Journal of Abnormal Psychology

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This prospective study examined the prognostic value of the Big Five personality model for changes in comorbidity patterns of emotional disorders both from a person- and trait-centered perspective. Moreover, it is investigated whether the predictive effect of personality can be attributed to symptom severity at baseline. We followed a cohort of 2566 persons (18–65 years) recruited in primary and specialized mental health care during two years. Personality dimensions at baseline were assessed with the NEO-FFI. The *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.)–based diagnostic interviews with the CIDI allowed assessment of changes in comorbidity patterns of anxiety and depressive disorders over two years. Data were analyzed with latent class analysis (LCA) and latent transition analysis (LTA). LCA identified a four-class latent comorbidity class solution (Few Disorders, Fear Disorders, Distress Disorders, and Comorbid Fear and Distress Disorders) and a five-class latent personality class solution (High Resilients, Medium Resilients, Low Overcontrollers, Medium Overcontrollers, and High Overcontrollers). LTA showed that the likelihood of remaining in the same latent class was larger than that of transitioning to a less severe comorbidity class. Also, after correcting for symptom severity, medium and high Overcontrollers as well as participants with lower levels of conscientiousness were less likely to transition to a less severe comorbidity class. In particular, the individual trait of conscientiousness may be less dependent on current levels of anxiety and depressive symptoms and be a key pathoplastic or even predisposing variable in anxiety and depression and needs more theoretical and empirical study.

Keywords: personality, comorbidity, anxiety disorder, depressive disorder, latent class analysis, latent transition analysis

The comorbidity of psychiatric disorders can be defined as the presence, simultaneously or in sequence, of two or more disorders in a person within a certain period of time (de Graaf, Bijl, Smith, Vollebergh, & Spijker, 2002). Many community-based epidemiological studies show a high degree of comorbidity among depressive and anxiety disorders (e.g., R. C. Kessler et al., 1994; Merikangas et al., 2003). Using statistical modeling techniques, such as confirmatory factor analysis (CFA) it can be investigated whether subgroups of emotional disorders show systematic patterns of co-occurrence, and various hierarchical models for emotional disorders have been proposed. In these models the prevalence of distinct emotional disorders within the hierarchy is conceptualized as an expression of an underlying latent vulnerability factor. Available studies of mental disorders (for a review; see Beesdo-Baum et al., 2009) report largely consistent findings of a hierarchical three-factor structure consisting of an "anxious-misery" (major depressive disorder [MDD], dysthymia [DYS], generalized anxiety disorder [GAD], posttraumatic stress disorder [PTSD]), "fear" (panic

disorder w/o agoraphobia [PAN], agoraphobia without panic [AGO], social phobia [SOC], simple/specific phobia [PHOB]), and "externalizing" factor, where the first two factors can be summarized into a second-order factor labeled "internalizing" (Krueger, 1999) (distress-fear model of emotional disorders). However, other studies suggest the superiority of a parsimonious single-factor organization of internalizing disorders (single factor model) (e.g., South & Krueger, 2008), whereas a structural organization of specific internalizing disorders into the two broad *Diagnostic and Statistical Manual of Mental Disorders, 4th ed.* (*DSM–IV*) categories of mood and anxiety disorders (in which GAD and PTSD are subsumed under the anxiety disorders *DSM–IV* model) seems inferior to other models examined (e.g., Vollebergh et al., 2001).

Factor analytic studies focus on the two-way associations between disorders. However, the distribution of comorbidity differs significantly from the distribution one would expect to find if the multivariate structure among the disorders was entirely attributable to the two-way associations between disorders. In the U.S. National Comorbidity Survey Replication investigating 19 different DSM diagnoses, of the 524,288 (2^{19}) logically possible multivariate disorder profiles, only 433 were observed (R. C. Kessler, Chiu, Demler, & Walters, 2005). Nearly 80% involved highly comorbid cases (three or more disorders). For this reason Latent Class Analysis (LCA) as a complementary data-analytic approach to understand comorbidity profiles was chosen. LCA is a person-centered approach, which models disorders as groups or clusters instead of as dimensions. Latent class analysis postulates a discrete latent variable defining class membership that explains covariance among observed indicators (i.e., disorders). Modeling data in this way may help to reveal what the characteristics are of persons who have comorbid disorders.

Comorbidity among mental disorders in the general population appears to occur in a finite number of distinct patterns. Four prior studies have undertaken LCAs of DSM-based disorders and have reported optimal solutions ranging from five to eight latent classes (R.C. Kessler, 1997; R. C. Kessler et al., 2005; Sullivan & Kendler, 1998; Vaidyanathan, Patrick, & Iacono, 2011). Although some similarities in results are evident across studies, direct comparisons are difficult because of different sets of disorders and differing time referents. Of note is that the results of a recent LCA study (Vaidyanathan et al., 2011) executed in two nationally representative epidemiological samples are highly accordant with dimensional models of comorbidity yielding five latent classes exhibiting distinctive profiles of diagnostic comorbidity: a fear class (all phobias and panic disorder), a distress class (depression, generalized anxiety disorder, dysthymia), an externalizing class (alcohol and drug dependence, conduct disorder), a multimorbid class (highly elevated rates of all disorders), and a few disorders class (very low probability of all disorders).

Personality dimensions may be particularly relevant for the high comorbidity of depressive and anxiety disorders. According to the reformulated integrative hierarchical model of depression and anxiety (Mineka, Watson, & Clark, 1998), a general factor is shared between the anxiety and depressive disorders, specific factors are linked to some disorders but not others, and unique factors are not shared with any other disorder. A recent quantitative review of 175 cross-sectional studies of Big personality traits in relation to emotional disorders (Kotov, Gamez, Schmidt, & Watson, 2010) showed that all

diagnostic groups were high on neuroticism and unexpectedly also low on conscientiousness (cf. Malouff, Thorsteinsson, & Schutte, 2005). Moreover, many disorders also showed low extraversion (depressive disorders and social phobia in particular). Applying this model to personality–psychopathology research, the comorbidity among emotional disorders can be conceptualized to be the result of the influence of neuroticism (negative emotionality) and conscientiousness as general factors and extraversion as a more specific factor. Other personality traits could be more unique for a specific disorder and do not contribute to comorbidity because they are uncorrelated with different disorders by definition.

Available cross-sectional epidemiological studies (Bienvenu et al., 2001; Weinstock & Whisman, 2006), twin studies (Hettema, Neale, Myers, Prescott, & Kendler, 2006; Khan, Jacobson, Gardner, Prescott, & Kendler, 2005), and clinical studies (Cuijpers, van Straten, & Donker, 2005; Spinhoven, de Rooij, Heiser, Smit, & Penninx, 2009) have indeed reported that high neuroticism is more common in persons with two or more emotional disorders. Similarly, low extraversion has been found to be associated with comorbidity of emotional disorders (Bienvenu et al., 2001; Cuijpers et al., 2005).

Strikingly, there is a dearth of studies of the relationship of personality dynamics with psychopathology. Most studies up till now used a five-factor variable-centered approach focusing on differences between individuals but neglecting the clustering of traits within individuals. As already stressed by Allport (1937), the dynamic organization within the individual is key to understanding personality. A dynamic, more person-centered approach is complementary to a variable-centered approach, although conceptually different. Using Q factor analysis or cluster analysis of Big-Five measurements, many studies have identified three personality types in children, adolescents, and adults (Asendorpf, Borkenau, Ostendorf, & Van Aken, 2001; Caspi, 1998): Resilients (low scores for Neuroticism (*N*) and average scores for Extraversion (E), Conscientiousness (C), Agreeableness (A), and Openness to Experience (O)), Overcontrollers (higher scores for N, lower scores for E, and average scores for C, A and O), and Undercontrollers (lower scores for C and A and average scores for N, E and O), although several studies failed to replicate these personality types (e.g., McCrae, Terraciano, Costa, & Ozer, 2006). To make further progress in elucidating the relationship between personality and psychopathology, it seems important not only to focus on separate traits in a nomothetic way but also to explore the interactions between various traits using a more dynamic approach (Kotov et al., 2010).

Ormel, Rosmalen, and Farmer (2004) hypothesized that what neuroticism items measure is a person's habitual level of distress. Consequently, even prospective associations of neuroticism with incidence of psychiatric disorders become self-evidently circular, because a person's habitual level of distress, assessed at a particular point in time, will—by definition—be associated with the level of distress at an earlier or later point in time. Of note is that almost none of the available studies on the predictive value of Big Five personality traits tried to control for possible state effects of depression or anxiety, so the extent to which current symptom severity confounds the prospective association of personality with psychopathology remains unknown. However, two recent longitudinal studies did control for state effects and observed that higher

levels of neuroticism (Jylha, Melartin, Rytsala, & Isometsa, 2009; Kendler, Gardner, Gatz, & Pedersen, 2007) and lower levels of extraversion (Jylha et al., 2009) remained predictive of comorbidity in persons with depressive disorder.

The present study is a prospective follow-up study of a previous cross-sectional study on personality dimensions and comorbidity among emotional disorders (Spinhoven et al., 2009). To the best of our knowledge, this is the first prospective study examining the prospective value of the Big Five personality model for temporal changes in comorbidity patterns using both a trait- and person-centered approach. The present study has three major aims. First, it was investigated whether with a person-centered approach like LCA comorbidity patterns can be identified which are in accordance with prevailing dimensional latent structure models of internalizing psychopathology. Second, using both a variable- and person-centered approach, it was explored to what extent the Big Five personality model is predictive of transitioning from one latent comorbidity class to another. Finally, it was determined to what extent the predictive value of personality can be attributed to state effects of symptom severity. We hypothesized that the nature of latent comorbidity classes would be in accordance with the dimensional distress–fear model of internalizing behavior. Moreover, we expected that of the Big Five personality traits, in particular Neuroticism and Conscientiousness, as general vulnerability factors would predict (changes in) comorbidity pattern (trait-centered approach) and that Overcontrolling participants would be less likely to transition to a less severe comorbidity cluster than Resilient participants. Finally, it was hypothesized that also after statistically controlling for possible state effects of symptom severity, both personality traits and types will still predict changes in comorbidity patterns.

Method

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 total of 2981 persons aged 18 through 65 years were included, consisting of healthy controls, persons with a prior history, 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 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.

Procedure

A detailed description of the NESDA design and sampling procedures is 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 draw. The research protocol was approved by the Ethical Committees of participating universities, and all respondents provided written informed consent.

After two years, a face-to-face follow-up assessment was conducted with a response of 87.1% (n = 2596). Prior history and presence of *DSM–IV*–based (American Psychiatric Association, 1994) depressive (MDD, DYS) or anxiety (PAN, SOC, GAD, AGO) disorders were established using the Composite Interview Diagnostic Instrument (CIDI, version 2.1), a highly reliable and valid instrument for assessing depressive and anxiety disorders (Wittchen, 1994). Presence of the disorders was defined as the occurrence of the disorder at any time during the six months preceding the baseline interview or the six months preceding the 2-year follow-up assessment. Our final study sample consisted of 2566 participants, because NEO-FFI scores were incomplete in 30 cases (1.2%). Mean age was 42.1 year (SD = 13.1), mean number of years of education attained was 12.3 years (SD = 3.3), and 66.3% was female. Of these participants, 1400 (54.6%) had a 6-month depressive or anxiety diagnosis and 1166 (45.4%) had no 6-month depressive or anxiety diagnosis at baseline.

Measures

Changes in diagnostic status during follow-up. Changes in diagnostic status were determined using the CIDI interview at the 2-year follow-up assessment, which determined the 6-month prevalence of *DSM–IV* classified depressive and anxiety disorders at the baseline assessment and at 2-year follow-up. Organic exclusion rules were used in defining diagnoses and hierarchy-free diagnoses. Using the CIDI it was determined whether participants fulfilled the diagnostic criteria for MDD, DYS, PAN, SOC, AGO, or GAD. Because a diagnosis of agoraphobia without panic (AGO) excludes a diagnosis of panic disorder with or without agoraphobia (PAN) the LCA assumption of conditional independence of indicators within latent classes was violated (see below), and consequently AGO was excluded from further statistical analysis (50 participants had agoraphobia as a single diagnosis and agoraphobia was a comorbid condition in 107 cases of SOC, PAN, MDD, and DYS).

Inventory of Depressive Symptoms (IDS). Severity of depressive symptoms was measured with the 30-item Inventory of Depressive Symptoms-self-report version (IDS-SR), which has shown high correlations with observer-rated scales such as the Hamilton Depression Scale (Rush, Gullion, Basco, Jarrett, & Trivedi, 1996). Internal consistency of the IDS-SR at baseline in the present study was .91.

Beck Anxiety Interview (BAI). Severity of generalized anxiety and panic symptoms was measured using the 21-item Beck Anxiety Inventory (BAI; Beck, Brown, Epstein, & Steer, 1988). This scale has shown sound psychometric properties such as factorial validity, internal consistency, and test–retest stability, as well as adequate convergent and discriminant validity. Internal consistency of the BAI at baseline in the present study was .94.

NEO Five-Factor Inventory (NEO-FFI). Personality was operationalized using the NEO personality questionnaire. A 60-item version of the longer 240-item NEO Personality Inventory Revised (NEO-PI-R), called the NEO-Five Factor Inventory, was used (NEO-FFI; Costa & McCrae, 1992). The NEO-FFI questionnaire measures the following five personality domains: Neuroticism (N), Extraversion (E), Agreeableness (A), Conscientiousness (C), and Openness to experience (O). The NEO-FFI scales show correlations of .75 to .89 with the NEO-PI factors. Internal con-

sistency values range from .74 to .89 (Costa & McCrae, 1992). Cronbach's alphas of the NEO-FFI subscales in NESDA were as follows: Neuroticism = .75; Extraversion = .78; Agreeableness = .83; Conscientiousness = .78; and Openness to experience = .72.

Statistical Analysis

To address our research questions, we first used Latent Transition Analysis (LTA; Collins & Wugalter, 1992). LTA is a type of longitudinal analysis that explores change in latent classes of individuals over time. LTA builds on two modeling traditions: latent class analysis (LCA; cf. McCutcheon, 1987) and autoregressive modeling, specifically Markov models (cf. Van de Pol & Langeheine, 1989). Latent class analysis, a latent variable mixture model, was used as a measurement model in LTA to identify unique comorbidity classes across the two measurement points. LCA groups similar individuals based on their pattern of responses on a set of indicators assuming that associations among observed indicators can be explained by underlying latent classes plus error (B. Muthen, 2004). In the present study each latent class represents a distinct profile of estimated disorder diagnosis probabilities (DDPs; i.e., the likelihood of having a certain anxiety or depression diagnosis given membership in a class). These estimated probabilities are the same for all members of the class, although individuals may actually differ in probability of diagnosis fulfillment because of measurement error and stochastic factors. LCA generates class membership probabilities and DDPs for each class in a model. LCA was also used to identify latent personality classes with each latent class representing a distinct profile of estimated N, E, C, A, and O scores.

Model fit was assessed using the Bayesian Information Criterion (BIC) and the Lo-Mendell-Rubin test (LMRT) (Nylund, Asparoutiov, & Muthen, 2007). The BIC is a commonly used model selection index, that balances model fit with model parsimony, adjusting for the size of the sample. The model with the lowest BIC is considered optimal (L. K. Muthen & Muthen, 1998-2010). In determining the number of personality classes we also required that adding an additional class should lead to a significant increase of fit, as indicated by the Lo-Mendell-Rubin test (LMRT). Note that LMRT is not available for LTA models.

The autoregressive component describes transitions among the classes that occur over time. LTA is a longitudinal extension of LCA that observes individuals' transitions in and out of latent classes, reflecting change in the latent variable of interest. LTA estimates the proportion of individuals in each class at each time point, and the probability of transitioning from one class to another, conditioned on prior membership status. The LCA and LTA analyses were conducted using the MPlus computer program (version 6.11; L. K. Muthen & Muthen, 1998–2010).

Following LTA, we assigned individuals to the class with the highest posterior probability for a given time point. Although this procedure results in some error because cases are probabilistically associated with latent classes (B. Muthen, 2004), when posterior probabilities are high, error in class assignment is relatively small. Next, we used (multinomial) logistic regression analyses to analyze predictors of transitioning from one class to another. All continuous variables (age, education, BAI, IDS, and NEO-FFI scores) were converted into z scores to facilitate interpretation of

results. These analyses were carried out by SPSS (version 18.0). A significance level of .05 was used for all analyses.

Results

Number of Latent Comorbidity Classes

First, LCA was used as a measurement model in LTA to identify unique latent comorbidity classes at baseline and 2-year follow-up simultaneously. Models specifying one to seven class solutions were run, and a four-class solution provided the best relative fit to the data at both time points based on BIC (see Table 1).

Figure 1 depicts the DDPs for each class in the four-class solution when DDPs were constrained to be equal at baseline and 2-year follow-up. If the DDPs were almost zero, relative to the DDPs from the whole sample, the latent class was characterized as "Few Disorders." If the probabilities across diagnostic indicators were generally positive, considering the DDPs from the full sample, a latent class was characterized as either "Comorbid Disorders" (with the highest DDPs for all diagnostic indicators across latent classes), "Fear Disorders" (with relatively high DDPs for SAD and PD), or "Distress Disorders" (with relatively high DDPs for MDD and to a lesser extent Dys and GAD). Table 2 presents the estimated proportion assigned to each class at baseline and 2-year follow-up. As can be derived from this table at both measurements, the Few Disorders class had the highest estimated proportion of members and the Comorbid Disorders class the lowest.

Transitions Between Latent Comorbidity Classes

Table 2 also shows the latent transition probabilities based on the estimated LTA model. Overall, there was a greater likelihood of remaining in the same latent class. The Few Disorders class had the highest stability rate (0.99) and the Fear Disorders class the lowest (0.48). Overall, there was a greater likelihood of transitioning to a less severe class, relative to moving to a more severe class at 2-year follow-up. Those in the Comorbid Disorders class at baseline had relatively high conditional probabilities of transitioning to the Distress Disorders class (.12) or Fear Disorders class (.33) at 2-year follow-up. Those in the Distress Disorders class (.43) or Fear Disorders class (.47) had relatively high conditional probabilities of transitioning to the Few Disorders class.

LTA Classification Quality and Assignment of Participants to Transition Classes

Classification quality of the LTA models was evaluated based on entropy and average posterior probabilities for each transition class.

Table 1
Fit Statistics for the Latent Class Analyses of Emotional Disorders

Model description	Log-likelihood	BIC	Entropy
2-Class	−9659.522	19421.096	.739
3-Class	−9510.149	19200.850	.686
4-Class	−9398.240	19071.234	.723
5-Class	−9359.344	19103.344	.760
6-Class	−9329.021	19168.299	.796
7-Class	−9310.453	19272.465	.844

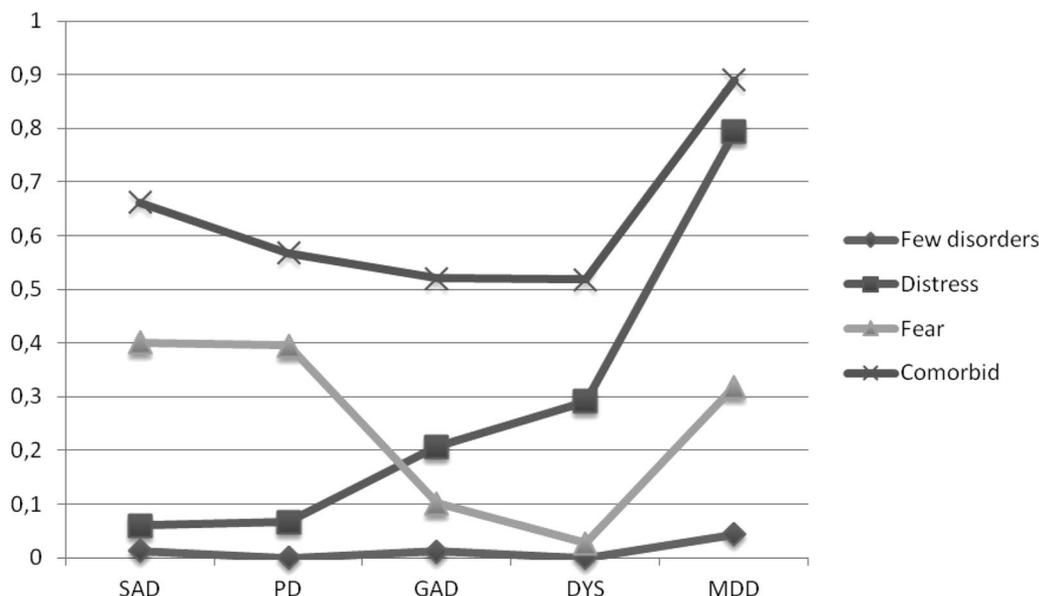*Note.* BIC = Bayesian Information Criterion.

Figure 1. Final four-class LCA model of latent comorbidity classes depicting estimated probability of disorder diagnosis. This graph represents the LCA solution at baseline and at 2-year follow-up. The *y* axis represents the estimated probability of disorder diagnosis; SAD = social anxiety disorder; PD = panic disorder w/o agoraphobia; GAD = generalized anxiety disorder; DYS = dysthymia; MDD = major depressive disorder.

Values closest to 1.0 represent more certainty in classification. Entropy was reasonable (.72) (see Table 1) and posterior probabilities at baseline (Few Disorders class: .86; Distress Disorders class: .64; Fear Disorders class: .82; Comorbid Disorders class: .84) and 2-year follow-up (Few Disorders class: .91; Distress Disorders class: .74; Fear Disorders class: .78; Comorbid Disorders class: .79) were all above .70 except for the Distress Disorders class at baseline. The reasonable classification quality found supported the post hoc assignment of participants to transition classes based on their highest probability value.

Table 3 shows the sociodemographic and clinical characteristics of members of the four latent comorbidity classes. As can be derived from this table, the level of depressive and anxiety symptoms and prevalence of emotional disorders across classes provide evidence for the external validity of the classes as identified by LCA. In general, the Few Disorders class shows the most favorable and the Comorbid Disorders class the most dysfunctional scores. The Fear and Distress Class obtain comparable scores positioned between these two extreme classes.

As to be expected, the Fear Disorders class manifest higher prevalences for PD and SAD and higher levels of anxiety (BAI) than the Distress Disorders class, while a reverse relationship was observed regarding prevalence of MDD, Dys, and GAD and level of IDS scores.

Multinomial logistic regression analyses to examine baseline NEO-FFI predictors of transition of class membership with the Few Disorders class as reference category, while controlling for age, gender, and education, did not prove to be feasible because five of the possible 16 (4^2) transition classes were empty. This resulted in a quasi-complete separation of data points compromising a maximum likelihood estimation and valid prediction model. Consequently, transition classes were collapsed into two categories, defined with the goal of examining the groups of greatest clinical significance. *Stayers* included participants who remained in the same latent class during the 2-year follow-up period (*n* = 1894; 73.8%), of which 1187 belonged to the class of Few Disorders. *Improvers* (*n* = 652; 25.4%) included participants who transitioned from the Comorbid Fear and Distress

Table 2

Proportion in Each Latent Class and Latent Transition Probabilities Based on the Estimated Four-Class Model

	Proportion		Latent transition probabilities			
	Baseline	2-yr FU	Few	Distress	Fear	Comorbid
Few	42.7%	63.8%	**.991**	.000	.000	.009
Distress	14.8%	10.3%	.431	**.554**	.000	.014
Fear	31.1%	18.5%	.468	.023	**.477**	.033
Comorbid	11.4%	7.3%	.048	.118	.327	**.506**

Note. Few = Few Disorders; Numbers in the table represent the estimated conditional probability of membership in the latent class at 2-year follow-up. Bolded numbers on the diagonal represent stability in class membership across time, and the off-diagonals represent movement among the classes.

Table 3

Baseline Characteristics of Participants Assigned to the Latent Comorbidity Class With the Highest Posterior Probability

	Few disorders (n = 1196)	Fear (n = 672)	Distress (n = 458)	Comorbid (n = 240)	F test/χ^2 analysis	Bonferroni contrasts (p < .01)
Sociodemographics						
Age	42.9 (13.9)	40.6 (12.4)	42.0 (12.5)	42.3 (11.5)	4.187**	C > F
Female gender (%)	782 (65.4%)	470 (69.9%)	292 (63.8%)	156 (65.0%)	5.936	n.a.
Education	12.7 (3.2)	12.0 (3.2)	12.3 (3.2)	11.0 (3.5)	19.307***	C, F, D > F + D; N > F
Psychiatric status						
MDD (%)	0 (0.0%)	255 (37.9%)	420 (91.7%)	222 (92.5)	1643.571***	C < F < D = F + D
Dysthymia (%)	0 (0.0%)	9 (1.3%)	103 (22.5%)	121 (50.4%)	764.695***	C < F < D < F + D
GAD (%)	37 (3.1%)	79 (11.8%)	84 (18.3%)	158 (65.8%)	665.609***	C < F < D < F + D
SAD (%)	0 (0.0%)	364 (54.2%)	11 (2.4%)	171 (71.3%)	1212.428***	C < D < F < F + D
Panic disorder (%)	0 (0.0%)	370 (55.1%)	14 (3.1%)	149 (62.1%)	1129.849***	C < D < F = F + D
Symptom severity						
Depression (IDS)	11.3 (8.6)	25.4 (11.3)	28.0 (11.3)	39.4 (10.9)	746.445***	C < F<D < F+D
Anxiety (BAI)	5.6 (5.9)	16.6 (10.1)	12.7 (8.7)	23.7 (10.4)	472.450***	C < D<F < F+D
Personality (NEO-FFI)						
Neuroticism	30.0 (8.1)	40.1(6.9)	39.7 (6.6)	46.0 (5.7)	527.495***	N < F = D < F + D
Extraversion	40.4 (6.5)	35.3 (6.7)	34.6 (6.8)	30.7 (6.4)	214.880***	N > F = D > F + D
Conscientiousness	44.1 (5.5)	40.7 (6.6)	39.9 (6.6)	37.6 (6.2)	115.734***	N > F = D > F + D
Agreeableness	45.0 (4.8)	43.5 (5.2)	43.3 (5.2)	41.5 (5.6)	37.555***	N > F = D > F + D
Openness	38.5 (5.7)	38.6 (6.1)	38.9 (5.9)	37.1 (6.3)	5.368***	N = F = D > F + D

Note. MDD = Major Depressive Disorder; GAD = Generalized Anxiety Disorder; SAD = Social Anxiety Disorder; IDS = Inventory of Depressive Symptoms; BAI = Beck Anxiety Inventory; NEO-FFI = NEO Five-Factor Inventory; C = Few Disorders class; F = Fear class; D = Distress class; F + D = Comorbid Disorders class.
** p < .01.　　*** p < .001.

Disorders class into the Fear Class (*n* = 58), Distress class (*n* = 29), or Few disorders class (*n* = 0) and participants who transitioned from the Fear Disorders class (*n* = 317) or Distress Disorders class (*n* = 248) into the Few Disorders class. Collapsing the groups into these two categories necessitated the exclusion of 20 participants (nine members from the Few disorder class transitioned to the Comorbid class, four members from the Fear class to the Distress class, and seven members of the Fear class to the Comorbid class).

Number of Latent Personality Classes

Next, LCA was used as a measurement model to identify unique latent personality classes at baseline. Models specifying one to seven class solutions were run, and a five-class solution provided the best relative fit to the data based on BIC (82968.260). Although the BIC value of the six-class solution (82966.452) was somewhat lower, adding a sixth class did not lead to a significant increase of fit, as indicated by the Lo-Mendell-Rubin test (LMRT) (47.892, *p* = .1231). Therefore, we decided to use a five-class model as the best fitting solution.

Figure 2 depicts the profiles of the classes. Estimated z scores for each class in the five-class solution show generally parallel estimates for N, E, and to a lesser extent C and A, which suggests that the latent classes are distinguished primarily by varying degrees of endorsement of these personality traits, rather than by endorsement of specific personality traits. The first (8.85%), second (9.08%), and third class (40.92%) manifest relatively high scores for N and relatively low scores for E in particular and on the basis of these high scores for emotional instability and introversion were characterized as High, Medium, and Low

Overcontrollers. The fourth (36.32%) and fifth class (4.83%) consist of participants with relatively low scores for N and relatively high scores for E and consequently were characterized as Medium and High Resilients.

Classification quality of the LTA models was evaluated based on entropy and average posterior probabilities for each personality class. Entropy was reasonable (.69) and posterior probabilities were all above .70 with one exception (High Overcontrollers: .75; Medium Overcontrollers: .68; Low Overcontrollers: .77; Medium Resilients: .85 and High Resilients: .84). Cross-classification with baseline *DSM–IV* CIDI diagnoses using chi-square analyses showed a significant association of the latent personality classes with PAN ($\chi^2(4)$ = 176.67, *p* < .001), SAD ($\chi^2(4)$ = 413.01, *p* < .001), GAD ($\chi^2(4)$ = 240.09, *p* < .001), DYS ($\chi^2(4)$ = 198.50, *p* < .001), and MDD ($\chi^2(4)$523.02 *p* < .001) with gradually decreasing prevalences of each disorder from the class of High Overcontrollers to the class of High Resilients. A similar pattern of results was observed analyzing differences in symptom severity between the five personality classes. Analysis of variance indicated significant class differences with respect to IDS scores, $F(4, 2561)$ = 605.01, *p* < .001, and BAI scores, $F(4, 2561)$ = 251.92, *p* < .001. Post hoc Bonferroni comparisons showed significant differences in IDS and BAI scores for each pairwise comparison of personality classes (*p* < .001).

Predictors of Latent Class Transition

Next, we performed hierarchical logistic regression analyses to examine the predictive value of personality for transitioning to a less severe comorbidity class, while controlling for age, gender, and education. In these analyses we contrasted the Improvers (*n* =
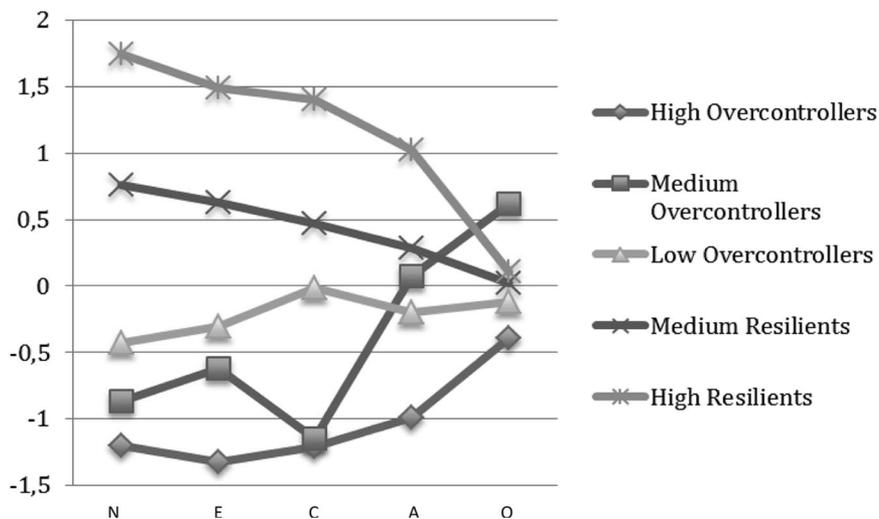
Figure 2. Final five-class LCA model of latent personality classes depicting estimated z scores. This graph represents the LCA solution at baseline. The *y* axis represents the estimated standardized score; N = Neuroticism (low); E= Extraversion; C= Conscientiousness; A = Agreeableness; O = Openness to experience.

652) with the Stayers from the Fear, Distress and Comorbid Disorders class ($n = 707$) excluding members of the Few Disorders class who by definition could not improve ($n = 1196$). First, we analyzed the predictive value of the latent personality classes (collapsing the classes of Medium and High Resilients because after excluding the Few Disorders class only 12 of the 124 High Resilients were retained for further analysis). Relative to Resilients, High Overcontrollers (OR = .347; 95% CI = .233–.516), Medium Overcontrollers (OR = .477; 95% CI = .323–.704) and Low Overcontrollers (OR = .664; 95%CI = .489–.903) showed a smaller likelihood of transitioning to a less severe psychopathology class. Moreover, after including IDS and BAI scores into the prediction model, latent personality classes remained a significant predictor of latent class transition (OR of High Overcontrollers = .545; 95% CI = .347–.855; OR of Medium Overcontrollers = .648; 95% CI = .427–.984), although the difference between Resilients and Low Overcontrollers was no longer significant (OR = .840; 95% CI = .605–1.166) (see Table 4 for the final model).

Next, we examined the predictive value of the individual Big Five trait scores. As can be derived from Table 5 each of the Big Five personality traits except for O was a significant univariate predictor for transitioning to a less severe comorbidity class. Entering scores for the Big Five traits into the regression equation simultaneously, while controlling for age, gender, and education, showed that besides N (OR = .786, 95% CI = .659–.938) only C (OR = 1.171; 95% CI = 1.037–1.323) remained predictive of improvement. However, adding IDS and BAI scores to the prediction model greatly attenuated the predictive value of N (OR = .964: 95% = .785–1.183), whereas C remained a significant predictor (OR = 1.184; 95% CI = 1.047–1.338), suggesting that participants with higher levels of conscientiousness have a higher probability of transitioning to a class with less severe psychopathology irrespective of their level of depressive and anxiety complaints. Results of the final model are presented in Table 5.

To examine the predictive value of the latent personality classes over and above the individual Big Five trait scores, we also performed a logistic regression equation with simultaneous entry of N, E, C, A and O and the latent personality classes, while controlling for age, gender, and education. Besides N (OR = .758, 95% CI = .608-.946) and C (OR = 1.195; 95% CI = 1.024–1.394) neither E, A, and O nor the latent personality classes significantly predicted improvement.

Discussion

The overall goal of this prospective study was to investigate whether the Big Five personality model predicts changes in comorbidity patterns during a 2-year follow-up period. First, it was determined whether with a person-centered approach like Latent Class Analysis (LCA) comorbidity patterns can be identified. We found that a four-class model provided the best fitting solution for *DSM–IV* based diagnoses of panic disorder (PAN), social anxiety disorder (SAD), generalized anxiety disorder (GAD), dysthymia (DYS), and major depressive disorder (MDD) at baseline and 2-year follow-up. The classes were labeled as follows: Few disorders (as indicated by a low probability for any disorder), Fear (as indicated by a high probability for PAN and SAD), Distress (as indicated by a high probability for MDD, DYS and GAD), and Comorbid Disorders (as indicated by a high probability for any disorder). Level of depressive and anxiety symptoms and prevalence of emotional disorders across classes provided compelling evidence for the external validity of the four comorbidity classes. The solution resembles the results of a recent LCA of common mental disorders from two nationally representative epidemiological samples (Vaidyanathan et al., 2011) yielding five latent classes also including a latent externalizing class characterized by alcohol and drug dependence and conduct disorder (i.e., diagnoses that were not assessed in the present study). Moreover, our latent comorbidity classes are in agreement with the dimensional

Table 4
Results of Hierarchical Logistic Regression Analyses Predicting Transitioning to a Latent Class With Less Comorbidity by Latent Personality Class

Predictors	β	SE	p>|z|	Multivariate		Univariate	
				OR	95% CI	OR	95% CI
Age	−.111	.060	.066	.895	.795–1.007	**.884**	.798–.991
Gender	−.116	.120	.333	.891	.705–1.126	.865	.677–1.105
Education	−.036	.058	.529	.964	.864–1.080	1.051	.945–1.169
Personality classes							
Resilient (ref.cat.)							
H overcontrolled	−.608	.230	=.008	**.545**	.347–.855	**.346**	.234–.512
M overcontrolled	−.434	.213	=.042	**.648**	.427–.984	**.476**	.322–.702
L overcontrolled	.174	.167	.297	.840	.605–1.166	**.652**	.481–.884
Depression (IDS)	−.244	.092	=.008	**.783**	.654–.938	**.658**	.581–.745
Anxiety (BAI)	−.103	.073	.160	.902	.782–1.041	**.752**	.675–.838

Note. Odds ratio (OR) of transitioning to a latent class with less psychopathology versus staying in the same latent class excluding participants from the Few Disorders class. Bolded numbers represent statistically significant ORs; H = High; M = Medium; L = Low.

distress-fear model of emotional disorders differentiating between an "anxious-misery" (MDD, DYS, GAD, and posttraumatic stress disorder (PTSD)), and "fear" (PD, SAD, agoraphobia without panic (AGO), and simple/specific phobia (PHOB)) latent factor underlying the prevalence of emotional disorders (for a review; see Beesdo-Baum et al., 2009). These results suggest that factor analytic and latent class analysis may be complementary approaches for modeling a set of disorders as latent dimensions or as clusters or groups.

Latent transition probabilities based on the estimated Latent Transitional Analysis (LTA) model showed that there was a greater likelihood of remaining in the same latent class than that of switching to some other class. The Few Disorders class had the highest stability rate (0.99), and almost all members of this class remained disorder free. Members from both the Fear and Distress class had an almost equal probability of around .45 to transition to the Few Disorder class, and members of the Comorbid class had a lower probability to move to the Fear Disorders class (.33) or to the Distress Disorders class (.12). These results strongly resemble

those of a previous analysis of the 2-year course of emotional disorders in the present sample using a structural organization of emotional disorders into the two broad *DSM–IV* categories of mood and anxiety disorders (in which GAD is subsumed under the anxiety disorders) (Penninx et al., 2011). Using the *DSM–IV* model, psychiatric status at 2-year follow-up was more favorable in participants with pure anxiety or pure depression compared with participants with comorbid anxiety and depression diagnoses.

A second aim of our study was to investigate the Big Five personality model as a predictor of transitions among latent comorbidity classes during the 2-year follow-up study. Adapting a person-centered approach to personality description, we first tried to define latent personality classes using LCA. The best fitting solution suggested five classes, which primarily differed in the degree of endorsement of Neuroticism (*N*), Extraversion (*E*) and to a lesser extent Conscientiousness (*C*) and Agreeableness (*A*), while Openness to experiences (*O*) was not systematically related to personality class. As De Fruyt et al. (2002) we were unable to replicate the three prototypes described by Caspi (1998) and Asen-

Table 5
Results of Hierarchical Logistic Regression Analyses Predicting Transitioning to a Latent Class With Less Comorbidity by Big Five Personality Traits

Predictors	β	SE	p>|z|	Multivariate		Univariate	
				OR	95% CI	OR	95% CI
Age	−.116	.063	.065	.890	.787–1.007	**.884**	.798–.991
Gender	−.145	.125	.246	.865	.677–1.105	.865	.677–1.105
Education	−.022	.061	.718	.987	.868–1.102	1.051	.945–1.169
NEO-FFI scores							
Neuroticism	−.037	.104	.725	.964	.785–1.183	**.673**	.582–.779
Extraversion	.083	.076	.274	1.086	.936–1.260	**1.337**	1.189–1.504
Openness	−.046	.059	.438	.955	.851–1.072	.983	.886–1.091
Agreeableness	.064	.060	.292	1.066	.947–1.199	**1.169**	1.051–1.301
Conscientiousness	.169	.063	=.007	**1.184**	1.047–1.338	**1.310**	1.178–1.458
Depression (IDS)	−.210	.098	=.032	**.810**	.669–.982	**.658**	.581–.745
Anxiety (BAI)	−.122	.075	.104	.885	.765–1.025	**.752**	.675–.838

Note. Odds ratio of transitioning to a latent class with less psychopathology versus staying in the same latent class excluding participants from the Few Disorders class. Bolded numbers represent statistically significant ORs; H = High; M = Medium; L = Low.

dorp and colleagues (2001) (i.e., resilient, over- and undercontrolled persons) using NEO scores. However, given the nature of our sample with primarily anxiety and depression diagnoses, it was also rather unlikely to identify a latent class of undercontrollers, a group characterized by externalizing problems in particular. Overcontrollers, however, represent a cluster of persons demonstrating internalizing behavior such as anxiety and depression and were predominant in our study sample. Our labeling of the classes as ordinal categories ranging from high and medium Resilients (low N and high E) to low, medium and high Overcontrollers (high N and low E) was cross-validated by corresponding increasing prevalences of disorders and levels of symptom severity.

Latent personality class proved to be a significant predictor of transition to a less severe comorbidity class with low, medium, and high Overcontrollers being less likely to move to a class with less severe comorbidity compared with Resilients. These results were essentially replicated using a variable-centered approach. Investigation of individual trait scores showed that N, E, C, and A had significant univariate associations with transitioning to a less severe comorbidity class. The predictive value of the temperamental core dimensions of N and E is in accordance with the reformulated integrative hierarchical model of depression and anxiety (Clark, Watson, & Mineka, 1994). However, of note is that the predictive value of E was no longer significant after taking the influence of the other personality traits into account and that only N and C remained significant multivariate predictor of transitioning to a less severe comorbidity class controlling for the other Big Five traits. Moreover, latent personality class was not predictive of improvement over and above N and C suggesting that N and C are the most influential personality traits affecting changes in comorbidity.

Our study is one of the first prospective studies to show that of the Big Five personality dimensions, in particular conscientiousness as a putative general factor is predictive for the course of emotional disorders. Conscientiousness has received little attention in relation to emotional disorders and consequently relatively few theoretical models or empirical data to interpret our findings are available. A pivotal study on the importance of conscientiousness is the study of Anderson and McLean (1997), who reported that in depressed patients conscientiousness had incremental utility in predicting depression scores at 6-month follow-up beyond the effects of social support, life stressors, and general psychiatric symptomatology. These authors already stressed the necessity of integrating conscientiousness in current conceptualizations of emotional disorders and hypothesized that inability to successfully perform, carry out tasks, and solve problems will be associated with an increased likelihood of negative self- and outcome expectancies (cf. Lonigan, Vasey, Phillips, & Hazen, 2004). In addition, persons low in conscientiousness are prone to failures and poor coping, and in this way conscientiousness may also increase exposure to negative life events (cf. Compas, Connor-Smith, & Jaser, 2004).

Our third study aim was to evaluate the extent to which current symptom severity confounds the relationship of personality with transitioning to another latent comorbidity class as almost none of the available studies tried to control for possible state effects of depression or anxiety. Adding severity of depressive and anxiety symptoms to our prediction models showed that in particular baseline severity of depressive symptoms was a strong predictor of transitioning to a less severe class, which attenuated the predictive

value of personality. After correcting for symptom severity, high and medium Overcontrollers remained less likely to move to a less severe comorbidity class compared with Resilients. However, being a low Overcontroller was no longer predictive for improvement. Moreover, the predictive value of N was completely nullified ($p = .725$). The attenuation of the predictive value of personality classes may also be primarily attributable to the central role of N in defining our latent personality classes.

These results are consistent with the assertion that N is positively associated with emotional disorders because N can be reduced to a minor expression of depression or anxiety and therefore the relationship is tautological (Ormel et al., 2004). However, we may have "overcontrolled" for the effects of N in our multivariate analyses and the possibility that higher depression or anxiety scores are a direct consequence of personality pathology rather than just depression or anxiety awaits further longitudinal studies. Content overlap of measures of N and psychopathology does not largely explain the associations of N with psychopathology as a general neurotic facet better predicts both depressive and anxiety symptoms than the depression resp. anxiety facet of N (Uliaszek et al., 2009). Evidently, more studies are needed to elucidate the underlying mechanisms that relate the various facets of N to emotional disorders.

One of our most striking findings is that the predictive value of C for transitioning to a less severe comorbidity class remained significant over and above the effect of symptom severity. C may be more immune for state effects (Karsten et al., submitted). Moreover, C is quite stable across the adult life span (Costa & McCrae, 1988) and manifests substantial heritability (Bergeman et al., 1993). This finding again underscores the need to pay more attention to the link between conscientiousness and emotional disorders, which up till now has received little attention in present theories of anxiety and depression.

It is appropriate to comment on the use of LCA and LTA in analyzing our data. Both LCA and LTA assume conditional independence. This assumption requires that all observed variables (i.e., psychiatric diagnoses and Big Five personality traits in the present study) be statistically independent within each latent class. Although we excluded the diagnosis of Agoraphobia for this reason, it is likely that this assumption was still violated to a certain extent. An alternative data analytic approach would have been to use Confirmative Factor Analysis (CFA) to assess the latent structure of psychopathology and personality and additionally Structural Equation Modeling (SEM) to assess the stability of psychopathology (for a review; see Beesdo-Baum et al., 2009). However, the appropriateness of CFA and SEM to assess the latent structure of psychopathology and its stability has been questioned. The major criticism is that a CFA on tetrachoric correlations of psychiatric diagnoses (nominal response variables) implicitly assumes that the joint distribution underlying two disorders is bivariate normal—the latent variables being linearly and uniformly related to one another (Kraemer, 1997). Also this assumption is likely to be violated, given the type of data used. Because SEM-based methods do not readily capture (predictors of) change in clinical status but are more suited to analyze predictors of change on an underlying latent vulnerability factor, we decided to analyze our data using LCA and LTA. Future research directly comparing latent dimensional and latent class models of the overarching

domain of emotional disorders is needed to clarify these methodological issues.

Strengths of this study include the following: (a) a prospective and longitudinal design in a representative sample of participants with or without a current emotional disorder at baseline from different recruitment settings; (b) use of a structured diagnostic interview to assess presence of emotional disorders; (c) examining the predictive value of the Big Five personality dimensions from a variable- and person centered perspective; and (d) use of latent class analyses to identify latent personality and psychopathology classes and latent transition analyses to examine predictors of change in class membership.

Finally, at least five limitations of this study merit consideration: (a) The NESDA study only investigates the most prevalent emotional disorders, and a wider range of diagnoses (including e.g., PTSD and OCD) would have been desirable for assessing more diagnoses as indicators for latent classes; (b) by using the NEO-FFI, only higher-order personality traits were investigated; (c) although the fit of our LCA and LTA solutions was reasonable, assigning individuals to the class with the highest posterior probability may have resulted in some error in class assignment; (d) agoraphobia could not be included in the analyses because the LCA assumption of conditional independence of indicators within latent classes was violated; (e) the follow-up period of 2 years may have been too short, and it is conceivable that the effect of other personality dimensions on changes in comorbidity patterns become more evident after a more extended follow-up period.

A person-centered approach to study patterns of comorbidity among emotional disorders and different personality types constitutes a valuable approach to investigate personality as a predictor of changes in comorbidity patterns. A more holistic approach to analyze how clusters of disorders interact with each other is needed to gain a better understanding of the complexity of comorbid relations and putative predictive variables (Cerda, Sagdeo, & Galea, 2008). More specifically, we conclude that overcontrollers (i.e., emotionally instable and introverted individuals) are less likely to develop a less severe pattern of comorbid emotional disorders. In particular, the individual trait of conscientiousness may be less dependent on current levels of anxiety and depressive symptoms and be a key pathoplastic or even predisposing variable in anxiety and depression. Further research on the role of conscientiousness in the onset and course of emotional disorders seems warranted.

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