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A latent profile analysis of schizotypy, temperament and character in a nonclinical population: Association with neurocognition

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ABSTRACT

Schizotypy is conceptualized as a latent personality construct that confers liability for schizophrenia, while it is also suggested that schizotypy can relate to certain favorable aspects. Investigating individual-level interactions between schizotypy and broader personality characteristics might give a clue to this question. We aimed to identify homogeneous classes of individuals based on schizotypy, temperament and character and to validate this classification using comprehensive neurocognitive data. We studied 455 nonclinical adults using the Schizotypal Personality Questionnaire, the Temperament and Character Inventory, and an array of neuropsychological tests. A latent profile analysis (LPA) of schizotypy, temperament and character was conducted, and cognitive performance was compared as a function of latent class membership. LPA provided a 3-class solution. Of the sample, 15% was classified into a "high-positive-schizotypy/adaptive" group characterized by high cognitive-perceptual but low interpersonal schizotypy, together with low harm avoidance and high self-directedness, cooperativeness and self-transcendence; 18% was classified into a "high-schizotypy/maladaptive" group characterized by overall high schizotypy, together with high harm avoidance and low self-directedness and cooperativeness; and 67% was classified into a "low-schizotypy/adaptive" group characterized by overall low schizotypy, together with intermediate-to-low harm avoidance, high self-directedness and intermediate-to-high cooperativeness. Overall cognitive performance of the high-positive-schizotypy/adaptive group was comparable to that of the low-schizotypy/adaptive group and superior to that of the high-schizotypy/maladaptive group. The present LPA clearly defines a group of individuals who have adaptive personality traits and intact neuropsychological functions despite high positive schizotypy, suggesting that there may be complex, nonlinear relationships between schizotypal traits and psychopathology.

1. Introduction

Schizotypy refers to latent personality organization that confers liability for schizophrenia-spectrum disorders (Meehl, 1962), and the past several years have witnessed a dramatic increase in empirical studies that address etiological similarities between schizophrenia and schizotypy (Nelson et al., 2013). Like other psychopathological traits, schizotypy is postulated to be distributed among the general population in a dimensional fashion (Claridge, 1985; Nelson et al., 2013). Findings from our studies have supported the dimensional model of schizotypy (Hori et al., 2008, 2011, 2012a, 2012b; Noguchi et al., 2008). In line with the association between schizophrenia and pervasive cognitive impairments (Tandon et al., 2009), schizotypy has been associated with lower performance on several cognitive domains, including attention (Gooding et al., 2006; Lenzenweger, 2001), working memory (Matheson and Langdon, 2008; Park and McTigue, 1997), executive functioning (Daneluzzo et al., 1998; Lenzenweger and Korfine, 1994) and some aspects of intellectual abilities (Hori et al., 2012a; Matheson and Langdon, 2008); however, these findings have not always been replicated (Jahshan and Sergi, 2007; Spitznagel and Suhr, 2004). Moreover, growing evidence as well as anecdotes and bibliographies suggest that schizotypy can be related to certain benign aspects such as creativity (Folley and Park, 2005; Weinstein and Graves, 2002). Hence, it would be necessary to go beyond the simple linear model relating schizotypy to psychobiological abnormalities (McCreery and Claridge, 2002).

While schizotypy is a well-defined personality construct, another line of research suggests that normal and abnormal

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personality variations can be treated within a single, unified structural framework (Markon et al., 2005; O'Connor, 2002). Assuming this, it is conceivable that a specific personality trait (like schizotypy) in individuals without apparent psychopathological anomalies interacts with their broader dimensions of personality, thereby forming heterogeneous constellation of personality characteristics. Among a variety of scales designed to assess fundamental personality traits, the Temperament and Character Inventory (TCI; Cloninger et al., 1993) is one of the most commonly used self-report questionnaires to measure a set of personality dimensions. Significant correlations were reported between schizotypal symptomatology as measured by the Schizotypal Personality Questionnaire (SPQ; Raine, 1991), a well-established self-report questionnaire measuring schizotypal traits, and temperament/character dimensions as measured by TCI; SPQ scores correlate positively with harm avoidance and self-transcendence and negatively with self-directedness and cooperativeness (Bora and Veznedaroglu, 2007; Daneluzzo et al., 2005; Hori et al., 2012a). Here, we address a more basic question as to how schizotypal trait in an individual interacts with his/her temperament and character by evaluating individual-level relationships between scores on SPQ and those on TCI.

A latent profile analysis (LPA), a form of latent class analysis (LCA) used in the evaluation of continuous variables, is an empirically derived contemporary approach to uncover unobserved heterogeneity in a population and find meaningful groups of individuals that are similar in their responses to measured variables. Thus, LCA is a person-centered (rather than variable-centered), fully data-driven statistical method to classify individuals based on a set of observed response variables. Previous studies have applied LCA to evaluate the latent structure of schizotypal features in various populations such as twins without Axis-I psychiatric disorders (Battaglia et al., 1999), psychiatric patients (Fossati et al., 2001) and general-population adolescents (Cella et al., 2013). These studies have demonstrated the usefulness of LCA in categorizing the samples based on schizotypy symptomatology including positive, negative and disorganized symptoms. However, we are not aware of any LCA studies that have considered the intra-individual interaction between schizotypy and broader personality characteristics.

As the present study is an attempt to develop a novel framework for classifying individuals based on a set of personality traits, we need to validate the new classification by investigating its association with a feature that is closely linked to pathophysiology of schizotypy. We focused on cognition for this purpose because (1) it is considered as a putative endophenotype for schizophrenia (Greenwood et al., 2007), (2) schizotypy is arguably associated with cognitive deficits and (3) some dimensions of temperament and character are also shown to be related to cognitive functions (Bergvall et al., 2003; Hori et al., 2012a; Smith et al., 2008). We evaluate an array of cognitive domains including verbal/visual memory, attention/working memory, executive function, processing speed and verbal comprehension, all of which are (albeit not consistently) reported to be impaired in relation to schizotypy (Daneluzzo et al., 1998; Gooding et al., 2006; Hori et al., 2012a; Lenzenweger, 2001; Lenzenweger and Korfine, 1994; Matheson and Langdon, 2008; Park et al., 2012; Park and McTigue, 1997).

The aim of this study is to identify homogeneous classes of nonclinical individuals based on schizotypy, temperament and character, using LPA. We also attempt to validate the latent classes by comprehensive neuropsychological assessment. Our hypotheses were that (1) LPA would identify at least 2 homogeneous groups based on different combinations of schizotypy and temperament/character and (2) each of the latent groups would be associated with a unique neuropsychological profile.

2. Materials and methods

2.1. Participants

Participants were 455 Japanese adults (mean age ± standard deviation [S.D.], 47.6 ± 15.0 (range, 19–74) years; 354 women) who resided in the western part of Tokyo. They were recruited from the community through advertisements in free local magazines and our website announcement. At the first visit, participants were interviewed using the Japanese version of the Mini-International Neuropsychiatric Interview (Sheehan et al., 1998) by a research psychiatrist, and only those who demonstrated no current Axis-I disorders were enrolled. In addition, individuals who demonstrated at least one of the following conditions in a non-structured interview performed by an experienced psychiatrist were excluded: past or current regular contact to psychiatric services, having a history of regular use of psychotropics or substance abuse/dependence, presenting other obvious self-reported signs of past primary psychotic and mood disorders, and having a prior medical history of central nervous system disease or severe head injury. The study was approved by the ethics committee of the National Center of Neurology and Psychiatry, Japan, and written informed consent was obtained from each participant.

2.2. Measures

2.2.1. Schizotypal Personality Questionnaire (SPQ)

SPQ (Raine, 1991) is a well-established, 74-item self-report questionnaire with a "yes/no" response format that incorporates DSM-III-R (APA, 1987) criteria for a diagnosis of schizotypal personality disorder (SPD). All items endorsed "yes" are scored 1 point. Each item loads onto one of the 3 factors: cognitive-perceptual, interpersonal and disorganized factors (Raine et al., 1994). We employed the validated Japanese version of the SPQ (Fujiwara, 1993; Someya et al., 1994).

Among various self-report measures to assess schizotypal personality traits, we decided to use the SPQ based on the following reasons. First, most (if not all) of the factor analytic studies, including the study of Raine et al. (1994), have shown that the SPQ has 3 factors consisting of cognitive-perceptual, interpersonal and disorganized factors, which correspond to positive, negative and disorganized symptoms of schizophrenia, respectively. This factor structure has been confirmed not only in student populations but in community adults (Badcock and Dragović, 2006; Bora and Baysan Arabaci, 2009; Raine et al., 1994). Employing multidimensional schizotypy construct that directly maps onto the schizophrenic symptomatology was considered important for the present study which, by building on the schizophrenia-schizotypy continuum model, aimed to give some insight into the pathophysiology of schizophrenia through the investigation into nonclinical schizotypy. Second, the SPQ is, to our knowledge, the only schizotypy scale that has been used to examine correlations of schizotypy multidimensionality with temperament and character dimensions, as described earlier (Bora and Veznedaroglu, 2007; Daneluzzo et al., 2005).

The internal consistency as measured by Cronbach's α of the total SPQ score in the present sample was 0.92, indicating high internal consistency reliability comparable to that of the original version (Raine, 1991). Cronbach's α for each factor was: 0.84 for the cognitive-perceptual factor, 0.88 for the interpersonal factor and 0.83 for the disorganized factor.

2.2.2. Temperament and Character Inventory (TCI)

TCI (Cloninger et al., 1993; Kijima et al., 1996) is a 240-item self-report questionnaire; each item requires a true/false answer. Four dimensions of temperament, i.e., novelty seeking (NS), harm