UvA-DARE (Digital Academic Repository)

Personality Across the Psychosis Continuum: A Fine-Grained Perspective

Begemann, M.J.H.; Boyette, L.-L.; Kwast, A.K.; Sommer, I.E.C.

[Link to publication]

Personality Across the Psychosis Continuum: A Fine-Grained Perspective

Marieke J. H. Begemann*,[1],[◦], Lindy-Lou Boyette[2,3], Aimo K. Kwast[1,3], and Iris E. C. Sommer[1]

[1]Department of Biomedical Sciences of Cells & Systems, Section of Cognitive Neurosciences, University Medical Center Groningen, University of Groningen, Groningen, The Netherlands; [2]Department of Clinical Psychology, University of Amsterdam, Amsterdam, the Netherlands; [3]These authors contributed equally to the article.

*To whom correspondence should be addressed; Department of Biomedical Sciences of Cells & Systems, Section of Cognitive Neurosciences, University Medical Center Groningen, University of Groningen, Groningen, The Netherlands; tel: +31-50-361-64-44, fax: +31-887555443, e-mail: m.j.h.begemann@umcg.nl

Background: Personality is associated with the etiology, course, and outcome of psychosis. Yet, more specific knowledge on this association, beyond the global domains of the Five-Factor Model, is scarce. One way to investigate this is to study the personality profile of individuals having frequent psychosis-like experiences (PE), but without clinical psychosis or Cluster A personality disorder and compare them to patients with such symptoms. *Methods:* We included 134 individuals with nonclinical PE, 40 psychotic disorder patients, and 126 healthy controls. Participants completed the NEO-PI-R. Domain and facet-level data were compared across groups. *Result:* As expected, group differences were significant for Neuroticism, Openness, and Conscientiousness. Facet-level analyses showed intermediate levels of Depression and Anxiety (N) in individuals with nonclinical PE, together with high Fantasy, Aesthetics and Ideas (O) compared to controls. Notably, they displayed high Angry Hostility (N) and Feelings (O), along with low Trust (A) and Gregariousness (E). Patients showed high Vulnerability and Self-Consciousness (N), and low Competence and Self-discipline (C), while both nonclinical groups showed similar levels. *Conclusions:* This is the first study to analyze both domain and facet-level data across the psychosis continuum. Our findings show how the facets Hostility and Feelings, low Trust and Gregariousness may be related to general PE proneness, both in nonclinical and clinical individuals alike, while Vulnerability and Self-Consciousness, low Competence, and low Self-discipline may differentiate patients from individuals with nonclinical PE. Current results encourage intervention strategies targeting coping and social skills for youth at risk for psychosis.

Key words: psychosis continuum/schizophrenia/psychotic experiences/personality/Five-Factor Model/personality facets

Introduction

Personality may play an important role in the etiology, course, and outcome of schizophrenia and related psychotic disorders.[1,2] The well-established Five-Factor Model for personality[3,4] (FFM) describes 5 global domains of personality: Neuroticism (N: the vulnerability to emotional instability and negative emotional responses), Extraversion (E: the tendency of being warm and outgoing), Openness to experiences (O: the cognitive disposition to new ideas, philosophy, and esthetics), Agreeableness (A: the tendency of being sympathetic, trusting and altruistic) and Conscientiousness (C: the tendency towards dutifulness and competence). High levels of Neuroticism have been associated with an increased risk of developing psychosis,[1,5,6] whereas high Extraversion could exert a risk-reducing effect.[6] After diagnosis of a psychotic disorder, the risk of psychotic relapse has also been related to high Neuroticism[7] and low Extraversion,[8] as well as to low Agreeableness.[7] In addition, Neuroticism is a predictor for the severity of positive symptoms not only in patients,[9] but also in the general population.[5] Finally, the 5 FFM domains are associated with numerous clinical outcome phenomena in patients with psychotic disorders,[10] among which symptom-corrected assessment of social functioning[11] and subjective wellbeing over a period of 6 years.[12]

Research on FFM personality domains and healthy individuals that report psychosis-like experiences (PE) but without clinical levels of distress or dysfunction have increased our understanding of the relationship between personality and psychosis. Although scarce, studies have found that subclinical positive psychotic experiences are correlated with higher Neuroticism and higher Openness in community samples,[13–16] some studies also reported on lower Agreeableness.[13,16] In addition to these association studies, our group investigated healthy individuals that report having frequent PE, including auditory verbal hallucinations.[17] After extensive screening by a psychiatrist, these individuals did not fulfill criteria for schizotypal personality disorder nor for a psychotic disorder and are therefore located more towards the healthy side of the psychosis continuum.[18] In a preliminary sample, we found that individuals with frequent nonclinical PE (*n* = 103) displayed high Openness relative to controls (*n* = 60).[17] We specifically evaluated Neuroticism (but no other FFM trait) as a dimensional vulnerability factor in a subsequent study, including patients with a psychotic disorder (*n* = 40), individuals with nonclinical PE (*n* = 135) and healthy controls without PE (*n* = 126) and found a graded difference in Neuroticism across the 3 groups, with patients at the high end and individuals with frequent nonclinical PE in the intermediate position.[19]

While prior results have increased our knowledge on personality and (non)clinical psychotic experiences in broad terms, more fine-grained research on specific associations would help to understand the exact phenomena that pose the risk to both PE and psychotic disorders.[20] As noted by its developers, the 5 FFM domains can remain somewhat shallow and undifferentiated, therefore 6 facets have been developed within each domain that provide a detailed, nuanced, and more accurate description of personality.[21,22] Research on these individual facets may reveal associations with PE that were less evident—or even suppressed—at the domain level.[23] Although the value of facet-level analyses has been stressed throughout literature,[7,13,22] no prior studies have yet investigated FFM facets in patients with psychotic symptoms. Some smaller studies have linked FFM facets to positive (sub)clinical symptoms of Cluster A personality disorder, showing higher Depression (N; susceptibility to feelings of sadness, hopelessness, worthlessness and guilt), higher Fantasy and Aesthetics (both O; tendency towards imagination and artistic interests, respectively) and lower Trust (A; tendency to believe that others are honest and well-intended) compared to healthy subjects.[13,24–26]

The aim of the current study was to investigate the full domain- and facet-level personality profile in a large sample of individuals experiencing frequent nonclinical PE including auditory verbal hallucinations (*n* = 134), in comparison to 2 reference groups: patients with a psychotic disorder (*n* = 40) and healthy controls (*n* = 126).

Based on previous findings, we hypothesize individuals with frequent nonclinical PE to display higher Openness relative to controls[17] and patients,[27] in addition to intermediate levels of Neuroticism.[19] Furthermore, although our nonclinical individuals do not fulfill criteria for schizotypal personality disorder, we expect that there is a certain degree of overlap with subclinical symptoms of cluster A personality. Therefore, we expected to find intermediate levels of Depression (N) and Trust (A) in individuals with frequent nonclinical PE, together with higher levels of Fantasy and Aesthetics (O) as compared to both patients and controls.[13,26] Analyses on facet levels scores in patients with psychotic disorders compared to controls were conducted in an exploratory manner.

Methods

Subjects

The sample of this study consisted of individuals with frequent nonclinical PE (including frequent auditory verbal hallucinations), patients with a psychotic disorder with current symptoms (including frequent auditory hallucinations), and healthy controls. All participants were between 18 and 65 years of age and provided informed written consent for study participation. Participants were recruited as part of the Spectrum study, data was collected between 2005 and 2011. For an extensive description of recruitment and selection, see Sommer et al.[17] Research ethics for all methods involved in this study was approved by the Human Ethics Committee of the University Medical Center Utrecht.

In short, the individuals with nonclinical PE and the healthy controls were recruited by means of a website entitled "Explore Your Mind." Participants filled in a self-report questionnaire on auditory verbal hallucinations, based on the Launay and Slade Hallucinations Scale (LSHS).[28] Those who scored 0 on both items were invited to participate as healthy controls. Those who had a score of 7 or higher on the 2 items ("*In the past, I have had the experience of hearing a person's voice and then found that no one was there*" and ("*I have been troubled by voices in my head*") were further screened during a telephone interview and included as individual with nonclinical PE when meeting the following inclusion criteria: (1) voices were distinct from thoughts and had a "hearing" quality, (2) voices were experienced at least once a month, (3) no diagnosis or treatment for psychiatric disorders other than depressive or anxiety disorders in remission, (4) no alcohol or drug abuse for at least 3 months, (5) no chronic somatic disorder, (6) 18 years of age or older, and (7) 4 Dutch-born grandparents (to restrict heterogeneity for later genetic studies).

Both nonclinical groups were invited to the University Medical Centre Utrecht. To exclude Axis I and Axis II pathology (other than depressive or anxiety disorders in complete remission) and alcohol or substance abuse

during the past 3 months, the CASH and the Structured Clinical Interview for DSM-IV (SCID-I)[29] were conducted by psychiatrists and trained psychologists. Although no clinical delusions were present in the individuals with nonclinical PE, this group was characterized by an elevated schizotypal and delusional tendency,[17] as measured with the Schizotypal Personality Questionnaire and the Peters Delusion Inventory. However, their magical beliefs were largely socially accepted (mainly spiritual ideas) and individuals were functioning well socially and emotionally.[17] Patients were recruited from the University Medical Centre Utrecht (figure 1) and were all diagnosed schizophrenia spectrum disorder according to DSM-IV criteria.[30] The Comprehensive Assessment of Symptoms and History Interview (CASH)[31] was administered to all patients by an independent psychiatrist to confirm psychiatric diagnosis and to verify that they experienced auditory verbal hallucinations regularly for over a year.

Phenomenology of auditory verbal hallucinations was assessed using an interview, including the LSHS and the PSYRATS Auditory Hallucinations Rating Scale.[32] In a previous study, we found that our patient group experienced their voices more frequently than the nonclinical group, also the content was more negative and patients felt that they were less in control. Moreover, age at onset of AVHs was significantly lower in healthy individuals. Patients did not differ from the nonclinical individuals regarding the perceived location of their voices (inside/outside the head), the number of voices, loudness, and personification.[33]

Instruments

The Dutch version of the self-report questionnaire NEO Personality Inventory (NEO-PI-R) was used (240 items) to evaluate the 5 key personality traits, namely Neuroticism, Extraversion, Openness, Agreeableness,
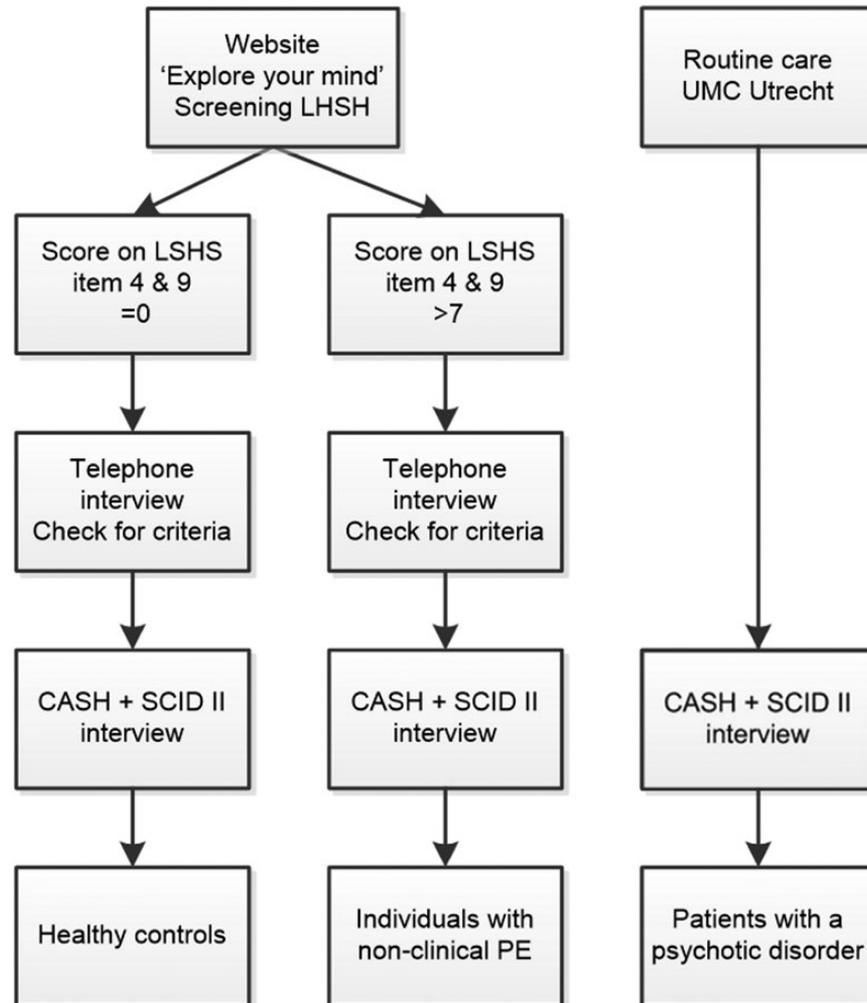

Fig. 1. Flow diagram of the recruitment and selection procedure. Note. LSHS = Launay and Slade Hallucinations Scale; CASH = Comprehensive Assessment of Symptoms and History Interview; SCID-II = Structured Clinical Interview for DSM-IV; PE=psychotic experiences.

and Conscientiousness. Each of these 5 dimensions are subdivided into 6 different facets. The NEO-PI-R has demonstrated satisfactory to excellent construct validity and moderate to good internal reliability in general population samples.[3,34] The factor structure and reliability of the FFM scales in patients with severe psychiatric disorders, including schizophrenia, were found to be similar to a normative sample.[35]

Following the NEO-PI-R manual, the cutoff of 40 missing values was applied to exclude participants with a large number of missing answers.[36] For the facet-level analyses, participants were excluded when having more than 2 missing values within one individual facet. Missing values in the remaining dataset were replaced with a neutral score of 3. This is the first analysis where we evaluate both domain and facet-level data from these 3 groups.

Statistical Analyses

Analyses were performed with SPSS 25. Differences in demographic variables were evaluated between individuals with nonclinical PE, patients, and controls using χ^2 (categorical variables) and ANOVA (continuous variables). First, domain-level analyses were performed using ANOVA comparing the 3 groups on levels of the 5 personality domains. Second, domains showing significant group differences were further investigated by performing separate ANOVAs for all underlying facets. For the remaining domains, additional facet-analyses were conducted using a final series of ANOVAs (only significant results are reported). Post hoc pairwise comparisons were conducted for the domains and facets showing significant group differences. To correct for multiple comparisons, the Benjamini-Hochberg procedure was applied (false discovery rate [FDR] of 5%) for the number of domains (5 in total) and facets (6 per domain) evaluated.[37] Lack of significant group differences may indicate absence of an effect, or of insufficient power to detect smaller effect sizes. To directly test the statistical equivalence between groups, 2 additional one-sided t-tests (TOST) equivalence procedures were performed.[38,39] This procedure assumes that there is a difference between groups, t-tests

are carried out on specified upper and lower limits that can be considered meaningful. To test a small effect, we used Cohen's $d = -0.3$ to 0.3. Groups are concluded to be equivalent when the observed difference between the groups falls within these limits. Finally, given the significant group difference in years of education, sensitivity analyses were performed by repeating analyses, including this variable as a covariate (ANCOVA). Years of education was also correlated with domain-level scores and, when significant for the total sample, the underlying facets were evaluated (Pearson's r).

Results

The final sample for the domain-level analyses consisted of 300 participants, after excluding one individual with nonclinical PE due to the number of missing values (table 1). For the facet-level analyses, one healthy control was excluded for missings in Impulsiveness and Excitement Seeking, and one patient was excluded for missings in Competence, Values, and Tender-mindedness.

Domain-Level Analyses

A significant group difference was found for Neuroticism ($P < .001$, FDR-corrected; see figure 2 and supplementary appendix, table 2), with graded levels found across the 3 PE severity groups. Post hoc group comparisons showed that patients displayed high Neuroticism compared to both individuals with nonclinical PE and healthy controls ($P \leq .001$). The high Neuroticism found in individuals with nonclinical PE relative to controls was significant at trend level ($P = .071$), equivalence testing was not significant ($P = .482$), thereby not ruling out the presence of a group difference.

Openness also showed a significant group difference ($P < .001$). Post hoc testing showed high levels in individuals with nonclinical PE relative to healthy controls ($P < .001$) and patients (trend level, $P = .085$; equivalence testing was not significant, $P = .650$). No effect was observed when comparing Openness between patients and controls, although the nonsignificant equivalence test prevented

Table 1. Demographic Characteristics of the Participants

	Patients (*N* = 40)	NCPE (*N* = 134)	Controls (*N* = 126)	Significance	Post hoc Group Comparisons
Age (*M*/SD)	37.87 (11.86)	42.71 (12.71)	43.48 (14.29)	$F(2) = 2.77$ $P = .064$	
Gender (male/female)	8/32	43/91	40/86	$X^2(2) = 2.34$ $P = .311$	
Years of education (*M*/SD)	13.15 (2.62)	13.37 (2.11)	14.05 (2.29)	$F(2) = 3.92$ **$P = .021$**	P = NCPE, $P = 1.000$ NCPE < C, $P = .050$ P < C, $P = .088$

Note: Significant *P* values (α = .05) are shown as boldface. *N*, sample size; *M* = mean; P = patients; NCPE, individuals with nonclinical psychotic experiences; C, healthy controls.
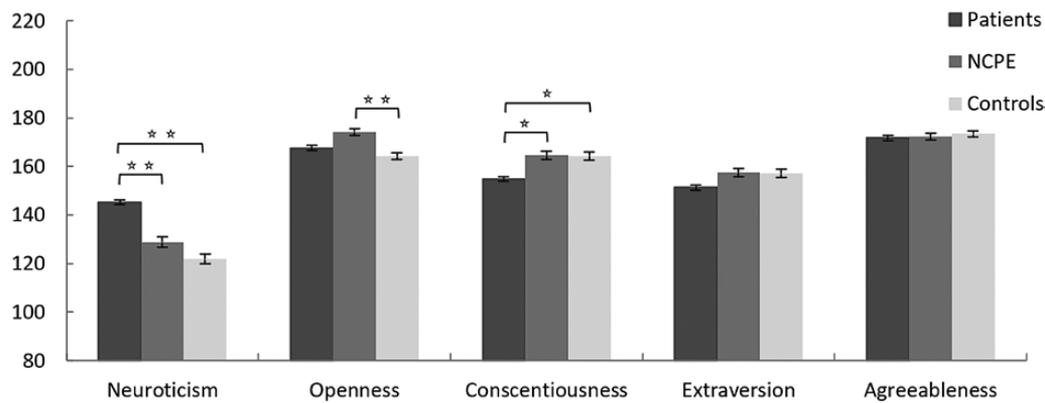
Fig. 2. Levels of Neuroticism, Openness, Conscientiousness, Extraversion, and Agreeableness in patients, individuals with nonclinical psychotic experiences (NCPE) and healthy controls, including standard error (SE). Note. Domains ranked according to *P*-value indicates significant group differences. *P < .05, **P < .001.

conclusions on a group difference being absent or not (*P* = .274).

The 3 groups differed significantly in levels of Conscientiousness (*P* = .026), patients scored lower than individuals with nonclinical PE (*P* = .018) and controls (*P* = .023). Individuals with nonclinical PE and controls did not differ, which was confirmed by equivalence testing (*P* = .010).

For Extraversion and Agreeableness, no significant group differences were found (figure 2; supplementary appendix, table 2).

Facet-Level Analyses

Facet-level analyses were conducted for the traits that proved to be relevant on the domain-level, namely Neuroticism, Openness, and Conscientiousness. Individual facets were ranked according to *P*-value (figure 3 and supplementary appendix, table 2). Overall, a graded difference was observed across the facets underlying *Neuroticism*, as individuals with nonclinical PE scored intermediate while patients had the highest levels and healthy controls were on the low end. Significant group differences were found for 5 of the 6 facets of Neuroticism (supplementary appendix, table 2): Anxiety, Depression, Vulnerability, Angry Hostility, and Self-Consciousness, a trend was found for Impulsiveness scores (*P* = .063). Post hoc analyses revealed that individuals with nonclinical PE formed a significant intermediate group regarding levels of Anxiety and Depression, scoring significantly lower than patients yet higher compared to healthy controls. For Vulnerability and Self-Consciousness, patients showed high levels compared to individuals with nonclinical PE and controls, both nonclinical groups tested statistical equivalent (*P* = .010 and *P* = .014, respectively). Both individuals with nonclinical PE and patients showed high Angry Hostility compared to controls, equivalence testing was not significant (*P* = .221).

For *Openness*, significant group differences were found for 4 facets (supplementary appendix, table 2), namely Feelings (emotionality), Aesthetics (artistic interest), Fantasy (imagination), and Ideas (open-mindedness). Post hoc analyses displayed that individuals with nonclinical PE displayed higher levels compared to controls on these 4 facets. They also scored significantly higher on Ideas than patients. Equivalence testing was not significant for Feelings (*P* = .462), Aesthetics (*P* = .236), and Fantasy (*P* = .250), preventing conclusions on the absence of group differences. Relative to controls, patients showed high levels of Feelings and Aesthetics (trend-level), equivalence testing was not significant for Aesthetics (*P* = .669) in addition to Fantasy (*P* = .458) and Ideas (*P* = .127).

Three facets of *Conscientiousness* showed significant group differences (supplementary appendix, table 2), including Competence, Self-Discipline, and Deliberation (tendency to reflect and think things through). Post hoc analyses revealed that patients displayed low Competence and Self-Discipline compared to both nonclinical groups, which were statistically equivalent (*P* = .035 and *P* = .026, respectively). For Deliberation, patients scored low relative to healthy controls (*P* = .016). Equivalence testing was not significant when comparing patients to individuals with nonclinical PE (*P* = .560) and individuals with nonclinical PE to controls (*P* = .126).

For the domains of *Extraversion* and *Agreeableness* that did not show significant group differences in the initial analyses, additional facet-level comparisons were performed (figure 4; supplementary appendix, table 3). The 3 groups differed significantly in levels of Gregariousness (tendency to be social and outgoing; *P* < .001) and Assertiveness (*P* = .017), subsuming *Extraversion*. Post hoc analyses showed lower levels of Gregariousness in individuals with nonclinical PE (*P* = .001) and patients (*P* = .003) compared to controls, equivalence testing was not significant (*P* = .183). Patients displayed low Assertiveness compared to individuals with
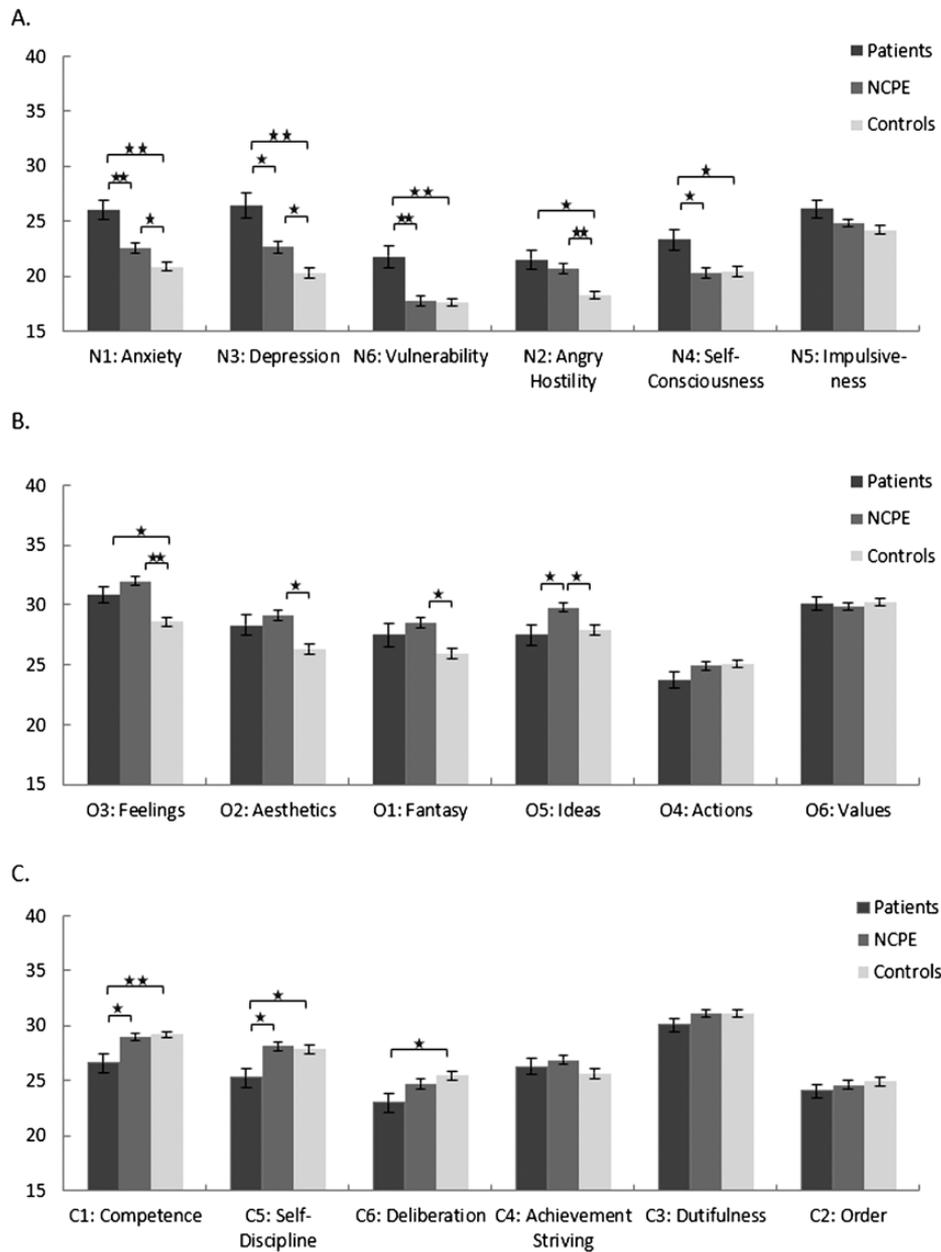
Fig. 3. Facets subsuming Neuroticism (A), Openness (B), and Conscientiousness (C) in patients, individuals with nonclinical psychotic experiences (NCPE), and healthy controls, including standard error (SE). Note. Individual facets ranked according to *P*-value indicates significant group differences. *P < .05, **P < .001.

nonclinical PE (*P* = .004). Equivalence testing was not significant when comparing controls to individuals with nonclinical PE (*P* = .313) and patients (*P* = .551). The 3 groups differed significantly on Trust in *Agreeableness* (*P* < .001). Both individuals with nonclinical PE (*P* = .003) and patients (*P* < .001) displayed lower Trust, equivalence testing was not significant (*P* = .486).

Sensitivity Analyses

When including years of education using ANCOVA analyses, the group difference found for the facet Deliberation in Conscientiousness (*P* = .040) reduced

to trend level (*P* = .055), yet other results did not significantly change. Years of education was positively associated with Openness in the total sample (*r* = .118, *P* = .042); supplementary appendix, table 4). This correlation was also observed in the healthy control group (*r* = .260, *P* = .003) but not in the other 2 groups. When evaluating the underlying facets of Openness, years of education was positively associated with Ideas (total sample: *r* = .237, <.001; healthy controls: *r* = .327, *P* < .001; patients: *r* = .323, *P* = .042) and Values (healthy controls: *r* = .20; *P* = .028). Finally, years of education was related to Extraversion in healthy controls (*r* = .18, *P* = .042).
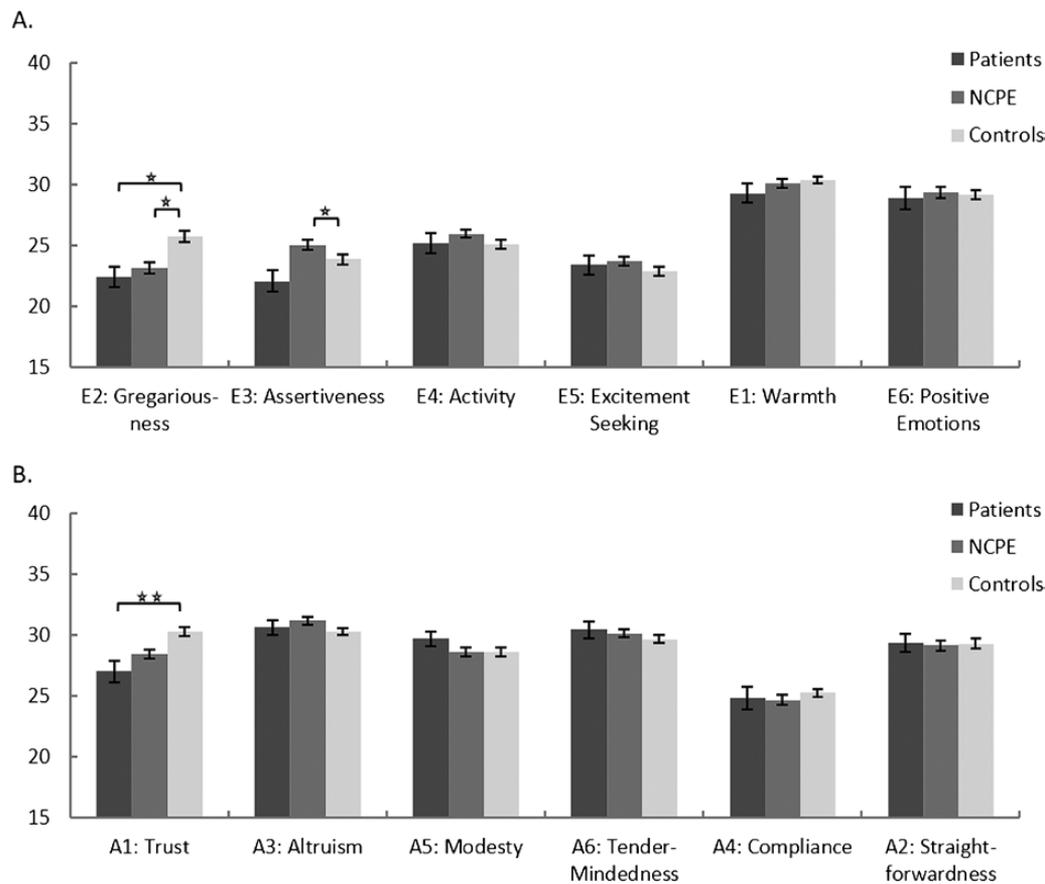
Fig. 4. Facets subsuming Extraversion (A) and Agreeableness (B) in patients, individuals with nonclinical psychotic experiences (NCPE), and healthy controls, including standard error (SE). Note. Individual facets ranked according to *P*-value. indicates significant group differences. *$P < .05$, **$P < .001$.

Discussion

This is the first study to provide a domain- and facet-level investigation of FFM personality profiles of individuals experiencing frequent nonclinical PE, patients with a psychotic disorder and healthy controls. Together with intermediate levels of Neuroticism, individuals with nonclinical PE showed high Openness compared to healthy controls and patients (trend-level). Patients displayed high Neuroticism and low Conscientiousness compared to individuals with nonclinical PE and controls.

Our results support the proposition that *Neuroticism*, also referred to as emotional instability, constitutes a dimensional risk factor for psychosis.[19] Within this domain, we found an intermediate level of Depression (the tendency to experience guilt, sadness, and loneliness) and Anxiety (the level of worrying and feeling tensed). The facet Depression has previously been linked to positive schizotypy.[13] Moreover, individuals with nonclinical PE displayed high levels of Angry Hostility (ie, negative attitudes, easily aroused anger, and aggressive behavior) relative to controls, which was also found for patients. In view of these results, feelings of depression, anxiety, frustration, and anger may be the specific aspects of Neuroticism that are linked to PE proneness across the continuum. Psychological intervention methods can be implemented to target negative thoughts and emotions. Cognitive behavioral therapy, for example, is now recommended by most schizophrenia treatment guidelines,[40] and has also been implemented to decrease conversion rates in prodromal groups with positive effects.[41] Our results further show that individuals with nonclinical PE may be distinguished from patients based on Vulnerability and Self-Consciousness, as they scored in the same range as controls (confirmed by equivalence testing) while patients display significantly higher levels. Low Vulnerability indicates that individuals with nonclinical PE are more competent in handling stressful situations and less prone to experience feelings of helplessness. We previously showed that, although individuals with frequent nonclinical PE report similar high rates of stressful events as patients, they have a more adaptive coping style.[42] Low Self-Consciousness suggests that individuals with nonclinical PE are less prone to shyness and social anxiety relative to patients with psychotic disorders. These results encourage the application of psychosocial interventions for youth at risk for psychosis to increase and support social skills. Previous studies in patients with psychotic symptoms have shown

that improving coping strategies[43] and boosting social skills[44] can be effective in reducing symptom severity. Researchers are now increasingly implementing similar recovery-oriented interventions in ultra high-risk populations, including cognitive-behavioral social skills training[45] and theater improvisation training,[46] the latest showing promising positive results.

Furthermore, we found high *Openness* in individuals with nonclinical PE compared to controls and patients. Other studies also found that elevated Openness is related to PE in nonclinical samples,[13–16] while this is not consistently observed in clinical samples.[10,15,27,47] This means that for people with PE, Openness may actually be a protective factor for developing psychotic disorders. On the facet-level, we confirmed our hypothesis that individuals with nonclinical PE displayed elevated Fantasy and Aesthetics compared to controls (ie, higher receptivity to the inner world of imagination and appreciation of art and beauty), which have also been linked to subclinical positive symptom schizotypy and Cluster A personality disorder.[13,26,47] Together with patients, they also scored significantly higher on Feelings compared to controls - a remarkable finding given the potential impact of negative symptoms in patients. This could suggest that proneness to PE, in general, may be associated with openness to inner feelings and emotions, perhaps in combination with a greater imagination and esthetic appreciation. Previous research has described absorption as a predisposing personality trait for hallucinatory experiences, dissociation, and anomalies of belief and experience,[48] but as of yet, there is no consensus to what extend these concepts are part of the psychosis continuum. As individuals with nonclinical PE differentiated from patients and controls in their high score on Ideas, it may be speculated that intellectual curiosity and the willingness to consider new or unconventional ideas may enable the individuals with nonclinical PE to better cope with extraordinary experiences, in addition to their greater emotional stability as described above.

Regarding *Conscientiousness, Extraversion,* and *Agreeableness,* individuals with nonclinical PE shared a similar personality profile with healthy controls. This is in line with past findings,[13–16] although 2 studies associated subclinical positive symptoms with lower Agreeableness.[13,16] However, our facet-level analyses revealed a more fine-grained perspective. Both Individuals with nonclinical PE and patients displayed low Trust compared to controls (*Agreeableness*).[27] Similar results were found for Gregariousness (*Extraversion*). The suggestion that individuals with nonclinical and patients both seem more inclined to believe that others are unreliable and dangerous, together with a reduced preference of other people's company and social situations, can aid in framing interventions that specifically target these personality traits. Lemmers-Jansen and colleagues (2019)[49] used a trust game, to show that impaired trust in a clinical high

risk and a first-episode sample can be restored, as in both groups social feedback learning was intact. Furthermore, patients differed from individuals with nonclinical PE in their low Assertiveness (*Extraversion*), indicating they are generally less comfortable with speaking out and taking charge. In line with previous findings,[10,27,47] patients also showed low *Conscientiousness* (the tendency towards dutifulness and competence) compared to controls and individuals with nonclinical PE, who tested statistically equivalent. This was evident in patients having low levels of Competence (ie, beliefs about the controllability of things that happen), Self-discipline (the ability to complete difficult tasks) and Deliberation (being less cautious and making more impulsive decisions). In line with our findings, recent-onset schizophrenia patients were reported to recent-onset schizophrenia patients were reported to appraise stressors as less controllable and their coping as less effective.[50]

Strengths and Limitations

This is the first study in the field of psychosis that investigated personality domains and facets using a fine-grained perspective across the psychosis continuum. Our group of individuals with frequent nonclinical PE provide an interesting perspective on the role of personality characteristics, outside the context of a schizophrenia spectrum disorder. Studying nonclinical individuals alongside patients will not only progress our understanding of the etiology of PE in general, but also provides more insight into risk factors for the conversion to the clinical stage.

A first limitation of our work is that causality between personality traits and the presence of psychotic symptoms cannot be inferred from this cross-sectional study. However, previous longitudinal research has indicated that some personality characteristics predate onset of illness,[1,5,6,51] and that the FFM personality traits are stable regardless of the fluctuations of positive symptoms or psychotic relapse.[52,53] As personality traits are usually quite stable, we may assume that these traits were also present before disease onset. Second, our 3 groups varied in years of education, although post hoc comparisons were not significant. Including years of education as a covariate did not change our results, apart from the group effect for Deliberation (C) that reduced to trend level ($P = .055$). Previous research has shown that personality and intelligence are not completely independent (Bartels et al.[54]). In our total sample, years of education was positively correlated with levels of Openness, this was also observed in the healthy controls (Bartels et al.[54]) but not in the individuals with nonclinical PE nor in patients. On the facet-level, years of education was positively associated with Ideas in the total sample as well as in the control and patient subgroups. In the healthy control group, years of education was also positively related to Extraversion. Third, negative and depressive symptoms

can influence FFM measurements.[53] Although it cannot be ruled out that Neuroticism levels are partly explained by current affective disturbances, present sample was carefully screened for current depressive and anxiety disorders meeting DSM criteria, which were not found to be present. Third, our patient group was 3 times smaller than the 2 nonclinical groups, which could potentially explain why some trend-level group differences did not reach significance in reference to the patient group.

Conclusion

In conclusion, our findings suggest that increased levels of depression, anxiety, and frustration, combined with the openness to inner feelings and in the context of a general distrust and reduced preference for social situations, can be related to the presence of PE—both in nonclinical individuals and in patients. Importantly, individuals with nonclinical PE may be differentiated from patients in their competence to handle stressful situations, level of control and self-discipline, next to their willingness to consider new or unconventional ideas and lower levels of social anxiety—which they share with healthy controls without frequent PE. These facet-level findings provide important leads for the development of training strategies for young individuals at risk for psychosis.

Supplementary Material

Supplementary data are available at *Schizophrenia Bulletin Open* online.

Funding

Acknowledgments

References

1. Lönnqvist JE, Verkasalo M, Haukka J, *et al.* Premorbid personality factors in schizophrenia and bipolar disorder: results from a large cohort study of male conscripts. *J Abnorm Psychol.* 2009;118(2):418–423.
2. Jobe TH, Harrow M. Schizophrenia course, long-term outcome, recovery, and prognosis. *Curr Dir Psychol Sci* 2010;19(4):220–225.
3. Costa Jr PT, McCrae RR. Four ways five factors are basic. *Pers Individ Differ* 1992;13(6):653–665.
4. Digman JM. Personality structure: emergence of the five-factor model. *Annu Rev Psychol.* 1990;41(1):417–440.
5. Krabbendam L, Janssen I, Bak M, *et al.* Neuroticism and low self-esteem as risk factors for psychosis. *Soc Psychiatry Psychiatr Epidemiol.* 2002;37(1):16.
6. Van Os J, Jones PB. Neuroticism as a risk factor for schizophrenia. *Psychol Med.* 2001;31(6):1129–1134.
7. Gleeson JF, Rawlings D, Jackson HJ, McGorry PD. Agreeableness and neuroticism as predictors of relapse after first-episode psychosis: a prospective follow-up study. *J Nerv Ment Dis.* 2005;193(3):160–169.
8. Jonsson H, Nyman AK. Predicting long-term outcome in schizophrenia. *Acta Psychiatr Scand.* 1991;83(5):342–346.
9. Lysaker PH, Wilt MA, Plascak-Hallberg CD, Brenner CA, Clements CA. Personality dimensions in schizophrenia: associations with symptoms and coping. *J Nerv Ment Dis.* 2003;191(2):80–86.
10. Dinzeo TJ, Docherty NM. Normal personality characteristics in schizophrenia: a review of the literature involving the FFM. *J Nerv Ment Dis.* 2007;195(5):421–429.
11. Lysaker PH, Davis LW. Social function in schizophrenia and schizoaffective disorder: associations with personality, symptoms and neurocognition. *Health Qual Life Outcomes.* 2004;2:15.
12. van Dijk FA, Schirmbeck F, Haan L; for Genetic Risk and Outcome of Psychosis (GROUP) Investigators. A longitudinal analysis of the effects of neuroticism and extraversion on subjective well-being in patients with schizophrenia. *Psychiatry Res.* 2018;259:538–544.
13. Ross SR, Lutz CJ, Bailley SE. Positive and negative symptoms of schizotypy and the Five-factor model: a domain and facet level analysis. *J Pers Assess.* 2002;79(1):53–72.
14. Larøi F, DeFruyt F, van Os J, Aleman A, Van der Linden M. Associations between hallucinations and personality structure in a non-clinical sample: comparison between young and elderly samples. *Pers Individ Differ* 2005;39(1):189–200.
15. Boyette LL, Korver-Nieberg N, Verweij K, *et al.*; GROUP. Associations between the Five-Factor Model personality traits and psychotic experiences in patients with psychotic disorders, their siblings and controls. *Psychiatry Res.* 2013;210(2):491–497.
16. Wiltink S, Nelson B, Velthorst E, *et al.* The relationship between personality traits and psychotic like experiences in a large non-clinical adolescent sample. *Pers Individ Differ* 2015; 73, 92–97.
17. Sommer IE, Daalman K, Rietkerk T, *et al.* Healthy individuals with auditory verbal hallucinations; who are they? Psychiatric assessments of a selected sample of 103 subjects. *Schizophr Bull.* 2010;36(3):633–641.
18. van Os J, Linscott RJ, Myin-Germeys I, Delespaul P, Krabbendam L. A systematic review and meta-analysis of the psychosis continuum: evidence for a psychosis proneness-persistence-impairment model of psychotic disorder. *Psychol Med.* 2009;39(2):179–195.
19. So SH, Begemann MJ, Gong X, Sommer IE. Relationship between neuroticism, childhood trauma and cognitive-affective responses to auditory verbal hallucinations. *Sci Rep.* 2016;6:34401.
20. Watson D, Stasik SM, Ellickson-Larew S, Stanton K. Extraversion and psychopathology: A facet-level analysis. *J Abnorm Psychol.* 2015;124(2):432–446.
21. Costa PT Jr, McCrae RR. Domains and facets: hierarchical personality assessment using the revised NEO personality inventory. *J Pers Assess.* 1995;64(1):21–50.
22. Walton KE, Pantoja G, McDermut W. Associations between lower order facets of personality and dimensions of mental disorder. *J Psychopathol Beh Assessment* 2018;40(3):465–475.

23. Reynolds SK, Clark LA. Predicting dimensions of personality disorder from domains and facets of the Five-Factor Model. *J Pers.* 2001;69(2):199–222.

24. Widiger TA, Trull TJ, Clarkin JF, Sanderson C, Costa Jr PT. A description of the DSM-III-R and DSM-IV personality disorders with the five-factor model of personality. In: Costa PT, Widiger TA, eds. *Personality Disorders and the Five Factor Model Personality*. Washington, DC: American Psychological Association; 1994:41–58.

25. Widiger TA, Trull TJ. Assessment of the five-factor model of personality. *J Pers Assess.* 1997;68(2):228–250.

26. Trull TJ, Burr RM, Widiger TA. Five-factor model relations to Axis II personality disorders. In: Paper presented at the 11th annual meeting of the American Psychological Society; 1999; Denver, CO.

27. Ohi K, Shimada T, Nitta Y, *et al.* The Five-Factor Model personality traits in schizophrenia: A meta-analysis. *Psychiatry Res.* 2016;240:34–41.

28. Larøi F, Marczewski P, Van der Linden M. Further evidence of the multi-dimensionality of hallucinatory predisposition: factor structure of a modified version of the Launay-Slade Hallucinations Scale in a normal sample. *Eur Psychiatry.* 2004;19(1):15–20.

29. First MB, Spitzer RL, Gibbon M, Williams JBW. The structured clinical interview for DSM-III-R personality disorders (SCID-II). Part I: Description. *J Personal Disord.* 1995;9(2):83–91.

30. American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders (DSM 5®)*. Washington, DC: American Psychiatric Pub; 2013.

31. Andreasen NC, Flaum M, Arndt S. The Comprehensive Assessment of Symptoms and History (CASH). An instrument for assessing diagnosis and psychopathology. *Arch Gen Psychiatry.* 1992;49(8):615–623.

32. Haddock G, McCarron J, Tarrier N, Faragher EB. Scales to measure dimensions of hallucinations and delusions: the psychotic symptom rating scales (PSYRATS). *Psychol Med.* 1999;29(4):879–889.

33. Daalman K, Boks MP, Diederen KM, *et al.* The same or different? A phenomenological comparison of auditory verbal hallucinations in healthy and psychotic individuals. *J Clin Psychiatry.* 2011;72(3):320–325.

34. Hoekstra HA, Ormel J, De Fruyt F. *NEO persoonlijkheidsvragenlijsten NEO-PI-R en NEO-FFI. Handleiding*. Lisse, The Netherlands: Swets Test Services (STS); 1996.

35. Bagby RM, Costa Jr PT, McCrae RR, *et al*. Replicating the five-factor model of personality in a psychiatric sample. *Pers Individ Differ* 1999;27(6):1135–1139.

36. Hoekstra HA, Ormel J, De Fruyt F. *NEO-PI-R Handleiding*. Amsterdam, The Netherlands: Hogrefe Uitgevers BV; 2007.

37. McDonald JH. *Handbook of biological statistics*. 3rd ed. Baltimore, MD: Sparky House Publishing; 2014.

38. The Jamovi Project. 2019. Jamovi (version 1.1) [Computer software]. https://www.jamovi.org. Accessed June 24, 2020.

39. Lakens D. Equivalence tests: a practical primer for t tests, correlations, and meta-analyses. *Soc Psychol Personal Sci.* 2017;8(4):355–362.

40. Rathod S, Phiri P, Kingdon D. Cognitive behavioral therapy for schizophrenia. *Psychiatr Clin North Am.* 2010;33(3):527–536.

41. Van der Gaag M, Smit F, Bechdolf A, *et al.* Preventing a first episode of psychosis: meta-analysis of randomized controlled prevention trials of 12 month and longer-term follow-ups. *Schizophr Res.* 2013; 149:56–62.

42. Begemann MJH, Stotijn E, Schutte MJL, Heringa SM, Sommer IEC. Letter to the Editor: Beyond childhood trauma - stressful events early and later in life in relation to psychotic experiences. *Psychol Med.* 2017;47(15):2731–2736.

43. Hayward M, Edgecumbe R, Jones AM, Berry C, Strauss C. Brief coping strategy enhancement for distressing voices: an evaluation in routine clinical practice. *Behav Cogn Psychother.* 2018;46(2):226–237.

44. Turner DT, McGlanaghy E, Cuijpers P, van der Gaag M, Karyotaki E, MacBeth A. A meta-analysis of social skills training and related interventions for psychosis. *Schizophr Bull.* 2018;44(3):475–491.

45. Kelsven S, Holden J, Devoe D, *et al.* Cognitive-behavioral social skills training in youth at clinical high risk for psychosis: quantitative and qualitative methods: for implementation and facilitator training. *Schizophr Bull.* 2019;45(S2):S345–S346.

46. Tang SX, Seelaus KH, Moore, *et al.* Theatre improvisation training to promote social cognition: a novel recovery-oriented intervention for youths at clinical risk for psychosis. *Early Interv Psychiatr* 2019;14(2):163–171. doi:10.1111/eip.12834.

47. Camisa KM, Bockbrader MA, Lysaker P, Rae LL, Brenner CA, O'Donnell BF. Personality traits in schizophrenia and related personality disorders. *Psychiatry Res.* 2005;133(1):23–33.

48. Glicksohn J, Barrett TR. Absorption and hallucinatory experience. *J. Appl Res Mem Cogn* 2003;17(7):833–849.

49. Lemmers-Jansen ILJ, Fett AJ, Hanssen E, Veltman DJ, Krabbendam L. Learning to trust: social feedback normalizes trust behavior in first-episode psychosis and clinical high risk. *Psychol Med.* 2019;49(5):780–790.

50. Horan WP, Ventura J, Nuechterlein KH, Subotnik KL, Hwang SS, Mintz J. Stressful life events in recent-onset schizophrenia: reduced frequencies and altered subjective appraisals. *Schizophr Res.* 2005;75(2-3):363–374.

51. Goodwin RD, Fergusson DM, Horwood LJ. Neuroticism in adolescence and psychotic symptoms in adulthood. *Psychol Med.* 2003;33(6):1089–1097.

52. Kentros M, Smith TE, Hull J, McKee M, Terkelsen K, Capalbo C. Stability of personality traits in schizophrenia and schizoaffective disorder: a pilot project. *J Nerv Ment Dis.* 1997;185(9):549–555.

53. Boyette LL, Nederlof J, Meijer C, de Boer F, de Haan L; GROUP. Three-year stability of Five-Factor Model personality traits in relation to changes in symptom levels in patients with schizophrenia or related disorders. *Psychiatry Res.* 2015;229(1-2):539–544.

54. Bartels, M, van Weegen Fl, van Beijsterveldt CE, *et al*. 2012. The five factor model of personality and intelligence: a twin study on the relationship between the two constructs. *Pers Individ Differ.* 2012;53(4):368–373.