Research report

Big Five personality and depression diagnosis, severity and age of onset in older adults

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ABSTRACT

Background: Personality may play an important role in late-life depression. The aim of this study is to examine the association between the Big Five personality domains and the diagnosis, severity and age of onset of late-life depression.

Methods: The NEO-Five Factor Inventory (NEO-FFI) was cross-sectionally used in 352 depressed and 125 non-depressed older adults participating in the Netherlands Study of Depression in Older Persons (NESDO). Depression diagnosis was determined by the Composite International Diagnostic Interview (CIDI). Severity of depression was assessed by the Inventory of Depressive Symptomatology (IDS). Logistic and linear regression analyses were applied. Adjustments were made for sociodemographic, cognitive, health and psychosocial variables.

Results: Both the presence of a depression diagnosis and severity of depression were significantly associated with higher Neuroticism (OR=1.35, 95% CI=1.28−1.43 and B=1.06, $p < .001$, respectively) and lower Extraversion (OR=.79, 95% CI=.75−.83; B=−.85, $p < .001$) and Conscientiousness (OR=.86, 95% CI=.81.−.90; B=−.86, $p < .001$). Earlier onset of depression was significantly associated with higher Openness (B=−.49, p=.026).

Limitations: Due to the cross-sectional design, no causal inferences can be drawn. Further, current depression may have influenced personality measures.

Conclusions: This study confirms an association between personality and late-life depression. Remarkable is the association found between high Openness and earlier age of depression onset.

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1. Introduction

Since Hippocrates, who described four types of temperament and related them to both (the lack of) physical and mental health, many theories have been developed to reflect on the association between personality characteristics and psychopathology. In contemporary psychology, several models have been proposed regarding the nature of the association between personality and psychopathology, including depression. These models can roughly be divided into three clusters (Klein et al., 2011). One cluster hypothesizes that personality and depression share a similar etiology, but do not have causal influence on each other. A second cluster views personality as having a causal effect on the onset and course of depression, and vice versa. Finally, the third cluster holds that personality and depression have a pathoplastic relationship, in wich they influence the presentation of one another (Klein et al., 2011; Weber et al., 2011).

In contrast, the Five-Factor Model (FFM, McCrae and Costa, 2008), which is the most widely-adopted empirical framework to describe personality, makes no statement about the nature or direction of the relationship between personality and psychopathology. According to the FFM, personality traits are relatively enduring patterns of thoughts, feelings and behaviors, which are rather consistent during lifetime and can be described according to five broad dimensions, also known as the Big Five personality

domains: Neuroticism or Emotional Lability (easily upset, not calm, and maladjusted), Extraversion or Surgency (energetic, assertive, and talkative), Conscientiousness or Will to Achieve (responsible, dependable, and orderly), Openness to Experience or Intellect (imaginative, independent-minded, and intellectual), and Agreeableness as the opposite of Antagonism (good-natured, cooperative, and trusting) (Costa and McCrae, 1992; Malouff et al., 2005; McCrae and Costa, 2008). Several studies have demonstrated that the Big Five personality domains are relatively stable over time, even during a depressive episode (Costa et al., 2005; McCrae and Costa, 2008; Morey et al., 2010; Steunenberg et al., 2005), or that they are at most only modestly influenced by mood disorders (Costa et al., 2005; Karsten et al., 2012). However, others have argued that personality is certainly influenced by a depressed mood (Lucas and Donnellan, 2011; Mooi et al., 2006), reflecting that the stability of personality is still a topic of debate.

An extensive amount of research has been done to study the association between the Big Five personality characteristics and depressive symptomatology in adults. Malouff et al. (2005) found in their meta-analysis that mood disorders were associated with a typical pattern of personality traits. They were generally associated with higher levels of Neuroticism, and lower levels of Extraversion, Conscientiousness and Agreeableness, with large effect sizes for Neuroticism, Extraversion and Conscientiousness, and small for Agreeableness, whereas no significant association was found with Openness. Another meta-analysis (Kotov et al., 2010) also showed an association between depressive disorders and both high levels of Neuroticism and low levels of Conscientiousness, with large effect sizes.

Although far less studied, there is growing evidence of the important role of personality in late-life depression as well (Weber et al., 2011). Late-life depression is defined by the occurrence of depression at an older age (over 60 years of age), and includes depression with a first onset in late life as well as recurrent depression with a first onset earlier in life. Current evidence suggests that especially Neuroticism is strongly related to the occurrence (Duberstein et al., 2008; Hayward et al., 2013; Steunenberg et al., 2006; Weber et al., 2011), course (Duberstein et al., 2008; Canuto et al., 2009; Kling et al., 2003; Steunenberg et al., 2007, Steunenberg et al., 2009; Weiss et al., 2009) and treatment outcome (Canuto et al., 2009; Hayward et al., 2013; Weber et al., 2011) of late-life depression. Albeit to a far less convincing extent, there is also evidence for an association between lower levels of Extraversion (Weber et al., 2010, 2011), Conscientiousness (Hayward et al., 2013; Weber et al., 2012) and Openness (Weber et al., 2012) and late-life depression diagnosis.

Until now, the association between the Big Five personality characteristics and severity of late-life depression has hardly been studied. In one recent study no significant association between depression severity and the Big Five personality characteristics in older adults were detected at baseline (Hayward et al., 2013). However, clinical improvement after 3 months of depression treatment was related to lower Neuroticism, and some aspects of Extraversion and Conscientiousness (Hayward et al., 2013). Instead of investigating severity of depression, most previous studies have focused on depression diagnoses, based on the Diagnostic and Statistical Manual of Mental Disorders (DSM, American Psychiatric Association, 2001). The DSM focuses on the presence or absence of symptoms rather than the intensity of symptoms (Rush et al., 1996). Such a dichotomous approach in itself does not reflect reality, in which mood problems could be placed on a continuum and in which subjective experience also plays an important role. In this study, we therefore have chosen not only to investigate depression diagnoses in older adults, but to study severity of depression as well regarding personality.

Several studies investigating late-life depression discern between early onset depression (EOD) and late onset depression (LOD), arguing that there is evidence for a different etiology of EOD and LOD. However, the results of studies on differences in etiology are ambiguous (Janssen et al., 2006). In addition, no general consensus exists on the cut-off age of the distinct age of onset groups (Bukh et al., 2011), which makes outcomes of studies on this topic difficult to compare. In general, a family history of depression and personality disorders are supposed to be mainly related to EOD (Blazer and Hybels, 2005; Brodaty et al., 2001; Bukh et al., 2011; Grace and O'Brien, 2003; Papazacharias et al., 2010; Parker et al., 2003; Zisook et al., 2007), whereas vascular and cognitive dysfunctions are thought to play an important role in LOD (Bukh et al., 2011; Grace and O'Brien, 2003; Papazacharias et al., 2010). Until now, only a few studies have included the age of depression onset when investigating the association between personality and late-life depression. Modest empirical evidence exists for persons with EOD to have higher levels of Neuroticism, compared to persons with LOD (Bukh et al., 2011; Duberstein et al., 2008; Canuto et al., 2010; Sneed et al., 2007; Weber et al., 2010). Other studies, however, did not find differences in the Big Five personality characteristics between older adults with EOD and those with LOD (Grace and O'Brien, 2003; Hayward et al., 2013; Weber et al., 2011). In view of these inconsistencies, age of onset of depression can perhaps better be seen within a continuum (Zisook et al., 2007). In this study, we therefore treat age of onset as a continuous variable in association with personality.

The aim of this study is to examine the association between the Big Five personality characteristics and the diagnosis, severity, and age of onset of depression in older adults. By investigating these various aspects of depression, we add a dimensional approach to the mere categorical approach of depression of most previous studies on this topic.

Based on previous findings, we hypothesize that (1) older adults with a depression diagnosis have significantly higher scores on Neuroticism, and lower scores on Extraversion and Conscientiousness, compared to non-depressed older adults. No significant differences between depressed and non-depressed older adults are expected with respect to Openness and Agreeableness; (2) severity of late-life depression is significantly associated with higher scores on Neuroticism and lower scores on Extraversion and Conscientiousness, but not significantly associated with Openness and Agreeableness; and (3) personality characteristics, especially Neuroticism, are significantly associated with earlier onset of depression.

2. Methods

2.1. Participants

For this study we used baseline data from the Netherlands Study of Depression in Older persons (NESDO). Design, recruitment and measurement instruments of this longitudinal study have been described extensively by Comijs et al. (2011). In short, the baseline NESDO sample consisted of 378 depressed and 132 non-depressed persons, aged 60 through 93 years. Inclusion criterion for the patient group was the presence of a current (preceding 6 months) diagnosis of depression, including major depression, minor depression, dysthymia and a double diagnosis of major depression and dysthymia. Both persons with a first age of depression onset earlier in life and persons with a first age of depression onset later in life were represented in the patient group. Exclusion criteria for both the depressed and non-depressed participants were dementia, a Mini-Mental State Examination score (MMSE) under 18 (out of 30 points) and an insufficient command of the Dutch language. For the non-depressed participants, an additional exclusion criterion was a

lifetime history of depression. Of the depressed sample ($n=378$), 281 patients were recruited from outpatient clinics, 45 from inpatient clinics and 52 from general practices (GP's). The response rate of depressed patients from the mental health institutions was estimated at 48.7% and from GP's at 60.3%. All 132 non-depressed controls were recruited from general practices (response 66.7%).

The baseline assessment of NESDO included measures for demographic variables, depression, psychosocial variables, (chronic) stressors, activity of the hypothalamic—pituitary—adrenal-axis, (re) activity of the autonomic nervous system, parameters for inflammation, somatic comorbidity, physical functioning and conditions, cognitive functioning and use of care. The baseline assessment included both diagnostic interviews and written self-report questionnaires, all being internationally accepted, commonly used measures for depression and personality. The interviews were conducted by carefully selected and thoroughly trained research assistants, mainly consisting of psychologists and mental health care nurses. The baseline assessment was mainly performed at the participating sites. When participants were not able to come to the site, they were interviewed at their homes. All interviews were audio taped to control the quality of the data. Data collection of the first measurement started in 2007 and was finished in September 2010. Of all 510 participants, 33 did not complete the personality questionnaire. Therefore, the data used in this study is based on 477 participants, consisting of 352 depressed patients and 125 control older adults.

The study protocol of NESDO has been approved centrally by the Ethical Review Board of the VU University Medical Center, and subsequently by the local ethical review boards of the participating centers. Before participating in the study, all persons were provided with oral and written information. Written informed consent was obtained from all participants at the start of the baseline assessment.

2.2. Personality

To assess personality characteristics, the NEO-Five Factor Inventory (NEO-FFI, Costa and McCrae, 1995; Dutch version, Hoekstra et al., 1996) was used. The NEO-FFI is a shortened version of the NEO PI-R (Costa and McCrae, 1995). The 60 item questionnaire measures the main Big-Five domains Neuroticism, Extraversion, Conscientiousness, Agreeableness and Openness to Experience. Participants rate the extent to which a statement applies to them on a 5-point Likert scale ranging from strongly disagree to strongly agree. Total scores on each separate domain range from 12 till 60. The psychometric properties of the Dutch version of the NEO-FFI are generally good (Hoekstra et al., 1996). The internal consistencies of all domains range from acceptable to good, and are comparable to those of the American version, with somewhat lower values with respect to Agreeableness. Stability and internal structure are both satisfactory, as well as the interrelationships with similar measurements (Hoekstra et al., 1996). Regarding the possible influence of depression on Big Five personality outcome measures, small state effects have been found on Neuroticism, Extraversion and Conscientiousness scores, while no effects have been demonstrated on Openness and Agreeableness scores (Costa et al., 2005; Karsten et al., 2012). A normalization of the personality domains after recovery from depression was found, while the overall shape of the profile did not change (Karsten et al., 2012). With respect to the older population, the reliability and stability of the domains are good. Only Openness had a somewhat lower test-retest correlation coefficient ($r=.68$; Hoekstra et al., 1996). In addition, another study demonstrated that Neuroticism remained rather stable in middle and older adulthood and could be measured reliably as it was not significantly affected by physical health variables (Steunenberg et al., 2005).

2.3. Depression diagnosis, severity of depressive symptoms and age of onset of depression

Current diagnosis (during the preceding 6 months), past diagnosis and age of onset of major depression, minor depression and dysthymia according to DSM-IV were determined by the Composite International Diagnostic Interview (CIDI, WHO version 2.1; life-time version). The CIDI is a structured clinical interview designed for use in research settings and has high reliability, including inter-rater agreement (Wittchen et al., 1991). In order to assess minor depression, some additional questions were complemented.

To assess the severity of depressive symptoms, we used the 28-item self-report version of the Inventory of Depressive Symptomatology (IDS-SR; Rush et al., 1996). Each statement consists of 4 response options, ranging from having no symptoms to having severe symptoms with respect to the specific depressive symptomatology. The IDS has a reasonable internal consistency, interrater reliability, and both discriminant and concurrent validity (Rush et al., 1996).

2.4. Covariates

Sociodemographic characteristics included age, gender, educational level, income level and marital status. Income level was divided into 24 categories, ranging from 600 euros net income and less to 5000 euros net income and more on a monthly base, climbing up 200 euros per category. Further, we included childhood trauma, recent life events, number of chronic diseases, functional limitations, social support and cognitive functioning as variables that knowingly might intervene the association between personality and depression (Weber et al., 2011). Global cognitive functioning was assessed using the Mini-Mental State Examination (Folstein et al., 1975). Childhood trauma, including emotional neglect as well as psychological, physical and sexual abuse, was assessed using a structured inventory previously used in the Mental Health Survey and Incidence Study (De Graaf et al., 2004) and the Netherlands Study of Depression and Anxiety (Penninx et al., 2008). Functional limitations were assessed by means of the WHO-Disability Assessment Scale (Chwastiak and Von Korff, 2003). Three domains of the WHO-DAS were excluded (understanding and communicating, getting along with people, participation in society) in order to prevent overlap between the depression concept. Getting around, selfcare and household activities were included. Number of chronic diseases and social support were assessed with the LASA Questionnaire (Kriegsman et al., 1996) and Close Person Inventory (CPI; Stansfeld and Marmot, 1992), respectively, and Brugha Questionnaire (Brugha et al., 1985) was used to assess recent life events.

2.5. Statistical analyses

The differences in sociodemographic characteristics and personality of the depressed and non-depressed participants were computed with independent *t*-tests (continuous variables) and Chi-square tests (categorical variables). To investigate the associations between the Big Five personality traits and depression diagnosis, logistic regression analyses were conducted. The association of the Big Five personality domains with the severity and age of onset of depression was examined using linear regression analyses. For the analysis of the association between personality and severity of depression, both patient and control groups were used ($N=477$), whereas the analysis of the association between personality and age of depression onset was only applicable in the patient group ($N=352$). In all analyses, the Big Five personality domains were the independent variables, while depression

diagnosis, severity of depressive symptoms and the age of onset were regarded as outcome variables. In case of significant Pearson's correlations between the covariates and both depression and the Big Five domain concerned, the covariates were included in the logistic and linear regression models as potential confounders. Finally, when the covariates changed the strength of the association between the Big Five personality domain and the used depression measurements for more than 10 percent, these variables were considered confounders and were included in the final model. All tests were two-sided with $P < .05$ denoting statistical significance. SPSS for Windows (version 18.0) was used for all analyses.

From both the patient group and control group, there were some missing data ($N = 33$) concerning the NEO-FFI. In order to check whether respons bias had occurred, we performed a non-response analysis in which we compared the participants who did and did not complete the NEO-FFI on the presence of a depression diagnosis, severity of depression (IDS) and age of depression onset. We found no significant differences between the respondents and non-respondents on the NEO-FFI with respect to these characteristics.

3. Results

The sociodemographic and clinical characteristics of both depressed (patient group) and non-depressed (control group) older adults are presented in Table 1. The vast majority of the patient group had a major depression, and a minority had also a comorbid disorder of dysthymia or anxiety disorder. Comparison between depressed and non-depressed older adults showed no differences in gender and recent life events. In contrast, depressed older adults were less educated, were more often unmarried, and had a lower income level compared with controls. Further, they were more likely to have an anxiety disorder, higher IDS scores and lower MMSE scores, experienced less social support, and had more chronic diseases, functional limitations and childhood

trauma. Regarding the Big Five personality domains, the depressed older adults showed higher scores on Neuroticism, and lower scores on Extraversion, Conscientiousness, Openness and Agreeableness. Within the depressed patient group, the specific sampling frame (primary care, outpatient- or inpatient clinic) did not make a difference regarding their scores on depression severity (IDS) or personality (NEO-FFI).

Using logistic regression analyses, all Big Five domains, except for Openness, were significantly associated with a diagnosis of depression (Table 2). After adjustment for confounding variables, Agreeableness was no longer significantly associated with the presence of a depression diagnosis. Here, functional limitations proved to be of particular importance, and did account for the non-significant association. In contrast, higher scores on Neuroticism, and lower scores on Extraversion and Conscientiousness remained significantly associated with depression, even after adjustment for confounders.

Table 3 shows the results of linear regression analyses on the associations between the Big Five personality traits and severity of late-life depression. The adjusted analyses showed Neuroticism, Extraversion and Conscientiousness to be significantly associated with depression severity. Comparable to the associations found with respect to depression diagnosis, more severe depressive symptomatology was associated with higher scores on Neuroticism, and lower scores on Extraversion and Conscientiousness. Educational level erased the initially significant association between Openness and depression severity. Regarding Agreeableness and its association with depression severity, childhood trauma was of considerable influence and turned the model into non-significance.

Finally, using lineair regression analyses, only Openness remained significantly associated with age of onset after adjustment for confounding variables (Table 4). More specifically, a higher score on Openness accompanied earlier onset of depression. For both Neuroticism and Conscientiousness, functional limitations was the most influential confounding variable, just as childhood trauma was for Openness and Agreeableness.

Table 1
Characteristics of the study sample ($N = 477$).

Factor	Patient group ($n = 352$)	Control group ($n = 125$)	t/x^{2} [a]	df	p
Age, yrs, M (SD)	70.75 (7.36)	70.12 (7.03)	−.84	475	.404
Range (yrs)	60–90	60—93			
Gender, female, n (%)	233 (66)	77 (62)	.86	1	.355
Educational level, yrs, M (SD)	10.35 (3.48)	12.54 (3.51)	6.03	475	< .001
Married or partner, n (%)	186 (53)	95 (76)	20.44	1	< .001
Income level M (SD)	8.49 (5.45)	12.22 (7.04)	6.03	475	< .001
Major depression, current, n (%)[b]	334 (95)	–	–	–	–
Dysthymia, current, n (%)	94 (27)	–	–	–	–
Major depression+Dysthymia, n (%)	88 (25)	–	–	–	–
Minor depression, n (%)	19 (5)	–	–	–	–
Comorbid Anxiety disorder, n (%)	127 (36)	7 (6)	42.42	1	< .001
Depression severity (IDS), M (SD)	29.91 (12.96)	7.69 (6.37)	−18.32	472	< .001
Range	0–60	0–41			
Age of onset depression, M (SD)	48.48 (20.62)	–	–	–	–
Range (yrs)	2–86				
Cognitive functioning, M (SD)	27.74 (2.00)	28.40 (1.43)	3.39	474	.001
Number of social support, M (SD)	40 (.49)	73 (.44)	6.57	473	< .001
Number of chronic diseases, M (SD)	2.11 (1.50)	1.43 (1.10)	−4.62	474	< .001
Functional limitations, M (SD)	63.09 (46.66)	28.11 (36.23)	−7.57	470	< .001
Childhood trauma index, M (SD)	1.03 (1.19)	19 (.45)	−7.62	473	< .001
Recent life events, M (SD)	44 (.77)	44 (.75)	05	473	.959
Neuroticism, M (SD)	39.05 (7.00)	24.85 (6.75)	-19.66	474	< .001
Extraversion, M (SD)	33.65 (6.44)	41.98 (5.59)	12.83	473	< .001
Conscientiousness, M (SD)	36.66 (5.69)	41.78 (4.88)	8.96	473	< .001
Openness, M (SD)	29.19 (5.46)	30.56 (4.84)	2.48	470	.013
Agreeableness, M (SD)	44.11 (5.24)	45.58 (5.64)	2.62	471	.009

[a] Based on independent t-tests for continuous variables and chi-square statistics for dichotomous and categorical variables.
[b] Current: disorder during the preceding 6 months.

Table 2
Results of logistic regression analyses between personality characteristics and depression diagnosis in older adults (patient group, $N=352$), adjusted for confounders.

Big Five personality domain	OR	95% CI	p
Neuroticism[a]	1.35	1.28; 1.43	< .001
Extraversion[a]	.79	.75; .83	< .001
Conscientiousness	.83	.80; .87	< .001
+ Adj. for functional limitations	.86	.81; .90	< .001
Openness	.95	.92; .99	.014
+ Adj. for educational level	1.00	.96; 1.05	.866
Agreeableness	.95	.91; .99	.011
+ Adj. for gender, educational level, income level and functional limitations	.96	.92; 1.01	.115

[a] No confounding variables were detected.

Table 3
Results of linear regression analyses between personality characteristics and the severity of depression in older adults (patient and control group, $N=477$), adjusted for confounders.

Big Five personality domain	t	B	β	95% CI	p
Neuroticism	24.38	1.21	.75	1.12; 1.31	< .001
+ Adj. for functional limitations	20.82	1.06	.65	.96; 1.16	< .001
Extraversion	−14.60	−1.18	−.56	−1.33; −1.02	< .001
+ Adj. for functional limitations and childhood trauma	−11.10	−.85	−.40	−1.00; −.70	< .001
Conscientiousness	−11.13	−1.16	−.46	−1.37; −.96	< .001
+ Adj. for functional limitations	−8.62	−.86	−.34	−1.05; −.66	< .001
Openness	−2.47	−.32	−.11	−.58; −.07	.014
+ Adj. for educational level	.10	.02	.01	−.26; .29	.918
Agreeableness	−4.03	−.52	−.18	−.77; −.27	< .001
+ Adj. for gender, educational level, chronic diseases, functional limitations and childhood trauma	−1.41	−.16	−.05	−.36; −.06	.158

Table 4
Results of linear regression analyses between personality characteristics and the age of onset[a] of a depressive disorder (depression or dysthymia) in depressed older adults (patient group, $N=352$), adjusted for confounders.

Big Five personality domain	t	B	β	95% CI	p
Neuroticism	−3.30	−.51	−.18	−.82; −.21	.001
+ Adj. for age, educational level and functional limitations	−1.59	−.25	−.09	−.56; −.06	.114
Extraversion	1.83	.31	.10	−.02; .65	.068
Conscientiousness	2.36	.45	.13	.08; .83	.019
+ Adj. for age and functional limitations	1.64	.30	.09	.06; .67	.101
Openness	−4.25	−.84	−.23	−1.23; −.45	< .001
+ Adj. for educational level and childhood trauma	−2.24	−.49	−.13	−.92; −.06	.026
Agreeableness	2.61	.56	.14	.14; .98	.010
+ Adj. for age, gender, educational level, functional limitations and childhood trauma	1.69	.35	.09	−.06; .76	.092

[a] Operationalized as a continuous variable, in terms of earlier and later age of onset.

4. Discussion

This study examined the associations between personality in terms of the Big Five domains and the presence of a depression diagnosis, depression severity and age of depression onset in older adults. Both a diagnosis and severity of a depressive disorder were associated with higher levels of Neuroticism and lower levels of Extraversion and Conscientiousness. Earlier age of onset showed to be associated with higher levels of Openness.

Consistent with our hypotheses, Neuroticism, Extraversion and Conscientiousness were found to be associated with the presence of a depression diagnosis in later life. The same pattern was found for severity of depression, contrary to findings in a comparable previous study (Hayward et al., 2013). This finding suggests that personality indeed plays a significant role in the acute experience of depression severity, and not only with regard to treatment response (Hayward et al., 2013). Since we found personality to be associated with diagnosis as well as severity of depression, it suggests that the association between personality and depression diagnosis holds independently of depression severity. The pattern of the associations found between the Big Five personality

characteristics and both diagnosis and severity of depression is not very surprising, since emotional lability (Neuroticism), social withdrawal and lack of interest to engage in activities (low Extraversion and Conscientiousness) are characteristic of a depressive state of mind. Therefore, the question arises whether these associations reflect an actual state of mind or a premorbid vulnerability. This question is in line with the controversy in literature regarding the stability of personality and personality measures. In the longitudinal follow-up study that is underway, we will be able to clarify this issue by testing whether personality measured by the NEO-FFI changes after recovery from depression.

Some of our findings were surprising. The initial significant association between Openness and both the diagnosis and severity of depression completely vanished when adjusted for educational level. This finding suggests that Openness as a personality characteristic is particularly and strongly associated with a higher level of education, and that educational level possibly mediates the association of Openness with both the presence of a depression diagnosis and severity of depression. The associations between the diagnosis, severity and age of onset of depression and Agreeableness lost their significance after adjustments for childhood trauma

and functional limitations. An explanation for these findings could be that physical abuse, sexual abuse or emotional neglect negatively influences one's perception of trust, empathy and connectedness regarding relationships, which are aspects of Agreeableness and possibly a prerequisite for both an altruistic state of mind and satisfactory relationships. Deprivation of these properties may lead to an increased vulnerability for undergoing a depression at a younger age, and developing functional problems at an older age.

The most remarkable finding, however, concerned the strong association found between higher levels of Openness and earlier age of onset of depression, even after adjustments for educational level and childhood trauma. This could imply that persons with a curious and sensitive nature are likely to experience both positive and negative events more intensely than others do. As a result, they are more prone to develop depressive symptoms as a reaction to negative early life events, such as sexual abuse or emotional neglect. If this is true, childhood trauma may play a particularly important role with those open-minded persons who developed a depression earlier in life. This is in line with a recent study of Comijs et al. (2013) within NESDO, where a strong association was found between childhood abuse and especially earlier onset of depression.

No studies so far have demonstrated the connection between age of depression onset and Openness. Instead, other studies found persons with an early onset depression, compared to healthy controls, to have higher levels of Neuroticism (Hayward et al., 2013; Weber et al., 2010), lower levels of Extraversion (Canuto et al., 2010; Weber et al., 2010) and lower levels of Conscientiousness (Hayward et al., 2013). In this study, however, the initial significant association between age of depression onset and both Neuroticism and Conscientiousness turned into non-significance after correcting for functional limitations. This may be partly due to a conceptual overlap, but it could also imply that high Neuroticism and low Conscientiousness lead to an increased vulnerability for developing a depression at a younger age, and facing functional limitations at an older age. These findings together give rise to further investigate the possible mediating influence of both negative early life events and functional limitations regarding the association between personality and late-life depression.

Further, age was found to play a confounding role in the association between age of onset of depression and personality. This may simply mean that as age increases, this also applies to the risk of developing a late-life depression. It could also suggest that age in some way changes (the perception of) personality. Future empirical research to substantiate existing theories about stability of personality during lifetime is therefore recommended.

This study has several strengths, such as a large study sample including a control group. Also, we took into account several components of late-life depression simultaneously, including current diagnosis, severity and age of onset. To our knowledge, our study is the first to present data on these various aspects of late-life depression and their connection with personality adding a dimensional approach of depression to the mere categorical, DSM-IV driven approach, which is commonly adopted in previous studies. Further, we took into account several cognitive, psycho-social and health covariates, which contribute to a more nuanced picture of the association of personality and late-life depression.

Our study has also some limitations. Our study concerned an observational study in clinically depressed older adults. Consequently, our findings do not apply to the general population. In addition, selection bias may have occurred during the recruitment process. Further, although patients with a severe depressive disorder were included as well, the most severely depressed were not always able to participate. Therefore, results can possibly not be generalized to the most severely depressed older adults. Due to the cross-sectional design, no conclusions can be drawn about the causality of the associations found between depression and personality characteristics. In addition, depressive mood may have influenced NEO-FFI scores, and therefore not properly reflect premorbid personality characteristics. Further, current depression diagnosis in our study covered a period of 6 months, in which recovery of symptoms could have occured. As a result, this could have weakened the results regarding the mutual influence of personality and depression, although they were already found to be significant. Another possible shortcoming of this study could be the estimated age of onset in retrospect by interviewing patients who may have had multiple depressive episodes at the time of the interview; this could have lead to unreliable data regarding earlier ages of onset of depression.

The outcomes of this study are of considerable clinical relevance, because they suggest the value of the involvement of Big Five personality diagnostics in the treatment of late-life depression. A number of studies which linked their results to clinical practice highlighted the influence of personality characteristics on treatment outcome. For example, higher levels of Neuroticism were reported to predict slower recovery from late-life depression (Weber et al., 2011). Lower levels of Conscientiousness and Agreeableness could potentially interfere with effective treatment (Malouff et al., 2005), while higher levels of Openness and Agreeableness could enhance treatment outcome (Canuto et al., 2009). Until now, personality assessment is not widely applied in the treatment of depressed older patients, and if so, it usually happens at a later stage of the treatment, for example when the treatment has been stagnated. Moreover, in clinical practice it is common to use DSM-IV to diagnose personality, with which only personality disorders can be identified. An advantage of assessing normal personality characteristics by means of the NEO-FFI or NEO-PI-R, is that it is applicable to all patients, including those who do not have a particular personality disorder. Very recently, DSM-IV has been superseded by DSM-5. Fortunately, this new version of the diagnostic manual seems to offer more space for a more dimensional approach of personality. The imminent dimensional approach of assessing personality in clinical practise will offer opportunities for clinicians to design and implement a more tailored treatment plan, based on the specific personality characteristics of their patients. For example, a depressed patient with low scores on Conscientiousness and Agreeableness could benefit from starting treatment with motivational interventions, before starting cognitive behavioral therapy for which homework assignments have to be made. Such an approach should prevent a drop out and enhance the effectivity of treatment.

In conclusion, our study found personality to be an important factor in the diagnosis, severity and age of onset of late-life depression. Management and treatment of depression may benefit from encompassing personality diagnostics from the start.

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