	95% CI
Bipolar spectrum disorders	2.18	0.72-6.63	1.17***	1.08-1.26	0.97	0.83-1.13
	Sensation seeking		HPS		Sensation seeking x HPS interaction	
	Odds ratio	95% CI	Odds ratio	95% CI	Odds ratio	95% CI
Bipolar spectrum disorders	0.70	0.29-1.73	1.18***	1.10-1.28	1.06	0.97-1.16
	Risky behavior		HPS		Risky behavior x HPS interaction	
	Odds ratio	95% CI	Odds ratio	95% CI	Odds ratio	95% CI
Bipolar spectrum disorders	1.53	0.65-3.60	1.16***	1.08-1.25	0.98	0.85-1.13

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

Table 8. Linear Regressions Examining the Moderating Effect of Impulsivity on the Relation of the HPS with Global Functioning

	Step 1			Step 2	
	Urgency	HPS		Urgency x HPS interaction	
Criterion	*B*	*B*	ΔR^2	*B*	ΔR^2
GAF – Global functioning	-.161	-.255	.125**	.106	.011
	Sensation seeking	HPS		Sensation seeking x HPS interaction	
	B	*B*	ΔR^2	*B*	ΔR^2
GAF – Global functioning	-.006	-.320	.104**	-.185	.034
	Risky behavior	HPS		Risky behavior x HPS interaction	
	B	*B*	ΔR^2	*B*	ΔR^2
GAF – Global functioning	.031	-.346	.112**	.035	.001

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

Figure 1. Percentage of Participants with Bipolar Spectrum Disorders at the Follow-Up Assessment by HPS Score

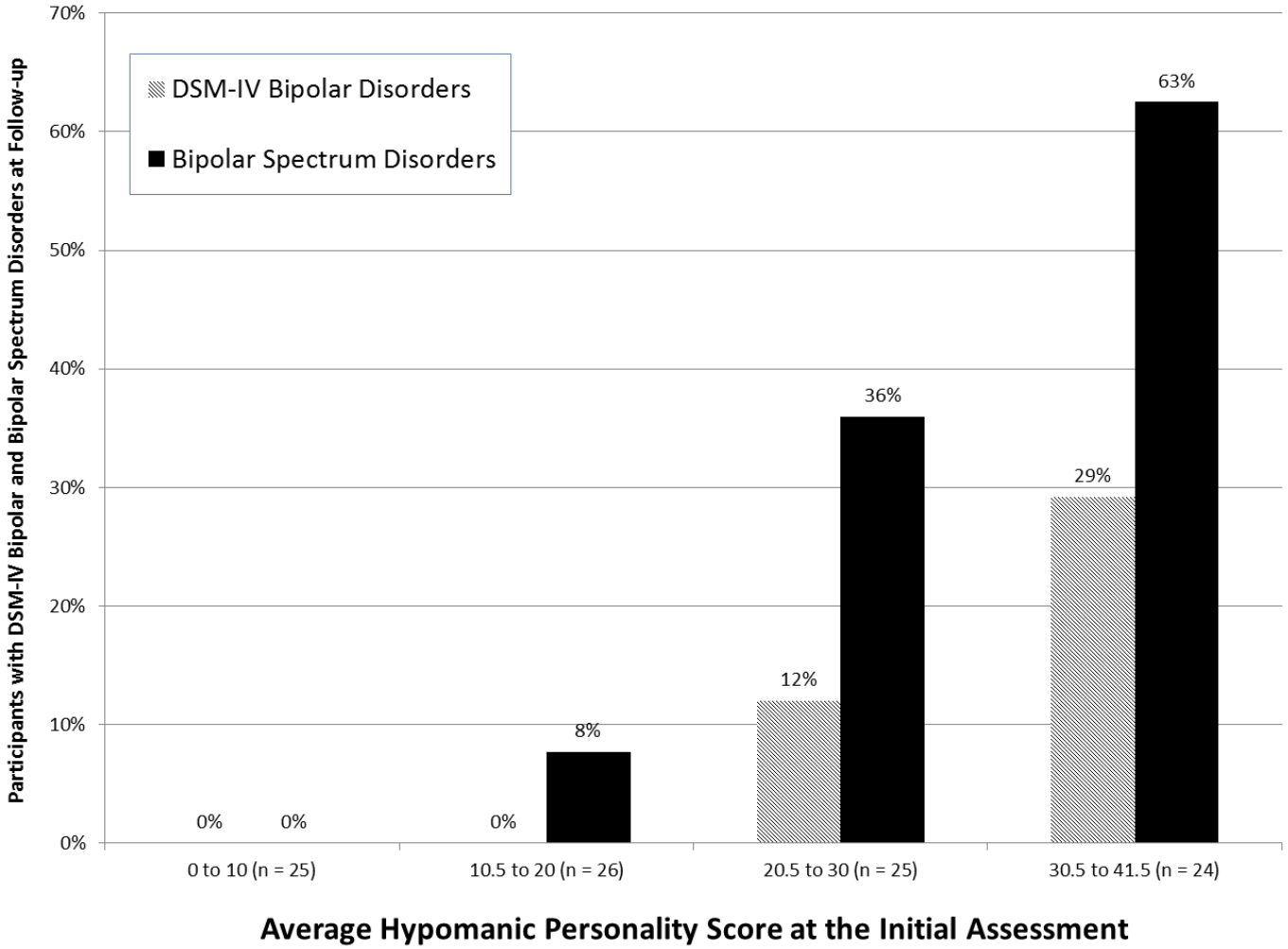

Figure 2. Percentage of Participants with Hypomania or Hyperthymic Temperament at the Follow-Up Assessment by HPS Score

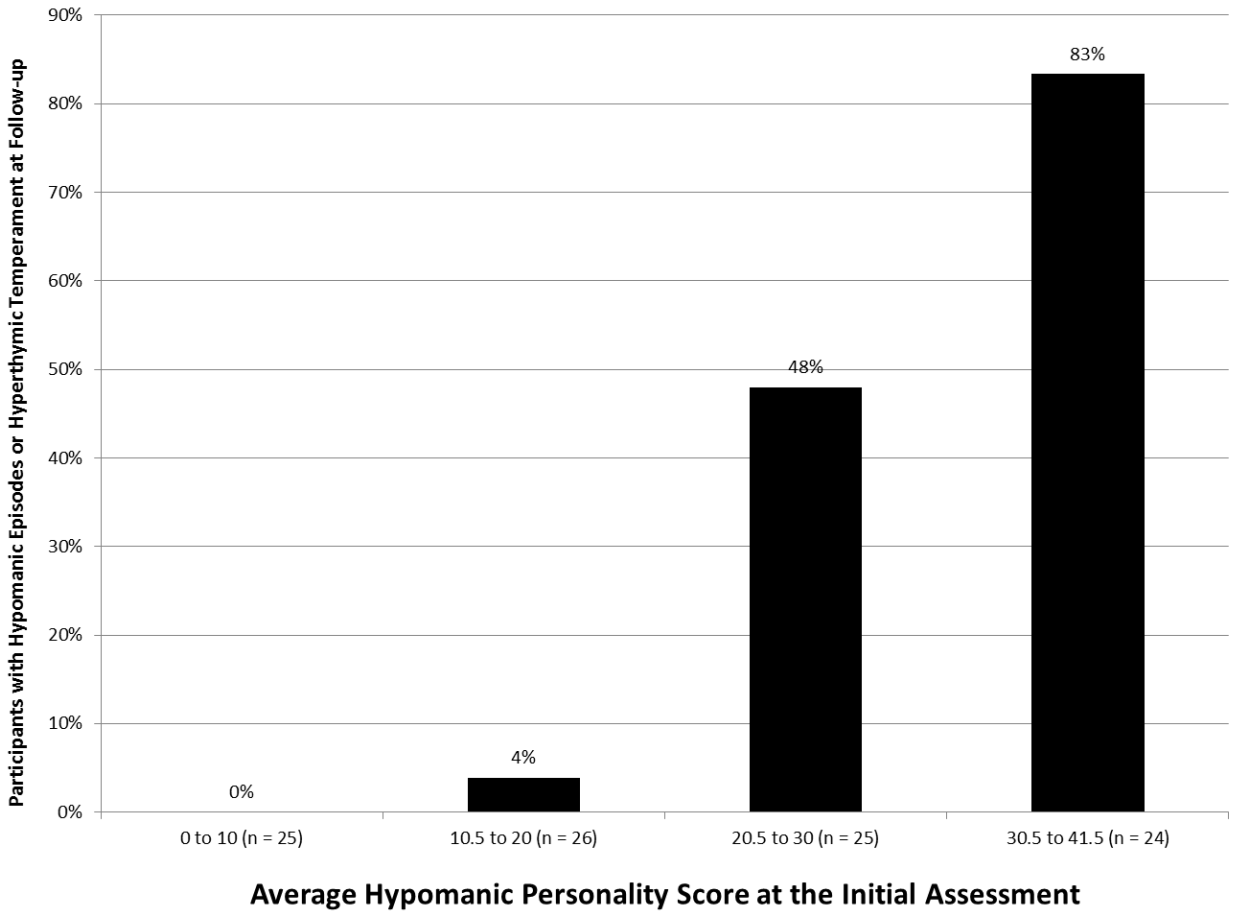

Figure 3. Association of the HPS at the Initial Assessment with Global Functioning at the Follow-Up Assessment