



A longitudinal study of facets of extraversion in depression and social anxiety



Philip Spinhoven^{a,b,*}, Bernet M. Elzinga^a, Albert M. van Hemert^b, Mark de Rooij^a, Brenda W. Penninx^{b,c}

^a Institute of Psychology, Leiden University, Leiden, The Netherlands

^b Department of Psychiatry, Leiden University Medical Center, Leiden, The Netherlands

^c EMGO Institute for Health and Care Research, VU University Medical Center, Amsterdam, The Netherlands

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ABSTRACT

The present study examines the relationship of lower level facets of extraversion with depression and social anxiety. A sample of 2942 adults aged 18–65, consisting of healthy controls, persons with a prior history of emotional disorders, and persons with a current emotional disorder were assessed at baseline (T0) and 2 (T2) and 4 years (T4) later. At each wave anxiety and depressive disorder according to DSM-IV criteria, symptom severity and facets of extraversion (positive affectivity, sociability and activity) were assessed. Using structural equation modeling we found that trait depression had a large association with lack of positive affectivity, while trait social anxiety showed moderately strong associations with both low sociability and lack of positive affectivity. Facet-level analyses increase the specification of associations of personality constructs with particular forms of psychopathology. Given the role of positive emotions in resilience against depression and possibly social anxiety, interventions directly aimed at increasing positive emotions seem warranted.

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1. Introduction

The assumption that personality is related to mental health has generated a long tradition of research. A recent comprehensive review of the associations of higher order personality traits in the Big Three and Big Five models (i.e., neuroticism, extraversion, disinhibition, conscientiousness, agreeableness, and openness) and depressive, anxiety, and substance use disorders in adults, showed that all diagnostic groups score high on neuroticism and low on conscientiousness. Many disorders are also associated with low levels of extraversion, with the largest effect sizes for dysthymic disorder and social anxiety disorder (Kotov, Gamez, Schmidt, & Watson, 2010).

Most of the literature on personality and emotional disorders has focused on the broad traits of neuroticism and extraversion. Whereas different disorders may be characterized by similar general levels of neuroticism or extraversion, more powerful or more specific associations with psychopathology might exist at the lower levels in the personality trait hierarchy (Klein, Kotov, & Bufferd, 2011). Examining these relations at both trait and facet

levels is necessary to identify the specific level driving a given association (Naragon-Gainey, Watson, & Markon, 2009).

Here we will focus on facets of extraversion in relation to depression and social anxiety as these disorders have shown consistent relationships with the general trait of extraversion in numerous previous studies (Kotov et al., 2010). Extraversion can be conceptualized as a multidimensional higher order trait that includes interpersonal/social as well as positive emotional aspects (Watson & Clark, 1997). Although facets of extraversion are named differently and inconsistently in the literature, extraversion typically includes the following major facets: affiliation (warmth and gregariousness), positive affectivity (joy and enthusiasm), energy (liveliness and activity), and ascendance (exhibitionism and dominance) (Watson & Clark, 1997). In relation to depression and social anxiety it is pertinent to understand whether the higher order trait of extraversion is the most relevant level to understand depression and social anxiety or whether lower order facets yield additional and more specific information to understand their interrelationships.

Only a very limited number of studies have simultaneously assessed the relation of different facets of extraversion with depression or social anxiety, with mixed results. Examining the six extraversion facets of the Revised NEO Personality Inventory (NEO PI-R; Costa & McCrae, 1992), Bienvenu et al. (2004) found that persons diagnosed with life time depression only scored lower

* Corresponding author at: Leiden University, Institute of Psychology, Wasenaarseweg 52, 2333 AK Leiden, The Netherlands. Tel.: +31 (0)71 5273377; fax: +31 (0)71 5274678.

E-mail address: spinhoven@fsw.leidenuniv.nl (P. Spinhoven).

on assertiveness than controls in a community sample, while persons with life time social phobia obtained lower scores for all facets, in particular for warmth and positive affectivity. Using multiple regression analyses only low warmth as one of the extraversion facets of the NEO PI-R predicted severity of depression in acutely depressed persons (Costa, Bagby, Herbst, and McCrae, 2005), whereas only low positive affectivity was predictive of depression severity in college students (Chioqueta & Stiles, 2005). Of special note is a recent study of Naragon-Gainey et al. (2009), who found that symptoms of social anxiety were related to all four analyzed facets of extraversion (sociability, ascendance, positive emotionality, fun-seeking), whereas depressive symptom severity correlated strongly only with low positive emotionality. Although this study, in contrast to the earlier study of Bienvenu et al. (2004), did control for the high co-variation of depression with social anxiety, the study was limited to self-report severity measures and no formal psychiatric diagnoses were made. Data on the association of facets of extraversion with psychiatric diagnoses of depression, social anxiety and other disorders while accounting for their high comorbidity are in need of further investigation (Naragon-Gainey et al., 2009; Watson & Naragon-Gainey, 2010). Moreover, as self-reported levels of extraversion are contaminated by the presence of a depressive or social anxiety disorder (Spinhoven, van der Does, Ormel, Zitman, & Penninx, 2013), a longitudinal study allowing the examination of associations between stable levels of extraversion, depression and social anxiety may attenuate this contamination because of state effects.

To summarize, the overall aim of the present longitudinal study is to assess the importance of lower order facets of extraversion (i.e., positive affectivity, sociability and activity) in depression and social anxiety. More specifically, we will investigate: (a) which facets of extraversion characterize depression and social anxiety compared to other emotional disorders and controls; and (b) which facets of extraversion show differential relations with depression and social anxiety. We expected lower positive affectivity and lower sociability in depression and social anxiety compared to other anxiety disorders and controls. Moreover, we expected lower levels of positive affectivity in depression than in social anxiety, and lower levels of sociability in social anxiety than in depression.

2. Materials and methods

2.1. Sample

The Netherlands Study of Depression and Anxiety (NESDA) is an ongoing cohort study designed to investigate determinants, course and consequences of depressive and anxiety disorders. A sample of 2981 persons aged 18–65 years was included, consisting of healthy controls, persons with a prior history of depressive and anxiety disorders, and persons with a current depressive and/or anxiety disorder. Respondents were recruited in the general population, through a screening procedure in general practice, or when newly enrolled in specialized health care in order to represent different health care settings and different developmental stages of psychopathology. General exclusion criteria were a primary diagnosis of psychotic, obsessive compulsive, bipolar or severe addiction disorder and not being fluent in Dutch.

2.2. Procedure

A detailed description of the NESDA design and sampling procedures has been given elsewhere (Penninx et al., 2008). The baseline assessment included assessment of demographic and personal characteristics, a standardized diagnostic psychiatric interview and a medical assessment including blood sampling. The research

protocol was approved by the Ethical Committees of the participating universities and all respondents provided written informed consent. After two (T2) and four years (T4), a face-to-face follow-up assessment was conducted with a response of 87.1% ($n = 2596$) at T2 and a response of 80.6% ($n = 2402$) at T4.

2.3. Measures

2.3.1. Psychiatric diagnosis

Presence of DSM-IV depressive [Major Depressive Disorder (MDD), Dysthymia (DYS)] or anxiety [Panic Disorder with or without Agoraphobia (PD), Social Anxiety Disorder (SAD), Generalized Anxiety Disorder (GAD), Agoraphobia without panic (AGO)] disorders was established using the Composite Interview Diagnostic Instrument (CIDI, version 2.1), a highly reliable and valid instrument for assessing depressive and anxiety disorders (ter Smiten, Smeets, & van den Brink, 1998; Wittchen, 1994), which determined prevalence of DSM-IV classified depressive (MDD, DYS) or anxiety (PD, SAD, GAD, AGO) disorders at T0, T2, and T4.

2.3.2. Symptom severity

Depression severity at each wave was measured by the Inventory of Depressive Symptomatology (IDS). The IDS is a 30-item self-report questionnaire to measure severity of depressive symptoms, which has shown high correlations with observer-rated scales such as the Hamilton Depression Scale (Rush, Gullion, Basco, Jarrett, & Trivedi, 1996). Social avoidance severity was measured with the 15-item *Fear Questionnaire*, which has been found to be a reliable and valid measure for different types of phobic avoidance (FQ; Marks & Mathews, 1979). The five-item subscale for social phobia is strongly related to social anxiety and discriminates between categories of phobics in the expected way (Van Zuuren, 1988).

2.3.3. Extraversion

Extraversion was measured at each wave using the NEO-FFI personality questionnaire, a 60-item questionnaire measuring 5 personality domains: neuroticism, extraversion, openness to experience, conscientiousness, and agreeableness (Costa & McCrae, 1992). In addition to the 5 broad personality domains, the NEO-FFI also reliably provides 13 item-cluster subcomponents (Chapman, 2007; Saucier, 1998). In the present study besides scale scores for the higher order trait of trait extraversion, also lower order facet scores for the following three four item-cluster subcomponents were calculated: positive affectivity, sociability and activity (Chapman, 2007; Saucier, 1998). These subcomponents correspond with three of the four major facets of extraversion as defined by Watson and Clark (1997) except for ascendance (positive affectivity, affiliation (sociability in the present study) and activity (energy in the present study). Alpha coefficients for extraversion measurements in the present study at T0 were: total score = .84; positive affectivity (i.e., light-hearted, cheerful, optimistic) = .85; sociability (gregarious, enjoys others, prefers company) = .65; activity (energetic, active, fast paced, action seeking) = .60. Test-retest reliabilities were: total score: .80 between T0 and T2 and .82 between T2 and T4 scores; positive affectivity: .75 and .79; sociability: .73 and .71; activity: .67 and .70.

2.4. Statistical analyses

On the basis of CIDI diagnoses at T0, T2 and T4 five different psychopathology groups were formed: (1) persons with a depressive disorder (Dys/MDD) and comorbid SAD (Dys/MDD + SAD) during the past five years; (2) persons with a depressive disorder, but no SAD (Dys/MDD) during the past five years; (3) persons with SAD, but no depressive disorder (SAD) during the past five years; (4) persons with another anxiety disorder (GAD, and/or PD, and/

or Ago; Other Disorders) during the past five years; (5) Persons with no disorder during the past five years (No disorder). Using (M) ANOVA To (facet) extraversion scores were compared and significant between group differences were followed up by Games-Howell post hoc multiple comparisons.

Next, in an attempt to address the high comorbidity among Dys, MDD and SAD, selective attrition at follow-up and symptom severity, we first analyzed the structure and stability of a two-factor measurement model for depression and social anxiety. Using Confirmatory Factor Analysis (CFA) we used the T0, T2 and T4 diagnostic and symptom severity assessments of depression (i.e., Dys, MDD, and IDS) and social anxiety (SAD and FQ) as repeatedly measured indicator variables and modeled the common latent trait factor for depression and social anxiety obtained from the latent factor scores for depression and social anxiety at T0, T2 and T4. Error covariances of analogous measures were freely estimated and analogous factors across groups of responses were allowed to be correlated. Factor loadings of the observed measures on their latent trait factor(s) were constrained to be equal over time in order to obtain a unique interpretation of the latent factor(s). In addition, using CFA we analyzed whether we could compute separate latent factor scores for extraversion and for facets of extraversion on the basis of the T0, T2 and T4 NEO-FFI measurements of extraversion.

After establishing our measurement models, we proceeded with fitting structural equation models (SEM) for the direct effect of (facets of) extraversion on the latent factors for trait depression and trait social anxiety. We used a weighted least squares estimator with a diagonal weight matrix and robust standard errors and a mean- and variance-adjusted χ^2 -statistic (WLSMV). The WLSMV estimator is appropriate for categorical and non-multivariate normal data and provides consistent estimates when data are missing at random with respect to covariates.

Model fit was evaluated using the Tucker–Lewis Index (TLI), the Comparative Fit Index (CFI), and the Root Mean Square Error of Approximation (RMSEA). For the TLI and CFI, values between 0.90 and 0.95 are considered acceptable, and >0.95 as good. For the RMSEA, acceptable models have values of <0.10, and good models of <0.05. We considered standardized estimates of less than .10 to represent a negligible, of .10 to represent a small, of .30 a moderate and of .50 or larger a strong association. (M)ANOVAs were run using SPSS version 20 and CFA and SEM models using MPlus v. 7.1 (Muthén & Muthén, 1998–2012). A significance level of $p < .05$ was used for all analyses.

3. Results

3.1. Sample characteristics

T0 baseline extraversion measurements were available for 2942 persons, constituting the present study sample. Of these persons 2376 completed the T4 assessment. Mean age at T0 was 42.0 years ($SD = 13.1$), mean number of years of education was 12.2 years ($SD = 3.3$) and 66.5% was female. We assessed whether persons had an anxiety and/or depressive disorder in the year before the T0 assessment or between T0 and T4. In the participants who completed the T4 assessment, 711 (25%) had MDD or Dys only, 158 (6%) had SAD only and 587 (23%) had comorbid depressive and social anxiety disorder. Furthermore, 157 participants (6%) had another anxiety disorder (i.e., PD, GAD and/or Ago). Finally, 763 persons (26%) had no disorder during the 5-year study period.

3.2. Differences in (facets of) extraversion between psychopathology groups

In order to investigate differences in extraversion at T0 between psychopathology groups we executed an ANOVA with extraversion

scores as dependent variable and psychopathology group (Dys/MDD + SAD; DYS/MDD only; SAD only; Other disorder; No disorder) as independent variable. We found a significant between groups difference in Extraversion scores with a large effect size ($F(4, 2371) = 170.24, p < .001, \eta_p^2 = .22$). Subsequent Games-Howell post hoc multiple comparisons showed that all psychopathology groups had lower means for Extraversion than the No disorder group. Extraversion mean scores of the comorbid Dys/MDD + SAD group were lower than those of the non-comorbid Dys/MDD and SAD group, which both had lower mean scores as compared to the Other Anxiety Disorder group (see Table 1).

MANOVA in order to analyze between groups differences in extraversion facets revealed a significant effect for group with a moderately large effect size (Pillai's trace = .242, $F(12, 7107) = 52.06, p < .001, \eta_p^2 = .08$). Separate ANOVAs showed significant effects of group for each of the extraversion facets (Positive affectivity: $F(4, 2369) = 157.70, p < .001, \eta_p^2 = .21$; Sociability: $F(4, 2369) = 94.43, p < .001, \eta_p^2 = .14$; Activity: $F(4, 2369) = 64.75, p < .001, \eta_p^2 = .10$). Effects sizes for positive affectivity and sociability were large and for activity moderately large. Subsequent Games-Howell post hoc multiple comparisons showed that all psychopathology groups had lower mean facet scores as compared to the No disorder group. Mean positive affect scores of the comorbid group were lower than those of the non-comorbid Dys/MDD and SAD group, which did not differ regards positive affectivity. Mean sociability scores of the comorbid group did not differ from those of the SAD alone group and were lower than those of the Dys/MDD group. Mean activity scores did not differ among psychopathology groups except for lower mean scores in the comorbid group.

3.3. Structure and stability of measurement model of symptom and diagnostic status variables

CFA in the 2942 persons with complete CIDI and extraversion data at T0 showed that a two-factor model for depression and social anxiety with latent variables based on diagnostic status and symptom severity indicators obtained at each assessment and a common latent trait factor for depression and social anxiety gave a good model fit ($\chi^2(77) = 499.62, p < .001$; CFI = .96; TLI = .95; RMSEA = .04). Although the common latent trait factors proved to be highly correlated (.81), fit indices were comparable to or slightly better than those of a single-factor model ($\chi^2(79) = 610.87, p < .001$; CFI = .95; TLI = .94; RMSEA = .05). Consequently, we chose the depression-social anxiety model as best representing the latent structure and stability of psychopathology.

CFA of the higher-order Extraversion scores obtained at T0, T2 and T4 resulted in a measurement model with an excellent fit to the data ($\chi^2(1) = .66, p = .42$; CFI = 1.00; TLI = 1.00; RMSEA = .00). CFA of the Extraversion facet scores obtained at T0, T2 and T4 resulted in a measurement model with a reasonable fit to the data ($\chi^2(27) = 750.25, p < .001$; CFI = .95; TLI = .93; RMSEA = .09).

3.4. Structural model of the association of extraversion with depression and social anxiety

A SEM model with three extraversion scores and 15 symptom and diagnostic status variables as endogenous indicator variables, six latent variables for Depression and Social Anxiety at T0, T2 and T4 and the three latent variables for Extraversion, Trait Depression and Trait Social Anxiety showed an acceptable fit to the data ($\chi^2(120) = 672.58, p < .001$; CFI = .96; TLI = .95; RMSEA = .04) ($n = 2942$). In this model the paths from Extraversion to the latent traits of depression (−.73) and social anxiety (−.74) were significant at $p < .001$ with a large effect size.

Table 1
Higher and lower order extraversion scores in groups differing in psychopathology ($n = 2376$).

Variable	1. DEP/DYS + SAD ($n = 587$)		2. DEP/DYS ($n = 711$)		3. SAD ($n = 157$)		4. Other Anx. disorder ($n = 158$)		5. No disorder ($n = 763$)		$F(4,2371)$	η_p^2	Post hoc contrasts
	M	SD	M	SD	M	SD	M	SD	M	SD			
Extraversion	32.5	6.7	36.4	6.8	35.7	6.9	38.8	5.8	41.6	6.2	170.24***	.22	1 < 2 = 3 < 4 < 5
Positive affectivity	11.1	3.2	12.7	3.4	12.8	3.3	13.8	3.0	15.3	2.9	157.70***	.21	1 < 2 = 3 < 4 < 5
Sociability	10.6	2.7	12.0	2.7	11.2	2.9	12.7	2.5	13.3	2.5	94.43**	.14	1 = 3 < 2 < 4 < 5
Activity	10.8	2.5	11.8	2.5	11.7	2.4	12.3	2.4	12.9	2.3	64.75*	.10	1 < 2 = 3 = 4 < 5

Note: * $p < .05$; ** $p < .01$; *** $p < .001$.

A subsequent model with positive affectivity, sociability and activity as nine endogenous independent variables ($n = 2939$) also yielded an acceptable model fit ($\chi^2(116) = 778.68$, $p < .001$; CFI = .94; TLI = .93; RMSEA = .03). In this model Positive affectivity had a large impact on Depression (−.59) and a moderately large impact on Social Anxiety (−.38). Sociability had a moderately large effect on Social Anxiety (−.36), but not on Depression (−.04). The paths from Activity to Depression (−.18) and Social Anxiety (−.08) although significant were small resp. negligible (see Fig. 1).

4. Discussion

This is the first longitudinal study to directly compare relations of different facets of extraversion with depression and social anxiety within a single study design using formal psychiatric diagnoses besides symptom severity measures. In showing that social anxiety is more broadly related to facets of extraversion, whereas depression is more strongly related to low positive emotionality only our study replicates the cross-sectional findings of Naragon-Gainey et al. (2009) among college students and psychiatric outpatients based on self-report measures for symptom severity. Our study extends their findings in two important aspects by showing that these results can be generalized to clinical diagnoses and to

stable trait levels of (facets of) extraversion, depression and social anxiety. A particular strength of the present study is our measurement model of depression and social anxiety including both formal DSM-IV diagnoses for dysthymia, major depression and social anxiety disorder as well as symptom severity measures for depression severity (IDS) and social anxiety (FQ: Social Phobia scale). Moreover, by modeling stable trait levels of (facets of) extraversion, depression and social anxiety we were able to assess the relationship of (facets of) extraversion with depression and social anxiety over a four-year period relatively unaffected by state effects of depression and social anxiety on extraversion and vice versa, while also accounting for the high comorbidity of depression with social anxiety.

As the higher order trait of extraversion showed a comparable strong inverse relationship with depression and social anxiety, our results demonstrate that moving beyond higher order personality traits and assessing lower level facets of personality dimensions may help to elucidate at which level of the personality hierarchy relations of various aspects of personality with psychopathology can best be understood. As recently reviewed by Watson and Naragon-Gainey (2010) low levels of positive affectivity are a distinguishing feature of depression, social anxiety and schizophrenia/schizotypy, but indicators of positive affectivity seem to be more strongly and systematically linked to depression than to these other syndromes.

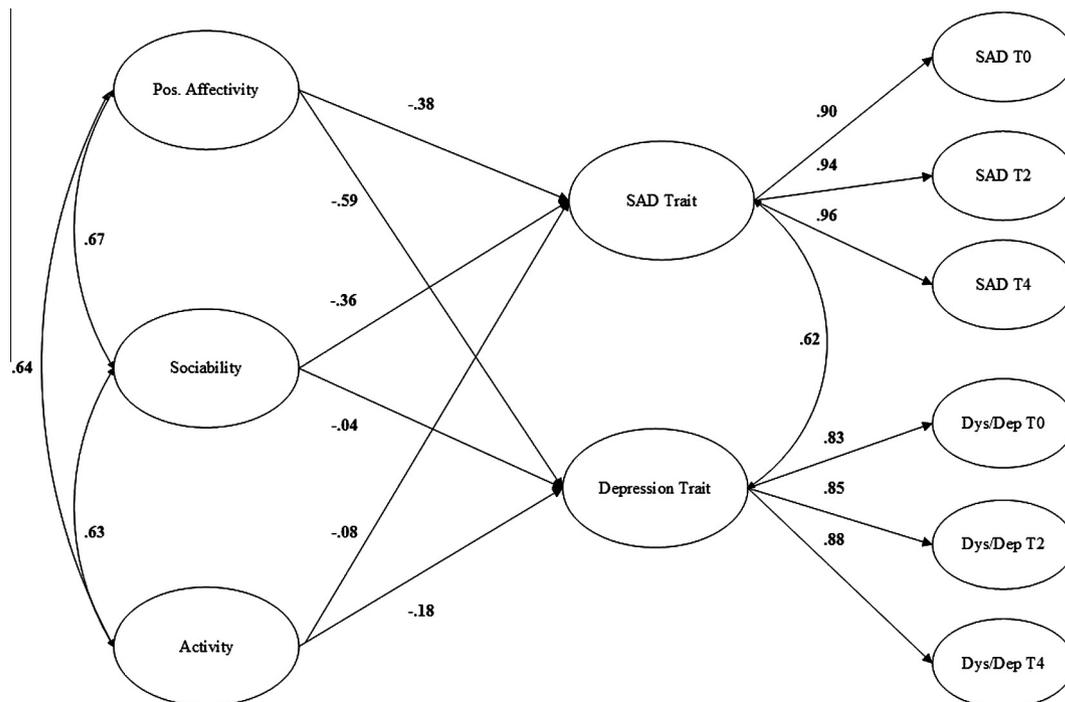


Fig. 1. Standardized parameter estimates for the model of the direct relationships of lower order facets of extraversion with latent trait depression and latent trait social anxiety.

It should be noted, however, that low positive affectivity also showed a moderately strong inverse relation with social anxiety in the present study showing that the relation of general extraversion to social anxiety is not confined to low sociability. These results are consistent with accumulating evidence on deficits in positive affectivity in social anxiety (Kashdan, 2007). By taking comorbidity with depression into account our results suggest that this deficit of positive emotionality in social anxiety is independent of depression.

Our study results have relevance for clinical practice. First, as the specific facet-levels showed more specific associations with psychopathology than the more general trait-level of extraversion, taking lower-order personality facets into account can help to improve assessment and differential diagnosis of psychiatric disorders (Watson & Naragon-Gainey, 2010). Lack of positive affectivity may constitute a rather specific indicator for depression and inclusion of lack of positive affectivity in assessment instruments for depression may improve their discriminatory and predictive power (Wardenaar, Giltay, van Veen, Zitman, & Penninx, 2012). Second, evidence for more specific relationships can help to elucidate relevant etiological factors. Current models of social anxiety more strongly emphasize low assertiveness and low sociability and could profit from including lack of positive affectivity as a relevant etiological factor (Brown, Chorpita, & Barlow, 1998; Watson, Clark, & Carey, 1988). In line, using an experience-sampling approach Kashdan and Steger (2006) found that socially anxious individuals reported fewer everyday positive emotions and positive events than did non-anxious individuals. In contrast to other anxiety conditions, excessive social anxiety seems to be associated with diminished positive subjective experiences. Third, our study suggests that boosting positive emotionality may be a treatment goal not only in the treatment of depression but also in the treatment of social anxiety. It has recently been shown that mindfulness-based cognitive therapy is associated with increased experience of momentary positive emotions as well as greater appreciation of, and enhanced responsiveness to, pleasant daily-life activities in persons vulnerable to depression (Geschwind, Peeters, Drukker, van Os, & Wichers, 2011). Moreover, engaging in kind acts has been found to increase positive affect in socially anxious individuals (Alden & Trew, 2013).

The current study has several strengths such as a longitudinal design in a relatively large representative sample of participants with or without a current depressive and/or anxiety disorder from different recruitment settings; use of both structured interviews and standardized self-report questionnaires to assess psychopathology; use of structural equation modeling to separate time-invariant and time-variant variance in both trait- and facet-level analyses of extraversion. Some study limitations, however, have to be acknowledged. First, there is no consensus regarding the exact lower-order facets comprising the higher order trait of extraversion (Naragon-Gainey et al., 2009) and a particular instrument-based facet scheme – especially of a short scale for personality as the NEO-FFI in the present study – may not actually capture the true structure of extraversion. Moreover, many current facet scales including the NEO-FFI have relatively low internal consistencies, but test–retest reliability may be more relevant for validity criteria (McCrae, Kurtz, Yamagata, & Terracciano, 2011). The mean alpha coefficient for the three extraversion facet scales in the present study was .70, which is similar to the alpha coefficients for the NEO-FFI facet scales (Saucier, 1998) and the published alpha coefficients for the 30 NEO-PI-R facet scales (Costa & McCrae, 1992). Second, there may have been content overlap between extraversion and psychopathology measures resulting in criterion contamination and artificially inflated correlations. We consider this less likely, because we used diagnostic status indicators in addition to self-report measures for symptom severity. Lastly, our model

assumes causal relationships of predictor variables with dependent variables of which the validity can be questioned. Personality cannot only impact upon depression and social anxiety, but depression and social anxiety can also affect personality. Finally, selective attrition during follow-up may have resulted in biased parameter estimates using the WLSVM estimator in analyzing all available information for all estimators.

5. Conclusion

Our longitudinal study shows that facet-level analyses increase the specification of associations of personality constructs and particular forms of psychopathology. Lack of positive emotionality as one of the facets of extraversion affects both depression and social anxiety. This makes the capacity to experience positive affect of central importance in the etiology, assessment and treatment of these disorders.

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