From Dispositional Traits to Psychopathological Symptoms: Social-Cognitive Vulnerabilities as Intervening Mechanisms

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Abstract The present research articulates a model delineating how influences of dispositional traits to psychopathological symptoms are carried by social-cognitive vulnerabilities. In two college student samples (total $N=335$), it was found that social-cognitive vulnerabilities (i.e., pessimistic inferential style, ruminative style, intolerance to uncertainty, anxiety sensitivity, fear of negative evaluation, and poor self-control) fully mediated between dispositional traits (i.e., Neuroticism and Conscientiousness) and various psychopathological symptoms (i.e., depression, worry, panic, social anxiety, and antisocial behavior). In contrast, dysfunctional attitudes, looming cognitive style, and poor self-regulation did not act as intervening variables. These findings demonstrated how distal-broad dispositions might impact on specific symptoms via increasingly differentiated intervening mechanisms as reflected by various vulnerabilities more proximal-specific in the etiology of psychopathology. Furthermore, the current model was useful in clarifying the common and unique processes leading to the various forms of psychopathological symptoms.

Keywords Personality · Five-factor model · Vulnerabilities · Depression · Anxiety · Antisocial behavior

Associations between personality and psychopathology have long intrigued researchers because elucidating these relations can potentially inform etiologic mechanisms of psychological distress. Although several models of personality-psychopathology relations have been proposed

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(see Widiger et al. 1999, for a review), the vulnerability model offers the view that certain people are predisposed to develop psychopathology because of their preexisting personality tendencies. Although there is some support for this view (e.g., Klein et al. 2011), much less is known about how broad dispositional traits actually lead to symptoms. In other words, what are the intermediate processes that carry the influence of dispositional traits to specific symptoms? Dispositions like Neuroticism (N) are often conceptualized as distal and broad factors that are able to predict a wide range of symptoms (e.g., anxiety and depression) and are thus well positioned as a possible explanation for symptom comorbidity (Clark 2005; Krueger 2005). Despite this advantage of evoking a dispositional perspective in delineating commonalities among different forms of psychopathology, it is equally important to unravel the precise intervening mechanisms between dispositional traits and specific symptoms. A major goal of the current research was to examine possible mediators between dispositions and a wide range of symptoms.

Dispositional Traits and Symptoms

The longstanding interest in personality-psychopathology relations stems from the belief that, by explicating the nature of psychopathology in the context of personality and vice-versa, common etiologic sources of psychopathology can be identified (Mineka et al. 1998; Watson et al. 1994). With the emerging consensus surrounding the taxonomy of normal and abnormal human personality traits, such as the Five-Factor Model (FFM, or the Big Five; Markon et al. 2005), relations to psychopathology can be systematically mapped out. One significant manner in which the dispositional trait perspective has enriched current understanding on the etiology of psychopathology is its ability to account for comorbidity observed

among various forms of psychopathology. In particular, internalizing psychopathology (e.g., mood and anxiety disorders) is positively associated with N whereas externalizing psychopathology (e.g., substance use and antisocial personality disorders) is linked to low Conscientiousness (C) and high N (Brown et al. 1998; Clark et al. 1994; Trull and Sher 1994).

The claim that various forms of psychopathology have links to common dispositional traits was further confirmed by a meta-analysis conducted by Kotov et al. (2010). Those authors surveyed the literature to establish the strength of associations between major trait dimensions and depressive, anxiety, and substance use disorders. Diagnostic groups across disorders were high on N but low on C. Associations with (low) Extraversion (E) were confined mainly to dysthymic disorder and social phobia. Agreeableness (A) and Openness to Experience (O) were generally unrelated to psychopathology. Although dispositions are well suited to account for comorbidity among different forms of psychopathology, they are less useful in delineating specific and proximal mechanisms that lead to specific manifestations of different disorders. For example, while N is able to predict different forms of anxiety disorders (e.g., panic, generalized anxiety, social anxiety), it remains unclear how the influence from a broad disposition becomes increasingly differentiated to accommodate varied manifestations of different psychopathological symptoms. As such, the next step is to identify possible mediators between these dispositions and symptoms (see Brown et al. 1998; Zinbarg and Barlow 1996).

Social-Cognitive Vulnerabilities and Symptoms

Psychopathology researchers have identified several vulnerability variables that predict the onset and maintenance of specific symptoms (see Table 1). Several vulnerabilities known to be associated with depression include pessimistic inferential style (Abramson et al. 1989; Haeffel et al. 2008), dysfunctional attitudes (Beck 1987; Scher et al. 2005), and ruminative style (Nolen-Hoeksema 2000; Nolen-Hoeksema et al. 2008). Vulnerabilities such as anxiety sensitivity (McNally 1994), intolerance of uncertainty (Dugas and Robichaud 2007), and fear of negative evaluation (Rapee and Heimberg 1997) have been posited to predict specific anxiety symptoms (i.e., panic, excessive worry/generalized anxiety, and social anxiety, respectively). Riskind et al. (2000) proposed the existence of looming cognitive style, a supposedly overarching cognitive vulnerability for various anxiety syndromes. With regard to disinhibitory problems like substance use and antisocial behavior, the lack of self-control and deficits in self-regulatory skills (e.g., goal-setting and the monitoring of goal-relevant behavior) appear to be important vulnerability factors (Miller and Brown 1991; Wills and Dishion 2004; Wills and Stoolmiller 2002).

Table 1 Brief description of the social-cognitive vulnerabilities evaluated in this study

Vulnerability	Conceptual description	Symptom
Pessimistic inferential style	Cognitive style for inferring causes of negative events (i.e., stability and globality); as well as inferring negative consequences and self-views that might arise from negative events.	Depression
Dysfunctional attitudes	Negative self-schemata pervaded with themes of inadequacy, loss, failure, worthlessness, and unloved by others.	Depression
Ruminative style	Tendency to focus passively on one's inadequacies, negative feelings, and the problem at hand when one is feeling sad.	Depression
Anxiety sensitivity	Tendency to misinterpret bodily sensations associated with anxiety as indicative of harmful consequences.	Panic anxiety
Intolerance of uncertainty	Tendency to view ambiguity and uncertainty as aversive, annoying, and something to be avoided.	Worry
Fear of negative evaluation	Tendency to believe that others are overly critical; often evaluating oneself in a disapproving manner.	Social anxiety
Looming cognitive style	Tendency to generate mental scenarios that an impending threat is escalating in magnitude as it approaches rapidly.	General anxiety
Poor self-control	Reflects distractibility, impatience, impulsiveness, poor delay of gratification, and anger-proneness.	Substance use and antisocial behavior
Poor self-regulation	Reflects the inability to adequately initiate, plan, and monitor one's goal-related behavior in terms of goal pursuit.	Substance use and antisocial behavior

A number of issues should be noted about the variables (henceforth collectively labeled *social-cognitive vulnerabilities*) mentioned in the preceding paragraph. First, unlike dispositions such as N, these variables are often conceptualized as more specific vulnerabilities that are more proximal to symptoms in the etiologic chain of psychopathology (Kotov et al. 2007; Lakdawalla and Hankin 2008; Norton and Mehta 2007; van der Heiden et al. 2010). This view is largely in line with Barlow's (2000, 2002) triple vulnerabilities model on the etiology of anxiety and mood disorders. In that model, *specific psychological vulnerabilities* thought to result in disorders (e.g., that social evaluation is threatening) have precipitating factors in largely genetically-based *generalized biological vulnerabilities* (e.g., N or its genetic bases) and *generalized psychological vulnerabilities* (e.g., a sense of uncontrollability fostered through difficult childhood environments).

A second issue has to do with the role of genetic versus environmental factors on social-cognitive vulnerabilities. Traditionally, theorizing about the etiology of vulnerabilities has focused primarily on early learning experiences and social-learning mechanisms, such as child maltreatment and modeling from caregivers (e.g., Gibb and Coles 2005). However, recent behavior genetics studies have shown that vulnerabilities exhibited heritabilities ranging between 0.20 and 0.50 (Beaver et al. 2009; Lau and Eley 2008; Taylor et al. 2008) and specific genetic polymorphisms have been linked with vulnerabilities (e.g., serotonin transporter promoter gene and dysfunctional attitudes; Whisman et al. 2011). Although these preliminary findings do not necessarily negate the role of social-learning in the development of social-cognitive vulnerabilities, they do highlight the possibilities of (a) complex gene-environment interplay and (b) the influence of genetically-based dispositions (Bouchard 2004) on these vulnerabilities.

Third, although the majority of the social-cognitive vulnerabilities have been postulated to predict a particular symptom specifically, empirical tests of symptom specificity do not always support these assertions. For instance, anxiety sensitivity has been posited to be a specific vulnerability variable in the development of panic anxiety (Taylor 1999), but recent findings suggest that it is also implicated in social and generalized anxiety (Naragon-Gainey 2010; Naragon-Gainey and Watson 2011). Similarly, intolerance of uncertainty has been linked to major depressive disorder, in addition to generalized anxiety disorder—the primary disorder it is posited to predict (Gentes and Ruscio 2011). Hence, further tests are needed to clarify this issue on symptom specificity.

Mediating Pathways

A body of research has recently emerged to clarify the associations among dispositional traits, social-cognitive vulnerabilities, and psychopathological symptoms. Focusing on vulnerabilities associated with depression (i.e., pessimistic inferential style, dysfunctional attitudes, autonomy, and sociotropy) and N, the research group for the Northwestern-UCLA youth emotion project (Sutton et al. 2011; Zinbarg et al. 2010) provided some insightful findings. First, the four social-cognitive vulnerabilities were strongly correlated and the majority of the variance in depression and anxiety symptoms was shared among these vulnerabilities. Second, N was a nonspecific general marker for all mood and anxiety symptoms (see also Griffith et al. 2010). Third, the four vulnerabilities provided small but significant incremental validity beyond N in predicting self-reported symptoms (Sutton et al. 2011) but not retrospective diagnoses derived from interviews (Zinbarg et al. 2010). Together, these studies show that putatively depressogenic vulnerabilities are predictive of anxiety as well (i.e., nonspecificity of symptoms) and that it would be misleading to examine the role of these vulnerabilities in the development of psychopathology independently of N.

Other research groups have focused on social-cognitive vulnerabilities associated with anxiety, including anxiety sensitivity, intolerance to uncertainty, and fear of negative evaluation (Fergus and Wu 2011; Kotov et al. 2007; McEvoy and Mahoney 2012; Norton and Mehta 2007; Norton et al. 2005; Sexton et al. 2003; van der Heiden et al. 2010). Those researchers argue that these vulnerabilities can be viewed as lower-order constructs that mediate between higher-order dispositional traits (i.e., negative and positive emotionality) and specific symptoms. As such, the nonspecific associations between negative emotionality (analogous to N) and the various anxiety/depression symptoms can be clarified via more specific vulnerabilities. Consistent with theoretical expectations, anxiety sensitivity is found to mediate the relation between N and panic symptoms (Kotov et al. 2007; Norton and Mehta 2007; Norton et al. 2005; Sexton et al. 2003). Intolerance to uncertainty mediates between N and not only worry, but also other symptoms like depression and social anxiety (Fergus and Wu 2011; McEvoy and Mahoney 2012; Norton and Mehta 2007; Norton et al. 2005; Sexton et al. 2003; van der Heiden et al. 2010). Kotov et al. demonstrated that fear of negative evaluation provided incremental validity in the prediction of social anxiety (and worry) beyond N. In general, these vulnerabilities play an important role in explaining the relationship between N and the specific symptoms which the vulnerabilities are posited to predict. However, there are instances of symptom nonspecificity as well.

Hong and Paunonen (2011) assembled a comprehensive set of vulnerabilities and examined their mediational roles between dispositional traits and symptoms. Those authors assessed vulnerabilities to (a) depression (i.e., pessimistic inferential style, dysfunctional attitudes, and ruminative style), (b) anxiety (i.e., anxiety sensitivity, intolerance to uncertainty, social-phobic inferential style), and (c) substance use (i.e., poor

self-control/regulation). Corroborating past work, vulnerabilities associated with depression and anxiety were found to mediate between N and their corresponding symptoms. Social-phobic inferential style mediated between E and social anxiety. Poor self-control/regulation, however, failed to mediate between C and substance use. In addition, using a diary-based methodology, Hong and Paunonen also demonstrated that (a) day-to-day pessimistic inferences and ruminative responses mediated between N and daily depressive moods, and (b) day-to-day social-phobic inferences and anxiety sensitive responses mediated between N and daily anxious moods.

The Present Study

The main objective of the present study was to evaluate whether social-cognitive vulnerabilities (as proximal and specific variables to psychopathology) carry the influence of distal and broad FFM dispositions in the etiologic chain of psychopathology. In particular, social-cognitive vulnerabilities associated with depression and anxiety should mediate between N and the corresponding symptom each vulnerability variable has been posited to predict (Table 1). Furthermore, fear of negative evaluation would act as an intervening variable between E and social anxiety. Vulnerabilities associated with disinhibitory problems should carry the influence of C (and, to a lesser extent, N) to substance use and antisocial behavior (Hong and Paunonen 2011). The issue on symptom specificity for vulnerabilities related to anxiety and depression was investigated as well. Rumination was hypothesized to predict primarily depression (Nolen-Hoeksema et al. 2008), with a possible secondary link to worrying (Hong 2007; Watkins 2008). Although anxiety sensitivity was anticipated to predict panic symptoms, it may exhibit secondary links to social anxiety and worry (see Naragon-Gainey 2010). Intolerance of uncertainty was predicted to be associated with worry and, to a lesser degree, depression symptoms (Gentes and Ruscio 2011).

The present study built upon previous research in several important ways. First, the set of social-cognitive vulnerabilities examined here was the most comprehensive to date. In particular, looming cognitive style and fear of negative evaluation (in lieu of social-phobic inferential style) were added to the variable set assessed in Hong and Paunonen (2011). Looming cognitive style was included here because its role as a possible mediator in the context of other anxiety-related vulnerabilities had yet to be examined. In place of social-phobic inferential style, fear of negative evaluation was used here because it was an empirically established risk factor for social anxiety (Naragon-Gainey and Watson 2011). Second, a major limitation of past studies has been the sole reliance on a single source of data, usually self-reports from participants. Correlations among dispositional traits, vulnerabilities, and

symptoms can potentially be inflated due to the artifact of a single data source. To circumvent this problem, the current study used informant reports of dispositions in one of the samples (see below). Third, this study employed a replication strategy using two independent samples to ensure greater confidence in the validity of findings. Last, there was a need to determine the generalizability of past findings to other non-Western populations. There is preliminary support that social-cognitive vulnerabilities are predictive of symptoms in Asian (e.g., Hong Kong, Singapore, and Taiwan) samples. For instance, depression is associated with pessimistic inferential style (Hong et al. 2006; Lo et al. 2008), dysfunctional attitudes (Liu 2003), and ruminative style (Lo et al. 2008); fear of negative evaluation is linked to social anxiety (Haikal and Hong 2010); and low self-control was related to delinquency (Cheung and Cheung 2008). However, to the author's knowledge, this was the first study to evaluate the mediational role of vulnerabilities in a non-Western culture.

Method

Participants and Procedure

Data for this research were available from two samples of undergraduates from the National University of Singapore. The first sample (S1) constituted 140 participants (84 females and 56 males) who were recruited through advertisements posted on campus. Participants completed a battery of self-report questionnaires in return for a token cash payment. Their mean age was 21.4 years (SD=1.71; range=18 to 28) and 82 % were of Chinese ethnicity (the remaining ethnic groups were Malay, Indian, and others).

The second sample (S2) comprised 210 undergraduates who participated for course credit within a research participation pool system maintained by the Department of Psychology. Participants completed questionnaires on vulnerabilities in an initial session followed by a second session four weeks later where they responded to symptom questionnaires. During the first session, knowledgeable significant others of the participants provided information about their dispositional trait profiles. Fifteen participants failed to return for the second session; however attrition analyses showed no differences between those remained versus dropped from the study. Hence, complete data were available for 195 participants (26 men, 169 women) and their informants (53 men, 140 women, 2 unreported). Mean age of the participants was 19.75 years (SD=1.26; range=18 to 24) and the majority were of Chinese ethnicity (93 %). Informants were predominantly friends of the participants (87 %), followed by dating partners (9 %) and family members (4 %). The average length of time informants reported themselves to know the respective participants was 4.4 years (SD=3.97); informants considered themselves to be

well-acquainted with the participants (*M*=6.90, *SD*=1.50; on a rating scale of acquaintanceship ranging between 1 and 9).

Participants were also asked about their past histories of psychiatric problems. Those who endorsed either one or both of questions (i.e., "Have you ever been diagnosed with a psychiatric condition?", "Were you receiving any treatment (e.g., drug treatment, psychotherapy, or both) for any psychological problems during the past year?") constituted 2.8 % and 3.6 % of S1 and S2, respectively. All questionnaires were administered in English as it is the first language for Singaporean college students.

Measures

Dispositional Traits The 240-item Revised NEO Personality Inventory (NEO-PI-R; Costa and McCrae 1992) was used to assess the five broad dispositional traits outlined in the FFM. Reliabilities of the trait scales in the current study were excellent, ranging between 0.79 and 0.91 for S1 (self-reported) and between 0.80 and 0.92 for S2 (informant-reported). For all analyses involving S1, a modified N score with anxiety and depression facets omitted was used instead of the original score. This was done to reduce artificial inflation of correlations due to potentially common items with symptoms measures. As expected, the correlations with symptoms were smaller in magnitude for the modified N score than original N score. This modification on the N score was not done for S2 as the NEO scores were based on informant reports.

Social-Cognitive Vulnerabilities to Depression The Cognitive Style Questionnaire (CSQ; Haeffel et al. 2008) was used to assess people's pessimistic inferential styles—the extent to which (a) causes of negative events were attributed to stable and global causes and (b) whether those events led individuals to infer negative consequences and implications for the self. Ratings of these inferences on 12 hypothetical negative situations were combined to obtain a composite index for pessimistic inferential style (Haeffel et al. 2008). The 40-item Dysfunctional Attitudes Scale (DAS; Weissman 1979) measures people's maladaptive beliefs surrounding themes of loss, inadequacy, failure, and being unloved. People's ruminative tendencies were assessed by the Ruminative Response Style subscale (RRS) of the Response Style Questionnaire (Nolen-Hoeksema and Morrow 1991). The 10-item version of the RRS (Treynor et al. 2003) was used here as it was less contaminated with depressive symptoms.

Social-Cognitive Vulnerabilities to Anxiety The 18-item Anxiety Sensitivity Index-3 (ASI-3; Taylor et al. 2007) measures the extent to which people dread their own arousal sensations. The 27-item Intolerance of Uncertainty Scale (IUS; Buhr and Dugas 2002) measures the degree to which

an individual think that uncertainty is undesirable, that it leads to subjective distress and frustration, and that it reflects negatively about himself or herself. The extent to which individuals are apprehensive about being socially evaluated by others is assessed using the brief version of Fear of Negative Evaluation scale (FNE; Leary 1983). The Looming Maladaptive Style Questionnaire (LMSQ; Riskind et al. 2000) was used to measure individuals' looming cognitive style. This is the tendency to see potentially dangerous situations as rapidly increasing in risk or threat (i.e., a looming threatening circumstance). Participants were asked four questions associated with their perception of looming threat after reading a short vignette depicting a possibly stressful situation (e.g., a romantic partner's behavior that hinted to a possible breakup). A total looming maladaptive style score was then calculated by aggregating responses to the four items across six vignettes.

Social-Cognitive Vulnerabilities to Disinhibitory Problems The 31-item Poor Self-Control (PSC) subscale of the Self-Control Scale (Wills and Dishion 2004; Wills and Stoolmiller 2002) was used to assess dysregulation of emotions and behavior, indexed by constituent constructs such as impatience, distractibility, impulsiveness, and poor delay of gratification. The 31-item short form version of the Self-Regulation Questionnaire (SSRQ; Carey et al. 2004) was also included. This scale was developed to capture self-regulation skills such as goal-setting and monitoring of goal progress. In this study, items were coded such that higher scores indicated poorer self-regulation. The internal consistency reliabilities of all social-cognitive vulnerabilities (depression, anxiety, and disinhibitory problems), across the two samples, were excellent (mean alpha= 0.87; range=0.69 to 0.95).

Symptoms Six symptom categories were assessed: (a) depression, (b) panic, (c) worry, (d) social anxiety, (e) antisocial behavior, and (f) substance use. Depressive symptomatology was assessed by two instruments: the Beck Depression Inventory-II (Beck et al. 1996) and the General Depression subscale of the Inventory of Depression and Anxiety Symptoms (IDAS; Watson et al. 2007). Across the samples, these two measures were strongly correlated (*r*s>0.77) and a depression composite was computed (*z*-transformed prior to aggregation). Similarly, panic-related anxiety was measured by a composite index of two instruments: the Beck Anxiety Inventory (BAI; Beck et al. 1988) and the Panic subscale of the IDAS (*r*s>0.75). The BAI was used here because it oversamples panic-related symptomatology (Cox et al. 1996). The Penn State Worry Questionnaire (Meyer et al. 1990) was used to assess features of uncontrollability, excessiveness, and pervasiveness implicated in pathological worry. The Social Anxiety subscale of the IDAS was used to measure participants' level of uneasiness in social situations. Participants

were asked to report their depressive and anxiety symptoms as experienced over the past two weeks. The mean alpha across these measures was 0.86 (range=0.75 to 0.94).

Antisocial behavior (i.e., aggressive and rule-breaking acts) enacted over the past one month was measured using items from the Adult Self Report (Achenbach and Rescorla 2003) selected by Burt and Donnellan (2008). Reliabilities of this scale was 0.67 (S1) and 0.69 (S2). Frequency of substance use among participants was measured using the Substance Use Questionnaire (Wills and Stoolmiller 2002). One item asking about marijuana use was dropped because it is an illegal substance in Singapore. The remaining three items ask about (a) the frequency of tobacco consumption (ranging from "never" to "everyday use"), (b) the frequency of alcohol consumption, and (c) the frequency of binge drinking (3 or more drinks on one occasion) for the past month. The average correlation among these items was 0.39 for S1 and 0.34 for S2 (i.e., the correlations between the tobacco item and the two alcohol-related items ranged between 0.22 and 0.38). Hence, items were combined to form an overall index of substance use.

Analytic Strategy

Path analysis would be used to examine the mediational role for the social-cognitive vulnerabilities within a comprehensive framework. Unlike previous studies that had examined only a few vulnerabilities simultaneously, the current study included a much larger set of vulnerabilities. This strategy allowed for the systematic evaluation on each vulnerability variable's unique contribution in predicting symptoms in the context of other vulnerabilities. A series of models would be tested using one of the samples. The first model would include all vulnerabilities specified as mediators. Vulnerabilities would be dropped from the model if they failed to play the role of a mediator (e.g., did not predict symptoms). Next, a model that allowed for direct effects between dispositions and symptoms would be examined against the alternative model that specified fully mediated effects (i.e., testing for full or partial mediation).

Multiple group analyses would then be conducted to determine the replicability of effects across the two samples. In addition, a bootstrapping procedure would be carried out to determine the confidence intervals (CI) surrounding these mediating (or indirect) effects. In studies with modest sample sizes, the assumption that the sampling distributions of the indirect effects approach normality may not be tenable, hence the need for a nonparametric re-sampling procedure (Cheung and Lau 2008; Shrout and Bolger 2002). Also, as the percentile bootstrap method may be susceptible to estimation biases resulting in problems with Type I error (especially so when the sampling distribution is skewed), a correction may be applied to determine the CIs more precisely (see Cheung and Lau 2008).

Results

Preliminary Analyses

Table 2 presents the means, standard deviations, and range of scores among the variables. In general, the symptom levels of the two samples were comparable to previous nonclinical samples (cf. Hong and Paunonen 2011; Watson et al. 2007). The two samples did not differ in mean levels for symptoms, the only exception being substance use. They differed, however, in several FFM traits (i.e., O, A, and C) and vulnerabilities (i.e., CSQ, RRS, ASI-3, and LMSQ).

Table 3 presents the correlations among the variables for S1 and S2 separately. The mean correlation among symptoms was 0.25 (range=−0.12 to 0.70) for S1 and was 0.32 (range=−0.12 to 0.65) for S2. Inspection of the correlation matrices revealed that substance use was not associated with the rest of the symptoms. If substance use were to be omitted, the mean correlation became 0.41 (range=0.24 to 0.70) for S1 and 0.45 (range=0.18 to 0.65) for S2. The social-cognitive vulnerabilities were moderately correlated; mean r=0.36, range=0.03 to 0.58, for S1; and mean r=0.35, range=0.01 to 0.66, for S2. Hence, there was substantial overlap among (a) symptoms (excluding substance use) and (b) social-cognitive vulnerabilities.

As seen in Table 3, all vulnerabilities exhibited significant positive correlations with N. Although the magnitudes of the correlations were reduced when informant reports of the FFM traits were used, they were nonetheless statistically significant at $p<.05$. As expected, the two vulnerabilities associated with disinhibitory problems (i.e., PSC and SSRQ) were also strongly associated with C, in addition to their links with N. Contrary to predictions, E was not reliably associated with fear of negative evaluation. It appears that only N and, to a lesser extent, C were associated with the various vulnerabilities.

The links between psychopathological symptoms and (a) the FFM dispositions and (b) the social-cognitive vulnerabilities were also explored (see Table 3). Not surprisingly, N was broadly associated with all symptoms (except substance use). Extraversion predicted social anxiety negatively whereas A was negatively associated with antisocial behavior. Unexpectedly, C failed to predict antisocial behavior and substance use. Finally, O was generally not associated with symptoms. Although most of the vulnerabilities were postulated to be specific risk factors of a particular symptom, the overall picture was that almost all vulnerabilities had moderate to strong relations with depression and anxiety symptoms. This observation is consistent with the fact that these symptoms are highly comorbid (Mineka et al. 1998). Another reason could be that the various vulnerabilities were correlated with one another, as reported above (see also Hong and Paunonen 2011). The vulnerabilities, with the exception of

Table 2 Descriptive statistics

Variable	S1			S2			t
	M	SD	Range	M	SD	Range	
Traits							
1. N[a]	64.81	11.92	38.0–98.0	90.88	22.08	35.0–168.0	–
2. E	110.06	18.72	56.0–151.0	111.84	19.58	49.0–158.0	−0.83
3. O	110.85	14.27	78.0–161.0	107.11	14.09	62.0–152.0	2.38*
4. A	113.02	16.21	68.0–163.0	122.26	19.06	60.0–169.0	−4.65**
5. C	110.89	20.06	67.0–154.0	117.41	21.96	49.0–168.0	−2.78**
Vulnerabilities							
6. CSQ	3.32	1.06	1.0–5.8	3.59	1.01	1.2–6.1	−2.34*
7. DAS	140.49	27.18	71.0–207.0	140.34	28.91	51.0–207.0	0.05
8. RRS	15.16	5.14	0.0–30.0	17.11	4.91	0.0–30.0	−3.62**
9. ASI-3	37.37	11.61	18.0–72.0	33.94	11.06	18.0–67.0	2.74**
10. IUS	63.98	18.58	30.0–107.0	61.94	18.64	31.0–120.0	0.98
11. FNE	41.64	7.63	16.0–60.0	41.61	8.80	12.0–59.0	0.03
12. LMSQ	9.39	1.90	3.8–13.8	10.01	2.07	3.0–15.0	−2.81**
13. PSC	2.35	0.61	1.1–4.4	2.36	0.57	1.2–4.1	−0.23
14. SSRQ	2.57	0.49	1.3–3.6	2.55	0.47	1.3–3.6	0.40
Symptoms							
15. Dep	0.00	0.94	−1.7–2.4	0.00	0.94	−1.6–3.4	0.02
16. Panic	0.00	0.94	−1.1–3.9	0.00	0.94	−0.9–5.2	0.00
17. Worry	48.89	12.29	22.0–80.0	46.93	13.40	18.0–80.0	1.37
18. SocAnx	10.12	3.88	5.0–21.0	9.66	4.04	4.0–22.0	1.09
19. AntiSoc	2.23	2.11	0.0–10.0	2.40	2.42	0.0–16.0	−0.08
20. SubUse	1.39	1.63	0.0–8.0	1.99	1.93	0.0–12.0	−3.01**

CSQ Cognitive Style Questionnaire; *DAS* Dysfunctional Attitudes Scale; *RRS* Ruminative Response Style subscale; *ASI-3* Anxiety Sensitivity Index-3; *IUS* Intolerance of Uncertainty Scale; *FNE* Brief Fear of Negative Evaluation Scale; *LMSQ* Looming Maladaptive Style Questionnaire; *PSC* Self-Control Scale—Poor Self Control; *SSRQ* Self Regulation Questionnaire—Short Form; *Dep* depression composite; *Panic* panic composite; *SocAnx* social anxiety; *AntiSoc* antisocial behavior; *SubUse* substance use

[a] The Neuroticism factor score used in S1 had been modified with anxiety and depression facets omitted; therefore it was not directly comparable to the corresponding score in S2

*p<0.05. ** p<0.01

poor self-control, were less predictive of disinhibitory problems. Overall, N and the vulnerabilities were meaningfully linked to the various symptoms.

Path Analysis

A hypothesized path model was specified based on past research findings (see Fig. 1). First, regression paths were specified (a) between N and the seven vulnerabilities associated with depression and anxiety, and (b) between C and the two vulnerabilities associated with behavioral dysregulation. Second, links between the vulnerabilities and the corresponding symptoms that they were posited to predict were specified (e.g., anxiety sensitivity predicted panic, social anxiety, and worry symptoms). Third, direct effects from the dispositional-traits to symptoms were added in the model; N was specified to predict depression and anxiety symptoms whereas C was specified to predict antisocial behavior (substance use was omitted because it was not associated with other variables). Because there was strong overlap among the social-cognitive vulnerabilities, their disturbances were allowed to covary. The same was applied to the disturbances of the symptom measures. This was done in recognition that variables outside this model (e.g., life experiences like negative events) could

potentially account for associations among (a) vulnerabilities and (b) symptoms, respectively (see also Fergus and Wu 2011; Norton and Mehta 2007).

The AMOS 19 program (Arbuckle 2010) was used to evaluate the path model. The three fit indices used in the present study were the comparative fit index (CFI), the standard root mean square residual (SRMR), and the root mean square error of approximation (RMSEA). For good model fit, the value of CFI should ideally be greater than 0.95; SRMR should be less than 0.08; and RMSEA should be less than 0.06 and its 90 % CI should not exceed 0.10 (Kline 2010). Data from S2 (instead of S1) were used to examine the validity of the hypothesized model given that (a) its variables were less susceptible to common method variance and (b) it had a larger sample size.

The hypothesized model yielded a moderately good fit to the data, χ^2(44, N=195)=107.61, p<.001; CFI=0.95; SRMR=0.08; RMSEA=0.09 (90 % CI=0.07–0.11). Inspection of the model revealed that dysfunctional attitudes, looming cognitive style, and self-regulation failed to predict their respective symptoms; hence the mediational hypothesis for these vulnerabilities was not supported. A second model was thus specified in which these three vulnerabilities were dropped. This model provided a satisfactory fit to the data,

Table 3 Correlations of variables in S1 (below diagonal) and S2 (above diagonal)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Traits																				
1. N		−.27*	.02	−.25*	−.38*	.19*	.16	.20*	.21*	.30*	.23*	.15	.16	.17	.26*	.26*	.29*	.23*	.19*	−.03
2. E	−.20		.30*	.07	.03	−.16	−.04	.04	−.15	−.15	−.03	−.06	.08	−.08	−.18	−.14	−.08	−.20*	.04	.10
3. O	−.05	.25*		.06	.03	.12	.02	.23*	.04	.03	−.03	−.05	.13	.04	.07	.07	−.01	.06	.15	.20*
4. A	−.28*	.01	.04		.21*	.21*	.21*	.04	.06	.04	.08	.17	−.10	.01	.08	.04	.06	.14	−.24*	−.24*
5. C	−.45*	.29*	.03	.13		−.11	−.06	−.13	−.06	−.15	−.06	.10	−.32*	−.29*	−.07	−.18	.01	−.10	−.17	−.15
SCV																				
6. CSQ	.35*	−.25*	.02	−.01	−.37*		.57*	.35*	.39*	.45*	.51*	.36*	.22*	.27*	.45*	.32*	.43*	.46*	.14	−.05
7. DAS	.30*	−.12	−.05	−.29*	−.24*	.42*		.43*	.39*	.59*	.66*	.42*	.25*	.30*	.43*	.28*	.49*	.54*	.22*	−.00
8. RRS	.32*	.06	.08	−.18	.03	.23*	.24*		.35*	.36*	.41*	.28*	.25*	.01	.36*	.28*	.38*	.33*	.21*	−.01
9. ASI-3	.32*	.02	−.05	−.15	−.15	.30*	.39*	.49*		.56*	.29*	.37*	.27*	.20*	.42*	.46*	.36*	.44*	.13	−.02
10. IUS	.32*	−.08	−.11	−.20	−.06	.46*	.52*	.40*	.58*		.54*	.42*	.30*	.30*	.57*	.40*	.60*	.56*	.24*	.02
11. FNE	.41*	−.20	−.13	−.10	−.31*	.50*	.55*	.25*	.32*	.40*		.46*	.13	.17	.40*	.21*	.54*	.48*	.12	−.09
12. LMSQ	.33*	−.06	−.12	.06	−.19	.51*	.23*	.18	.34*	.34*	.46*		.18	.25*	.39*	.31*	.40*	.33*	.11	−.12
13. PSC	.39*	.20	.06	−.23*	−.45*	.27*	.36*	.24*	.47*	.40*	.28*	.34*		.49*	.29*	.27*	.12	.33*	.43*	.27*
14. SSRQ	.46*	−.26*	−.02	−.12	−.70*	.41*	.40*	.03	.29*	.29*	.38*	.28*	.53*		.31*	.32*	.23*	.37*	.17	.09
Symptoms																				
15. Dep	.46*	−.01	−.01	−.23*	−.29*	.40*	.44*	.29*	.45*	.54*	.37*	.29*	.50*	.43*		.65*	.64*	.60*	.39*	.01
16. Panic	.26*	−.00	−.00	−.08	−.13	.20	.22	.24*	.51*	.27*	.17	.17	.37*	.24*	.58*		.40*	.56*	.36*	.03
17. Worry	.42*	.02	−.08	−.18	−.07	.39*	.40*	.38*	.49*	.59*	.41*	.31*	.30*	.27*	.70*	.42*		.49*	.18	−.12
18. SocAnx	.40*	−.25*	−.13	−.15	−.26*	.44*	.33*	.30*	.47*	.47*	.47*	.31*	.35*	.34*	.46*	.45*	.33*		.24*	−.02
19. AntiSoc	.29*	.21	.06	−.54*	−.08	.15	.25*	.29*	.30*	.25*	.05	.19	.42*	.18	.42*	.26*	.28*	.24*		.41*
20. SubUse	−.10	.34*	.09	−.01	−.10	.04	−.05	−.08	−.09	−.16	.04	.03	.07	−.02	−.07	−.11	−.12	−.09	.06	

CSQ Cognitive Style Questionnaire; DAS Dysfunctional Attitudes Scale; RRS Ruminative Response Style Subscale; ASI-3 Anxiety Sensitivity Index-3; IUS Intolerance of Uncertainty Scale; FNE Brief Fear of Negative Evaluation Scale; LMSQ Looming Maladaptive Style Questionnaire; PSC Self-Control Scale—Poor Self Control; SSRQ Self Regulation Questionnaire—Short Form; Dep depression composite; Panic panic composite; SocAnx social anxiety; AntiSoc antisocial behavior; SubUse substance use

* $p < .01$

χ^2(31, N=195)=84.25, p<.001; CFI=0.94; SRMR=0.07; RMSEA=0.09 (90 % CI=0.07–0.12), and was preferred over the hypothesized model because of its lower Akaike Information Criterion index (204.25 versus 291.61). Next, a third model in which no direct effects between dispositions and symptoms was specified, and it yielded a satisfactory fit, χ^2(36, N=195)=92.36, p<.001; CFI=0.94; SRMR=0.09; RMSEA=0.09 (90 % CI=0.07 – 0.11). The chi-square difference test indicated that this "no direct effects" model should be preferred, $\Delta\chi^2$(5, N=195)=8.11, p=.150. This suggested that the associations between dispositions and symptoms were fully mediated by the vulnerabilities. A last round of model trimming was done by examining if any of the hypothesized paths was nonsignificant. The path between anxiety sensitivity and worry was dropped based on this criterion. This final model yielded a satisfactory fit, χ^2(37, N=195)=92.35, p<.001; CFI= 0.94; SRMR=0.08; RMSEA=0.09 (90 % CI=0.07–0.11), and was the preferred model, $\Delta\chi^2$(1, N=195)=0.99, p=.320.

Next, to examine if the model developed using S2 could be replicated in S1, multiple group path analysis was conducted (see Table 4). A baseline model, where all parameters across the two samples were allowed to be freely estimated (i.e., M1; unconstrained model), provided a moderately good fit to the data. A second, more restrictive model (M2) was specified in which the regression path coefficients and the covariance between N and C were constrained to be equal across the two samples. The chi-square difference test indicated that the more parsimonious model (i.e., M2) should be preferred. A final and most restrictive model, (M3) with additional equality constraints on the error variances of the endogenous variables, was specified and it was preferred over M2. In sum, the various parameters were consistent across the two samples, providing some evidence for the generalizability concerning the mediating role of social-cognitive vulnerabilities. Figure 2 depicts the final model with the standardized parameter estimates presented.[1]

To estimate the significance of the indirect effects of the social-cognitive vulnerabilities, bias-corrected 95 % CI were obtained through a re-sampling rate of 1,000 using AMOS 19. The use of bootstrapping here was particularly relevant because the sampling distribution of a mediated effect may not be normal for small to moderate (i.e., N=100 to 200) sample sizes (Cheung and Lau 2008). As seen in Table 5, the bootstrapping procedure suggested that all indirect effects had CIs that did not include zero. This further bolsters

the idea that the various vulnerabilities played crucial intervening roles between dispositions and symptoms.

To summarize, the mediational hypothesis was supported for a subset of social-cognitive vulnerabilities (i.e., pessimistic inferential style, ruminative style, anxiety sensitivity, intolerance to uncertainty, fear of negative evaluation, and poor self-control). At the same time, each of these social-cognitive vulnerabilities was able to predict the corresponding symptom it had been posited to predict, although it is noted that some of them had secondary links with other symptoms. Specifically, ruminative style predicted both depression and worry symptoms. Intolerance to uncertainty was a strong predictor of worry and, to a lesser extent, depression symptoms. As expected, anxiety sensitivity had links with both panic and social anxiety symptoms. The current path model implied that these vulnerabilities fully mediated the influence from dispositions to symptoms.

Discussion

The main objective in this research was to articulate a model whereby social-cognitive vulnerabilities mediate between broad dispositions and psychopathological symptoms. Although the links between dispositions and psychopathology are well-established (Kotov et al. 2010), the intervening mechanisms are less clearly delineated. This endeavor to clarify the intervening mechanisms is particularly relevant to N as it has been criticized as a nonspecific vulnerability marker for various forms of psychopathology, with little informational value in describing how it impacts these various symptoms (Ormel et al. 2004). Social-cognitive vulnerabilities associated with depression and anxiety appear to fill in this gap as intervening mechanisms that lead to the various symptoms. In other words, these relations represent continuities from distal-broad dispositional traits to proximal-specific mechanisms that clarify the differentiated etiologic pathways to different symptom profiles.

Although several social-cognitive vulnerabilities purportedly linked to depression have been proposed, few studies have examined them simultaneously to determine their unique contributions in mediating the influence of N to depressive symptoms. This study showed that, among the depressogenic vulnerabilities, pessimistic inferential style and ruminative style appeared to be robust mediators between N and depression (cf. Hong and Paunonen 2011). In addition, rumination predicted worry symptoms, consistent with previous research documenting the robust link between these two constructs (Hong 2007; Watkins 2008). Dysfunctional attitudes, however, did not carry the influence of N to depression when other social-cognitive vulnerabilities were taken into account.

The current results concerning vulnerabilities associated with anxiety were largely consistent with the extant literature.

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[1] Given that the N score across the two samples were derived differently (modified in S1 and informant-reported in S2), one might wonder about how these differences might have impacted the multiple group analyses. As seen in Fig. 2, the standardized regression paths between N and the social-cognitive vulnerabilities differed in magnitude. Also, the variance for N was different across the two samples (see Table 2). Nonetheless, these differences were not substantial enough to make the multiple group analyses untenable, as indicated by the fit indices.

Fig. 1 The hypothesized path model. *Solid lines* indicate positive associations whereas *dashed lines* indicate negative associations. Correlations among disturbances of **a** social-cognitive vulnerabilities and **b** symptoms are not depicted for clarity's sake
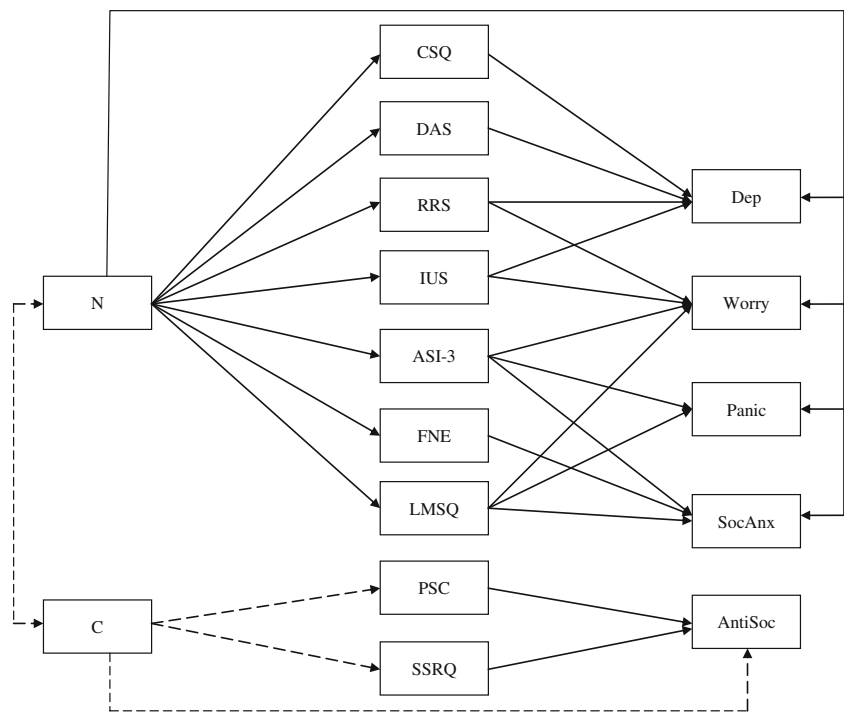
Anxiety sensitivity predominantly mediated between N and panic symptoms (Hong and Paunonen 2011; Kotov et al. 2007; Norton and Mehta 2007). The Naragon-Gainey (2010) meta-analysis demonstrated that anxiety sensitivity had secondary links with social anxiety and worry. The current findings found support for anxiety sensitivity's association with social anxiety but not worry symptoms. As expected, intolerance to uncertainty predominantly mediated between N and worry symptoms. The mediating role of intolerance to uncertainty between N and depression is less robust in the literature. The findings here converged with several previous reports (McEvoy and Mahoney 2012; van der Heiden et al. 2010; see also Gentes and Ruscio 2011), though it is worth noting that other studies did not find a link between intolerance to uncertainty and depression (Fergus and Wu 2011; Norton and Mehta 2007). Instead, those researchers found that intolerance to uncertainty mediated between negative affectivity and social anxiety (and worry and obsessive-compulsive tendencies). Fear of negative evaluation, as hypothesized, carried the influence of N to only social anxiety.

The present results supported the proposal that social-cognitive vulnerabilities associated with anxiety act as crucial mediators between N and the various anxiety syndromes. Although the primary vulnerability-symptom associations were consistent with extant literature, the secondary associations (if any) were less so. Past studies differed widely on various parameters, including the specific vulnerabilities and symptoms assessed, the sample characteristics, and the statistical techniques used. Such differences could have contributed to the inconsistencies seen in the literature. Nonetheless, robust findings were obtained for the specificity of the various vulnerabilities (see Table 1), despite the strong overlap among vulnerabilities and among symptoms. Finally, a note on looming cognitive style is warranted; that is, this study found no evidence that it played a mediating role. This cognitive style failed to provide unique predictions of the various anxiety symptoms. This is inconsistent with previous findings where looming cognitive style was found to contribute unique variance in anxiety and worry symptoms over and beyond the influence of other vulnerabilities like intolerance of uncertainty (Riskind et al. 2007). Perhaps, in the context of a wide variety of anxiety-related vulnerabilities, looming cognitive style no longer constitutes a unique predictor of anxiety symptoms. This is plausible because looming cognitive style

Table 4 Fit statistics of multiple group path model comparisons

Model	χ^2	df	CFI	SRMR	RMSEA [90 % CI]	Comparison	$\Delta\chi^2$ (Δdf)
M1: Unconstrained	206.69	74	.92	.08	.07 [.06, .09]		
M2: Equal paths and covariance	231.88	90	.91	.08	.07 [.06, .08]	M1 vs. M2	25.20 (16)
M3: Equal paths, covariance, and error variances	243.46	101	.91	.08	.07 [.06, .08]	M2 vs. M3	11.57 (11)

Fig. 2 The final model obtained from the multiple group analysis. Standardized coefficients from S2 are presented first (before slash) followed by the corresponding coefficients from S1. All coefficients were significant at $p<.05$. To preserve clarity in the figure, correlations among disturbances of **a** social-cognitive vulnerabilities and **b** symptoms are not depicted
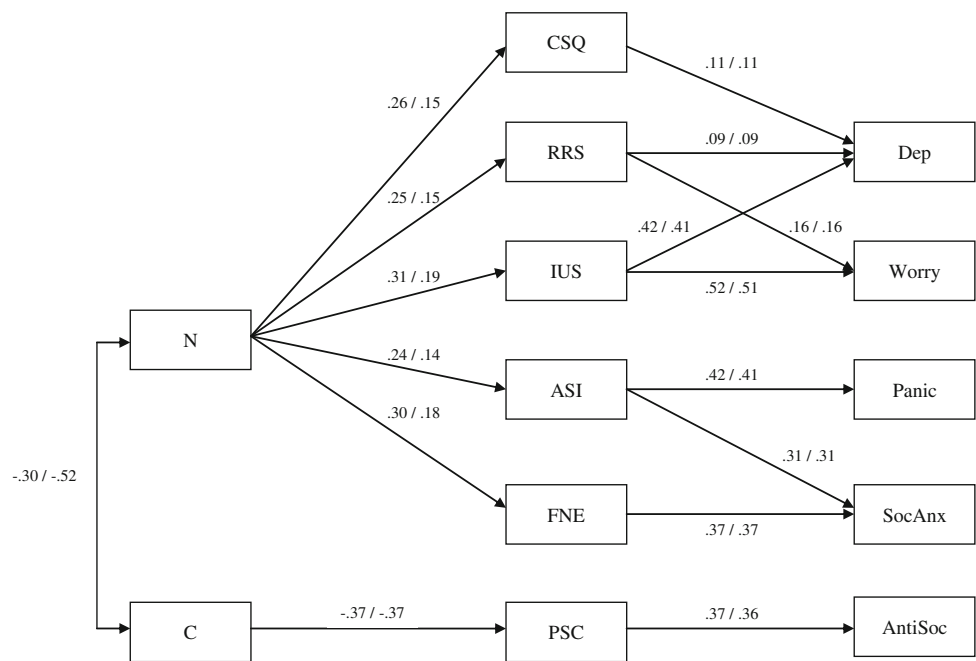
has been hypothesized to be an overarching (vs. unique) vulnerability factor to various (vs. specific) forms of anxiety (Riskind et al. 2000). Other studies could however explore this issue further in the future.

Between the two disinhibitory social-cognitive vulnerabilities, only poor self-control (but not self-regulation) mediated between C and antisocial behaviors. It appears that one's low standing on C can lead to increased antisocial behavior via dysregulation in one's own behavior and emotion. Substance use, on the other hand, was not reliably predicted by both poor self-control and self-regulation, consistent with the Hong and Paunonen (2011) findings. Unexpectedly, associations between C and disinhibitory symptoms were not found, contrary to previous research on Western participants (e.g., Kotov et al. 2010). One plausible explanation for these findings is that the use of Asian college students here may have constrained the variance of symptom severity as there are normative pressures

to do well academically and not engage in destructive behaviors.

The final path model depicted nonsignificant direct effects between dispositions and symptoms, which was a deviation from a literature that has typically found such direct effects (e.g., N predicting depression and anxiety symptoms; see Fergus and Wu 2011; Hong and Paunonen 2011; Norton and Mehta 2007; van der Heiden et al. 2010). One plausible reason for this discrepancy could be that, unlike previous studies, the current study addressed the issue on the potential inflation of the Neuroticism-symptom links. Specifically, care was taken to reduce inflated correlations by omitting potentially common items for N and symptoms in S1 and getting informants' perspective on participants' N in S2. As such, the correlations between N and symptoms were reduced in magnitude, especially for S2 (Table 3). This highlights the importance of having multiple sources of data rather than the sole reliance

Table 5 Bootstrapping results for indirect effects

Predictor–criterion (via mediators)	S2		S1	
	Indirect effect (*SE*)	95 % CI	Indirect effect (*SE*)	95 % CI
N–Dep (via CSQ, RRS, IUS)	.18 (.04)	[.12, .25]	.11 (.02)	[.06, .15]
N–Worry (via RRS, IUS)	.10 (.03)	[.05, .16]	.06 (.02)	[.03, .10]
N–Panic (via ASI-3)	.20 (.04)	[.13, .28]	.12 (.03)	[.07, .17]
N–SocAnx (via ASI-3, FNE)	.18 (.04)	[.11, .25]	.11 (.02)	[.07, .15]
C–AntiSoc (via PSC)	−.14 (.03)	[−.19, −.09]	−.13 (.03)	[−.18, −.09]

Standardized estimates are presented. *SE* standard error; *CI* bias-corrected confidence intervals obtained through a re-sampling rate of 1,000; *CSQ* Cognitive Style Questionnaire; *RRS* Ruminative Response Style Subscale; *ASI-3* Anxiety Sensitivity Index-3; *IUS* Intolerance of Uncertainty Scale; *FNE* Brief Fear of Negative Evaluation Scale; *PSC* Self-Control Scale—Poor Self Control; *Dep* depression composite; *Panic* panic composite; *SocAnx* social anxiety; *AntiSoc* antisocial behavior

on self-reports on dispositions and symptoms. Future studies should continue to examine the issue of full versus partial mediation by the social-cognitive vulnerabilities using multiple data sources and methods.

Implications

The present model converges with models articulated by other researchers (Fergus and Wu 2011; Norton and Mehta 2007; van der Heiden et al. 2010; Zinbarg et al. 2010; see also Barlow 2000, 2002). Commonalities among these models include the specification of generalized vulnerability factors (i.e., dispositions) and specific vulnerability factors (i.e., social-cognitive variables), and an attempt at delineating the precise processes leading from broad/nonspecific factors to specific psychopathological syndromes. Such a general framework is useful on at least two accounts. First, comorbidity observed at the levels of symptoms and of social-cognitive vulnerabilities that supposedly bring about those symptoms points strongly to common underlying etiologic antecedents (Clark 2005; Krueger 2005). Dispositional traits such as N and C are able to account for such comorbidity and also the pervasive impact on a wide range of psychopathological symptoms and disorders (Kotov et al. 2010). Given that genetic factors have some influence on social-cognitive vulnerabilities (Beaver et al. 2009; Lau and Eley 2008; Taylor et al. 2008), it is possible that (a) this process is mediated by dispositions or that (b) the covariation between dispositions and vulnerabilities is due to common genetic factors.

Although explaining for comorbidity in etiologic mechanisms is crucial for theoretical advancement, accounting for symptom specificity is just as important. In this regard, the dispositions, being broad and distal factors, may not be suitable for explaining how their influences become increasingly differentiated to predict different forms of psychopathology. The various social-cognitive vulnerabilities are promising candidates as intermediate variables that carry the influences of dispositions to the specific psychopathological syndromes, as seen in the current and previous studies. Still, issues related to symptom specificity of social-cognitive vulnerabilities remains somewhat equivocal. More research is needed to clarify if a particular vulnerability is unique to one symptom profile or is predictive of several syndromes.

One implication for clinicians is that they should be cognizant of multiple vulnerabilities operating simultaneously, and ensure adequate assessment and intervention for these co-occurring vulnerabilities. In addition, given that a number of these supposedly diverse social-cognitive vulnerabilities have common antecedents in dispositional traits, particularly N, formalized assessment of normal personality should be incorporated into standard protocols of clinical assessment (Krueger et al. 2000). A number of variables

examined here exhibited nonspecific processes (e.g., intolerance to uncertainty predicted worry and depression), pointing to the possibility of transdiagnostic phenomenon (Harvey et al. 2004). Emphasis on developing intervention strategies (e.g., Unified Protocol; Ellard et al. 2010; see also Norton 2012), which have broad-based treatment efficacy on these transdiagnostic processes, would be a step in the right direction.

Limitations and Conclusion

The current data should be interpreted with several caveats in mind. First, the current findings were derived using analog student samples which might not generalize to samples with diagnosed clinical problems. Further studies can consider using clinical or community samples to examine the generalizability of these results. In addition, the sample here comprised high-functioning college students and this has implications on the base rates for certain symptoms like substance use. A second limitation is that symptoms were obtained from self-reports only. Clinically diagnostic information can constitute another data source in future research. The third shortcoming is the direction of causality between dispositional traits and social-cognitive vulnerabilities cannot be firmly established given the current cross-sectional design. Longitudinal designs would be better suited to test the proposed mediation hypotheses. For instance, child temperament dimensions like negative affectivity (Rothbart and Bates 2006) may be assessed during childhood years, whereas social-cognitive vulnerabilities and symptoms may be assessed subsequently in adolescence.

In conclusion, the present findings extend previous research by examining the mediational role of a very comprehensive set of social-cognitive vulnerabilities. The inclusion of these diverse vulnerabilities allows for the delineation of specific or general pathways from N and C (more distal in the etiologic chain) to the various psychopathological symptoms. This has enriched current understanding on how effects of dispositions get transmitted and differentiated in the manifestation of psychopathological outcomes.

References

Abramson, L. Y., Metalsky, G. I., & Alloy, L. B. (1989). Hopelessness depression: a theory-based subtype of depression. *Psychological Review, 96*, 358–372.

Achenbach, T. M., & Rescorla, L. A. (2003). *Manual for ASEBA adult forms & profiles*. Burlington: University of Vermont, Research Center for Children, Youth, & Families.

Arbuckle, J. (2010). *IBM SPSS AMOS 19 user's guide*. Crawfordville: Amos Development Corporation.

Barlow, D. H. (2000). Unraveling the mysteries of anxiety and its disorders from the perspective of emotion theory. *American Psychologist, 55*, 1247–1263.

Barlow, D. H. (2002). *Anxiety and its disorders: The nature and treatment of anxiety and panic* (2nd ed.). New York: Guilford Press.

Beaver, K. M., Shutt, J. E., Boutwell, B. B., Ratchford, M., Roberts, K., & Barnes, J. C. (2009). Genetic and environmental influences on levels of self-control and delinquent peer affiliation: results from a longitudinal sample of adolescent twins. *Criminal Justice and Behavior, 36*, 41–60.

Beck, A. T. (1987). Cognitive models of depression. *Journal of Cognitive Psychotherapy: An International Quarterly, 1*, 5–37.

Beck, A. T., Epstein, N., Brown, G., & Steer, R. A. (1988). An inventory for measuring clinical anxiety: psychometric properties. *Journal of Consulting and Clinical Psychology, 56*, 893–897.

Beck, A. T., Steer, R. A., & Brown, G. K. (1996). *Beck depression inventory manual* (2nd ed.). San Antonio: Psychological Corporation.

Bouchard, T. J., Jr. (2004). Genetic influences on human psychological traits: a survey. *Current Directions in Psychological Science, 13*, 148–151.

Brown, T. A., Chorpita, B. F., & Barlow, D. H. (1998). Structural relationships among dimensions of the DSM-IV anxiety and mood disorders: implications for classification of emotional disorders. *Journal of Abnormal Psychology, 110*, 49–58.

Buhr, K., & Dugas, M. J. (2002). The Intolerance of Uncertainty Scale: psychometric properties of the English version. *Behaviour Research and Therapy, 40*, 931–945.

Burt, S. A., & Donnellan, M. B. (2008). Personality correlates of aggressive and non-aggressive antisocial behavior. *Personality and Individual Differences, 44*, 53–63.

Carey, K. B., Neal, D. J., & Collins, S. E. (2004). A psychometric analysis of the Self-Regulation Questionnaire. *Addictive Behaviors, 29*, 253–260.

Cheung, N. W. T., & Cheung, Y. W. (2008). Self-control, social factors, and delinquency: a test of the general theory of crime among adolescents in Hong Kong. *Journal of Youth and Adolescence, 37*, 412–430.

Cheung, G. W., & Lau, R. S. (2008). Testing mediation and suppression effects of latent variables: bootstrapping with structural equation models. *Organizational Research Methods, 11*, 296–325.

Clark, L. A. (2005). Temperament as a unifying basis for personality and psychopathology. *Journal of Abnormal Psychology, 114*, 505–521.

Clark, L. A., Watson, D., & Mineka, S. (1994). Temperament, personality, and the mood and anxiety disorders. *Journal of Abnormal Psychology, 103*, 103–116.

Costa, P. T., Jr., & McCrae, R. R. (1992). *Revised NEO Personality Inventory (NEO-PI-R) and NEO Five-Factor Inventory (NEO-FFI) professional manual*. Odessa, FL: Psychological Assessment Resources.

Cox, B. J., Cohen, E., Direnfeld, D. M., & Swinson, R. P. (1996). Does the Beck Anxiety Inventory measure anything beyond panic attack symptoms? *Behaviour Research and Therapy, 34*, 949–954.

Dugas, M. J., & Robichaud, M. (2007). *Cognitive-behavioral treatment for generalized anxiety disorder: From science to practice*. New York: Routledge.

Ellard, K. K., Fairholme, C. P., Boisseau, C. L., Farchione, T. J., & Barlow, D. H. (2010). Unified protocol for the transdiagnostic treatment of emotional disorders: protocol development and initial outcome data. *Cognitive and Behavioral Practice, 17*, 88–101.

Fergus, T. A., & Wu, K. D. (2011). Searching for specificity between cognitive vulnerabilities and mood and anxiety symptoms. *Journal of Psychopathology and Behavioral Assessment, 33*, 446–458.

Gentes, E. L., & Ruscio, A. M. (2011). A meta-analysis of the relation of intolerance of uncertainty to symptoms of generalized anxiety disorder, major depressive disorder, and obsessive-compulsive disorder. *Clinical Psychology Review, 31*, 923–933.

Gibb, B. E., & Coles, M. E. (2005). Cognitive vulnerability-stress models of psychopathology: A developmental perspective. In B. L. Hankin & J. R. Z. Abela (Eds.), *Development of psychopathology: A vulnerability-stress perspective* (pp. 104–135). Thousand Oaks: Sage Publications.

Griffith, J. W., Zinbarg, R. E., Craske, M. G., Mineka, S., Rose, R. D., Waters, A. M., et al. (2010). Neuroticism as a common dimension in the internalizing disorders. *Psychological Medicine, 40*, 1125–1136.

Haeffel, G. J., Gibb, B. E., Metalsky, G. I., Alloy, L. B., Abramson, L. Y., Hankin, B. L., et al. (2008). Measuring cognitive vulnerability to depression: development and validation of the cognitive style questionnaire. *Clinical Psychology Review, 28*, 824–836.

Haikal, M., & Hong, R. Y. (2010). The effects of social evaluation and looming threat on self-attentional biases and social anxiety. *Journal of Anxiety Disorders, 24*, 345–352.

Harvey, A. G., Watkins, E., Mansell, W., & Shafran, R. (2004). *Cognitive behavioural processes across psychological disorders: A transdiagnostic approach to research and treatment*. Oxford: Oxford University Press.

Hong, R. Y. (2007). Worry and rumination: differential associations with anxious and depressive symptoms and coping behavior. *Behaviour Research and Therapy, 45*, 277–290.

Hong, R. Y., & Paunonen, S. V. (2011). Personality vulnerabilities to psychopathology: relations between trait structure and affective-cognitive processes. *Journal of Personality, 79*, 527–562.

Hong, R. Y., Gwee, K., & Karia, M. (2006). The role of event-specific inferences in the etiological chain of hopelessness depression. *Personality and Individual Differences, 41*, 1119–1129.

Klein, D. N., Kotov, R., & Bufferd, S. J. (2011). Personality and depression: explanatory models and review of evidence. *Annual Review of Clinical Psychology, 7*, 269–295.

Kline, R. B. (2010). *Principles and practice of structural equation modeling* (3rd ed.). New York: Guilford Press.

Kotov, R., Watson, D., Robles, J. P., & Schmidt, N. B. (2007). Personality traits and anxiety symptoms: the multilevel trait predictor model. *Behaviour Research and Therapy, 45*, 1485–1503.

Kotov, R., Gamez, W., Schmidt, F., & Watson, D. (2010). Linking "big" personality traits to anxiety, depressive, and substance use disorders: a meta-analysis. *Psychological Bulletin, 136*, 768–821.

Krueger, R. F. (2005). Continuity of axes I and II: toward a unified model of personality, personality disorders, and clinical disorders. *Journal of Personality Disorders, 19*, 233–261.

Krueger, R. F., Caspi, A., & Moffitt, T. E. (2000). Epidemiological personology: the unifying role of personality in population-based research on problems behaviors. *Journal of Personality, 68*, 967–998.

Lakdawalla, Z., & Hankin, B. L. (2008). Personality as a prospective vulnerability to dysphoric symptoms among college students: proposed mechanisms. *Journal of Psychopathology and Behavioral Assessment, 30*, 121–131.

Lau, J. Y. F., & Eley, T. C. (2008). Attributional style as a risk marker of genetic effects for adolescent depressive symptoms. *Journal of Abnormal Psychology, 117*, 849–859.

Leary, M. R. (1983). A brief version of the Fear of Negative Evaluation scale. *Personality and Social Psychology Bulletin, 9*, 371–375.

Liu, Y. L. (2003). The mediators between parenting and adolescent depressive symptoms: dysfunctional attitudes and self-worth. *International Journal of Psychology, 38*, 91–100.

Lo, C. S. L., Ho, S. M. Y., & Hollon, S. D. (2008). The effects of rumination and negative cognitive styles on depression: a mediation analysis. *Behaviour Research and Therapy, 46*, 487–495.

Markon, K. E., Krueger, R. F., & Watson, D. (2005). Delineating the structure of normal and abnormal personality: an integrative hierarchical approach. *Journal of Personality and Social Psychology, 88*, 139–157.

McEvoy, P. M., & Mahoney, A. E. J. (2012). To be sure, to be sure: intolerance of uncertainty mediates symptoms of various anxiety disorders and depression. *Behavior Therapy, 43*, 533–543.

McNally, R. J. (1994). *Panic disorder: A critical analysis*. New York: Guilford Press.

Meyer, T. J., Miller, M. L., Metzger, R. L., & Brokovec, T. D. (1990). Development and validation of the Penn State Worry Questionnaire. *Behaviour Research and Therapy, 40*, 313–323.

Miller, W. R., & Brown, J. M. (1991). Self-regulation as a conceptual basis for the prevention and treatment of addictive behaviors. In N. Heather, W. R. Miller, & J. Greely (Eds.), *Self-control and the addictive behaviors* (pp. 3–79). Sydney: Maxwell Macmillan.

Mineka, S., Watson, D., & Clark, L. A. (1998). Comorbidity of anxiety and unipolar mood disorders. *Annual Review of Psychology, 49*, 377–412.

Naragon-Gainey, K. (2010). Meta-analysis of the relations of anxiety sensitivity to the depressive and anxiety disorders. *Psychological Bulletin, 136*, 128–150.

Naragon-Gainey, K., & Watson, D. (2011). Clarifying the dispositional basis of social anxiety: a hierarchical perspective. *Personality and Individual Differences, 50*, 926–934.

Nolen-Hoeksema, S. (2000). The role of rumination in depressive disorders and mixed anxiety/depressive symptoms. *Journal of Abnormal Psychology, 109*, 504–582.

Nolen-Hoeksema, S., & Morrow, J. (1991). A prospective study of depression and posttraumatic stress symptoms after a natural disaster: the 1989 Loma Preita earthquake. *Journal of Personality and Social Psychology, 61*, 115–121.

Nolen-Hoeksema, S., Wisco, B. E., & Lyubomirsky, S. (2008). Rethinking rumination. *Perspectives on Psychological Science, 3*, 400–424.

Norton, P. J. (2012). A randomized clinical trial of transdiagnostic cognitive-behavioral treatments for anxiety disorder by comparison to relaxation training. *Behavior Therapy, 43*, 503–517.

Norton, P. J., & Mehta, P. D. (2007). Hierarchical model of vulnerabilities for emotional disorders. *Cognitive Behaviour Therapy, 36*, 240–254.

Norton, P. J., Sexton, K. A., Walker, J. R., & Norton, G. R. (2005). Hierarchical model of vulnerabilities to anxiety: replication and extension with a clinical sample. *Cognitive Behaviour Therapy, 34*, 50–63.

Ormel, J., Rosmalen, J., & Farmer, A. (2004). Neuroticism: a noninformative marker of vulnerability to psychopathology. *Social Psychiatry and Psychiatric Epidemiology, 39*, 906–912.

Rapee, R. M., & Heimberg, R. G. (1997). A cognitive-behavioral model of anxiety in social phobia. *Behaviour Research and Therapy, 35*, 741–756.

Riskind, J. H., Williams, N. L., Gessner, T., Chrosniak, L. D., & Cortina, J. (2000). The looming maladaptive style: anxiety, danger, and schematic processing. *Journal of Personality and Social Psychology, 79*, 837–852.

Riskind, J. H., Tzur, D., Williams, N. L., Mann, B., & Shahar, G. (2007). Short-term predictive effects of the looming cognitive style on anxiety disorder symptoms under restrictive methodological conditions. *Behaviour Research and Therapy, 45*, 1765–1777.

Rothbart, M. K., & Bates, J. E. (2006). Temperament. In W. Damon & R. Lerner (Series Eds.), & N. Eisenberg (Vol. Ed.), *Handbook of child psychology, Vol. 3: Social, emotional, and personality development* (6th ed., pp. 99–166). New York: Wiley.

Scher, D., Ingram, R. E., & Segal, Z. V. (2005). Cognitive reactivity and vulnerability: empirical evaluation of construct activation and cognitive diatheses in unipolar depression. *Clinical Psychology Review, 25*, 487–510.

Sexton, K. A., Norton, P. J., Walker, J. R., & Norton, G. R. (2003). A hierarchical model of generalized and specific vulnerabilities in anxiety. *Cognitive Behaviour Therapy, 32*, 1–13.

Shrout, P. E., & Bolger, N. (2002). Mediation in experimental and nonexperimental studies: new procedures and recommendations. *Psychological Methods, 7*, 422–445.

Sutton, J. M., Mineka, S., Zinbarg, R. E., Craske, M. G., Griffith, J. W., Rose, R. D., et al. (2011). The relationships of personality and cognitive styles with self-reported symptoms of depression and anxiety. *Cognitive Therapy and Research, 35*, 381–393.

Taylor, S. (Ed.). (1999). *Anxiety sensitivity: Theory, research, and treatment of the fear of anxiety*. Mahwah: Lawrence Erlbaum.

Taylor, S., Zvolensky, M. J., Cox, B. J., Deacon, B., Heimberg, R. G., Ledley, D. R., et al. (2007). Robust dimensions of anxiety sensitivity: development and initial validation of the Anxiety Sensitivity Index-3. *Psychological Assessment, 19*, 176–188.

Taylor, S., Jang, K. L., Stewart, S. H., & Stein, M. B. (2008). Etiology of the dimensions of anxiety sensitivity: a behavioral-genetic analysis. *Journal of Anxiety Disorders, 22*, 899–914.

Treynor, W., Gonzalez, R., & Nolen-Hoeksema, S. (2003). Rumination reconsidered: a psychometric analysis. *Cognitive Therapy and Research, 27*, 247–259.

Trull, T. J., & Sher, K. J. (1994). Relationship between the five-factor model of personality and Axis I disorders in a nonclinical sample. *Journal of Abnormal Psychology, 103*, 350–360.

van der Heiden, C., Melchior, K., Muris, P., Bouwmeester, S., Bos, A. E. R., & van der Molen, H. T. (2010). A hierarchical model for the relationships between general and specific vulnerability factors and symptom levels of generalized anxiety disorder. *Journal of Anxiety Disorders, 24*, 284–289.

Watkins, E. R. (2008). Constructive and unconstructive repetitive thought. *Psychological Bulletin, 134*, 163–206.

Watson, D., Clark, L. A., & Harkness, A. R. (1994). Structures of personality and their relevance to psychopathology. *Journal of Abnormal Psychology, 103*, 18–31.

Watson, D., O'Hara, M. W., Simms, L. J., Kotov, R., Chmielewski, M., McDade-Montez, E. A., et al. (2007). Development and validation of the Inventory of Depression and Anxiety Symptoms (IDAS). *Psychological Assessment, 19*, 253–268.

Weissman, A. (1979). *The Dysfunctional Attitude Scale: A validation study*. Unpublished doctoral dissertation, University of Pennsylvania, Philadelphia.

Whisman, M. A., Johnson, D. P., & Smolen, A. (2011). Dysfunctional attitudes and the serotonin transporter promoter polymorphism (5-HTTLPR). *Behavior Therapy, 42*, 300–305.

Widiger, T. A., Verheul, R., & van den Brink, W. (1999). Personality and psychopathology. In L. A. Pervin & O. P. John (Eds.), *Handbook of personality: Theory and research* (pp. 347–366). New York: Guilford Press.

Wills, T. A., & Dishion, T. J. (2004). Temperament and adolescent substance use: a transactional analysis of emerging self-control. *Journal of Clinical Child and Adolescent Psychology, 33*, 69–81.

Wills, T. A., & Stoolmiller, M. (2002). The role of self-control in early escalation of substance use: a time-varying analysis. *Journal of Consulting and Clinical Psychology, 70*, 986–997.

Zinbarg, R. E., & Barlow, D. H. (1996). Structure of anxiety and the anxiety disorders: a hierarchical model. *Journal of Abnormal Psychology, 105*, 181–193.

Zinbarg, R. E., Mineka, S., Craske, M. G., Griffith, J. W., Sutton, J., Rose, R. D., et al. (2010). The Northwestern-UCLA youth emotion project: associations of cognitive vulnerabilities, neuroticism, and gender with past diagnoses of emotional disorders in adolescents. *Behaviour Research and Therapy, 48*, 347–358.