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THREE YEAR STABILITY OF FIVE-FACTOR MODEL PERSONALITY TRAITS IN RELATION TO CHANGES IN SYMPTOM LEVELS IN PATIENTS WITH SCHIZOPHRENIA OR RELATED DISORDERS

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ABSTRACT

Background

Five-Factor Model (FFM) personality traits have been reported to be related to a wide range of clinical outcome in patients with psychotic disorders. However, it is not clear whether personality is, in turn, affected by psychotic illness. Although there is indication for short-term stability of the FFM traits despite fluctuations in positive symptoms, the potential impact of negative symptoms and disorganization levels is unknown.

Methods

Temporal stability of the FFM traits was examined in 91 patients with non-affective psychotic disorders, while taking changes in positive, negative and disorganization symptoms between baseline and three-year follow-up into account. As negative and depressive symptoms are known to show symptomatic overlap, analyses were repeated while controlling for depressive symptoms.

Results

The mean level of Conscientiousness showed a slight increase after three years; other FFM traits showed no mean level changes. FFM trait test-retest correlations were moderate to strong. Changes in positive symptoms and disorganization levels did not predict change in any FFM trait. Change in negative symptoms predicted changes in Neuroticism and (inversely) in Extraversion and Openness. When correcting for depressive symptoms, only a trend for Openness remained.

Conclusion

The results of the current study indicate that fluctuations in positive and disorganization symptom levels exert no effect on the temporal stability of FFM traits in patients with psychotic disorders. Changes in negative symptoms, however, may affect Openness levels. Also, consistent with findings reported in the general population, future studies should account for possible state-trait confusion between depressive symptoms and Neuroticism and Extraversion.

1. INTRODUCTION

Normal personality traits as conceptualized by the Five-Factor Model (FFM) of personality (Digman, 1990; McCrae, 1992) have been found to be associated with numerous clinical phenomena in patients with psychotic disorders (Dinzeo and Docherty, 2007). For instance, FFM personality traits were found to be related to substance abuse (Reno, 2004), medication non-adherence (Lecomte et al., 2008), suicidal behavior (Pillmann et al., 2003), social functioning (Lysaker and Davis, 2004), subjective quality of life (Boyette et al., 2014; Couture et al., 2007), psychotic symptom exacerbation (Lysaker and Taylor, 2007) and psychotic relapse (Gleeson et al., 2005; Jonsson and Nyman, 1991). An underlying assumption of these studies is that FFM personality traits represent stable, independent constructs, unaffected by manifestation of illness. It is, however, possible that the expression or consequences of psychotic illness alter the levels of FFM traits in patients with psychotic disorders; a hypothesis known as the 'scar effect' (Andersen and Bienvenu, 2011).

Up to date, two studies provide preliminary support that FFM personality traits remain stable in patients with psychotic disorders, despite fluctuations in psychotic symptom levels. In the first study, Kentros et al. (1997) examined the rank-order stability of the FFM traits in 21 outpatients with schizophrenia and schizo-affective disorder over an avarage period of 6 months. The authors found strong test-retest correlations for Neuroticism, Extraversion, Openness and Conscientiousness and a moderate strenght test-retest correlation for Agreeableness. Since the test-retest correlation for positive symptoms was not statistically significant (indicating change), the authors concluded that FFM traits remain stable over time, despite fluctuations in positive symptoms. No definite conclusion was reached for negative or depressive symptoms, since, in this sample, these levels remained stable high. Disorganization levels were not assessed.

In the second study, Beauchamp et al. (2006) examined the mean-level stability of FFM personality traits in 79 patients with first-episode psychosis over an avarage period of 3 months. Paired t-tests showed no statistically significant differences for the FFM traits between baseline and follow-up. Since there was a statistically significant decrease in the mean level of postive symptoms, the authors concluded that FFM traits remain stable over time, despite fluctuation in positive symptoms. Negative symptoms and disorganization levels were not assessed in this study.

Negative symptoms may, however, be of particular relevance, for two reasons. First, it is possible that the short-term stability of the FFM traits as reported in the

aforementioned studies in fact reflects stability of negative symptoms, as negative symptoms are also more 'trait-like' in nature (Arndt et al., 1995). Second, negative symptoms may confound part of the relations between FFM traits and clinical outcome reported in earlier studies, as negative symptoms are generally associated with worse prognosis and more functional impairment (Fenton and McGlashan, 1991). Kentros et al. (1997) acknowledged that negative symptoms may have excerted a strong influence on the stability of the FFM traits in their study, but the small sample size restricted them in the possibilities for further analysis. In order to specifically test whether change in negative symptoms predict change in FFM traits, a larger sample size and a longer follow-up period, allowing for more variation in negative symptoms, would be required.

When examing the temporal stability of FFM traits in relation to negative symptoms, depressive symptoms may present a complicating factor. Large general population studies demonstrated that during a depressive episode, levels of Neuroticism temporarily increase and levels of Extraversion temporarily decrease (Fanous et al., 2007; Jylha et al., 2009; Ormel et al., 2004). Since depression is a very common comorbidity in patients with psychotic disorders (Buckley et al., 2009), and depressive and negative symptoms show considerable syndromal overlap (Siris et al., 1988; Siris, 2000), it is possible that depressive symptoms may distort any found relation between FFM traits and negative symptoms in patients with psychotic disorders. Finally, the potential impact of disorganization symptom levels, which is thought to represent a symptom cluster of psychotic symptoms independent from positive and negative symptoms (Klimidis et al., 1993; Malla et al., 1993; Peralta et al., 1992), is yet unknown.

Consequently, the objective of the present study is to examine the temporal stability of the FFM traits in patients with psychotic disorders, in relation to changes in positive symptoms, negative symptoms and disorganization levels over a three-year time interval, while controlling for depressive symptoms. Based on associations between FFM traits and psychotic symptoms found in earlier studies (Boyette et al., 2013; Dinzeo and Docherty, 2007; Kentros et al., 1997), we expected that change in psychotic symptoms may impact FFM levels. Change in negative symptoms may especially impact Extraversion, Openness and Agreeableness (Boyette et al., 2013; Kentros et al., 1997). Change in positive and disorganization symptom levels may impact levels of Agreaeableness (Boyette et al., 2013). However, part of these relations may be accounted for by depressive symptoms, which are known to affect levels of Neuroticism and Extraversion.

2. METHODS

2.1 Participants and procedures

GROUP (Genetic Risk and Outcome of Psychosis) is a recently completed Dutch longitudinal multicenter cohort study that was designed to study vulnerability and resilience factors for variation in expression and course of non-affective psychotic disorders. Details of the GROUP study have been described elsewhere (Korver et al., 2012). GROUP patients from the Amsterdam region, who participated in FFM personality assessment at baseline and three year follow-up, were included in the current study. Eligible patients fulfilled the following criteria: (1) age between 18 and 50 (extremes included), (2) meeting DSM-IV criteria (American Psychiatric Association, 2000) for a non-affective psychotic disorder: schizophrenia, schizophreniform disorder, schizoaffective disorder, delusional disorder or psychotic disorder NOS, (3) maximum duration of illness of 10 years, and (4) fluent in Dutch.

2.2 Instruments

DSM diagnoses regarding psychotic illness were based on the Comprehensive Assessment of Symptoms and History (CASH) (Andreasen et al., 1992). The CASH is a widely-used semi-structured interview, designed for research studies of schizophrenia spectrum conditions.

The Dutch version of the NEO-Five Factor Inventory (NEO-FFI) (Hoekstra et al., 1996) was used to rate FFM traits at baseline and three year follow-up. Long term stability of the FFM traits has been demonstrated in the general population (Caspi et al., 2005; Costa, Jr. and McCrae, 1988; Roberts and DelVecchio, 2000; Soldz and Vaillant, 1999). The NEO-FFI has also demonstrated satisfactory to excellent construct validity and moderate to good internal reliability in general population samples (Costa and McCrae, 1992; Hoekstra et al., 1996). The factor structure and reliability of the FFM scales in patients with schizophrenia were found to be highly similar to a normative sample (Bagby et al., 1999).

Positive, negative and disorganization symptoms at baseline and three year follow-up were assessed with the Positive and Negative Syndrome Scale (PANSS) (Kay et al., 1987). The PANSS is a widely used interview to assess the symptoms of schizophrenia. PANSS scales according to Van der Gaag et al. were used for analyses (van der Gaag et al., 2006a). This model shows good validity compared to earlier models (van der Gaag et al., 2006b).

Depressive symptoms were assessed with the Calgary Depression Scale (CDS) (Addington et al., 1993). The CDS is a structured interview specially designed to assess depression in patients with psychotic disorders. The CDS has shown to be better in differentiating depressive symptoms from negative and extrapyramidal symptoms compared to other widely used measures (Lako et al., 2012; Schennach et al., 2012).

2.3 Data analyses

Since rank-order stability operates independently from mean-level changes (Roberts and DelVecchio, 2000), both methods were used to assess the temporal stability of the FFM traits. Paired t-tests were performed to examine mean-level stability and test-retest correlations were performed to examine rank-order stability. The same analyses were performed for psychotic (positive, negative and disorganization) symptom levels. Non-parametric alternatives were used for variables that were not normally distributed. Subsequently, in order to test whether changes in psychotic symptom levels predicted changes in FFM traits, multiple regression analyses were performed with changes (follow-up minus baseline scores) in positive, negative and disorganization symptom levels as predictors and changes (follow-up minus baseline scores) in the FFM traits as dependent variables. Predictors were entered in a stepwise fashion. Separate analyses were conducted for all five FFM traits. Preliminary checks were made to ensure no violations of assumptions. Finally, in order to control for depressive symptoms, regression analyses were repeated, entering change in depressive symptoms according to the CDS as step 1 (enter) and changes in positive, negative and disorganization symptoms at step 2 (stepwise). SPSS 20 was used for all analyses.

3. RESULTS

3.1 Sample characteristics

Socio-demographic and clinical characteristics of participating patients (N = 91) are shown in **Table 1.** Baseline and follow-up NEO-FFI, PANSS and CDS scores are presented in **Table 2.**

3.2 Mean-level and rank-order stability of the FFM traits

Paired t-test showed a statistically significant mean-level difference between baseline and follow-up for Conscientiousness (t = 2.17, p = 0.032, η^2 = 0.05, small effect). No mean-level differences were found for the other four FFM traits. Pearson correlations

Table 1. Socio-demographic and clinical characteristics (*N* = 91)

Characteristics	
Age (M, SD)	31.6 (8.5)
Gender (% male)	81.3
Decent (% Caucasian)	76.9
DSM diagnosis (%)	
Schizophrenia	68.1
Schizophreniform disorder	3.3
Schizoaffective disorder	12.1
Delusional disorder	1.1
Psychotic disorder NOS	14.3
Age of onset first psychosis (M, SD)	24.7 (8.2)
Status antipsychotics (%)	
Currently using	78.0
Not currently using	8.8
Unknown	13.2

Table 2. NEO-FFI, PANSS and CDS scores at baseline and 3 year follow-up

Test	Scale*	Baseline M (SD)	Follow-up M (SD)	Change scores[1] M (SD)	Range change scores
NEO-FFI	N	35.42 (9.58)	34.44 (8.71)	-0.98 (7.34)	-19 to 20
	E	36.58 (7.44)	37.54 (6.34)	0.96 (6.46)	-17 to 16
	O	38.55 (5.95)	38.41 (5.92)	-0.14 (4.94)	-19 to 9
	A	43.25 (5.44)	43.71 (5.33)	0.46 (5.31)	-22 to 12
	C	40.46 (7.13)	41.79 (7.01)	1.33 (5.84)	-14 to 17
PANSS	Pos.	11.55 (5.61)	12.00 (5.81)	0.45 (5.05)	-15 to 19
	Neg.	13.54 (5.50)	12.56 (5.53)	-0.98 (5.91)	-19 to 12
	Dis.	15.87 (5.09)	15.52 (6.65)	-0.35 (5.79)	-14 to 23
CDS	Total score	2.94 (3.19)	1.96 (2.77)	-0.98 (3.88)	-10 to 8

* N: Neuroticism, E: Extraversion, O: Openness, A: Agreeableness, C: Conscientiousness
  Pos.: positive symptoms, Neg.: negative symptoms, Dis.: disorganization symptoms.
[1] Change scores = score at follow-up – score at baseline

showed moderate to strong associations between baseline and three year follow-up scores for the FFM traits: Neuroticism ($r = 0.68$, $p < 0.001$), Extraversion ($r = 0.57$, $p < 0.001$), Openness ($r = 0.65$, $p < 0.001$), Agreeableness ($r = 0.52$, $p < 0.001$) and Conscientiousness ($r = 0.66$, $p < 0.001$).

3.3 Mean-level and rank-order stability of symptom levels

Wilcoxon Signed Rank tests showed no statistically significant mean-level difference for positive, negative, disorganization or depressive symptoms. Spearman rho correlations showed moderate strength associations between baseline and three year follow-up scores in psychotic symptoms: positive symptoms ($rho = 0.58$, $p < 0.001$), negative symptoms ($rho = 0.47$, $p < 0.001$) and disorganization symptoms ($rho = 0.46$, $p < 0.001$). The Spearman rho correlation for depressive symptoms was not statistically significant.

3.4 Symptom level changes as predictor of FFM level changes

Table 3 presents Spearman rho correlations between changes in FFM traits and changes in symptom levels. Multiple regression analyses showed that changes in negative symptoms predicted changes in Neuroticism ($R^2 = 4.7\%$, F = 4.17, $p = 0.044$, β negative symptoms = 0.22), Extraversion ($R^2 = 4.9\%$, $F = 4.42$, $p = 0.038$, β negative symptoms = -0.22) and Openness ($R^2 = 7.0\%$, $F = 6.37$, $p = 0.014$, β negative symptoms = -0.26). Changes in positive symptoms or disorganization levels did not predict change in any FFM trait. Also, no changes in psychotic symptoms predicted change in Agreeableness or Conscientiousness.

Table 3. Spearman rho correlations between changes in FFM traits and changes in symptoms

	N change	E change	O change	A change	C change
Pos. change	0.05	0.03	-0.01	0.10	-0.14
Neg. change	0.18[1]	-0.20[1]	-0.30**	0.03	-0.12
Dis. change	-0.05	-0.03	-0.04	-0.12	-0.01
Depr. change	0.34*	-0.38**	-0.19	0.13	-0.01

Change = score at follow-up – score at baseline; N: Neuroticism, E: Extraversion, O: Openness, A: Agreeableness, C: Conscientiousness;
Pos.: positive symptoms, Neg.: negative symptoms, Dis.: disorganization symptoms, Depr.: depressive symptoms.
[1] $p < 0.10$, * $p < 0.05$, ** $p < 0.01$

3.5 Controlling for depression

When depressive symptoms were included to regression analyses in a first step, only changes in depressive symptoms predicted changes in Neuroticism (R^2 = 11.1%, F = 5.96, p = 0.018, β depressive symptoms = 0.33) and Extraversion (R^2 = 16.9%, F = 9.75, p = 0.003, β depressive symptoms = -0.41). Changes in negative symptoms continued to predict changes in Openness, now on a trend level (R^2 = 11.8%, F = 3.14, p = 0.053, β negative symptoms = -0.34, p = 0.025). The models for Agreeableness and Conscientiousness were not statistically significant.

4. DISCUSSION

Earlier studies indicated short-term (three and six months) stability of FFM personality traits in patients with psychotic disorders, despite functuations in positive symptoms (Beauchamp et al., 2006; Kentros et al., 1997). The results of the current study support this finding for a follow-up period of three years, by demonstrating that change in positive symptoms is not related to change in any FFM trait. The current study also expands on earlier studies by demonstrating that changes in disorganization symptoms are unrelated to changes in FFM traits. Furthermore, changes in negative symptoms were found to predict changes in Neuroticism, Extraversion and Openness, but this seemed partly due to symptomatic overlap between negative and depressive symptoms. When depressieve symptoms were controlled for, changes in negative symptoms only predicted an (inverse) change in Openness on a trend level. Finally, the patients in the current study showed a slight increase in the mean level of Conscientiousness, which could not be accounted for by fluctuations in psychotic or depressive symptom levels.

Higher Conscientiouness reflects a stronger tendency towards dutifulness and competence (Costa and McCrae, 1992) and higher degrees of being governed by conscience and self-control (McCrae, 1992). Part of the increase in Conscientiousness found in the present study may be caused by normative development: a meta-analysis of 92 general population studies showed mean levels of Conscientiouness to increase over lifetime, particularly in young adulthood (ages 20 to 40) (Roberts et al., 2006). Other possibilities are that the mean level of Conscientiousness increased due to better adaptation to psychotic illness, positive treatment effects and/or longer duration of symptomatic and/or functional remission for a subgroup of patients. Since we did not examine these variables in the present study, we can currently only speculate about what caused the increase. In a clinical sense, an increase in Conscientiousness is likely to

constitute a positive development, as higher Conscientiousness is associated with, for instance, better social functioning (Lysaker and Davis, 2004) and lower risk for suicidal behavior (Pillmann et al., 2003). On the other hand, one should also stay aware that the increase in Conscientiousness found in the current study is of a small magnitude, and that compared with general population norms (NEO-FFI manual, appendix E), patients still presented a fairly low mean level of Conscientiousness at follow-up (Hoekstra et al., 1996).

The current study showed Openness to be the only FFM trait to be affected by psychotic symptom levels (when also controlling for depressive symptoms). Openess reflects a broad factor of personality, including creativity, aesthetic sensitivity, intellectual interests, unconventional values and need for variety (McCrae, 1992). The levels of Openness in patients with psychotic disorders are generally reported to be either comparable to (Boyette et al., 2013; Camisa et al., 2005; Kentros et al., 1997; Reno, 2004) or lower than (Gurrera et al., 2000) community controls. A different pattern may exist for first-episode patients, since some studies (Beauchamp et al., 2006; Couture et al., 2007), although not all (Gleeson et al., 2005), report higher levels of Openness for this group. Also, levels of Openness have been found to be elavated in individuals with a cluster A personality disorder (Camisa et al., 2005), and positive associations have been reported between Openness and subthreshold positive symptoms in both clinical and non-clinical populations (Boyette et al., 2013; Ross et al., 2002). In earlier work, we have suggested that, for a subgroup of more severely impaired patients with psychotic disorders, negative symptoms may suppress Openness levels (Boyette et al., 2013). The current findings are supportive of this suggestion. Nonetheless, one should realize that higher levels of Openness do not necessarily indicate an absence of pathology in patients with psychotic disorders, since higher Openness could also reflect higher levels of subthreshold positive symptoms. This duality may also contribute to the finding, expressed by Dinzeo and Dochtery (2007), that Openness is generally less consistent and less strongly related to clinical outcome in patients with psychotic disorders compared to the other FFM traits.

The FFM trait Agreeableness reflects a tendency towards being sympathetic, trusting and altruistic (Costa and McCrae, 1992). Contrary to our expectations, Agreeableness was not found to be affected by change in psychotic symptom levels. This lack of interconnectedness is noteworthy, as lower Agreeableness has been found to be associated with higher levels of positive symptoms (Boyette et al., 2013; Lysaker et al., 2003) and to predict psychotic symptom exacerbation (Lysaker and Taylor, 2007)

and psychotic relapse (Gleeson et al., 2005). As the current study indicates that lower Agreeableness is not influenced by psychotic symptom severity, other explanations are warrented in order to explain these findings. Gleeson et al. (2005) describe several theories how cognitives biases and interpersonal behavior associated with lower Agreeableness may lead to a higher vulnerability for psychotic symptom exacerbation.

The findings of the current study should be viewed in the light of its limitations. First, our selection of subjects, who are able and willing to give informed consent and collaborate with study procedures, may not be representative for the group of patients with psychotic disorders as a whole. Indeed, in the current sample, psychotic symptom levels were mostly clustered at the lower values at both baseline and three year follow-up. The ranges of symptom changes presented in Table 2 show that, on an individual level, substantial variation in symptom change existed, and regression analyses were conducted in an attempt to capture more fine-grained effects. Even so, it cannot be ruled out that FFM traits may be more affected in the more severe, or longer, course of psychotic illness. For instance, multiple psychotic episodes may generate a cumulative effect on FFM levels. Although there is indication that (equivalents of) Neuroticism are fairly consistent across samples with different symptomatic states (inpatients vs. outpatients) as well as across different stages of illness (recent-onset vs. chronic) (Horan et al., 2008), it is unknown whether this is also the case for the other FFM traits. Additionally, it is not clear whether personality development may have already been "scarred" at onset of psychotic illness. There is evidence that higher Neuroticism (Goodwin et al., 2003; Krabbendam et al., 2002; van Os and Jones, 2001) and lower Extraversion (van Os and Jones, 2001) are precursors of onset of psychotic illness, also when controlling for depressive symptoms, yet as far as we are aware, no studies have been conducted comparing pre- and post-onset levels of the FFM traits in patients with psychotic disorders. Future studies are required to address these issues.

Concluding, based on the findings of the current study, we recommend that future studies on relations between FFM traits and clinical outcome in patients with psychotic disorders should account for negative and depressive symptom levels.

ACKNOWLEDGEMENT

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