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Change in Self-Reported Personality During Major Depressive Disorder Treatment: A Reanalysis of Treatment Studies From a Demoralization Perspective

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Change in self-reported personality trait scores (especially Neuroticism and Extraversion) over the course of treatment for major depressive disorder (MDD) has been robustly demonstrated. We believe that these observed changes on personality trait scales may reflect reduction in demoralization rather than changes in personality per se. Data were combined from 3 archival samples: a randomized clinical trial and 2 naturalistic follow-up studies. All participants ($N = 300$) received either psychotherapy or psychopharmacological treatment. Pre- and posttreatment participants were assessed with the revised NEO Personality Inventory (NEO-PI–R), the 17-item Hamilton Rating Scale for Depression (HRSD–I7), and Beck Depression Inventory—II (BDI–II). Comparisons were made between "unadjusted" and "adjusted" NEO-PI–R substantive personality trait scales—in which demoralization-related items were removed from their original trait scale (i.e., adjusted NEO-PI–R scales) and also used to form a separate NEO demoralization scale (NEOdem). The NEOdem scale changed more over the course of treatment ($d = .41$) compared with the adjusted NEO-PI–R scales, which manifested only small changes ($d < |.19|$). Moreover, the adjusted NEO-PI–R trait scales revealed much smaller changes compared with their unadjusted counterparts. The study provides further support for the utility of distinguishing between demoralization and NEO-PI–R traits in clinical assessment and research. A substantial part of change in self-reported personality during treatment for depression resulted from a reduction in demoralization.

Keywords: demoralization, five-factor model, major depressive disorder, NEO-PI–R, clinical assessment

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Change in self-reported personality trait scores (especially Neuroticism and Extraversion) following the successful treatment of a major depressive episode has been shown across several studies (e.g., Costa, Bagby, Herbst, & McCrae, 2005; Quilty, Meusel, & Bagby, 2008; Tang et al., 2009). For example, in a placebo-controlled RCT study, Tang et al. found that patients with major depressive disorder (MDD) treated with paroxetine reported greater personality change than patients in the placebo condition, even after controlling for change (reduction) in depressive symptom severity. Knutson et al. (1998) reported changes in personality in response to the administration of an SSRI-based antidepressant (paroxetine) in participants who did not meet the diagnostic criteria for MDD. Bagby, Levitan, Kennedy, Levitt, and Joffe (1999) reported similar changes in a sample of depressed outpatients in response to administration of either SSRI's (paroxetine or sertraline) or noradrenergic (desipramine) antidepressants—these effects could not be attributed to change in depression severity. Several other studies have generated support for the notion that personality change may precede (Tse & Bond, 2001) or even mediate (Quilty et al., 2008) change in depression severity. In combination, the results from these various investigations suggest that observed changes in scores on self-report personality tests cannot be fully attributed to state effects of MDD, and that pharmacologically based treatment of depression and even psychological interventions for MDD might alter the underlying biological bases of personality traits (e.g., Costa et al., 2005; Tang et al., 2009), which in turn results in observed changes in both self-reported personality traits and symptoms of depression. The present study aims to test an alternative hypothesis; namely, that change in scores on self-reported personality trait scales in response to treatments for depression reflects change (a decrease) in demoralization and not personality traits per se.

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Personality and the Demoralization Construct

In recent years, a substantial body of empirical research has demonstrated the long surmised theoretical notion (Tellegen, 1985) that self-reported personality, as well as measures of psychological adjustment, can be strongly influenced by the general phenomenon of demoralization. Demoralization refers to a subjective sense of nonspecific unhappiness and dissatisfaction with life, which is shared by individuals with a broad range of psychological, social, or medical problems (e.g., Clarke & Kissane, 2002; Connor & Walton, 2011; de Figueiredo & Frank, 1982). It is an affective phenomenon of specific importance for clinical assessment that has been psychometrically demarcated on the basis of the well-established theory of self-reported positive and negative affect (Tellegen, 1985; Watson & Tellegen, 1985; Watson, Wiese, Vaidya, & Tellegen, 1999).[1] Demoralization can have a negative impact on the discriminant validity of scales used in clinical assessment (e.g., Noordhof, Sellbom, Eigenhuis, & Kamphuis, 2015; Sellbom, Ben-Porath, and Bagby, 2008; Tellegen, Ben-Porath, & Sellbom, 2009; see, e.g., Ben-Porath, 2012, for a review). For instance, Dohrenwend, Shrout, Egri, and Mendelsohn (1980) argued that many psychiatric screening scales are saturated with a nonspecific psychological distress factor, more so than being related to any specific disorder. Demoralization is not, however, merely a form of measurement bias, but a conceptually broader construct with specific and distinct associations with a wide range of clinically relevant negative outcomes (e.g., treatment dropout, suicidality; see Ben-Porath & Tellegen, 2008/2011).

The influence of demoralization on clinical assessment has been extensively documented in the context of the Minnesota Multiphasic Personality Inventory—2 (MMPI–2; e.g., Sellbom et al., 2008; Tellegen et al., 2009). For this instrument, Tellegen et al. (2003) demonstrated how the influence of demoralization on the measurement of psychopathology can be reduced, and the subsequent removal of items contributing to its variance from the MMPI–2 item pool, ultimately lead to development of the MMPI–2 Restructured Form (MMPI–2–RF; Ben-Porath and Tellegen, 2008/2011), which is the most recent and revised version of the family of MMPI instruments. As an extension of this line of research, Noordhof et al. (2015) demonstrated that the scales of the revised NEO Personality Inventory (NEO-PI–R; Costa & McCrae, 1992) also contain a substantial number of items related to demoralization. Using a latent variable analytic schema akin to Tellegen et al.'s approach, Noordhof et al. (2015) empirically distinguished demoralization from personality traits proper and subsequently removed demoralization-related items from the original NEO-PI–R domain scales, deriving a separate NEO-PI–R demoralization scale (NEOdem) and created a set of "adjusted" NEO-PI–R domain scales (i.e., those with demoralization-related items removed). These adjusted NEO-PI–R domain scales showed better discriminant validity than their original ("unadjusted") counterpart scales.

Demoralization should not be mistaken for the symptoms of MDD (Wellen, 2010). In common parlance the word *depression* may specifically refer to the category and criteria of MDD, but also connotes a subjective sense of unhappiness and dissatisfaction with life. The latter phenomenon is closely related to Tellegen's (1985) notion of demoralization as nonspecific, self-reported unpleasant affect. Demoralization differs from MDD in that it is both more encompassing (i.e., nonspecific unpleasant affect, including distress, distinguishable from pure anhedonia or vegetative symptoms) and more general (i.e., associated with a broad range of disorders and not only MDD). Furthermore, and of crucial importance for the current study, it is hypothesized to be strongly associated with the subjective expression of distress and unhappiness reflected especially on self-report questionnaires like the MMPI–2 or NEO-PI–R.

The Current Study

In the current study we utilize these previously developed distinctions in order to clarify the nature of change in self-reported personality traits over the course of treatment for MDD. Both psychopharmacological treatment and psychotherapy may well have a marked effect on the nonspecific subjective unhappiness, which characterizes demoralization. If—as is hypothesized in the current study—some self-reported personality traits are strongly influenced by demoralization, then changes in demoralization due to either psychotherapy or psychopharmacological treatment may well be due to changes in demoralization as well.

If observed "personality change" in response to treatment for depression could indeed be attributed to change in demoralization, this would not necessarily imply that personality does not change at all. As argued by Ormel et al. (2013) and Costa et al. (2005), measures of personality and psychopathology may be influenced by the same underlying biological traits and the same logic may apply to demoralization. Therefore, we concur with Riese, Ormel, Aleman, Servaas, and Jeronimus (2016) that "statistically controlling for depression" does not properly take into account the full complexity of associations between psychopathology and personality traits and may well result in underestimating trait-effects. At the same time, *not* taking these effects into account does not do justice to this complexity either (Bianchi & Laurent, 2016). Widiger and Smith (2008) conceptually distinguished several possible relationships between personality and mental disorders: pathoplastic (e.g., temporary effects of psychopathology on personality), etiological (lasting effects of psychopathology on personality or vice versa) and spectrum relationships (personality scales and psychopathology are not completely distinct phenomena, but related to a shared spectrum). Ormel et al. (2013) made similar distinctions in a review on the association between Neuroticism and common mental disorders and concluded that previous studies supported aspects of several of these differing models.

It is important to note that traits like Neuroticism do not represent a narrowly delineated phenomenon, but rather a heteroge-

[1] Specifically, demoralization was derived from the circumplex model of self-reported affect (Watson & Tellegen, 1985). On this circumplex the axes of positive affect (PA) and negative affect (NA) can be distinguished, which have been related to the Behavioral Activation System and Behavioral Inhibition System respectively (Watson et al., 1999). However, many items from questionnaires on affective experience are not specifically associated with either PA or NA, but rather with a combination of low PA and high NA (or vice versa), which is evidenced by a dominant pleasantness-unpleasantness axis in the circumplex model. The unpleasant pole can be used to define demoralization; it indicates the nonspecific unpleasant experiences that are common in clinical practice. This central assumption has been the basis in the development of both the restructured MMPI-2 clinical scales (Tellegen et al., 2003) and the adjusted NEO-PI–R scales (Noordhof et al., 2015).

neous domain of associated phenomena. Hence, some aspects of Neuroticism, Extraversion, or Conscientiousness might be associated to MDD mostly due to pathoplastic effects, others due to a spectrum relationship and still others due to etiology. In the current study we assume that NEOdem represents those aspects that are particularly reactive to general unhappiness and difficulties in living that people cannot cope with and to psychopathological conditions associated with such circumstances. Therefore, we expect NEOdem to be specifically associated with improvement over treatment. Such a finding would *not* demonstrate that personality is irrelevant to the etiology or course of depression *nor* (even) that treatment cannot change personality. It would inform, however, what *specific variance in* personality scales changes over the course of treatment for MDD.

Method

Participants

To maximize statistical power, we combined data from archival samples with similar methodological designs. First, data were used from a randomized clinical trial (RCT; $N = 122$) comparing interpersonal therapy ($n = 45$), cognitive behavior therapy ($n = 40$) and pharmacological treatment ($n = 37$). Participants were recruited through advertisements for a study investigating personality and treatment for depression. Second, we included data from a naturalistic, clinical study of referrals to a Mood Disorders Clinic (MDC), during the periods between 1994 and 1999 (MDC-1; $N = 133$) and 2000–2003 (MDC-2; $N = 45$); all these patients in the MDC received pharmacological treatment. Patient characteristics, as well as procedures of the trials, selection-methods and drop-out rates have been detailed elsewhere (RCT; Bagby et al., 2008; MDC-1; Harkness, Bagby, Joffe, & Levitt, 2002; MDC-2; Bagby, Rector, Bacchiochi, & McBride, 2004).

All patients met *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.; *DSM–IV*; American Psychiatric Association, 1994) criteria for current MDD, assessed using the Structured Interview for *DSM–IV*, Axis I Disorders, Patient version (SCID-I/P; First, Spitzer, Gibbon, & Williams, 2002), had a score of 15 or higher on the 17-item Hamilton Rating Scale for Depression (HRSD–I7; Hamilton, 1960), gave informed consent, and were free of antidepressant medications for 2 weeks prior to treatment initiation (4 weeks for Fluoxetine). Patients (from all studies) were excluded if they met *DSM–IV* criteria for seasonal affective disorder, dysthymic disorder, bipolar disorder (current or past), schizoaffective disorder, schizophrenia, and substance abuse or dependence (current or within the past 6 months). Patients were also excluded if their primary diagnosis fell within the anxiety disorders or eating disorders, or if it was antisocial or borderline personality disorder. Individuals who displayed active psychotic symptoms, suicidal or self-harm behaviors, organic brain syndromes and injuries, or concurrent active medical illnesses were also excluded.

Materials and Measurements

Prior to initiation of treatment and posttreatment all subjects completed the NEO-PI–R and were interviewed using the HRSD–I7. In all samples except MDC-1, patients also completed the BDI–II. Psychotherapy was offered for 16 weeks following structured guidelines or based on manualized psychotherapy protocols (IPT, CBT). ADM was administered—also for a period of 16 weeks—in accordance with the Canadian Network for Mood and Anxiety Treatment Guidelines (Canadian Psychiatric Association and the Canadian Network for Mood and Anxiety Treatments., 2001).

Revised NEO Personality Inventory (NEO-PI–R). All participants completed the NEO-PI–R (Costa & McCrae, 1992). The NEO-PI–R has 240 items rated on a five-point Likert scale. These items compose 30 "lower order" facet scales (eight items per facet), and unique sets of six related facets are used to form one of the five "higher order" domain scales [Neuroticism (N), Extraversion (E), Openness (O) to Experience, Agreeableness (A), and Conscientiousness (C)] of the five-factor model of personality, as conceptualized by Costa and McCrae (1992). For these five domain scale scores, previous work showed good reliabilities in both "normal" (Costa & McCrae, 1992) and patient samples (Costa, Bagby, Herbst, & McCrae, 2005; De Fruyt, Van Leeuwen, Bagby, Rolland, and Rouillon, 2006; Santor, Bagby, & Joffe, 1997). The factor structure of the NEO-PI–R is also retrievable in patient samples (Bagby, Costa, et al., 1999).

We used two sets of NEO-PI–R personality domain scales—the "original" NEO-PI–R scales (N, E, O, C and A) and a set of "adjusted scales" developed by Noordhof et al. (2015) for Neuroticism (N_{adj}), Extraversion (E_{adj}), Agreeableness (A_{adj}) and Conscientiousness (C_{adj}).[2] The adjusted scales did not include items that formed the NEO demoralization scale created by Noordhof et al. (2015; NEOdem; see Table 1). Coefficient alpha estimates as well as test–retest correlations for these adjusted scales and the original scales for the current sample are reported in Table 2.

Hamilton Rating Scale for Depression. The Hamilton Rating Scale for Depression (HRSD–I7; Hamilton, 1960) is the most frequently used interview-based scale that assesses presence and severity of depressive symptoms. Many of its psychometric properties have been well established in numerous settings and populations (Bagby, Ryder, Schuller, & Marshall, 2004): reliability (internal, interrater, test–retest), convergent validity, discriminant validity, and predictive validity. However, factor analytic studies (see Bagby, Ryder, et al., 2004) indicate a multidimensional structure which is neither entirely clear nor replicable over samples. Nevertheless, the instrument can be regarded as a valid and reliable indicator of severity of depression. Although there are several versions of the Hamilton depression scales (Bagby, Rector, et al., 2004), all the patients across the three studies used in the current investigation were administered the 17-item version. Total scores range from 0 to 52. Scores between 7 and17 indicate mild, between 18 and 24 moderate, and scores higher than 24 reflect severe depression.

Beck Depression Inventory—II. The Beck Depression Inventory—II (BDI–II; Beck, Steer, & Brown, 1996) is a widely used self-report rating scale that assesses the presence and severity of depressive symptoms. The 21 items follow a multiple-choice format, and scores can range from 0 to 3, or 0 to 63 in total, with scores between 14 to 19 indicating mild, between 20 to 28 mod-

[2] The Openness-scale (O) did not include any demoralization-related items (Noordhof et al., 2015) and therefore no O_{adj} scale was developed.

Table 1
The Items of the NEO-PI–R Demoralization Index

Item	Facet	Description of content
1	Nanx	Worried
2	Nanx	Fearful thoughts
3	Ndep	Lonely or sad
4	Ndep	Worthless
5	Ndep	Sad or depressed
6	Ndep	Self-blame
7	Ndep	Sad and hopeless
8	Ndep	Easily disheartened
9	Epem	Not cheerful optimist
10	Epem	Not cheerful and happy
11	Nvul	Helpless
12	Nvul	Able to solve problems myself
13	Nvul	Feel like breaking down
14	Nvul	Emotionally stable
15	Ccom	Not successful in anything
16	Cord	Not able to get things under control
17	Cdis	Difficulty to do what needs to be done
18	Cdis	Don't want to know all things that need to be done

Note. Nanx = Neuroticism–Anxiety; Ndep = Neuroticism–Depression; Epem = Extraversion–Positive Emotionality; Nvul = Neuroticism–Vulnerability; Ccom = Conscientiousness–Competence; Cord = Conscientiousness–Order; Cdis = Conscientiousness–Discipline.

erate, and scores higher than 28 reflecting severe depression. It has been accepted as one of the better self-report measures of depression (Dozois, Dobson, & Ahnberg, 1998) and has been extensively used in both research and practice.

Data Analytic Strategy

In all analyses, comparisons were made between adjusted NEO-PI–R scales (Noordhof et al., 2015) and unadjusted NEO-PI–R scales. The rationale for this strategy was the assumption that the unadjusted scales are influenced by demoralization, whereas in the adjusted scales demoralization is measured as a distinct phenomenon (NEOdem scale; items are reported in Table 1) the influence of which has been removed from the personality domain scales.

Our primary aim was to distinguish between change during treatment in (a) severity of MDD, (b) demoralization, and (c) adjusted personality traits. Before analyzing change, we did several preliminary analyses on the pretreatment associations between these scales. These were based on Pearson product–moment correlations and tested three expectations that follow from the conceptual distinctions discussed in the introduction. First, we expected that adjusted personality trait scales would be less strongly correlated with demoralization (NEOdem) than unadjusted personality scales (N, E, A, C), which was exactly the aim of constructing these scales (Noordhof et al., 2015). In order to avoid confounding due to item-overlap between the unadjusted scales and the NEOdem scale, we subtracted the NEOdem-items from each of the original scales. Steiger's Z-test (based on the Z_1, Formula 14, in Steiger, 1980) was used to test whether differences between correlations were significant. Second, we expected that demoralization (NEOdem) would be specifically correlated with self-reported depression, given that both scales are self-report measures presumably strongly influenced by a demoralized condition upon entering treatment. We expected NEOdem and BDI–II to be associated due to (a) conceptual overlap (BDI-2 capturing some demoralization-related variance), (b) methodological overlap (i.e., self-report), and (c) MDD being associated with a demoralized condition. NEOdem and HRSD–I7 would be mainly associated for this third reason and hence less strongly correlated. However, we did not expect NEOdem and BDI–II to be measuring the same phenomenon. Specifically, we expected that BDI–II would be more strongly and specifically associated with severity of depression symptoms as measured by the HRSD–I7. Third, we inspected associations between personality traits and severity of depression (HRSD–I7, BDI–II). We anticipated that associations between unadjusted personality scales and depression would be inflated due to demoralization. If so, correlations between adjusted scales would be attenuated in comparison.

Subsequently, we used mixed models to estimate significance and effect-sizes of change over time for (a) severity of MDD, (b) demoralization, and (c) adjusted personality traits. In different models each of our scales (BDI–II, HRSD–I7, unadjusted NEO-PI–R scales, adjusted NEO-PI–R scales, NEOdem) was dependent on main effects of time (pre vs. post) and—in order to correct for effects due to the heterogeneity of our sample—main effects of subsample (RCT vs. MDC1 vs. MDC2), treatment-modality (psychotherapy vs. medication), and all 2- and 3-way interactions between time, sample and treatment-modality. The repeated measures (i.e., the treatment effect) were assumed to follow an autoregressive covariance structure with unequal residual variances. These analyses yield many effects, many of which are not significant nor of primary interest for the current study. Hence, in the main results section we focused on describing the effects of interest (i.e., the pre- vs. posttreatment time effects as influenced by demoralization). The effects of sample and treatment modality on the treatment effects are reported in the online supplementary material.

Table 2
Number of Items, Cronbach's Alphas, and Test–Retest Correlations for All Scales Used in the Study

Scale	No. of items	α	$r_{test–retest}$
BDI–II	21		.44
HRSD–17	17		.31
NEO_{dem}	18	.82	.54
N	48	.90	.65
N_{adj}	18	.73	.69
E	48	.91	.82
E_{adj}	29	.81	.82
O	48	.88	.85
A	48	.86	.80
A_{adj}	41	.81	.78
C	48	.91	.78
C_{adj}	36	.88	.79

Note. BDI–II = Beck Depression Inventory—II; HRSD–17 = Hamilton Rating Scale for Depression; NEO_{dem} = NEO-PI–R Demoralization scale as developed by Noordhof et al. (2015); N_{adj} = adjusted NEO-PI–R scale; N = NEO-PI–R Neuroticism; E = NEO-PI–R Extraversion; O = NEO-PI–R Openness; A = NEO-PI–R Agreeableness; C = NEO-PI–R Conscientiousness.

Results

Associations and Distinctions Between Demoralization, MDD, and (Adjusted) Personality Trait Scales

Correlations between severity of MDD symptoms (HRSD–I7, BDI-2), demoralization (NEOdem) and adjusted as a well as unadjusted personality scales are reported in Table 3. First, as expected, adjusted personality scales (N_{adj}, E_{adj}, A_{adj}, C_{adj}) were significantly less strongly correlated with NEOdem than unadjusted personality scales. This attenuation was less pronounced than in a previous study (Noordhof et al., 2015) especially so for C_{adj} ($r = -.46$). However, for N_{adj} and E_{adj} substantial attenuations of the correlation with NEOdem were found. In line with Noordhof et al. (2015), the N_{adj} and E_{adj} scales were also not significantly intercorrelated ($r = .05$, *ns*), in contrast with the unadjusted scales, $r = -.34$, $p < .05$.

Second, NEOdem was indeed associated with self-reported (BDI–II) and less so with interview-based severity of symptoms of MDD (HRSD–I7).[3] Also, the BDI–II was substantially correlated with both HRSD–I7 and NEOdem, which is consistent with the hypothesis that scores on this self-report measure are influenced by two distinct phenomena: demoralization and MDD. Partial correlations provided some additional evidence for this distinction: correcting for NEOdem did not attenuate the association between HRSD–I7 and BDI–II (partial $r = .46$, $p < .05$). Similarly, controlling for HRSD–I7 scores did not attenuate the association between BDI–II and NEOdem (partial $r = .47$, $p < .05$).

Third, as displayed in Table 3, adjusted personality traits were indeed more differentially associated with severity of MDD than unadjusted personality traits. However, discrepancies were not as pronounced as anticipated. Specifically, the association between N_{adj} and BDI–II was substantially lower than between Neuroticism and BDI–II, but for Conscientiousness (vs. C_{adj}) no such reduction was observed. Furthermore, to our surprise, neither E nor E_{adj} were associated with severity of MDD symptoms in our sample. Associations between interview-based severity of MDD (HRSD–I7) and personality scales were generally small ($r < .20$) and mostly nonsignificant.[4] Finally, the correlation between demoralization (NEOdem) and self-reported severity of MDD (BDI–II; $r = .45$) was substantially larger than for each of the adjusted personality scales ($r < |.19|$).

Table 3
Correlations Between (Adjusted) Personality Scales and Depression Measures

Scale	BDI–II	HRSD–17	NEOdem
BDI–II			
HRSD–17	.46*		
NEO_{dem}	.45*	.16*	
N	.34*	.19*	.70*
N_{adj}	.24*†	.16*	.52*†
E	−.12	−.04	−.45*
E_{adj}	−.08†	−.02	−.30*†
O	−.02	−.05	−.07
A	−.08	.04	−.07
A_{adj}	−.08	.04	−.05
C	−.24*	−.02	−.56*
C_{adj}	−.20*†	−.03	−.46*†

Note. BDI–II = Beck Depression Inventory—II; HRSD–17 = Hamilton Rating Scale for Depression; NEO_{dem} = NEO-PI–R Demoralization scale as developed by Noordhof et al., 2015; N_{adj} = adjusted NEO-PI–R scale; N = NEO-PI–R Neuroticism; E = NEO-PI–R Extraversion; O = NEO-PI–R Openness; A = NEO-PI–R Agreeableness; C = NEO-PI–R Conscientiousness.
* $p < .05$. † Steiger's Z-test for difference of correlation between adjusted and unadjusted scale, $p < .05$.

Change in Depression, Demoralization and (Adjusted) Personality Trait Scales During Treatment

The estimated mean change and effect sizes of scale scores from the mixed models for the depression, and the original and adjusted NEO-PI–R scales are displayed in Table 4. As reported in the online supplementary material, effects of treatment-modality and sample-heterogeneity did not substantially affect the main effects that are of primary interest to the current paper. Significant reductions in depressive symptoms between pre- and posttreatment were observed, with large effect sizes on both the BDI–II ($d = -.84$) and HRSD–I7 ($d = -1.15$; more detailed outcome analyses can be found in the original treatment outcome articles as well as in the online supplement). Using the original NEO-PI–R scales, a significant reduction in N was observed ($d = -.35$), as well as significant increases in E ($d = .20$), O ($d = .09$) and C ($d = .09$). The pre- and postmean levels of A remained unchanged. Using the NEO-PI–R adjusted scales, a different pattern emerged. As expected, less change was observed for the adjusted scales than for the original scales (N_{adj}, $d = -.19$; E_{adj}, $d = .14$; and C_{adj} did not show significant change). Moreover, changes in NEOdem ($d = -.41$) were much stronger than those in the NEO-PI–R adjusted scales ($d < |.19|$)).

Discussion

We believe that the results reported in this paper provide further support for the utility of the separating demoralization-related variance from the domain scales of NEO-PI–R (Noordhof et al., 2015). The adjustment of scales allowed testing to what extent observed changes in unadjusted NEO-PI–R scores reflect a reduction in demoralization. The findings show that a substantial portion of change can indeed be attributed to reductions in demoralization, because change in demoralization-adjusted personality-traits were

[3] Extraversion, as well as E_{adj}, would theoretically be expected as indicators of the anhedonic aspects of MDD. The finding of no association in our sample could well result from a restriction of range due to the selection of individuals meeting criteria for MDD. Within such a sample, the heterogeneity of severity of depressive symptoms might well be more strongly associated with Neuroticism and Conscientiousness. A similar argument—restriction of range—may also explain the generally quite low correlations with interview-based severity of MDD (HRSD–I7). Alternatively, the NEO-PI–R Extraversion scale might not be particularly sensitive to anhedonia-specific traits.

[4] Unfortunately, the two alternatives cannot be tested directly, as the study used the shorter NEO-FFI. In some unpublished analyses (can be obtained from the authors upon request) we established that NEO-FFI Neuroticism is particularly saturated with demoralization-related items and hence does not allow for distinguishing other Neuroticism components. This does lend some credibility to the idea that reductions in demoralization account for the results in Tang et al. (2009), but there is no way to test the two competing explanations.

Table 4
Mean Raw Scores and Percentiles Pre- and Posttreatment, Estimated Mean Change in Z Scores, and Cohen's d Effect Sizes for Depression and (Adjusted) Personality Scales

Scale	*n*	Pre		Post		Estimated mean *Z* change (pooled *SD*)[a]	Cohen's *d*
		M (*SD*)	Perc.	*M* (*SD*)	Perc.		
BDI–II	167	30.8 (8.6)		20.5 (10.6)		−1.07 (1.26)**	−0.84
HRSD–17	295	20.0 (4.7)		8.8 (7.5)		−1.84 (1.60)**	−1.15
NEO_{dem}	300	50.6 (8.7)		43.8 (11.5)		−0.66 (1.59)**	−0.41
N	300	121.8 (20.7)	96–97	109.0 (24.3)	90	−0.53 (1.49)**	−0.35
N_{adj}	300	40.9 (7.9)		44.0 (11.4)		−0.27 (1.43)**	−0.19
E	300	86.7 (22.3)	9–12	93.6 (22.7)	16–21	0.28 (1.42)**	0.20
E_{adj}	300	56.7 (12.9)		59.1 (12.5)		0.19 (1.39)**	0.14
O	300	115.5 (19.8)	60–67	117.8 (19.9)	60–67	0.13(1.41)**	0.09
A	300	119.5 (17.9)	42–52	120.1 (16.5)	42–52	−0.02 (1.36)	−0.01
A_{adj}	300	90.5 (13.2)		90.7 (12.2)		−0.05 (1.39)	−0.04
C	300	98.9 (22.5)	7–10	102.6 (21.5)	10–12	0.13 (1.40)*	0.09
C_{adj}	300	77.2 (16.9)		78.7 (15.8)		0.06 (1.40)	0.04

Note. BDI–II = Beck Depression Inventory—II; HRSD-17 = Hamilton Rating Scale for Depression; NEO_{dem} = NEO-PI–R demoralization scale; N_{adj} = adjusted scale; N = NEO-PI–R Neuroticism; E = NEO-PI–R Extraversion; O = NEO-PI–R Openness; A = NEO-PI–R Agreeableness; C = NEO-PI–R Conscientiousness; Perc. = percentile-scores based on norm-tables (Appendix C) provided in Costa and McCrae (1992).
[a] Values are based on the estimated means from the mixed models (see method section). Scores were standardized on pretreatment scores.
* $p < .05$. ** $p < .01$.

clearly attenuated in comparison with original (i.e., nonadjusted) scales.

The results indicate that not only conceptually but also empirically, demoralization can be distinguished from MDD and for the original NEO-PI–R personality traits. In contrast to the original scales, the adjusted personality scales for Neuroticism (N_{adj}) and Extraversion (E_{adj}) were uncorrelated. This replicates results from Noordhof et al. (2015), which used a different sample and provides further support for the hypothesis that the covariance between N and (low) E reflects the shared phenomenon of demoralization. Furthermore, demoralization was associated with self-reported severity of MDD, but the two concepts could be distinguished, as is evident by their markedly different association with interview-based severity of MDD.

Finally, moderate support was found for the hypothesis that correlations of adjusted personality traits with self-reported severity of depression would be attenuated. However, this evidence was less robust than anticipated; it was observed for Neuroticism, but not for Conscientiousness. Furthermore, the results generally show that not all associations between MDD and FFM personality traits (e.g., Kotov, Gamez, Schmidt, & Watson, 2010) result from a common influence of demoralization.

The results of the current paper do not support the hypothesis that change in self-reported personality reflects *exclusively* reduction in demoralization, but rather that it does so *predominantly*. These findings allow for a more fine-grained understanding of observed changes in self-reported personality over the course of MDD treatment (e.g., Quilty et al., 2008; Tang et al., 2009). There are several possible explanations for the associations between personality traits and psychopathology, and different aspects of heterogeneous constructs like Neuroticism and Extraversion may be associated with psychopathology for different reasons. A likely explanation for our findings is that NEOdem captures a construct specifically sensitive to *pathoplastic effects.* If a patient's current difficulties in living, inability to cope, and general unhappiness specifically influence the set of items in the NEOdem scale (see Table 1), then improvement in these areas will primarily result in changes in NEOdem.

It is important to note, however, that the current results do not provide definitive evidence for pathoplasticity. It might, for example, be the case that treatment for MDD causes persistent change in underlying psychobiological traits (see Knutson et al., 1998), which subsequently causes improvement in NEOdem. From this perspective NEOdem would be a specifically sensitive marker of persistent change. Which of these explanations apply should be investigated longitudinally in general population samples rather than in clinical samples. A pathoplastic interpretation would be implied when NEOdem-scores covary with onset and remission of common mental disorders and difficulties in living. A persistent change explanation would be more likely when increases in NEOdem precede onset of these problems and persist after remission.

Regardless of the tenability of either of these explanations, it is informative that NEOdem—a reliable and homogeneous scale derived from a well-established theory of self-reported affect—captured most change in NEO-PI–R over treatment. It is important to note that NEOdem is related, but not equivalent, to the broader construct of Neuroticism. Neuroticism appears to capture demoralization, reactivity to a wide range of emotions—including fear, anger and sadness—as well as impulsivity and aggression. Conceptually we can distinguish between demoralization (which also includes aspects of E and C) and "other aspects of Neuroticism." The latter are represented by the adjusted Neuroticism scale (N_{adj}), which is a very heterogeneous scale consisting of only 18 items. This scale does not measure the same construct as the original, but it does (in contrast with NEOdem) covary with the same broad range of psychopathological outcomes (see Noordhof et al., 2015) and it does not change much over the course of MDD treatment (current study). For this reason, we hypothesize that these aspects of Neuroticism are less susceptible to *pathoplasticity* and associated with psychopathology for other reasons.

Our findings underscore the importance of identifying demoralization-related variance in clinical assessment. Many if not most formal evalua-

tions of personality and specific psychopathological conditions depend on self-report questionnaires. Most patients are likely in a state of demoralization at the beginning of treatment. If scales in these evaluations are saturated with demoralization-related variance, the final results will be unduly affected by nonspecific unhappiness and distress, and will lack discriminant validity (see also Noordhof et al., 2015; Tellegen et al., 2003).

We believe the current investigation has four main limitations and all four warrant further consideration. First, the designs of the studies used in this investigation did not include a control group (e.g., waiting list or placebo), as it was deemed unethical by the research ethics board at the hospital where these studies were conducted to withhold active treatment. As a consequence, it is not possible to disentangle effects of treatment and effects associated with the passage of time alone. This limitation does not invalidate our conclusions, however, as all pertain to change *during* rather than *due to* treatment. Second—as mentioned before—the design of the study did not permit to draw strong conclusion as to how stable or malleable the construct of demoralization it is over (nontreatment) time. The current investigation indicated moderate change in demoralization in relatively short periods of time. Indeed, test–retest correlations for NEOdem were markedly lower ($r = .54$) than those for adjusted personality scales (r between .69 and .82). The question remains whether this change is indicative of the resolution of a demoralized episode—resulting in gains that are maintained at follow-up—or rather a temporary optimistic deviation from a stable "demoralized set point" to which clients may return posttreatment. It is interesting to note that the results show that levels of demoralization are certainly not independent from more stable (adjusted) personality traits like Conscientiousness.[5] Third, the NEOdem scale and adjusted scales were developed on the basis of a Dutch translation of the NEO-PI–R (Noordhof et al., 2015). Hence, it cannot be ruled out that due to cultural and linguistic differences alternative scales would be derived if scales were derived from the English version. Preferably the study of Noordhof et al. (2015) should be replicated in a different English-speaking sample. However, we did not choose to derive scales within the current sample of MDD-patients, preferring instead to use previously derived scales that were developed independently of the current study. Finally, it should be emphasized that our exploratory restructuring of the NEO-PI–R item set does not constitute a full effort of scale construction or scale validation. That said, we are encouraged by the current results and recommend further research in this direction.

To our knowledge, this study is the first to show how the conceptual distinctions between MDD, demoralization and personality traits can be used to understand the nature of change over the course of treatment. The phenomenon of demoralization presumably pertains not only to personality assessment, but to a quite broad range of instruments regularly used in treatment evaluation studies (as originally suggested by Tellegen in 1985). Other likely candidate instruments are symptom measures (e.g., BDI–II, the State Trait Anxiety Inventory, Symptom Checklist–90), self-reported coping, and process-oriented questionnaires (e.g., worrying, rumination). Distinguishing between demoralization and personality seems crucial for disentangling what specifically changes during treatment. Future research may also evaluate the course of effects of remoralization versus more specific changes in personality over the long run. For some clients remoralization alone might restore their ability to cope with the specific problems that brought them to therapy (see Finn & Kamphuis, 2006 for an illustrative case), but for others targeting the core (personality) pathology underlying their problems will be essential for more permanent improvement. For these reasons, we believe careful reexamination of self-report measurement instruments in order to distinguish demoralization and other specific psychological domains has the potential to contribute to a better understanding of treatment-effects and processes.

[5] There is no inconsistency in that fact that after adjusting scales by removing demoralization-related items, a substantial correlation with demoralization is still found. On the contrary, this is an interesting observation and rationale for constructing adjusted scales rather than "controlling for" demoralization. In the latter case one could for example use demoralization as a covariate and analyze (change in) residuals of personality traits. The result would be that demoralization would be uncorrelated with these "residualized personality traits." However, such zero correlations would not be consistent with the concept of demoralization. On the contrary, it is rather likely that the interaction between certain personality traits and life events would result in some people being specifically vulnerable to become demoralized.

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