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Current clinical and epidemiological research provides support for a continuum of bipolar psychopathology: a bipolar spectrum that ranges from subclinical manifestations to full-blown bipolar disorders. The present research examined the validity of the Hypomanic Personality Scale (HPS) as a measure of bipolar spectrum psychopathology in a nonclinically identified sample of young adults. In the first study, participants were interviewed and completed questionnaires regarding psychopathology, personality, and functioning. The HPS was positively associated with DSM-IV-TR bipolar disorders, bipolar spectrum disorders, the presence of hypomania or hyperthymia, depressive symptoms, poor psychosocial functioning, cyclothymia, irritability, and symptoms of borderline personality disorder. The second study employed experience sampling methodology to examine the expression of bipolar spectrum psychopathology in daily life. Consistent with the hypotheses, the HPS was associated with negative affect, thought disturbance, risky behavior, and measures of grandiosity. Individuals who scored highly on the HPS were more reactive in negative affect in response to stress and how positively they viewed their situation, and experienced difficulty concentrating regardless of how they viewed their situation. The HPS accounted for variance in bipolar spectrum psychopathology over and above the normal personality dimensions of extraversion and openness to experience. Furthermore, the findings for the HPS remained independent of DSM-IV-TR bipolar disorders—consistent with the hypothesis that the spectrum of bipolar psychopathology extends beyond traditional clinical disorders to include

subclinical manifestations. Together, these studies provide further validation of the HPS as a measure of bipolar spectrum psychopathology.

LOOKING FOR BIPOLAR SPECTRUM PSYCHOPATHOLOGY:  
IDENTIFICATION AND EXPRESSION  
IN DAILY LIFE

by

Molly S. Armistead

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## CHAPTER I

### INTRODUCTION

Recent literature supports a broad spectrum of bipolar psychopathology (Akiskal, 2004; Angst et al., 2003). This spectrum includes, but extends beyond, bipolar diagnoses listed in the *Diagnostic and Statistical Manual of Mental Disorders*, 4<sup>th</sup> edition, text revision, (DSM-IV-TR; American Psychiatric Association, 2000). The present studies examined the construct validity of the Hypomanic Personality Scale (HPS; Eckblad & Chapman, 1986) as a measure of bipolar spectrum psychopathology. Study 1 examined the relation of scores on the HPS with interview and questionnaire measures of bipolar spectrum psychopathology. Study 2 assessed the expression of bipolar spectrum psychopathology in the daily lives of young adults using experience sampling methodology (ESM).

#### The Bipolar Spectrum

Recent reports of the lifetime prevalence of bipolar disorder estimate that approximately 0.8 % and 1.1% of the general population meet diagnostic criteria for bipolar I disorder and bipolar II disorder, respectively (Merikangas et al., 2007). However, there is considerable epidemiological and clinical evidence to support a wider bipolar spectrum that extends beyond the diagnostic boundaries of the DSM-IV-TR. Given that bipolar disorders are a leading cause of premature mortality (largely resulting from suicide and accidental death) and are associated with significant impairment in

functioning (Osby, Brandt, Correia, Ekborn, & Sparen, 2001; Calabrese et al., 2003), it may be useful to consider a broader conceptualization of bipolar psychopathology.

Furthermore, people with subclinical symptoms who fall on this broader bipolar spectrum appear to be at heightened risk for developing full-blown bipolar disorders (Angst & Cassano, 2005). Identification of a broader spectrum of bipolar psychopathology should enhance our understanding of the etiology and development of such disorders and ultimately facilitate the development of prophylactic treatment interventions.

#### *DSM-IV-TR Bipolar Disorders*

The DSM-IV-TR recognizes four bipolar disorders: bipolar I disorder, bipolar II disorder, bipolar disorder not otherwise specified (bipolar NOS), and cyclothymic disorder. Bipolar I disorder is characterized by at least one episode of mania, which is usually accompanied by cycling episodes of mania and major depression. Bipolar II disorder is characterized by cycling episodes of hypomania and major depression. Hypomania and mania share many of the same characteristics, such as elevated or irritable mood, inflated self-esteem, decreased need for sleep, and racing thoughts. A manic episode, however, must last at least one week and cause significant impairment in occupational or social functioning whereas a hypomanic episode may be as short as four days and is not associated with impairment in functioning. Note that individuals with bipolar II disorder are at heightened risk for developing bipolar I disorder. Alcohol and substance abuse are often comorbid with DSM-IV-TR bipolar diagnoses, and tend to increase in severity during manic and hypomanic episodes (American Psychiatric Association, 2000). Bipolar NOS may be diagnosed when an individual exhibits bipolar

features, but does not meet criteria for one of the bipolar diagnoses. Unlike bipolar I and bipolar II disorder, cyclothymic disorder is not defined by discrete mood episodes. Rather, cyclothymic disorder is characterized by at least a two-year period of mood cycling between (usually brief) episodes of mild depression and hypomania. The duration of mood symptoms within this two-year period are of undefined length, but an individual may not experience more than two months of euthymic mood (i.e., an absence of depressive or elevated mood symptoms).

#### *Akiskal's Proposed Bipolar Spectrum Disorders*

Akiskal (2004) proposed a wider spectrum of bipolar disorders beyond the DSM-IV-TR diagnoses. In addition to bipolar I and II disorders, Akiskal proposed the following disorders:

- Bipolar II ½: Major depression superimposed on cyclothymic temperament (i.e., trait-like hypomanic and depressive symptoms—consistent with DSM-IV-TR cyclothymia)
- Bipolar III: Repeated major depressive episodes plus hypomania occurring solely in association with antidepressant or other somatic treatment
- Bipolar IV: Major depression superimposed on a hyperthymic temperament (i.e., trait-like hypomanic mood and functioning)

Consistent with the categorical nature of the DSM-IV-TR, Akiskal's conditions represent discrete diagnostic categories. Akiskal posited that his proposed disorders are prevalent in both psychiatric and general medical settings, and are associated with other psychopathology, including substance use, eating, and personality disorders.

### *A Broader Spectrum of Bipolar Psychopathology?*

Prospective research (Angst et al., 2003) suggests that the current diagnostic system may be too stringent to detect bipolar psychopathology in the general population, particularly among adolescents and young adults whose symptoms may not yet meet the full-blown diagnostic criteria. Using data from a prospective 20-year community cohort study of young adults in Zurich, Switzerland, Angst and colleagues (2003) found that 9% of their sample met criteria for subthreshold bipolar symptoms. These individuals reported having a mild depressive episode (e.g., dysthymia, subthreshold depressive episode, or recurrent brief depression) that was associated with hypomanic symptoms or hypomania as defined in the *Diagnostic and Statistical Manual of Mental Disorders*, 4<sup>th</sup> edition (DSM-IV, American Psychiatric Association, 1994). Angst et al. (2003) also identified a purely hypomanic group, comprising 3% of their sample, who experienced DSM-IV hypomania without any history of depression. This group experienced significantly higher rates of criminal offenses and substance abuse or dependence, as well as higher rates of family history of mania, compared to a control group. Such findings suggest that there may be clinically relevant symptoms of bipolar disorder that do not fall within current diagnostic nomenclature and therefore may not be recognized in clinical practice.

Angst (1998) described hypomanic episodes lasting shorter than the four-day duration set forth in the DSM-IV. This study indicated that shorter episodes of hypomania can be of clinical importance, given that participants who experienced any hypomanic episode, regardless of duration, reported a four fold higher rate of suicide

attempts than control participants and were at heightened risk for developing DSM-IV bipolar disorders. Furthermore, Judd and Akiskal (2003) found that, compared to control participants, individuals with lifetime histories of manic episodes, hypomanic episodes, *or* subthreshold symptoms all exhibited increased marital discord, greater use of health, welfare, and disability services, and increased suicidal behavior. Finally, Merikangas and colleagues (2007) included subthreshold bipolar disorder as part of the National Comorbidity Replication Study, defining subthreshold bipolar disorder as recurrent hypomania without a major depressive episode or with fewer symptoms than required for threshold hypomania. Of the 9,282 adults surveyed, 2% met criteria for this definition of subthreshold bipolar disorder in their lifetime. Moreover, 46% of individuals in this subthreshold group reported psychosocial impairment associated with their hypomanic symptoms in the past year. Taken together, these studies support the conjecture that subthreshold bipolar symptoms can be a significant public health concern.

#### *Implications of a Bipolar Spectrum*

Following a ten-year review of bipolar spectrum research, Akiskal (2004) reported that between 30 and 70% of individuals diagnosed with unipolar depression in private psychiatric and community mental health services fall within his extended range of bipolar disorders. This finding, albeit controversial, suggests that bipolar disorders are more common than expected and often are misdiagnosed as unipolar depression. Broadening the diagnostic criteria has important implications with regard to understanding the etiology of bipolar and unipolar disorders, potential developmental trajectories, and treatment implications. Examining subthreshold symptoms 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 symptoms may provide information regarding risk and protective factors associated with unipolar and bipolar psychopathology. Greater attention to subclinical symptoms 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.

#### Characteristics of Bipolar Spectrum Psychopathology

Whether defined narrowly (e.g., DSM-IV-TR) or broadly (e.g., the current subclinical and clinical conceptualizations), bipolar spectrum psychopathology involves dysregulation in mood, cognition, and behavior. With regard to mood, bipolar spectrum psychopathology is characterized by extreme manifestations of euphoria, dysphoria, and irritability, as well as lability of affect (American Psychiatric Association, 2000). Disruptions in cognition associated with euphoric or irritable mood include changes in the form of thought, such as racing thoughts, fullness of thought, and loosened associations, as well as changes in the content of thought, such as grandiosity, overconfidence, and numerous (and often unrealistic) plans and goals. Behavioral and somatic changes associated with euphoria or irritability include increased energy and sociability, behavioral disinhibition and impulsivity, decreased need for sleep, and pressured speech. Contrary to many forms of psychopathology, subclinical manifestations of many of these symptoms (i.e., those not reaching manic intensity) may

be experienced as adaptive or enjoyable (e.g., hyperthymia—described below). However, positive experiences associated with mood elevation are typically in sharp contrast to the symptoms experienced during periods of depressed mood.

One important question raised by an examination of bipolar symptoms is whether they represent episodic or trait-like functioning. Akiskal and colleagues suggested that four affective temperaments underlie bipolar spectrum psychopathology (Akiskal et al., 1998; Akiskal & Akiskal, 2005; Akiskal, Akiskal, Haykal, Manning, & Connor, 2005): hyperthymia, dysthymia, cyclothymia, and irritability. An affective temperament is defined as a mood that is characteristic of an individual's habitual functioning. The DSM-IV-TR partially recognizes the expression of two affective temperaments, cyclothymia and dysthymia, and supports further study of depressive personality disorder (although these diagnoses do not map on perfectly to Akiskal's formulations). The inclusion of these diagnoses in the DSM-IV-TR suggests that some people are likely to experience more prolonged or trait-like mood symptoms—although the DSM-IV-TR classifies cyclothymia and dysthymia as episodic Axis I disorders rather than temperaments. The irritable affective temperament, *per se*, is not included in the DSM-IV-TR, although it has been associated with both bipolar and borderline personality disorders (Akiskal et al., 2005).

Akiskal (2004) indicated that hyperthymia was a core component of bipolar IV disorder. Akiskal defined hyperthymia as consisting of the following characteristics: 1) upbeat and exuberant, 2) jocular and articulate, 3) overoptimistic and carefree, 4) overconfident and boastful, 5) high energy level, full of plans and improvident activities,

6) versatile, with broad interests, 7) overinvolved and meddlesome, 8) uninhibited and risk-taking, and 9) decreased need for sleep (< 6 hours/night). It is expected that in the absence of clinical depression or full manic expressions, hyperthymic temperament can be adaptive for some people. These individuals may be successful in a wide range of activities and feel upbeat, optimistic, energetic and confident. Note that hyperthymia and extraversion share many features in common, and are significantly associated with one another (Blöink, Brieger, Akiskal, & Marneros, 2005), but they are distinguished in part by their relation with bipolar psychopathology. Specifically, extraversion did not predict future bipolar disorders in the Zurich longitudinal cohort study of young adults (Ernst, Angst, Klesse, & Zuberbühler, 1996). Thus, it appears that most or all hyperthymic people will be high in extraversion, but that relatively few extraverts will have bipolar spectrum psychopathology.

In addition to extraversion, bipolar spectrum psychopathology also shares a relationship with the personality dimension openness to experience (Meyer, 2002). Strong et al. (2007) reported openness to be elevated in euthymic bipolar participants, compared to individuals with major depression and healthy control participants, and reported no differences across bipolar subgroups (i.e., bipolar I, II, or NOS). In addition, Lozano and Johnson (2001) reported manic symptoms to be associated with openness to experience among participants diagnosed with bipolar I disorder.

Angst (2007) included borderline personality disorder as part of the spectrum of bipolar psychopathology, suggesting that it is an intermediate step between subthreshold bipolar disorders and affective temperaments. Angst contended, however, that the



relation of personality disorders to bipolar disorders remains unclear and warrants further study. A review of the phenomenology of borderline personality disorder and bipolar disorders suggests that they are overlapping, yet distinct constructs (Paris, Gunderson, & Weinberg, 2007). Specifically, both are associated with high neuroticism and low conscientiousness, yet borderline personality disorder is associated with high harm avoidance. The authors also reported that affective dysregulation is common to both bipolar and borderline personality disorders; however, the mood changes differ across the disorders. For example, bipolar II disorder is associated with mood changes from depression to elation, whereas borderline personality disorder is associated with switches from euthymia to anxiety, anger, and despair, but rarely to elation. In addition, environmental stressors, particularly interpersonal events, appear to play a stronger role in affective responses in borderline personality disorder than bipolar disorders. The authors also noted that impulsivity is associated with bipolar psychopathology and borderline personality disorder, but in different capacities. Impulsivity tends to be episodic among individuals with bipolar disorder (unless accompanied by substance use), but chronic among individuals with borderline personality disorder. Specifically, impulsivity associated with borderline personality disorder may include frequent efforts to relieve distress (i.e., urgency) and repeated suicide attempts or gestures.

Based on Paris et al.'s (2007) review, a subset of individuals will likely exhibit features associated with both bipolar psychopathology and borderline personality disorder, such as impulsivity, low conscientiousness, and affective dysregulation. These characteristics are expected to contribute to risk for bipolar disorders. For example,

frequent mood switches from depression to elation, or euthymia to anger, are likely to be associated with increased psychosocial impairment within the broad spectrum of bipolar psychopathology.

Although, the relation of DSM-IV-TR bipolar disorders and impulsivity has been widely studied (e.g., Lewis, Scott, & Frangou, 2009; Swann, Lijffijt, Lane, Steinberg, & Moeller, 2009; Strakowski et al., 2009), there have been limited investigations of the relation of subclinical bipolar psychopathology and impulsivity. Whiteside, Lynam, Miller, and Reynolds (2005) described impulsivity as a multidimensional construct, resulting from several 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.). The second factor, (lack of) premeditation, refers to difficulty reflecting on a behavior and its potential consequences, prior to engaging in it. The third factor, (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 an openness to experiences that may be dangerous.

#### Assessment of Bipolar Spectrum Psychopathology

Several researchers have developed screening measures to assess bipolar spectrum psychopathology. Akiskal and colleagues (2005) developed the self-report Temperament Evaluation of Memphis, Pisa, Paris, and San-Diego-Autoquestionnaire version (TEMPS-A) to examine the construct of affective temperaments. The scale is

based on interview evaluations of hyperthymia, irritability, cyclothymia, and dysthymia, and has been psychometrically validated within a moderately severe group of outpatients in a mood disorders clinic (Akiskal et al., 2005). Kesebir et al. (2005) examined the extent to which affective temperaments can be identified among participants with bipolar I disorder as well as their first-degree relatives. The authors found higher ratings of hyperthymia among individuals with bipolar I disorder, first-degree relatives with bipolar I disorder, as well as unaffected first-degree relatives, in comparison to matched control participants and their first-degree relatives. Furthermore, ratings of cyclothymic and hyperthymic temperaments were higher among participants with bipolar I disorder than the matched control group.

The General Behavior Inventory (GBI; Depue et al., 1981) was designed to identify individuals at risk for bipolar disorders. It has been associated with higher rates of mood disorders in family members, as well as increased impairment and treatment over a 19-month follow-up period within a nonclinically identified population (Klein & Depue, 1984). The GBI successfully identifies subclinical and clinical bipolar symptoms in psychiatric outpatient (Depue & Klein, 1988) and nonclinical (Depue et al., 1981; Klein, Depue, & Slater, 1986) populations. Although there is support for the GBI as a measure of bipolar spectrum psychopathology, the scale focuses primarily on dysthymic and cyclothymic symptoms (Mallon, Klein, Bornstein, & Slater, 1986). As a result, the GBI may fail to detect individuals at risk for bipolar disorders who exhibit hypomanic characteristics, and may primarily identify individuals with predominantly depressive symptoms (Eckblad & Chapman, 1986).

Eckblad and Chapman (1986) developed the self-report HPS to identify individuals at risk for bipolar disorders. The scale was designed to assess mild, manic, trait-like functioning, or “energetic, upbeat, gregarious people who are often able to work long hours with little sleep and who juggle numerous projects and social commitments” (p. 214-215). 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 hypomanic, manic, and depressive episodes, and alcohol and drug 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), compared to none of the control participants. Furthermore, 6 of the 9 individuals in the HPS group who did not receive a hypomanic diagnosis reported usually feeling euphoric or energetic. With regard to week-long depressive episodes, individuals within the HPS group reported significantly higher rates of episodes than the control group. The HPS group also exceeded the control group on diagnoses of cyclothymic personality disorder, and had significantly higher alcohol and drug use.

A thirteen-year follow-up of this sample revealed similar group differences (Kwapil et al., 2000). 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. Additionally, the HPS group exceeded the control group on ratings of borderline symptoms. HPS participants who scored highly on a measure of impulsive nonconformity at the initial assessment had especially poor outcomes at the follow-up compared to non-impulsive HPS participants. The measure of impulsive nonconformity assesses an unwillingness to conform to society's norms, a lack of empathy toward others' suffering, and 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 HPS group (67% compared to 11%). Twenty-two percent of the HPS-impulsive group experienced manic episodes, compared to none of the individuals in the HPS group. Furthermore, 56% of the HPS-impulsive group reported being arrested compared to 15% of the HPS group. This impulsive group also exceeded the control group on borderline characteristics and alcohol use, and experienced poorer overall functioning. 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 full-blown bipolar disorders. Although previous studies indicated that the HPS predicts DSM-IV bipolar disorders, they have not fully examined the relation of the HPS with subclinical characteristics of bipolar spectrum psychopathology.

#### *Expression of Bipolar Spectrum Psychopathology in Daily Life*

One way to enhance understanding of bipolar spectrum psychopathology is to examine its expression in daily life. Researchers have recently begun using experience

sampling methodology (ESM), also referred to as ecological momentary assessment, to examine the experience and expression of clinical and subclinical psychopathology in daily life (e.g., Myin-Germeys, Delespaul, & van Os, 2003; Brown, Silvia, Myin-Germeys, & Kwapil, 2007). ESM is a widely used, within-day self-assessment technique in which participants are prompted at random intervals to complete a brief questionnaire. ESM has been used in clinical and social psychology research and offers several powerful advantages to traditional data collection procedures (e.g., Csikszentmihalyi & Larson, 1987; deVries, 1992; Reis & Gable, 2000). Specifically, ESM: (1) repeatedly assesses participants in their normal daily environment, thereby enhancing ecological validity; (2) assesses the participants' experiences at the time of the signal (or in the moment), thereby minimizing retrospective bias; (3) allows for an examination of the context of participants' experiences; and 4) allows for the use of sophisticated multilevel modeling.

Few research studies have specifically examined the expression of bipolar spectrum psychopathology in daily life. Havermans, Nicolson, and deVries (2007) investigated the experience of daily uplifts and hassles within a sample of remitted bipolar patients using ESM. The investigators examined the frequencies and appraisals of negative and positive daily events, as well as whether individual differences in the experience of daily events were related to time use patterns, avoidant and support-seeking coping styles, and clinical features (number of past episodes and current manic and depressive features). The stressfulness of negative events was positively related to both depression scores and the number of previous episodes of depression. Specifically,

individuals who had more than four past episodes of depression experienced negative events as more stressful. Similarly, Myin-Germeys, Peeters, et al. (2003) assessed emotional reactivity to daily stress in a group of individuals with non-affective psychosis, bipolar disorder, and major depressive disorder. Results of the study indicated that individuals with major depression and non-affective psychosis experienced increased negative affect in response to stress. Furthermore, individuals with bipolar disorder and non-affective psychosis experienced a decrease in positive affect in relation to stressful situations.

Kwapil et al. (2010) conducted a study examining the expression of bipolar spectrum psychopathology (as measured by the HPS) in daily life using ESM in a sample of 321 nonclinically ascertained young adults. They found that scores on the HPS were associated with elevated euphoria, energy, dysphoria, irritability, racing thoughts, overconfidence/grandiosity, and risky behavior in daily life. However, they suggested that this was a preliminary study and noted several limitations. First of all, the ESM data collection was completed as much as 12 weeks after the HPS was administered. Although the scale was designed to measure stable characteristics and has good test-retest reliability across this time frame (Eckblad & Chapman, 1986), it was not possible to confirm that the participants' HPS scores represented their functioning at the time of the ESM study. The study also failed to consider the severity and nature of participants' bipolar spectrum psychopathology. Participants did not receive any other measures or diagnostic assessment at the time of the ESM assessment, therefore it was not possible to

examine whether elevated scores on the HPS were associated with diagnosable mood disorders or subclinical bipolar psychopathology.

### Goals and Hypotheses of the Present Studies

The present research examined the construct validity of the HPS as a measure of bipolar spectrum psychopathology in a large sample of young adults (Study 1). Study 1 was designed to replicate and expand upon findings from previous interview studies using the HPS (Eckblad & Chapman, 1986; Kwapil et al., 2000). Study 2 employed ESM to examine the expression of bipolar spectrum psychopathology in daily life in this sample. Specific goals, hypotheses, methods, and analytic strategies are described in the subsequent sections. Given that bipolar disorders are equally common among men and women, and there is not a consistent literature on differential expression of bipolar spectrum psychopathology among men and women, hypotheses regarding sex differences are not offered.



## CHAPTER II

### STUDY 1

#### Goals and Hypotheses

The following section offers specific hypotheses regarding the relation of the HPS with interview and questionnaire measures of clinical and subclinical bipolar psychopathology with related measures of impairment and psychopathology. These hypotheses test the assumptions that the HPS is associated with a spectrum of bipolar psychopathology and impairment in a nonclinically ascertained sample, and that the HPS accounts for variance in measures of bipolar spectrum psychopathology over and above the normal personality dimensions of extraversion and openness to experience.

Consistent with the notion that the spectrum includes subclinical manifestations of bipolar psychopathology, the effects for the HPS were expected to remain, in most cases, independent of participants with DSM-IV-TR bipolar disorders (i.e., the results were not expected to be due simply to the inclusion of a subset of participants with full-blown bipolar disorders). Overall, the relations of the HPS with subclinical manifestations were expected to remain significant independent of individuals with DSM-IV-TR bipolar disorders, but relations with clinical psychopathology were not expected to remain significant. Based upon data from the Kwapil laboratory and from Eckblad and Chapman's (1986) study, it was hypothesized that approximately 10-15 % of the total sample would meet criteria for DSM-IV-TR bipolar disorders. Specific hypotheses are

offered below based upon the hypothesized spectrum of subclinical and clinical bipolar psychopathology.

*Relation of HPS with Interview and Questionnaire Measures*

Study 1 examined the relation of the HPS with DSM-IV-TR bipolar disorders, Akiskal's (2004) bipolar spectrum disorders, subclinical bipolar characteristics, depressive disorders and symptoms, and psychosocial functioning. Specific hypotheses are outlined below.

- 1a The HPS will predict lifetime history of DSM-IV-TR bipolar disorders.
- 1b The HPS will predict lifetime history of Akiskal's broad bipolar disorders.
- 1c The HPS will predict lifetime history of hypomania or interview-rated hyperthymia.
- 1d The HPS will predict lifetime history of major depressive episodes. This relation is not expected to remain independent of participants with DSM-IV-TR bipolar disorders (note that the remaining participants with major depressive episodes will only have unipolar mood disorders).
- 1e The HPS will be modestly associated with current ratings of depressive symptoms. This relation is not expected to remain independent of participants with DSM-IV-TR bipolar disorders.
- 1f The HPS will be negatively associated with ratings of psychosocial functioning. This relation is not expected to remain independent of participants with DSM-IV-TR bipolar disorders.

Study 1 also examined the relation of the HPS with questionnaire measures of affective temperament and personality. Specific hypotheses are outlined below.

2a The HPS will be positively associated with ratings of affective temperament. The relation of the HPS with dysthymic temperament is not expected to remain independent of participants with DSM-IV-TR bipolar disorders.

2b The HPS will be positively associated with neuroticism, extraversion, and openness to experience. The relation of HPS with neuroticism is not expected to remain independent of participants with DSM-IV-TR bipolar disorders.

Study 1 examined the relation of the HPS with interview and questionnaire measures of borderline personality disorder, impulsivity, and substance use. Specific hypotheses are outlined below.

3a The HPS will be positively associated with symptoms of borderline personality disorder. This relation is not expected to remain independent of participants with DSM-IV-TR bipolar disorders. Given the low base rate of borderline personality disorder and the young age range of the participants, the HPS is not expected to predict elevated rates of borderline personality disorder.

3b The HPS will be positively associated with measures of impulsivity. Specifically, it will be associated with (lack of) premeditation and sensation seeking, but not urgency or (lack of) perseverance. These relations are not expected to remain independent of participants with DSM-IV-TR bipolar disorders.

- 3c The HPS will be positively associated with current and heaviest ratings of substance use and impairment. Specifically, the HPS will be positively associated with alcohol and cannabis use.

Study 1 examined the relation of the HPS with interview measures of family history and treatment history of psychopathology. Specific hypotheses are outlined below.

- 4a The HPS will predict past or current treatment of mood disorders, in general, and bipolar disorders, in specific. These relations are not expected to remain independent of participants with DSM-IV-TR bipolar disorders.
- 4b Given that higher rates of bipolar disorders have been found among first-degree relatives of individuals with bipolar disorders, the HPS will predict family history of mood disorders, in general, and bipolar disorders, in specific.

## Method

### *Participants*

Approximately 1,200 college students enrolled in General Psychology courses at the University of North Carolina at Greensboro (UNCG) completed self-report questionnaires as part of departmental mass screenings during three consecutive semesters. A total of 191 college students were invited to participate in Study 1. Specifically, all participants who scored at least 1.5 standard deviations above the mean on the HPS in mass screening were contacted by telephone or email, as well as a comparable number of randomly selected participants who scored less than 1.5 standard deviations above the mean. A total of 147 college students were enrolled in both the interview and ESM studies. Two participants were dropped from the studies due to

invalid questionnaire measures. Neither age nor sex were significantly correlated with HPS scores ( $r = -.09$  and  $-.02$ , respectively). This recruitment strategy was designed to ensure that a sufficient number of individuals who experience bipolar spectrum psychopathology were included in the study. Participants in Study 1 received course credit in General Psychology for their participation. The final sample included 100 women and 45 men. Mean age of the sample was 19.5 years ( $SD = 2.3$  years, range 18 to 36 years old). Consistent with the student demographics at UNCG, the sample was 65% Caucasian, 16% African American, 4% Hispanic, 4% Asian/Pacific Islander, 4% other, and 7% not specified.

### *Materials and Procedures*

#### *Mass Screening Questionnaires*

Mass screening participants completed a brief demographic questionnaire, the HPS, the NEO Five Factor Inventory (NEO-FFI; Costa & McCrae, 1992), and additional questionnaires not included in the present study over the course of 1½-2 hours. The HPS consists of 48 true-false items that are worded to reflect either stable characteristics or recurrent experiences. Sample items for the scale include, “When I feel an emotion, I usually feel it with extreme intensity” [keyed true], “I can usually slow myself down when I want to” [keyed false], and “Sometimes ideas and insights come to me so fast that I cannot express them all” [keyed true]. All items were selected based on their high item-scale correlations and low correlations with measures of social desirability and acquiescence. Eckblad and Chapman (1986) reported high internal consistency (coefficient alpha = .87) for the HPS in an undergraduate sample ( $n = 1,519$ ), and a test-

retest reliability of .81 after an interval of 15 weeks ( $n = 89$ ). The items on this scale were intermixed with a 13-item measure of infrequent responding (Chapman & Chapman, 1983). Participants who endorsed more than two infrequency items were dropped from further study, consistent with the recommendations of Chapman and Chapman.

The NEO-FFI is a 60-item, widely used self-report measure of the Five Factor Model of personality. Specifically, it assesses the personality domains of neuroticism, extraversion, openness to experience, agreeableness, and conscientiousness. All items are scored on a five-point Likert scale from “strongly agree” to “strongly disagree.” Costa & McCrae (1992) reported coefficient alpha reliabilities ranging from .74 to .89 for the individual domains.

#### *Structured Interview*

The interview assessed mood disorders, broader bipolar spectrum disorders, alcohol and drug use/abuse, psychosocial functioning, borderline personality disorder traits, lifetime history of treatment for psychopathology, as well as family history of psychopathology. All interviews were tape-recorded and took 1-2 hours. Interviews were conducted by two advanced graduate students in clinical psychology under the supervision of a licensed psychologist. One-fifth of the interviews were double-rated to assess interrater reliability.

The Structured Clinical Interview for DSM-IV (SCID-I; First, Spitzer, Gibbon & Williams, 1995) was used to assess current and past depressive, manic, and hypomanic episodes, as well as cyclothymic disorder. The SCID-I is a semi-structured interview designed to allow clinicians to assign DSM-IV Axis I diagnoses. Interrater reliability

kappas for the SCID-I range from .61 to .93 for major depressive episodes, and from .79 to .84 for bipolar disorder (Skre, Onstad, Torgersen, & Kringlen, 1991).

Broader bipolar spectrum disorders were diagnosed using the criteria reported in Akiskal (2004). The SCID-I interview was appropriate for determining diagnoses of bipolar II ½ (major depression superimposed on cyclothymia) 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).

The interview also assessed participants for DSM-IV-TR substance abuse and dependence using the SCID-I and the scoring 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 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 or 5 mixed drinks). 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 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, hallucinogens, and phencyclidine; and from 0 (none) to 8 (weekly use) 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 1 (none) to 6 (major life disruptions).

Participants' current 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), were based on an individual's psychological, social, scholastic, and occupational functioning.

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

#### *Self-Report Questionnaires*

Following the structured interview, participants completed several self-report questionnaires. The HPS was re-administered to assess test-retest reliability. The 50-item TEMPS-A was administered to assess affective temperaments. Sample true-false items of the TEMPS-A include, "I'm usually in an upbeat or cheerful mood" (hyperthymic), "My feelings are easily hurt by criticism and rejection" (dysthymic), "I get *sudden* shifts in mood and energy" (cyclothymic), and "When angry, I snap at people" (irritable). The



scale was validated in a sample of 398 outpatients from two mood clinics in Memphis, Tennessee (Akiskal et al., 2005). Cronbach alpha coefficients were good: cyclothymic .88, irritable .84, hyperthymic .81, and dysthymic .76. Furthermore, good test-retest reliability after 6-12 months was reported: hyperthymic .70, dysthymic .69, cyclothymic .68, and irritable .58.

In addition, participants completed the Beck Depression Inventory (BDI; Beck, Ward, Mendelson, Mock, & Erbaugh, 1961). The BDI is a widely used screening measure of the severity of depressive symptoms. A coefficient alpha of .81 has been reported for non-psychiatric patients, based on a meta-analysis of the BDI's internal consistency (Beck, Steer, & Garbin, 1988).

Participants also completed the UPPS Impulsivity Scale (Whiteside & Lynam, 2001; Whiteside et al., 2005). The UPPS is a 46-item scale designed to measure the 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 of .87, .89, .85, and .83 have been reported for (lack of) premeditation, urgency, sensation seeking, and (lack of) perseverance, respectively (Whiteside et al.).

## Results

Statistical analyses were computed using SPSS 15 (SPSS, 2006). Regression analyses were employed to examine the extent to which the HPS accounts for variance within a broad spectrum of bipolar psychopathology over and above the normal personality dimensions of extraversion and openness to experience and independent of

DSM-IV-TR diagnoses. Binary logistic regression was used to examine the relation of the HPS with dichotomous measures, such as diagnoses of psychopathology, history of treatment, and family history of psychopathology. Linear regressions were used to analyze the relation of the HPS with all self-report questionnaires and quantitative variables from the interview. Unless otherwise noted, the following order of entry was used in the logistic and linear regression analyses: NEO-FFI extraversion and openness to experience scores were entered at the first step, HPS score was entered at the second step, followed by a dichotomous code indicating presence or absence of DSM-IV-TR bipolar disorder at step 3. Finally, the HPS x diagnosis interaction term was entered at the fourth step. This was done to determine whether the main effects of the HPS remain when considered only in participants without DSM-IV-TR bipolar disorders. In the case of a significant HPS x diagnosis interaction, simple slopes analyses were to be conducted to determine if the slope for participants without bipolar disorders remained significant.<sup>1</sup> However, none of the interaction terms were significant in Study

1. Additionally, given that this study focused on the validity of the HPS as a measure of bipolar spectrum psychopathology, the relations of extraversion and openness to experience with criterion measures fall outside the scope of this research and therefore are not discussed in detail.

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<sup>1</sup> Note that I originally proposed to simply rerun the analyses with the participants with DSM-IV-TR bipolar disorders omitted to determine if the effects of the HPS remained. However, at the recommendation of the committee, I adopted the analytic strategy above. Note that the interaction term indicates whether the slopes for the relation of the HPS with criteria differ for participants with and without DSM-IV-TR bipolar disorders. However, the primary question of interest is whether there is a main effect for the HPS and whether the main effect was simply driven by the inclusion of a small set of deviant (clinically disordered) participants. The latter question—which is central to examining the presence of a broader bipolar spectrum—can only be considered in the case of a significant interaction by computing simple slopes analyses.

### *HPS Data*

Participants completed the HPS on two occasions—at mass screening and at the time of the interview (2 to 12 weeks later, mean = 5.5 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, standard deviation = 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). Nevertheless, HPS scores were strongly correlated across the two time points (intraclass correlation coefficient = .85,  $p < .001$ ). Given the magnitude of this association, participants were assigned an average HPS score for all analyses (simply referred to as the HPS score). Of note, the results were substantively unchanged when using the HPS average score or the HPS score from either time point.

### *Relation of HPS with Interview and Questionnaire Measures*

Thirty interviews (21%) were independently rated by both interviewer/raters to assess interrater reliability. Intraclass correlations using two-way mixed models for absolute agreement for single ratings were computed for continuous measures, including overall functioning (GAF) .82, borderline symptoms .84, heaviest alcohol use .97, and heaviest drug use .99. Kappa was computed for dichotomous measures, including DSM-IV-TR bipolar diagnoses 1.0, broad bipolar spectrum diagnoses 1.0, interview-rated hyperthymia .83, and past major depressive episodes .92. The findings indicate good agreement between the two interviewer/raters.

Prior to examining the predictive validity of the HPS in the regression analyses, zero-order correlations were computed of the HPS score with the interview and

questionnaire measures. Table 1 presents these relations. Table 2 presents the associations of HPS scores with dichotomous indicators of bipolar spectrum disorders, subclinical bipolar characteristics, major depressive episodes, treatment of mood disorders, and family history of mood disorders. Fifteen (10%) of the participants met criteria for a DSM-IV-TR bipolar disorder (3 with bipolar I disorder, 6 with bipolar II disorder, 1 with cyclothymic disorder, and 5 with bipolar NOS disorder). In addition, 6 other participants qualified for bipolar IV disorder and 1 for bipolar II ½ disorder. HPS scores were positively associated with interview ratings of DSM-IV-TR bipolar disorders, Akiskal's (2004) bipolar spectrum disorders, and history of hypomania or hyperthymia. Note that the estimations for the final two steps in the analysis of broad bipolar diagnoses did not converge. However, the analysis was rerun in the sample excluding participants with DSM-IV-TR bipolar disorders, and the results remained significant for HPS score. Note that 20 of these 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; however, HPS scores were positively associated with current ratings of depressive symptoms (see Table 3). The relations of the HPS with treatment of mania or any mood disorder were not significant. Similarly, the HPS did not account for significant variance in family history of mania or any mood disorder.

As shown in Table 3, the HPS was positively associated with hyperthymia, cyclothymia, and irritability, and was unrelated to dysthymia. The HPS was negatively associated with ratings of psychosocial functioning. In addition, the HPS was positively

associated with neuroticism, extraversion, and openness to experiences, and was negatively associated with agreeableness and conscientiousness. The HPS accounted for significant variance in borderline personality disorder symptoms, as well as urgency. The relations of the HPS with (lack of) premeditation, sensation seeking, and (lack of) perseverance were not significant. In addition, the HPS did not account for significant variance in measures of alcohol use and impairment or overall substance use and impairment. The HPS was positively associated with current cannabis use, consistent with hypotheses.

#### *Cooperative Suppression Effect of Extraversion and the HPS*

As noted above, NEO-FFI openness and extraversion were partialled out of the analyses to examine whether the HPS accounted for significant variance in the dependent variables over and above the variance accounted for by these dimensions of normal personality (which it generally did). Unexpectedly, the analyses indicated that there was a classical cooperative suppression effect of extraversion and the HPS in the prediction of a number of measures of psychopathology. The relation of the HPS and extraversion with overall functioning (GAF) illustrates this finding. HPS scores were highly correlated with extraversion ( $r = .51$ ) and had a moderately high inverse correlation with GAF ( $r = -.30$ ). Extraversion was not significantly correlated with GAF ( $r = .07$ ). However, when simultaneously entered as predictors into a regression equation, the partial correlation of the HPS with GAF increases to  $-.45$  (significant change using Aroian test,  $p < .01$ ). Furthermore, the partial correlation of extraversion with GAF becomes significant in the opposite direction,  $.31$  (significant increase using Aroian test,  $p < .001$ ). Of note, despite

the fact that the HPS and extraversion correlate positively, the HPS is associated with poorer overall functioning (both in the zero-order and partialled relations), and extraversion is associated with better overall functioning in the partialled relation. Comparable findings occurred for the associations with TEMPS-A cyclothymia and irritability, and IPDE borderline dimensional ratings. Note that, in every case, the HPS had a significant zero-order association with these dependent measures (see Table 1). Thus, the suppression effect amplified the relation of the HPS with the outcomes, but did not create or change the direction of the association in any cases.

#### Summary of Study 1

As hypothesized, the HPS was associated with measures of psychopathology, personality, and functioning in a nonclinically ascertained sample. Specifically, the HPS was positively associated with interview ratings of DSM-IV-TR bipolar disorders, Akiskal's (2004) broad bipolar spectrum disorders, hypomania or hyperthymia, borderline symptoms, and current cannabis use, as well as questionnaire measures of current depressive symptoms, cyclothymia, irritability, and hyperthymia. The HPS was negatively associated with ratings of psychosocial functioning. All of these findings remained after partialling extraversion and openness to experience. Furthermore, the findings were not simply due to the presence of a few markedly impaired participants with DSM-IV-TR bipolar disorders. The results support the notion that the HPS captures variance in a bipolar spectrum that extends beyond traditional clinical disorders and comprises more than normal variations in personality dimensions. Given this support for

the validity of the HPS as a measure of bipolar spectrum psychopathology, Study 2 examined the expression of this bipolar spectrum in daily life.

## CHAPTER III

### STUDY 2

#### Goals and Hypotheses

Study 2 examined the expression of bipolar spectrum psychopathology, as assessed by the HPS, in daily life using ESM. Table 4 shows hypothesized relations of the HPS with experiences in daily life. Note that the Appendix lists specific ESM items, including three indices composed of the mean of related ESM items. It was expected that the HPS would be significantly associated with the following criteria assessed in daily life: positive affect, negative affect, perceiving situations positively, perceiving situations negatively, trouble concentrating, fullness of thought, daydreaming, risky behavior, restlessness, doing something exciting, doing many things, grandiosity, uncertainty, and boredom. Consistent with the hypothesis that the HPS is a measure of broad bipolar spectrum psychopathology over and above the normal personality dimensions of extraversion and openness, all of the direct effects of the HPS with experiences in daily life were expected to remain significant after partialling out extraversion and openness to experience. Furthermore, the effects of the HPS on the ESM criteria were expected to remain independent of DSM-IV-TR bipolar disorders.

In addition to the direct effects of bipolar spectrum psychopathology on experiences in daily life, it was expected that the HPS would moderate the effects of context in daily life on behaviors. In other words, the effects of contextual factors in daily



life (e.g., experiencing stressful situations and positive situations) on cognitions, emotions, and behaviors would be different for participants with high scores on the HPS compared to participants with low scores. It was hypothesized that high HPS scorers would be more reactive to the experience of stress and to positive experiences in daily life. For example, it was hypothesized that the HPS would moderate the relation of 1) stress with negative affect and with fullness of thought, and 2) perceiving one's situation positively with positive affect and grandiosity. It was expected that the results corresponding to these specific hypotheses would remain significant independent of individuals with DSM-IV-TR bipolar disorders and after partialling out extraversion and openness.

## Method

### *Participants*

Everyone who completed Study 1 took part in Study 2. As noted in the Study 1 method section, two participants were dropped due to unusable questionnaires. Seven additional participants were dropped from Study 2 due to failure to complete sufficient ESM protocols (final  $n = 138$  for Study 2). Participants received research credit for taking part in the study, and those who completed 70% of the ESM questionnaires were entered into a drawing for two \$100 gift cards awarded each semester.

### *Materials and Procedures*

The ESM protocol (listed in the Appendix) was designed to assess experiences relevant to bipolar spectrum psychopathology (e.g., racing thoughts, risky behavior) and contextual factors (social context). All of the items were scored on a 7-point scale from

“not at all” to “very much,” except for question 22, “Are you alone right now?” that was answered “yes” or “no.”

Following the structured interview and completion of the self-report questionnaires in Study 1, participants completed a fifteen-minute information session during which experimenters provided a PalmPilot Personal Digital Assistant (PDA) and described study procedures, and participants completed a practice questionnaire. Before participants left the session, they were provided a written summary of the study instructions and contact information in the event that they experienced problems with the procedures.

After completing the information session, participants kept the PDAs for seven days. 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. One signal occurred randomly during each of the eight 90-minute blocks that fell within the twelve-hour window. Participants responded by tapping the appropriate answer on the PDA screen with a stylus. Participants had up to three minutes to initiate their responses following the signal and up to three minutes to complete each subsequent question. After these time intervals (or the completion of a questionnaire), the PDA turned off and did not reactivate until the next signal. This procedure ensured that participants did not skip questionnaire administrations and complete them at a later time. The ESM questionnaires required about two minutes to complete.

Participants returned to the lab on days two and four of the study to allow investigators to download their data. These visits decreased the likelihood of data loss

resulting from lost or defective PDAs and increased the likelihood of participants regularly completing the protocols.

### *Statistical Method*

Consistent with Study 1, the analyses examined the effect of the HPS on criterion measures over and above extraversion and openness to experiences and independent of DSM-IV-TR bipolar disorders. ESM data have a hierarchical structure in which ESM ratings (level 1 data) are nested within participants (level 2 data). Multilevel or hierarchical linear modeling provides a more appropriate method than conventional unilevel analyses for analyzing nested data (Affleck, Zautra, Tennen, & Armeli, 1999; Schwartz & Stone, 1998). Multilevel modeling techniques are a variant of the more commonly used unilevel regression analyses (Hox, 2002; Luke, 2004), and are standard for the analysis of ESM data (see Nezlek, 2001; Reis & Gable, 2000).

The multilevel analyses examined two types of relations between the HPS score and experiences rated in daily life over and above extraversion and openness to experience and independent of DSM-IV-TR disorders. The first was the intercept of the level 1 criterion, which assessed the independent effects of the level 2 predictor (HPS score) on level 1 dependent measures (ESM ratings in daily life). The intercept,  $\beta_0$ , was computed using the formula,  $\beta_0 = \gamma_{00} + \gamma_{01}(\text{extraversion}) + \gamma_{02}(\text{openness}) + \gamma_{03}(\text{HPS}) + \mu_0$ . In this model,  $\gamma_{00}$  is the mean value of the level 1 dependent measure,  $\gamma_{03}$  is the effect of the level 2 HPS predictor after partialling the effects of  $\gamma_{01}(\text{extraversion})$  and  $\gamma_{02}$  (openness), and  $\mu_0$  is the residual variance term. The  $\gamma_{01}$ ,  $\gamma_{02}$ , and  $\gamma_{03}$  coefficients provide information that is comparable to the unstandardized regression weight of each level 2

predictor with the level 1 measures. To test the hypothesis that the direct effects were not related to a subgroup of participants with DSM-IV-TR bipolar disorders, a dichotomous code indicating presence or absence of DSM-IV-TR bipolar disorder and the HPS x DSM-IV-TR disorders interaction term were added to the model:  $\beta_0 = \gamma_{00} + \gamma_{01}(\text{extraversion}) + \gamma_{02}(\text{openness}) + \gamma_{03}(\text{HPS}) + \gamma_{04}(\text{DSM}) + \gamma_{05}(\text{DSM} \times \text{HPS}) + \mu_0$ . Specifically, NEO-FFI extraversion and openness to experience scores were entered at the first step, HPS score was entered at the second step, followed by a dichotomous code indicating presence or absence of DSM-IV-TR bipolar disorder at step 3. Finally, the HPS x diagnosis interaction term was entered at the fourth step to examine its effect over the partialled main effects. The interaction term indicated whether the relation of the level 2 predictor (HPS) and criterion differed for participants with and without DSM-IV-TR bipolar disorders. Note that none of the interaction terms were significant in Study 2.

The second set of analyses examined the cross-level interactions of the relation of a level 1 predictor and criterion (e.g., stressful experiences and fullness of thought) with the level 2 HPS score over and above extraversion and openness to experience. Cross-level interactions (or slopes-as-outcomes effects, as they are sometimes called; see Kreft & de Leeuw, 1998) tested whether level 1 relations varied as a function of the level 2 variable (HPS) after partialling out variance related to extraversion and openness to experience. Note that the DSM-IV-TR diagnosis code and HPS x diagnosis interaction terms were also entered into the model at steps 3 and 4, but none of the interactions were significant. Cross-level interactions were evaluated by estimating the effect of the level 2 predictor on the level 1 slopes, using the equation,  $\beta_1 = \gamma_{10} + \gamma_{11}(\text{extraversion}) +$

$\gamma_{12}(\text{openness}) + \gamma_{13}(\text{HPS}) + \mu_1$  (in which  $\gamma_{10}$  is the mean value of the level 1 slope,  $\gamma_{13}$  is the effect of the level 2 HPS predictor after partialling the level 2 predictors—extraversion and openness to experience;  $\mu_1$  is the error term). If the HPS predictor was significant, then it explained variability in the within-person slopes over and above extraversion and openness to experience. Note that the  $\gamma_{10}$  coefficient evaluates the strength of the relations of the level 1 predictor and criterion, independent of the level 2 variables. These values provide an effective test of the validity of the assessment of daily experiences (e.g., failing to find a significant relation between daily life ratings of stressful situation and irritability would raise concerns about the validity of the ESM method), although they are not necessarily directly related to the specific hypotheses regarding bipolar spectrum psychopathology.

The multilevel analyses were computed with HLM 6 (Raudenbush, Bryk, & Congdon, 2004). Consistent with the recommendations of Cohen, Cohen, West, and Aiken (2003) and Luke (2004), the level 1 predictors were group mean centered and the level 2 predictors were grand mean centered. Parameter estimates were calculated using robust standard errors if the data departed from normality, following the recommendations of Hox (2002).

## Results

Participants averaged completing 40.4 usable questionnaires ( $SD = 9.9$ ). The HPS and openness to experience were negatively correlated with the number of usable records ( $r = -.22, p < .01$ ;  $r = -.18, p < .05$ , respectively). Extraversion was not significantly correlated with the number of usable records ( $r = -.14$ ). The sections below summarize

the relations of the HPS with experiences in daily life over and above extraversion and openness to experience. Note that none of the results for DSM-IV-TR bipolar disorder (step 3) or the DSM-IV-TR bipolar disorder x HPS interaction (step 4) were significant, and therefore, for simplicity's sake, were not reported.

#### *Expression of Bipolar Spectrum Psychopathology in Daily Life*

##### *Expression of Bipolar Spectrum Psychopathology in Daily Life: Affect, Thoughts, and Behaviors*

Table 5 presents the direct effects of the HPS with affect, thoughts, and behaviors in daily life. As hypothesized, the HPS was positively associated with measures of negative affect, including anger, sadness, irritability, worry, and perceiving one's situation as stressful. Note that the HPS did not account for additional variance in the experience of positive affect in daily life over-and-above the effects of extraversion and openness to experience<sup>2</sup>. As expected, the HPS was positively associated with measures of thought disturbance in daily life, including trouble concentrating, fullness of thought (e.g., racing thoughts, thinking about many things), and daydreaming. In addition, the HPS was associated with risky behavior, restlessness, and increased activity (e.g., doing many things) in daily life. The HPS did not account for variance in perceiving one's current activity as exciting over and above extraversion and openness.

##### *Expression of Bipolar Spectrum Psychopathology in Daily Life: Sense of Self in the World*

Table 6 presents the direct effects of the HPS with measures of sense of self in the

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<sup>2</sup> HPS had a significant zero-order association with exuberance in daily life, but this effect did not remain after partialling variance associated with extraversion.

world. As expected, the HPS was positively associated with two measures of grandiosity—perceiving oneself as the center of attention and perceiving oneself as better than others. Contrary to predictions, the HPS did not account for variance in measures of confidence, optimism, or success in one’s current activity over and above extraversion and openness to experience. The HPS was positively associated with feeling uncertain and bored in daily life.

#### *Expression of Bipolar Spectrum Psychopathology in Daily Life: Social Interactions*

Table 6 also presents the relation of the HPS with social experiences in daily life. HPS scores were positively associated with liking others (when with others), but also with being alone because others did not want to be around. The HPS was unrelated to feeling close to others when with others or preferring to be with others when alone.

#### *Moderating Effects of Bipolar Spectrum Psychopathology on Relations of Daily Life Experiences*

Cross-level interactions examined the relations of level 1 variables in daily life across levels of the HPS in two broad areas—1) relation of positive experiences with measures of affect and functioning, and 2) relation of stressful experiences with measures of affect and functioning. Note that the lack of cross-level interactions does not mean that there was not a relation between the HPS and the dependent measure—those direct effects are indicated in the previous section. However, a cross-level interaction clarifies this relation of the HPS with experiences in daily life.

*Relation of positive experiences with affect and functioning.* Table 7 summarizes the first set of cross-level analyses, which examined whether the HPS moderated the

relation of viewing one's situation as positive with measures of affect and functioning. There were significant relations between viewing one's situation as positive and measures of positive affect (i.e., happiness and exuberance), indicating that, as expected, people experienced positive affect when they interpreted their situation as positive. These relations were not moderated by the HPS. Conversely, measures of negative affect (i.e., anger, sadness, irritability, and worry) had inverse relations with how positively the situation was viewed. The HPS moderated several of these relations, such that participants with high HPS scores exhibited greater reactivity in anger, sadness, and worry in response to how positively they viewed their situation. Figure 1 illustrates these cross-level interactions by comparing the slopes of positive situation and anger for high and low HPS scorers. The HPS did not moderate the relation of irritability with how positively the situation was viewed.

There were inverse relations between positive situation and measures of thought disturbance. In general, people were less likely to report experiencing trouble concentrating when they interpret their situation as positive. The relation of positive situation with trouble concentrating was moderated by HPS score. Specifically, participants with low HPS scores experienced increased difficulty concentrating as situations became less positive, whereas high HPS scorers tended to show elevated concentration difficulties regardless of how positively they viewed their situation. Figure 2 shows this cross-level interaction by comparing the slopes of positive situation and trouble concentrating for high and low scorers on the HPS. The relation of positive situation with fullness of thought was not moderated by HPS score.



In terms of behaviors in daily life, positive experiences were negatively associated with risky behavior, and positively associated with exciting activities. This indicates that people tended to perceive risky situations non-positively and associated exciting experiences as positive. These relations were not moderated by HPS score. Positive experiences were also associated with grandiosity in daily life, namely perceiving oneself as better than others. However, this relation was not moderated by the HPS.

The HPS moderated the relation of positive experiences with social experiences in daily life. Specifically, positive experiences were negatively associated with reports of being alone because others did not want to be around. The HPS exacerbated this relation, such that participants with high scores on the HPS were more likely to report being alone because they were not wanted in non-positive situations compared to participants with low scores on the HPS. Positive experiences were positively associated with feeling close to others. This relation was also moderated by the HPS such that participants with high HPS scores were less likely to feel close to others in positive situations compared to participants with low HPS scores.

*Relations of stressful experiences with affect and functioning.* Table 8 summarizes the second set of cross-level analyses, which examined whether the HPS moderated the association of stressful experiences with measures of affect and functioning over and above extraversion and openness to experience. There was an inverse relation between stressful experiences and measures of positive affect (i.e., happiness and exuberance). This relation was not moderated by HPS score. Measures of negative affect (i.e., anger, sadness, irritability, and worry) had a positive relation with stressful experiences,

indicating that people experienced increasing negative affect under stress. The relations of stressful experiences with anger and sadness were exacerbated by HPS score, indicating that not only did high HPS scorers have a main effect for greater negative affect, but their anger and sadness was more reactive to the experience of stress.

There was a positive relation between stressful experiences and measures of thought disturbance. This suggests that people were more likely to report experiencing fullness of thought or trouble concentrating when they interpreted their situation as stressful. The relation of stressful experiences with trouble concentrating was moderated by the HPS such that participants with high HPS scores were more likely to experience trouble concentrating regardless of how stressful the situation was, whereas participants with low HPS scores generally experienced concentration difficulties only when under stress. The relation of stressful experiences with fullness of thought was not moderated by the HPS.

In terms of behaviors in daily life, stressful experiences were positively associated with risky behavior and negatively associated with exciting activities. This indicates that people tended to perceive risky situations as stressful and associated exciting experiences as non-stressful. These relations were not moderated by HPS score.

Stressful experiences were negatively associated with grandiosity in daily life. Specifically, stressful experiences had an inverse association with perceiving oneself as better than others, but this was not moderated by the HPS. Stressful experiences were positively associated with reports of being alone because others did not want them, suggesting that people generally feel stressed when they perceive that others do not want

to be around them. Stressful experiences were negatively associated with feeling close to others (when with others). The HPS did not moderate either of these relations.

## CHAPTER IV

### DISCUSSION

#### Reconsidering Traditional Categorical Views of Bipolar Psychopathology

Traditional psychiatric literature divides the world into those with bipolar disorders and those without. This categorical system simplifies the diagnosis of bipolar disorders, but does not map onto the continuous expression of psychopathology and impairment existing in nature. The DSM-IV-TR focuses on defining reliable diagnostic categories. As a result, it lacks guidelines for conceptualizing (and treating) individuals who have bipolar traits and symptoms that do not fit into the diagnostic criteria. The current diagnostic system also fails to represent the various bipolar disorders as being on a continuum, separated by degree, not type. Therefore, DSM-IV-TR diagnoses offer only a glimpse of bipolar characteristics, and may be better conceptualized as classification “short-cuts” than an accurate reflection of the broader bipolar spectrum.

#### Relation of the HPS with Measures of Psychopathology

Construct validation of the bipolar spectrum requires adequate measurement tools. The present studies supported the validity of the HPS as a measure of clinical and subclinical bipolar spectrum psychopathology in a nonclinically ascertained sample. In the first study, the HPS was positively associated with DSM-IV-TR bipolar disorders, Akiskal’s bipolar spectrum disorders, as well as a range of subclinical bipolar characteristics and associated traits, including hypomania and hyperthymia, borderline

symptoms, cyclothymic temperament, irritability, and depressive symptoms. The present results also suggested that the bipolar spectrum is a heterogeneous construct. Consistent with clinical bipolar disorders, the manifestation of subclinical bipolar characteristics varies broadly from one person to another. For instance, an individual experiencing irritable hypomania and risk-taking behavior, as well as someone with hyperthymia and recurrent depression would be included within the bipolar spectrum.

This study built on previous cross-sectional (e.g., Eckblad & Chapman, 1986) and longitudinal (e.g., Kwapil et al., 2000) investigations that reported that the HPS predicts DSM-IV bipolar disorders. However, neither of these validation studies fully examined the relation of the HPS with bipolar spectrum characteristics. The present research indicated that the HPS provides a useful “foot in the door” for identifying the bipolar spectrum. Furthermore, these studies highlighted that the HPS measures a wide range of bipolar psychopathology, well beyond the initial assumption that the HPS only measured hypomanic functioning. The HPS captured dysregulation in affect, energy, cognition, behavior, and psychosocial functioning associated with bipolar spectrum psychopathology, as well as borderline personality symptoms. Furthermore, previous studies of the validity of the HPS were often hampered by the fact that the HPS was administered in screening sessions that were weeks or months prior to the validity studies. This raised concerns regarding both the stability of the measure and the stability of the construct being assessed (given the cyclical nature of bipolar psychopathology). The present studies addressed these issues by administering the measure at the initial screening and on the day of the interview and ESM information session. The stability

coefficient was high, suggesting that the HPS is a reliable instrument across a one to three-month interval, and that the construct it assesses is relatively stable, despite fluctuations in bipolar characteristics.

HPS scores were associated with a history of bipolar disorders (consistent with hypotheses). As noted, more than 10% of the sample had a history of DSM-IV-TR bipolar disorders and the rate increased to 15% when Akiskal's broader diagnostic categories were considered. However, consistent with the hypothesized spectrum, the association of the HPS with bipolar spectrum psychopathology remained independent of participants with DSM-IV-TR bipolar disorders. Thus, the results were not driven by a subset of disordered participants. In fact, in several cases, relations that were expected to be weakened when considered independent of participants with bipolar disorders remained significant. This was the case for relations of the HPS with borderline symptoms, current depressive symptoms, ratings of psychosocial functioning, and neuroticism. Demonstrating that the HPS captures variance in bipolar spectrum psychopathology over and above DSM-IV-TR disorders was critical to the validation of the HPS as a measure of subclinical bipolar psychopathology.

The positive relation of the HPS with symptoms of borderline personality disorder is consistent with the hypothesized nature of bipolar spectrum psychopathology. If the bipolar spectrum includes disruptions in affect, cognition, behavior, and energy, then one would expect some overlap with borderline personality traits. Furthermore, the relation of the HPS with borderline personality traits is consistent with the notion that bipolar and borderline characteristics represent overlapping constructs (Paris et al., 2007). Both

bipolar and borderline characteristics may include labile affect, impulsive behavior, and suicidal gestures, for example. However, bipolar spectrum psychopathology is also associated with changes in cognitions (e.g., racing thoughts, fullness of thought) and energy (e.g., hypomania, hyperthymia) that fall outside the range of borderline personality disorder symptoms. Overall, the relation of the HPS with borderline personality traits further validates the HPS as a measure of bipolar spectrum psychopathology, and supports the assumption that borderline and bipolar spectrum psychopathology involve dysregulation in affect and behavior.

The HPS captured variance in a range of bipolar spectrum psychopathology, including potentially adaptive (e.g., hyperthymia) and deviant (e.g., cyclothymia, borderline symptoms) characteristics. This suggests that the HPS may be multi-dimensional, with items tapping both positive and negative aspects of bipolar spectrum psychopathology. On one hand, this heterogeneity is a strength of the HPS since it appears to be tapping a full range of bipolar characteristics. On the other hand, it remains unclear whether different items of the HPS are tapping adaptive and deviant traits. Future item analyses should increase our understanding of the multi-dimensional structure of the HPS, as well as the interpretation of HPS scores.

#### The HPS, Extraversion, and the Bipolar Spectrum

Previous studies of the HPS and bipolar spectrum psychopathology (e.g., Kwapil et al., 2000; Kwapil et al., 2010) have been limited by the fact that they did not disentangle the HPS from normal dimensions of personality such as extraversion and openness to experience. As noted previously, bipolar spectrum psychopathology shares a

number of phenomenological features with extraversion, such as upbeat mood and increased energy level, and with openness to experience, such as uninhibited and/or risk-taking behavior. Furthermore, the HPS is significantly correlated with self-report ratings of these dimensions. The present study considered this issue by examining the extent to which HPS scores accounted for variance in bipolar spectrum psychopathology and characteristics over-and-above the effects of extraversion and openness. This is not a perfect solution, however, the findings demonstrated that the HPS is capturing variance beyond these dimensions of personality and that this variance is associated with bipolar spectrum features. Note that this is not suggesting that future use of the HPS should partial out these personality dimensions. In fact, it is concerning that such practices may remove variance that is important to the adaptive aspects of the bipolar spectrum. Perhaps a simple summation is that people who fall within the bipolar spectrum are likely to be elevated on extraversion, but that most people who are elevated on extraversion are unlikely to experience or be at risk for bipolar spectrum psychopathology.

Unexpectedly, there was a cooperative suppression effect of extraversion and the HPS in the prediction of several measures of bipolar spectrum psychopathology. However, in every case the HPS had a significant zero-order correlation with the measure. Therefore, partialling extraversion amplified existing associations between the HPS and measures of psychopathology (as opposed to creating them). The detection of suppression effects supports the notion that the HPS is a multi-dimensional construct, with items tapping both adaptive and deviant traits associated with bipolar spectrum psychopathology. Furthermore, these suppression effects underscore the heterogeneity of



the HPS as a measure of a broad range of bipolar spectrum characteristics. Item analyses will examine the nature of the overlap of extraversion and the HPS.

### Expression of the Bipolar Spectrum in Daily Life

Study 1 utilized diagnostic interviews and self-report questionnaires to demonstrate that the HPS taps clinical and subclinical bipolar spectrum psychopathology in the laboratory. Study 2 built upon the validation work of Study 1 and previous work with the HPS (e.g., Kwapil et al., 2010) as it examined the extent to which the HPS taps real-life experiences associated with bipolar spectrum psychopathology. Using ESM, Study 2 assessed thoughts, behaviors, affect, sense of self, and social interactions in daily life thought to be related to bipolar spectrum psychopathology. Thus, it assessed the validity of the HPS as a measure of bipolar characteristics in real world settings—and independent of the effects of DSM-IV-TR bipolar disorders. Finding continuity of the HPS across methodologies further supports construct validity.

### *Cognition*

Disturbances in thought are a hallmark of bipolar spectrum psychopathology. During periods of dysphoria, individuals often experience difficulty concentrating and making decisions, while hyperthymia, hypomania, and mania are associated with racing thoughts and distractibility. It was expected that the HPS would tap thought disruption associated with bipolar spectrum psychopathology, including difficulty concentrating, fullness of thought, and daydreaming. As expected, the HPS was positively associated with all of these and the results were not driven by a subset of individuals with DSM-IV-TR bipolar disorders. This finding suggested that the HPS captures variance in thought

disturbance associated with bipolar spectrum psychopathology in daily life, offering further validation of the HPS as a measure of this construct.

### *Behaviors*

Disruptive behaviors are also associated with bipolar spectrum psychopathology—and are especially problematic during episodes of hypomania and mania. Specifically, these mood states are often characterized by an increase in goal-directed activity, psychomotor agitation, as well as reckless behavior. At the subclinical end of the spectrum, individuals may display milder impulsive behaviors (e.g., occasional shoplifting, over-spending, recreational substance use, etc.). It was expected that the HPS would capture behaviors associated with bipolar spectrum psychopathology, including risky behavior, restlessness, perceiving one's current activity as exciting, and perceiving oneself as doing many things. The HPS was positively associated with risky behavior, restlessness, and with doing many things; however, the HPS did not capture variance in viewing one's situation as exciting over and above extraversion and openness to experience. Note that the HPS had a significant zero-order correlation with perceiving one's situation as exciting. Overall, these findings provide support for a bipolar spectrum that extends beyond clinical boundaries—and that this spectrum includes disturbances in behavior. Specifically, these results underscore the notion that individuals without bipolar disorders engage in risky behaviors and experience periods of restlessness and increased activity.

### *Affect*

Bipolar spectrum psychopathology involves marked disruptions in affect. It was hypothesized that the HPS would be positively associated with measures of positive affect, negative affect, viewing one's situation as positive, and viewing one's situation as negative. The HPS was positively associated with measures of negative affect, including anger, sadness, irritability, worry, and viewing one's situation as stressful (consistent with hypotheses). The HPS did not account for variance in positive affect. This is not surprising, however, given that extraversion was partialled out of the analyses. Note that the HPS had a significant zero-order correlation with measures of exuberance, including enthusiasm and energy. This suggests that the warmth and energy associated with extraversion is also captured by the HPS. Overall, these findings highlight that disturbances in affect are not limited to clinical bipolar disorders.

### *Sense of Self in the World*

In addition to disruptions in thought, behaviors, and affect, bipolar spectrum psychopathology involves changes in one's perception of self. For example, individuals may experience inflated self-esteem at the subclinical level and, at extreme levels, grandiosity. The HPS was positively associated with two measures of grandiosity—perceiving oneself as the center of attention and as better than others, but did not account for variance in confidence or optimism. The HPS had a significant zero-order correlation with optimism, however. The HPS was also positively associated with uncertainty and boredom. These findings indicate that the HPS identifies grandiose traits—a core feature of bipolar spectrum psychopathology.

### *Social Interactions*

Although no specific hypotheses were offered, the relations of the HPS with measures of social interaction were examined. The results suggest that the HPS taps aspects of the gregariousness commonly associated with hypomania, as well as irritability. Specifically, the results highlight that the HPS taps a desire for company, but also the perception that one's company is not wanted by others. This perception of being unwanted may be a reflection of irritability or other aspect of negative affect (e.g., dysphoria, anger).

### *Moderating Effects of the HPS on the Relation of Daily Life Experiences*

In addition to examining the direct effects of the HPS on experiences in daily life, Study 2 also explored the moderating effects of bipolar spectrum psychopathology on the relations of experiences in daily life. Given the complex nature of cross-level interactions, it is worth reviewing their application to the current study. Cross-level interactions examined the relations of level 1 variables in daily life across levels of the HPS in two areas—1) relation of perceiving one's situation as positive with measures of affect and functioning, and 2) relation of perceiving one's situation as stressful with measures of affect and functioning. Cross-level interactions indicated whether the relation (slope) of the level 1 variables differed across levels of the HPS. Cross-level interactions also tested whether these relations varied as a function of the HPS after partialling extraversion and openness to experience. Note that the lack of a cross-level interaction does not mean that there was not a main effect of the HPS on the dependent measure. It was hypothesized that high HPS scores would be associated with greater

reactivity to positive experiences, and to stressful experiences, in daily life. The following sections elucidate the nature of these relations. In some cases, high HPS scorers were reactive to positive or stressful situations in daily life; however, in other cases, high HPS scorers were unaffected by how they viewed their situation.

#### *Relation of Affect with Experiences in Daily Life*

Cross-level analyses examined whether the HPS moderated the relation of viewing one's situation as stressful with measures of affect over and above extraversion and openness to experience. The relations of stressful experiences with anger and sadness were exacerbated by the HPS, indicating that high HPS scorers exhibited greater reactivity in anger and sadness when they were under stress. Although the cross-level interactions of irritability and stress and worry and stress across levels of HPS score were not significant, there were main effects such that HPS score was associated with irritability and worrying in daily life. Consistent with the hypotheses, these findings indicate that high HPS scorers are more reactive to stressful situations. Specifically, high HPS scorers experience greater reactivity in anger and sadness when they view their situation as stressful.

The relation of negative affect with viewing one's situation positively was also exacerbated by the HPS, such that participants with high HPS scores exhibited greater reactivity in negative affect in response to how positively they viewed their situation. These findings indicate that high HPS scorers are more reactive to non-positive situations. In other words, high HPS scorers experience greater reactivity in anger, sadness, and worry when they do not view their situation as positive.

Contrary to the hypotheses, the relations of positive affect (e.g., happiness and exuberance) with viewing one's situation as positive were not moderated by the HPS. Specifically, high HPS scorers did not exhibit greater reactivity in positive affect in response to how positively they viewed their situation. The HPS also did not moderate the relation of stressful experiences and measures of positive affect. In other words, high HPS scorers did not experience greater reactivity in measures of positive affect when they experienced stress. These findings suggest that high HPS scorers exhibit greater reactivity in negative affect than positive affect during stressful or non-positive situations. However, these conclusions may also reflect the partialling of extraversion out of the HPS. Specifically, removing the warmth and energy of extraversion out of the HPS weakens the potential impact of the HPS on relations of affect with positive experiences in daily life.

Taken together, these findings suggest that high HPS scorers are especially reactive to experiences they view as stressful or non-positive. High HPS scorers experienced greater reactivity in anger and sadness when they were put under stress, and greater reactivity in anger, sadness, and worry if they did not view their situation as positive. In other words, high HPS scorers exhibited affective lability in non-positive or stressful situations. Given that the bipolar spectrum is thought to include disruptions in affect, these findings are consistent with the notion that the HPS captures variance in bipolar spectrum psychopathology. Furthermore, these results offer support for the HPS as a measure of affective dysregulation within the bipolar spectrum.

### *Relation of Thought Disturbances with Experiences in Daily Life*

Cross-level analyses also examined whether the HPS moderated the relation of experiences in daily life with measures of cognition over and above extraversion and openness to experience. The relation of stressful experiences with trouble concentrating was moderated by HPS score. Participants with high HPS scores were more likely to experience trouble concentrating regardless of how stressful the situation was, whereas people with low HPS scores generally experienced concentration difficulties only when under stress. The relation of positive experiences with trouble concentrating was also moderated by HPS score. Specifically, participants with low HPS scores experienced increased difficulty concentrating as their situation became less positive, whereas participants with high HPS scores tended to show elevated concentration difficulties across the board. Contrary to hypotheses, these findings suggest that high HPS scorers tend to experience trouble concentrating regardless of how they view their situation—whereas low HPS scorers tend to experience concentration difficulties only when they view their situation as stressful or non-positive.

The relation of positive experiences with fullness of thought was not moderated by the HPS. However, there was a main effect of HPS score with fullness of thought in daily life, indicating that the HPS is associated with racing thoughts and having many thoughts in daily life. The relation of stressful experiences with fullness of thought also was not moderated by the HPS. Similar to the findings for concentration difficulties, high HPS scorers tended to experience fullness of thought regardless of the situation. Interestingly, when faced with negative circumstances, low HPS scorers experienced

increases in concentration difficulties (a ubiquitous phenomena), but not increases in fullness of thought (a core symptom of bipolar disorders).

Overall, these findings suggest that thought problems may be a trait-like feature of bipolar spectrum psychopathology. Although disruptions in thought are characteristic of episodic mood states (e.g., depression, mania, and hypomania), these findings suggest that individuals experiencing bipolar spectrum psychopathology may tend to experience thought problems regardless of their mood state. Future research examining cognitive functioning across mood cycles (e.g., euthymia, subclinical symptoms, depression, hypomania, and mania) would further our understanding of the expression of thought disturbance within the bipolar spectrum.

#### *Future Study of the Bipolar Spectrum in Daily Life*

Study 2 demonstrated the utility of ESM for assessing bipolar spectrum psychopathology in a nonclinically ascertained sample of young adults. ESM appears to be an effective method of capturing disruptions in affect, thoughts, behaviors, and sense of self associated with bipolar spectrum psychopathology in daily life. Furthermore, ESM data should ultimately allow for the examination of more complex relations. This study only scratched the surface of the potential of ESM for examining bipolar spectrum psychopathology. For example, future research may examine ESM outcomes over longer periods of time. This technique may be especially useful for assessing bipolar spectrum psychopathology, as individuals may cycle in and out of various affective states. ESM may also be useful in examining the effects of combinations of level 2 predictors on bipolar spectrum psychopathology. Specifically, future work may address the role of the



combination of high HPS scores and impulsivity (as noted in Kwapil et al., 2000) on bipolar spectrum traits. In addition, ESM may also be valuable in translational research. For example, ESM may be useful in clinical settings for monitoring bipolar symptoms between psychiatric appointments. These questions and analyses fell outside the scope of the thesis project, but will be explored in subsequent manuscripts.

### Conceptualizing a Spectrum of Bipolar Psychopathology

Conjecturing a bipolar spectrum carries the burden of operationalizing the construct and its boundaries. The bipolar spectrum includes clinical and subclinical expressions of bipolar symptoms, ranging from mild hypomanic episodes and mild hyperthymic or cyclothymic temperament at the low end to severe expressions of bipolar I disorder at the high end. It may best be conceptualized as a constellation of personality and psychopathology characteristics (the extremes of which are represented in the DSM-IV-TR diagnoses). Specifically, the bipolar spectrum involves dysregulation in affect, energy, cognition and behavior that can be expressed at clinical or subclinical levels. This conceptualization of the bipolar spectrum differs from the DSM-IV-TR and Akiskal's proposition of bipolar psychopathology as it does not limit the concept of bipolar characteristics to extreme clinical manifestations. Rather, it suggests that there are personality factors and pathology that comprise the bipolar spectrum that are worthy of further research. By identifying individuals who experience these subclinical bipolar characteristics, we will be able to better understand the nature of the bipolar spectrum, as well as factors associated with the etiology and phenomenology of bipolar disorders. Furthermore, studying bipolar spectrum psychopathology will provide insight to the risk

and resilience factors associated with the development of full-blown bipolar disorders, as well as the ways to prevent, assess, and treat bipolar psychopathology.

This model of a bipolar spectrum does not suggest that there is a normal personality dimension of bipolarity—contrasting it from personality dimensions such as extraversion-introversion. Thus, it is not suggesting that every person falls somewhere along a bipolar continuum. Rather, as noted above, it suggests that the bipolar spectrum represents a confluence of personality and psychopathology factors that will presumably have discernable etiological pathways. This formulation begs the questions of what are the etiological pathways and what factors (and to what degree) must be present to be considered as representative of the bipolar spectrum. These questions fall outside of the current construct validity study. However, the examination of both clinical features (Study 1) and daily life experiences (Study 2) provided a unique approach for examining bipolar characteristics and the current findings are consistent with the idea of a broader bipolar spectrum and support further investigations of these issues. The bipolar spectrum model also raises questions of whether the spectrum is taxonic—that is, does the spectrum represent a discontinuity in nature. However, it is important to move beyond phenomenological features to consider this issue. If the bipolar spectrum is characterized by a confluence of personality factors and psychopathology, the lack of these characteristics suggests that someone does not fall within the bipolar spectrum. However, clarity regarding taxonicity requires identifying disparate etiological pathways.

Bipolar spectrum characteristics and psychopathology are multifaceted. This is apparent in Akiskal's temperaments, in the cyclical nature of the disorders, and the

domains of expression and impairment (elevated and dysphoric affect, form and content of thought, impulsive and erratic behavior, etc.). These findings are suggestive of possible multidimensional formulations. However, such formulations should be based upon *a priori* theorizing and consider possible etiological mechanisms, and should avoid over-interpreting *post hoc* groupings of phenomenological characteristics. Given the lack of theoretical guidance, the present study is agnostic regarding putative multidimensional structure of bipolar spectrum psychopathology.

Dimensional models of psychopathology are being considered for many other disorders, including schizophrenia (e.g., Meehl, 1999) and depression (e.g., Hankin, Fraley, Lahey, & Waldman, 2005). These models suggest that the clinical disorders are part of a larger spectrum of symptoms and impairment. Patients with the disorders often exhibit mild or subclinical manifestations prior to the onset of the disorder, and people with subclinical expressions are presumed to be at heightened risk for transitioning into clinical disorders. However, the bipolar spectrum is relatively unique compared to these other models in that subclinical manifestations of the bipolar spectrum can be advantageous (although Claridge, 1997, and others have suggested advantageous aspects of pre-schizophrenic conditions). Numerous studies (e.g., Akiskal et al., 2000; Benazzi, 2003; Benazzi, 2004; Akiskal & Benazzi, 2006) indicated that sporadic hypomania or trait-like hyperthymia (in the absence of depression or full-blown mania) can enhance functioning in many domains (although, the caveat of heightened risk of mania and depression cannot be overlooked). Nevertheless, this creates challenges for conceptualizing the spectrum and identifying people who fall on this continuum (even the

term “bipolar spectrum psychopathology” belies this idea). Assessment must not simply rely on impairment or dysfunction, but also has to identify spectrum characteristics that can be adaptive.

Following Cronbach and Meehl (1955), the construct of the bipolar spectrum is at the present time relatively loosely defined. However, the current findings provide preliminary support for the conceptualization. Investigation of the issues presented above provides a road map toward operationalizing and testing a more systemized construct. Furthermore, the bipolar spectrum model appears to provide a conceptually richer basis for understanding and ultimately treating bipolar psychopathology than current diagnostic formulations.

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## APPENDIX A. EXPERIENCE SAMPLING QUESTIONNAIRE

Note: Protocol is presented on a personal digital assistant (PDA). Each question appears on a separate screen on the PDA. Participants only see the nonbolded information and scoring options.

Unless otherwise noted, all items are scored from 1 (not at all) to 7 (very much).

- 1) I feel confident right now.
- 2) I am doing something exciting right now
- 3) My thoughts are racing right now.
- 4) I have trouble concentrating right now.
- 5) I am thinking about a lot of things right now.
- 6) I am daydreaming right now.
- 7) I feel happy right now.
- 8) I feel bored right now.
- 9) I feel irritable right now.
- 10) I am doing something risky right now.
- 11) I feel sad right now.
- 12) I feel uncertain right now.
- 13) I feel enthusiastic right now.
- 14) I am the center of attention right now.
- 15) I feel worried right now.
- 16) I feel restless right now.
- 17) I am doing something right now that I may regret later.
- 18) I feel optimistic right now.
- 19) I feel angry right now.
- 20) I feel energetic right now.

21) I feel like I am better than most people right now.

22) Are you alone at this time?    Yes    No

[If alone, yes to #22):]

23) I am alone right now because people do not want to be with me

24) Right now I would prefer to be with other people

[If with others, no to #22:]

25) I like this person (these people).

26) I feel close to this person (these people).

[All participants answer:]

27) I am successful in my current activity.

28) I am doing many things right now.

29) My behavior right now could get me into trouble.

30) My current situation is stressful.

31) My current situation is positive.

### Indices

1) Exuberance = mean(ESM13, ESM20)

2) Fullness of Thought = mean(ESM3, ESM5)

3) Risky Behavior = mean(ESM10, ESM17, ESM29)



## APPENDIX B. TABLES & FIGURES

*Table 1. Zero-Order Correlations of the HPS with Interview and Questionnaire Measures of Psychopathology, Personality, Treatment, and Family History*

<u>Criterion</u>	<u>Pearson Correlation (2-tailed)</u>
Any DSM-IV bipolar disorder	.28***
Any broad bipolar disorder	.40***
Hypomania or hyperthymia	.55***
Major depressive episode	-.14
BDI - Depressive symptoms	.17*
GAF - Psychosocial functioning	-.30***
TEMPS-A	
Hyperthymia	.54***
Dysthymia	-.04
Cyclothymia	.52***
Irritability	.31***
NEO-FFI	
Neuroticism	.18*
Extraversion	.51***
Openness	.32***
Agreeableness	-.38***
Conscientiousness	-.22**
IPDE Borderline symptoms	.36***
UPPS Impulsivity	
(Lack of) Premeditation	.30***
Urgency	.41***
Sensation seeking	.34***
(Lack of) Perseverance	.01

*Table 1 (continued)*

<u>Criterion</u>	<u>Pearson Correlation (2-tailed)</u>
Current alcohol use	.11
Heaviest alcohol use	.16
Current alcohol impairment	.11
Heaviest alcohol impairment	.17*
Current substance use	.05
Heaviest substance use	.16
Current substance impairment	.11
Heaviest substance impairment	.15
Current cannabis use	.17*
Heaviest cannabis use	.14
Treatment of mania	.10
Treatment of any mood disorder	.04
Family history of bipolar disorder	-.03
Family history of mood disorders	-.01

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

Table 2. Binary Logistic Regressions examining the Relation of HPS Scores with Mood Disorders, Treatment, and Family History

Hyp.	Criterion	Step 1		Step 2		Step 3		Step 4			
		OR	95%CI	OR	95%CI	OR	95%CI	OR	95%CI		
1a	DSM bipolar dx	1.00	.92-1.09	1.07	.99-1.16	3.69**	1.62-8.39	a	a	a	a
1b	Broad bipolar dx	1.02	.95-1.09	1.07	.99-1.15	5.67***	2.48-12.97	b	b	b	b
1c	Hypomania or hyperthymia	1.18***	1.09-1.28	1.02	.96-1.08	4.71***	2.41-9.21	5.13***	2.10-12.5	2.82	.10-76.40
1d	Maj. dep. episode	0.96	.90-1.01	1.08*	1.02-1.14	1.29	.83-2.00	1.46*	1.01-2.10	0.89	.55-1.44
4a	Treatment of mania	0.93	.73-1.18	0.93	.37-1.22	5.42	.62-47.12	b	b	b	b
	Treatment of a mood disorder	0.93	.87-1.00	1.05	.98-1.13	1.37	.79-2.39	1.18	.77-1.81	0.99	.57-1.71
4b	Family history of bipolar disorder	0.96	.87-1.06	0.98	.89-1.07	1.09	.53-2.25	b	b	b	b
	Family history of mood disorders	1.00	.96-1.06	1.00	.95-1.05	0.93	.62-1.39	1.44	.99-2.09	0.93	.58-1.5

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

<sup>a</sup>Following the hypotheses, these steps were not analyzed.

<sup>b</sup>Estimations for these steps failed to converge.

Table 3. Linear Regressions examining Continuous Measures of Psychopathology and Personality

Hyp.	Criterion	Step 1		Step 2		Step 3		Step 4	
		Extraversion/Openness		HPS		DSM bipolar diagnosis		HPS x DSM interaction	
		<i>B</i>	$\Delta R^2$	<i>B</i>	$\Delta R^2$	<i>B</i>	$\Delta R^2$	<i>B</i>	$\Delta R^2$
1e	Depressive symptoms	~	.031	.341	.081***	-.005	.000	-.039	.001
1f	Psychosocial functioning	~	.013	-.453	.143***	-.239	.051**	-.110	.006
2a	Hyperthymia	~	<b>.347***</b>	.335	.078***	-.073	.005	.121	.007
	Dysthymia	~	.037	.084	.005	.068	.004	.128	.008
	Cyclothymia	~	.037	.757	<b>.398***</b>	.140	.098*	.056	.002
	Irritability	~	.053*	.545	.206***	.236	.050**	-.054	.001
2b	Neuroticism	a	a	.181	.033*	.106	.010	-.087	.004
	Extraversion	a	a	.512	<b>.262***</b>	-.114	.012	.105	.005
	Openness	a	a	.315	.099***	.062	.004	.112	.006
	Agreeableness	a	a	-.377	.142***	-.129	.015	-.005	.000
	Conscientiousness	a	a	-.215	.046**	-.160	.024	-.015	.000
3a	Borderline symptoms	~	.042*	.496	.171***	.368	.122***	.013	.000
3b	(Lack of) Premeditation	~	.143***	.137	.013	.138	.017	.211	.022
	Urgency	~	.006	.594	.245***	.114	.012	-.037	.001

Table 3 (continued)

Hyp.	Criterion	Step 1		Step 2		Step 3		Step 4	
		Extraversion/Openness		HPS		DSM bipolar diagnosis		HPS x DSM interaction	
		<i>B</i>	<i>ΔR</i> <sup>2</sup>	<i>B</i>	<i>ΔR</i> <sup>2</sup>	<i>B</i>	<i>ΔR</i> <sup>2</sup>	<i>B</i>	<i>ΔR</i> <sup>2</sup>
	Sensation seeking	~	.160***	.176	.022	.048	.002	.145	.010
	(Lack of) Perseverance	~	.049*	.112	.009	.117	.012	.081	.003
3c	Current alcohol use	~	.027	.099	.007	.019	.000	.057	.002
	Heaviest alcohol use	~	.054*	.111	.009	.008	.000	-.037	.001
	Current alc. impairment	~	.046*	.059	.002	.099	.009	.001	.000
	Heaviest alc. impairment	~	.055*	.118	.010	.193	.034*	.035	.001
	Current substance use	~	.026	.134	.012	-.111	.011	.078	.003
	Heaviest substance use	~	.034	.170	.020	-.047	.002	-.018	.000
	Current sub. impairment	~	.024	.159	.018	-.077	.005	.153	.011
	Heaviest sub. impairment	~	.043*	.106	.008	-.083	.006	-.024	.000
	Current cannabis use	~	.013	.241	.040*	-.118	.013	.094	.004
	Heaviest cannabis use	~	.048*	.115	.009	-.032	.001	-.113	.006

\*  $p < .05$

\*\*  $p < .01$

\*\*\*  $p < .001$

Note. Medium effect sizes are shown in bold (consistent with Cohen, 1992).

<sup>a</sup>Following the hypotheses, these steps were not analyzed.

*Table 4. Expected Relations of the HPS with Experiences in Daily Life after partialling Extraversion and Openness*

<u>ESM Criterion</u>	<u>Expected Relation with the HPS</u>
<u>Affect</u>	
Measures of positive affect	+
Measures of negative affect	+
Current situation is positive	+
Current situation is stressful	+
<u>Thoughts</u>	
Trouble concentrating	+
Fullness of thought	+
Daydreaming	+
<u>Behavior</u>	
Risky behavior	+
Restless	+
Doing something exciting	+
Doing many things	+
<u>Sense of self in the world</u>	
Measures of grandiosity	+
Uncertain	+
Bored	-

Table 5. Relation of the HPS with Affect, Thoughts, and Behavior in Daily Life after partialling Extraversion and Openness ( $N = 138$ )

<u>ESM Criterion</u>	Level 2 Predictors		
	Step 1: Extraversion $\gamma_{01}$ ( $df=135$ )	Step 1: Openness to Experience $\gamma_{02}$ ( $df=135$ )	Step 2: HPS $\gamma_{03}$ ( $df=134$ )
<u>Affect</u>			
Happy	0.045( $SE=0.011$ )***	-0.009( $SE=0.013$ )	-0.108( $SE=0.087$ )
Exuberant	0.057( $SE=0.011$ )***	0.002( $SE=0.013$ )	0.056( $SE=0.103$ )
Angry	-0.004( $SE=0.008$ )	-0.002( $SE=0.007$ )	0.326( $SE=0.068$ )***
Sad	-0.004( $SE=0.009$ )	0.020( $SE=0.015$ )	0.366( $SE=0.074$ )***
Irritable	-0.012( $SE=0.011$ )	0.012( $SE=0.012$ )	0.431( $SE=0.083$ )***
Worried	-0.003( $SE=0.013$ )	0.017( $SE=0.016$ )	0.357( $SE=0.093$ )***
Current situation is positive	0.035( $SE=0.010$ )**	-0.017( $SE=0.011$ )	-0.078( $SE=0.092$ )
Current situation is stressful	0.008( $SE=0.014$ )	0.007( $SE=0.016$ )	0.452( $SE=0.089$ )***
<u>Thoughts</u>			
Trouble concentrating	0.006( $SE=0.013$ )	0.017( $SE=0.015$ )	0.491( $SE=0.087$ )***
Fullness of thought	0.029( $SE=0.014$ )*	0.012( $SE=0.016$ )	0.435( $SE=0.115$ )***
Daydreaming	0.001( $SE=0.016$ )	0.037( $SE=0.016$ )*	0.398( $SE=0.104$ )***
<u>Behaviors</u>			
Risky behavior	0.006( $SE=0.007$ )	0.002( $SE=0.006$ )	0.271( $SE=0.055$ )***
Restlessness	0.019( $SE=0.014$ )	0.033( $SE=0.018$ )	0.481( $SE=0.100$ )***
Doing something exciting	0.031( $SE=0.009$ )**	-0.008( $SE=0.010$ )	0.115( $SE=0.084$ )
Doing many things	0.033( $SE=0.012$ )**	-0.009( $SE=0.012$ )	0.335( $SE=0.100$ )**

\*  $p < .05$

\*\*  $p < .01$

\*\*\*  $p < .001$

Note. Values are raw multilevel regression coefficients (and standard error).

Table 6. Relation of the HPS with Sense of Self and Social Interactions in Daily Life after partialling Extraversion and Openness ( $N = 138$ )

ESM Level 1 Criterion	Level 2 Predictors		
	Step 1: Extraversion $\gamma_{01}$ ( $df=135$ )	Step 1: Openness to Experience $\gamma_{02}$ ( $df=135$ )	Step 2: HPS $\gamma_{03}$ ( $df=134$ )
<u>Sense of self in the world</u>			
Confident	0.039( $SE=0.012$ )**	-0.003( $SE=0.013$ )	0.046( $SE=0.096$ )
Center of attention	0.038( $SE=0.014$ )**	-0.000( $SE=0.010$ )	0.267( $SE=0.091$ )**
Optimistic	0.055( $SE=0.012$ )***	0.018( $SE=0.016$ )	-0.035( $SE=0.118$ )
Better than others	0.052( $SE=0.020$ )**	0.020( $SE=0.017$ )	0.431( $SE=0.138$ )**
Successful in current activity	0.034( $SE=0.012$ )**	-0.014( $SE=0.013$ )	-0.116( $SE=0.098$ )
Uncertain	-0.012( $SE=0.011$ )	0.027( $SE=0.016$ )	0.376( $SE=0.096$ )***
Bored	-0.005( $SE=0.009$ )	0.005( $SE=0.010$ )	0.279( $SE=0.079$ )**
<u>Social Interactions</u>			
Alone <sup>a</sup> at signal	0.005( $SE=0.002$ )**	-0.003( $SE=0.002$ )	0.016( $SE=0.015$ )
<u>When alone:</u>			
Prefer to be with others	0.065( $SE=0.018$ )**	0.004( $SE=0.017$ )	0.050( $SE=0.143$ )
Alone b/c not wanted	-0.009( $SE=0.006$ )	0.001( $SE=0.008$ )	0.118( $SE=0.043$ )**
<u>When with others:</u>			
Close to other(s)	0.030( $SE=0.012$ )*	-0.010( $SE=0.013$ )	-0.051( $SE=0.120$ )
Like other(s)	0.028( $SE=0.008$ )**	0.006( $SE=0.010$ )	-0.176( $SE=0.082$ )*

\*  $p < .05$

\*\*  $p < .01$

\*\*\*  $p < .001$

Note. Values are raw multilevel regression coefficients (and standard error).

<sup>a</sup>Item is reverse scored (1 = yes [alone], 2 = no [with others]).



Table 7. Cross Level Interactions of the HPS and Experiences in Daily Life during Positive Situations

<u>ESM Level 1 Criterion</u>	<u>ESM Level 1 Predictor</u>	Relation of ESM Predictor & Criterion $\gamma_{10}$ ( $df=135$ )	Level 2 Predictors		
			Step 1: Extraversion $\gamma_{11}$ ( $df=135$ )	Step 1: Openness $\gamma_{12}$ ( $df=135$ )	Step 2: HPS $\gamma_{13}$ ( $df=134$ )
Happy	Situation Positive	0.376( $SE=0.021$ )***	0.000( $SE=0.003$ )	-0.000( $SE=0.003$ )	-0.015( $SE=0.026$ )
Exuberant	Situation Positive	0.322( $SE=0.018$ )***	-0.000( $SE=0.003$ )	-0.000( $SE=0.003$ )	-0.014( $SE=0.024$ )
Angry	Situation Positive	-0.182( $SE=0.016$ )***	0.004( $SE=0.003$ )	-0.003( $SE=0.002$ )	-0.054( $SE=0.020$ )**
Sad	Situation Positive	-0.190( $SE=0.018$ )***	-0.000( $SE=0.003$ )	0.001( $SE=0.003$ )	-0.049( $SE=0.024$ )*
Irritable	Situation Positive	-0.231( $SE=0.021$ )***	0.002( $SE=0.003$ )	-0.007( $SE=0.003$ )*	-0.038( $SE=0.021$ )
Worried	Situation Positive	-0.221( $SE=0.019$ )***	0.003( $SE=0.003$ )	-0.002( $SE=0.003$ )	-0.047( $SE=0.020$ )*
Trouble concentrating	Situation Positive	-0.118( $SE=0.025$ )***	0.007( $SE=0.004$ )	-0.008( $SE=0.004$ )	0.057( $SE=0.028$ )*
Fullness of thought	Situation Positive	-0.040( $SE=0.021$ )	0.005( $SE=0.003$ )	-0.002( $SE=0.004$ )	0.042( $SE=0.025$ )
Risky behavior	Situation Positive	-0.066( $SE=0.014$ )***	-0.000( $SE=0.002$ )	-0.002( $SE=0.002$ )	-0.008( $SE=0.016$ )
Doing something exciting	Situation Positive	0.368( $SE=0.026$ )***	0.002( $SE=0.004$ )	-0.001( $SE=0.004$ )	-0.062( $SE=0.032$ )
Better than others	Situation Positive	0.131( $SE=0.019$ )***	0.004( $SE=0.003$ )	0.001( $SE=0.003$ )	0.019( $SE=0.020$ )
<u>When alone:</u>					
Alone b/c not wanted	Situation Positive	-0.054( $SE=0.021$ )*	0.001( $SE=0.003$ )	-0.000( $SE=0.002$ )	-0.044( $SE=0.021$ )*
<u>When with others:</u>					
Close to other(s)	Situation Positive	0.203( $SE=0.029$ )***	0.001( $SE=0.004$ )	0.001( $SE=0.004$ )	-0.076( $SE=0.030$ )*

\* $p < .05$

\*\* $p < .01$

\*\*\* $p < .001$

Note. Values are raw multilevel regression coefficients (and standard error).

Table 8. Cross Level Interactions of the HPS and Experiences in Daily Life during Stressful Situations

<u>ESM Level 1 Criterion</u>	<u>ESM Level 1 Predictor</u>	Relation of ESM Predictor & Criterion $\gamma_{10}$ ( $df=135$ )	Level 2 Predictors		
			Step 1: Extraversion $\gamma_{11}$ ( $df=135$ )	Step 1: Openness to experience $\gamma_{12}$ ( $df=135$ )	Step 2: HPS $\gamma_{13}$ ( $df=134$ )
Happy	Situation Stressful	-0.276( $SE=0.017$ )***	0.001( $SE=0.003$ )	-0.002( $SE=0.003$ )	0.007( $SE=0.021$ )
Exuberant	Situation Stressful	-0.144( $SE=0.015$ )***	0.001( $SE=0.003$ )	-0.002( $SE=0.002$ )	-0.016( $SE=0.022$ )
Angry	Situation Stressful	0.241( $SE=0.017$ )***	-0.003( $SE=0.003$ )	0.004( $SE=0.003$ )	0.042( $SE=0.019$ )*
Sad	Situation Stressful	0.206( $SE=0.016$ )***	-0.000( $SE=0.003$ )	-0.003( $SE=0.003$ )	0.054( $SE=0.020$ )**
Irritable	Situation Stressful	0.317( $SE=0.018$ )***	-0.000( $SE=0.003$ )	0.005( $SE=0.003$ )	0.025( $SE=0.021$ )
Worried	Situation Stressful	0.413( $SE=0.019$ )***	0.001( $SE=0.003$ )	0.001( $SE=0.003$ )	-0.005( $SE=0.021$ )
Trouble concentrating	Situation Stressful	0.255( $SE=0.017$ )***	0.001( $SE=0.003$ )	0.003( $SE=0.002$ )	-0.060( $SE=0.022$ )**
Fullness of thought	Situation Stressful	0.233( $SE=0.019$ )***	0.004( $SE=0.003$ )	0.000( $SE=0.003$ )	-0.042( $SE=0.024$ )
Risky behavior	Situation Stressful	0.102( $SE=0.015$ )***	0.000( $SE=0.002$ )	-0.000( $SE=0.002$ )	-0.012( $SE=0.018$ )
Doing something exciting	Situation Stressful	-0.201( $SE=0.020$ )***	0.003( $SE=0.003$ )	0.007( $SE=0.003$ )*	0.024( $SE=0.026$ )
Better than others	Situation Stressful	-0.034( $SE=0.016$ )*	0.001( $SE=0.002$ )	-0.002( $SE=0.002$ )	-0.013( $SE=0.019$ )
<u>When alone:</u>					
Alone b/c not wanted	Situation Stressful	0.052( $SE=0.017$ )**	0.002( $SE=0.002$ )	-0.002( $SE=0.002$ )	0.012( $SE=0.019$ )
<u>When with others:</u>					
Close to other(s)	Situation Stressful	-0.074( $SE=0.023$ )**	-0.004( $SE=0.003$ )	0.004( $SE=0.003$ )	-0.004( $SE=0.025$ )

\* $p < .05$

\*\* $p < .01$

\*\*\* $p < .001$

Note. Values are raw multilevel regression coefficients (and standard error).

Figure 1. The cross level interaction of the HPS with anger and situation positive

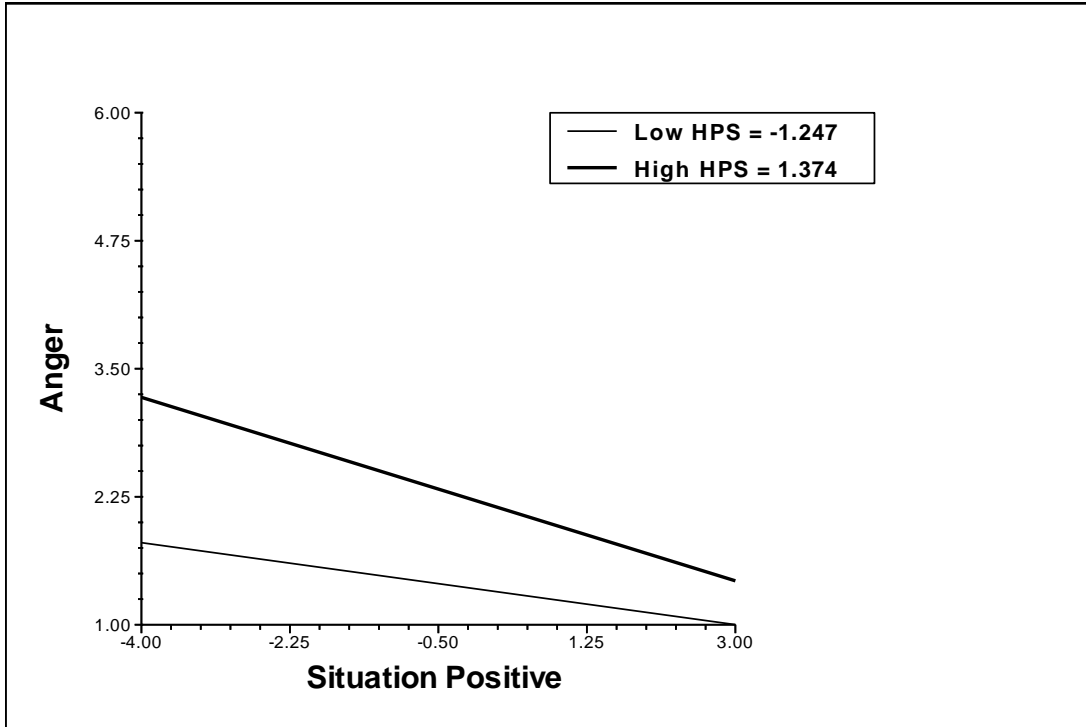


Figure 2. The cross level interaction of the HPS with difficulty concentrating and situation positive

