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Bifactor structure of the schizotypal personality questionnaire (SPQ)

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ABSTRACT

The schizotypal personality questionnaire (SPQ) is used to characterize schizotypy, a complex construct helpful for the investigation of schizophrenia-related psychopathology and putative endophenotypes. The SPQ factor structure at item level has been rarely replicated and no study had tested a bifactor model of the SPQ so far. The unidimensional, the correlated, the second-order and the bifactor models of the SPQ were tested to evaluate whether the items converge into a major single factor defining the schizotypy-proneness of the participants, to be used for grouping purpose. Parallel principal component analysis (PCA) and confirmatory factor analysis (CFA) were used to determine the optimal number of factors and components in a cross-sectional, survey design involving 649 college students (males: 47%). The first-order, nine-subscale model was confirmed by CFA in the whole sample. The best evidence from parallel PCA in the training set was in favor of a two-factor model; the bifactor implementation of this model showed good fit in the subsequent CFA. Two main dimensions of positive and negative symptoms underlie schizotypy in non-clinical samples, entailing specific risk of psychosis. On a measurement level, the study provided support for the use of the total scores of the SPQ to characterize schizotypy.

1. Introduction

This study set out to investigate the factor structure of the Schizotypal Personality Questionnaire (SPQ) (Raine, 1991), a widely used measure of schizotypy. Schizotypy is conceived as a risk factor for schizophrenia, laying into a dynamic continuum from personality to psychosis (Ettinger et al., 2014; Barrantes-Vidal et al., 2015). The investigation of schizotypy is an important strategy to identify the genes potentially related to psychosis, and to study correlates of psychosis-proneness in the general population without the interference of medications and other confounding factors (e.g., the negative impact of institutionalization on cognition), which may bias the identification of the psychosis correlates. Moreover, the investigation of the schizotypy continuum may favor the identification of the mechanisms operating across different levels of severity along this continuum (Barrantes-Vidal et al., 2015). Better understanding of the factor structure of the tools that are used to identify people with schizotypy is mandatory for measurement purposes.

Confirmatory factor analysis (CFA) was used to reproduce the factor structure of the SPQ, but models were tested at the subscale level rather than at the item level. The factor structure of the SPQ at the item level has been rarely considered, and no study had tested a bifactor model of the SPQ so far. Indeed, most studies were based on a "correlated traits" model, in which a construct domain is decomposed into separate, correlated elements. However, this is not a measurement model per se, since "there is no one common target dimension to be measured or that directly affects item variance" (Reise et al., 2010, p. 546). If the SPQ is intended to measure schizotypy as a general construct, a second-order or a bifactor model is more appropriate than a simply "correlated traits" model.

In a standard "correlated traits model", the common variance on an item is "partitioned into a weighted function of variation on two or more correlated primary traits" (e.g. Siever and Gunderson, 1983, p. 547). Alternatively, a second-order model can be constructed, whereby independent dimensions are correlated because they share a common cause they converge to. This second-order model explains why two or more primary dimensions are correlated (Reise et al., 2010). In a bifactor model, the general and group factors are constrained to be orthogonal (Holzinger and Swineford, 1937; Schmid J, 1957). The general factor reflects the common elements among the items, and represents the individual

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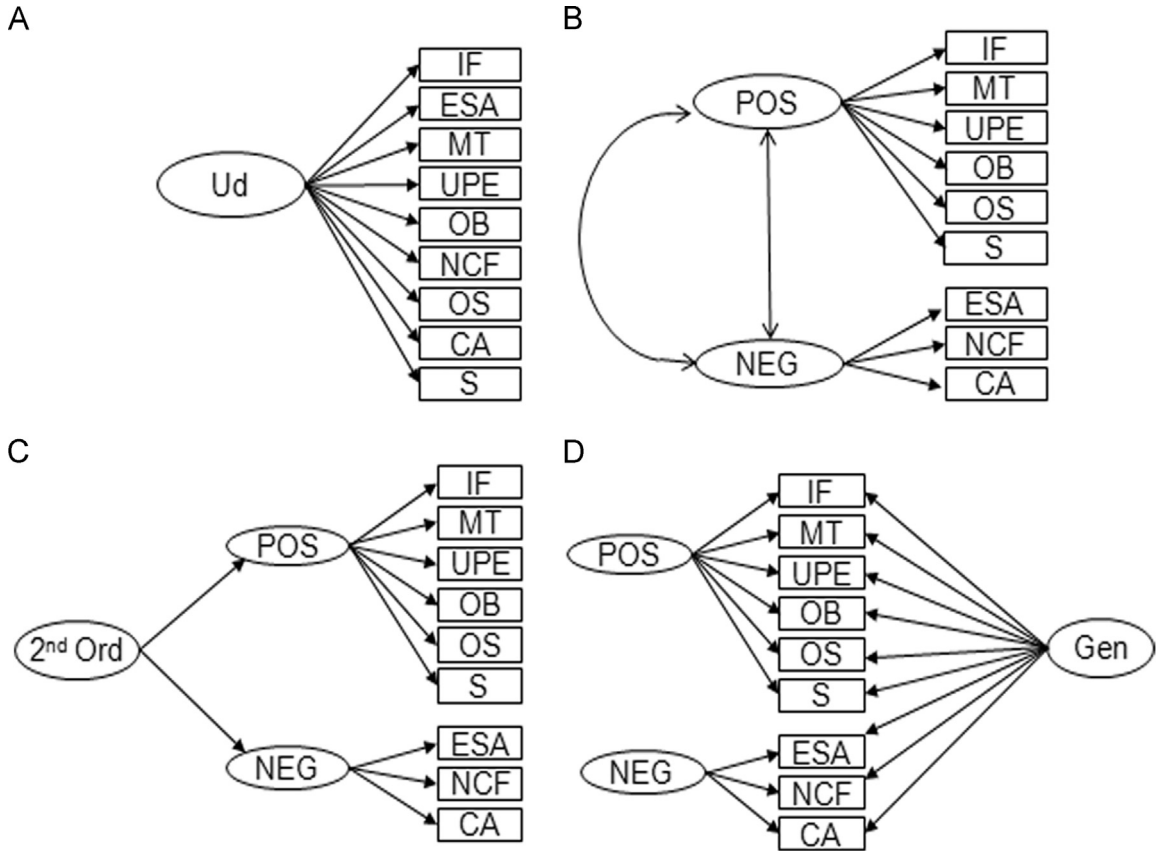

Fig. 1. Schematic representation of the four models — Model A, a strictly unidimensional model; Model B: a standard correlated traits model; Model C, a second-order model; Model D, a bifactor model. Grouping factors: Ud = unidimensional; 2nd Ord = 2nd order factor; Gen = general factor. Primary factors: Pos = SPQ-Positive symptoms; Neg = SPQ-Negative symptoms. Sub-domain: IF = Ideas of reference; ESA = Excessive social anxiety; MT = Odd beliefs or magical thinking: UPE = Unusual perceptual experiences; OB = Odd or eccentric behavior; NCF = No close friend; OS = Odd speech; CA = Constricted affect; S = Suspiciousness.

differences on the target dimension (Reise et al., 2010; Reise, 2012). The group factors are a reflection of item response variance that is not accounted for by the general factor, and represent additional variance that is explained by sub-dimensions within the items. A bifactor model is alternative to the strictly unidimensional factor, in which all variation on the components is thought to be affected by variation in the target latent trait, and there is only one common source of variance (see Fig. 1).

The relevance of these alternative models to the investigation of schizotypy as a risk factor for schizophrenia is a reflection of the conceptualization of schizotypy.

1.1. The concept of schizotypy

The psychoanalyst Rado (Rado, 1953) used the term "schizotype" (from "schizophrenic genotype") to describe individuals who, despite having no psychosis, displayed attenuated symptoms that were phenotypically similar to those observed in schizophrenia. Over time, the term has spread to indicate a schizophrenia-like pattern of beliefs and perceptual experiences observed in first-degree relatives of patients diagnosed with psychosis, and in people from the general population in the absence of psychosis (Tarbox and Pogue-Geile, 2011). The spectrum of traits related to schizotypy includes attenuated psychotic symptoms in the form of unusual subjective experiences and odd beliefs or magical thinking (Chapman, 1978; Chapman et al., 1984; Mason and Claridge, 2006); attenuated negative symptoms such as anhedonia, apathy and social withdrawal (Chapman et al., 1976); and more bizarre or disorganized behaviors expressed through eccentricity, lack of spontaneity or impulsive nonconformity (Chapman et al., 1984; Mason and Claridge, 2006). Schizotypal traits encompass the recently emphasized ultra high-risk criteria for the detection of people at high risk of psychosis (Fusar-Poli et al., 2013; Yung and Nelson, 2013), but the two do not overlap completely.

Emphasis on the early detection and intervention in psychosis in recent years has renewed interest in the assessment of vulnerability traits for psychosis, hence in the investigation of the factor structure and the correlates of schizotypy (Fonseca-Pedrero et al., 2008; Kwapil et al., 2008; Barrantes-Vidal et al., 2009, 2010). Indeed, schizotypy is a complex psychopathology construct, which can be helpful as an overarching framework for the investigation of schizophrenia-related psychopathology and putative endophenotypes (Cohen et al., 2015; Lenzenweger, 2015).

1.2. Framework of the current study

The early intervention paradigm refocused the research into risk factors for schizophrenia on the stress-vulnerability model (Zubin and Spring, 1977; Birchwood and Macmillan, 1993; Debbane and Barrantes-Vidal, 2014). According to this model, an underlying genetic vulnerability to psychosis coupled with the impact of environmental stressors may trigger psychotic symptoms in at-risk people (Zubin and Spring, 1977; Birchwood and Macmillan, 1993). This vulnerability has not been identified precisely so far, but a family history of psychosis and schizotypy may represent specific risk factors for the triggering of psychosis (Fusar-Poli et al., 2013; Yung and Nelson, 2013). The measurement of