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Deconstructing sub-clinical psychosis into latent-state and trait variables over a 30-year time span

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ABSTRACT

Background: Our aim was to deconstruct the variance underlying the expression of sub-clinical psychosis symptoms into portions associated with latent time-dependent states and time-invariant traits.
Methods: We analyzed data of 335 subjects from the general population of Zurich, Switzerland, who had been repeatedly measured between 1979 (age 20/21) and 2008 (age 49/50). We applied two measures of sub-clinical psychosis derived from the SCL-90-R, namely schizotypal signs (STS) and schizophrenia nuclear symptoms (SNS). Variance was decomposed with latent state–trait analysis and associations with covariates were examined with generalized linear models.
Results: At ages 19/20 and 49/50, the latent states underlying STS accounted for 48% and 51% of variance, whereas for SNS those estimates were 62% and 50%. Between those age classes, however, expression of sub-clinical psychosis was strongly associated with stable traits (75% and 89% of total variance in STS and SNS, respectively, at age 27/28). Latent states underlying variance in STS and SNS were particularly related to partnership problems over almost the entire observation period. STS was additionally related to employment problems, whereas drug-use was a strong predictor of states underlying both syndromes at age 19/20. The latent trait underlying expression of STS and SNS was particularly related to low sense of mastery and self-esteem and to high depressiveness.
Conclusions: Although most psychosis symptoms are transient and episodic in nature, the variability in their expression is predominantly caused by stable traits. Those time-invariant and rather consistent effects are particularly influential around age 30, whereas the occasion-specific states appear to be particularly influential at ages 20 and 50.

1. Introduction

In the past two decades, several studies have demonstrated that the expression of a psychosis phenotype can be observed below the threshold of its clinical detection (van Os et al., 2000; Wiles et al., 2006; Rössler et al., 2007). The occurrence of psychotic symptoms in the general population can be characterized as a continuum with differing levels of severity and persistence (Rössler et al., 2013). Van Os et al. (2009) have found in their systematic review that the median prevalence is approximately 5% for sub-clinical psychosis, which is at least five-fold higher than the prevalence for diagnosed schizophrenia (Rössler et al., 2005) or three to four times higher for non-affective psychosis in the general population (Kendler et al., 1996; Perala et al., 2007).

Van Os' research group has estimated that 75–90% of those sub-clinical psychosis symptoms are transitory and disappear over time. Otherwise we could demonstrate, that sub-clinical psychosis symptoms are quite persistent over time in some individuals (Rössler et al., 2007). Thus, subclinical psychosis may as well indicate a more stable underlying psychopathology. This latter assumption is in agreement with the concept of schizotypal personality disorder, which has been defined as a stable maladaptive personality trait (American Psychiatric Association, 2000).

There are several theoretical models that describe how sub-clinical psychosis symptoms might arise and persist. Psychosis symptoms might express an underlying liability. Such an underlying liability is not restricted to psychosis symptoms and can provoke all kind of transient psychopathological symptoms (Rössler et al., 2011b). And psychosis symptoms can also be triggered by environmental influences (for instance by acute stress). Finally, those (psychosis) symptoms provoked by the social environment can interact with various other individual personality dimensions, which can alternatively ameliorate or deteriorate the clinical picture. As a result the affected subjects then either recover more quickly or develop more enduring psychopathological manifestations.

We are not aware of any study that has attempted to determine the longitudinal latent state–trait structure of sub-clinical psychosis. To date, we are still uncertain whether liability to sub-clinical psychosis represents either transient and occasion-specific states or a stable

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dispositional trait. Furthermore, the particular proportions of states and trait might vary over time. Thus, this study is the first to specifically analyze the latent state–trait structure of sub-clinical psychosis within a community sample that entails a cohort of adults evaluated seven times between the ages of 20 and 50.

Our study objectives were to: i) determine the proportion of variance explained in subclinical psychosis related to latent states and trait over a 30-year time span within a community sample, and ii) identify coping strategies, personality dimensions or environmental factors, which might relate to these latent states and trait.

2. Methods

2.1. Sampling procedure

The Zurich Study comprised a cohort of 4547 subjects (m = 2201; f = 2346) representative of the canton of Zurich in Switzerland, who were screened in 1978 with the Symptom Checklist 90 Revised (SCL-90-R) (Derogatis, 1977) when males were 19 and females were 20 years old. A stratified subsample of those participants was selected for comprehensive face-to-face interviews and subsequent follow-ups. Such a two-phase procedure is fairly common in epidemiological research (Dunn et al., 1999) and is applied to enrich the interview sample with persons at risk for psychopathological syndromes. Stratification was based on a cut-off value along the 85th percentile of the SCL-90-R global severity index (GSI). Two-thirds of the interview cohort comprised high scorers (defined by the 85th percentile or above on the GSI) while the remaining third was randomly selected from the rest of the initial sample (GSI scores below the 85th percentile). In all, 591 subjects (292 males, 299 females) were chosen through this process. Face-to-face interviews were conducted in 1979 at age 20/21 (N = 591), 1981 at age 22/23 (N = 456), 1986 at age 27/28 (N = 457), 1988 at age 29/39 (N = 424), 1993 at age 34/35 (N = 407), 1999 at age 40/41 (N = 367), and 2008 at age 49/50 (N = 335). Over that span, 57% of the original cohort continued to participate. The initial allocation to the two groups according to the cut-off value along the 85th percentile of the GSI did not change over the time span, although dropouts were rather extremely high or low scorers on the GSI (Eich et al., 2003). We repeated those dropout analyses for the last interview in 2008 and additionally found, that dropouts did not differ significantly in their socioeconomic status and education at onset of the study from subjects who remained in the study. Neither was there a difference in initial psychopathologic impairment according to the nine SCL-90-R subscales. However, there was a moderate bias with respect to sex: dropouts were rather males (OR = 1.82; 95%-CI = 1.31–2.53; $p < 0.001$). A detailed description of the sampling procedure is provided elsewhere (Angst et al., 1984; Rössler et al., 2012a). For the present study we considered only subjects who also participated in the last assessment in 2008 (191 females; 144 males).

2.2. Instrument and measures

The SCL-90-R is a comprehensive self-report questionnaire of 90 items that cover a wide variety of psychiatric symptoms. Subjects responded according to a five-point Likert scale of distress that ranged from “not at all” to “extremely”. The SCL-90-R covered the most recent four-week period of psychopathology at each measurement occasion. Its 90 items are grouped along nine subscales that reflect a broad spectrum of symptoms. We applied two subscales relevant to sub-clinical psychosis (i.e., “paranoid ideation” and “psychoticism”). The SCL-90-R has historically shown good internal consistency and test–retest reliability (Schmitz et al., 2000). However, the factor structure has led to contradictory results. Commonly, fewer than nine factors are identified (Schmitz et al., 2000), and the “psychoticism” subscale yields the least consistent results (Olsen et al., 2004). To overcome those shortcomings, we used factor-analytic methods to rearrange those psychosis subscales slightly. Our first new subscale was used to address social and interpersonal deficiencies, as evidenced by a reduced capacity for close relationships as well as ideas of reference, odd beliefs, and suspicion/paranoid ideation. As such, this factor was reminiscent of the criteria required for diagnosing a “schizotypal personality disorder”. Thus we named this new subscale “schizotypal signs”. Our second new subscale included the items of thought insertion, thought-broadcasting, thought control, and hearing voices. These symptoms represent attenuated forms of the nuclear symptoms of schizophrenia. Thus we named this the “schizophrenia nuclear symptoms” subscale. A detailed description of those subscales has been provided elsewhere (Rössler et al., 2007). In the meantime those subscales of sub-clinical psychosis have been replicated and applied in other samples (Breetvelt et al., 2010; Rössler et al., 2011a). In the present study the internal consistency (Cronbach's α) of STS over all interviews ranged from $\alpha = 0.800$ to $\alpha = 0.869$, with a mean $\alpha = 0.821$. Cronbach's α of SNS ranged from $\alpha = 0.497$ to $\alpha = 0.694$, with a mean $\alpha = 0.595$. To assess discriminant and convergent validity we correlated our psychosis subscales with the three subscales of the Schizotypal Personality Questionnaire Brief-form (SPQ-B) (Raine and Benishay, 1995), using data from the 2008 assessment wave of the Zurich Study. Pearson r values for the associations with the SPQ-B subscales cognitive–perceptual, interpersonal, and disorganized were 0.370, 0.485, and 0.357 for STS and 0.319, 0.249, and 0.228 for SNS. The correlation between STS and SNS for the measurement occasions 1979, 1981, 1986, 1988, 1993, 1999, and 2008 was 0.441, 0.537, 0.437, 0.489, 0.446, 0.496, and 0.636, respectively.

To examine the impact of different coping resources we incorporated the well-established scales of mastery and self-esteem from the work by Pearlin and Schooler (1978). Mastery describes the extent to which a subject is convinced that she or he has control and influence over personal life events and problems (e.g.: “I have little control over the things that happen to me”). Self-esteem measures a subject's positive attitude and confidence toward her- or himself (e.g., “I feel that I have a number of good qualities”). The mastery subscale comprises seven items; the self-esteem subscale, six. All questions were rated on a four-point Likert scale ranging from “completely agree” to “completely disagree”. The two subscales have shown good reliability and validity (Pearlin and Schooler, 1978; Hobfoll and Walfisch, 1984). Coping was assessed in 1979, 1986, 1993, 1999, and 2008. Because measures were highly correlated over time (all $r > 0.5$) and highly stable (i.e., participants' mean scores did not significantly change over time), we computed a mean value from those five measurements.

During the interview in 1988, we evaluated participants' personality with the Freiburger Persönlichkeits-Inventar (FPI) (Fahrenberg et al., 1984). The FPI is a popular German inventory that depicts personality traits on nine distinct subscales. Those primary traits are 1) nervousness (e.g. being anxious), 2) aggressiveness (being hostile), 3) depressiveness (being sad, gloomy), 4) irritability (being susceptible), 5) sociability (being outgoing), 6) resiliency (being calm), 7) dominance (being intrusive), 8) inhibition (being self-conscious), and 9) openness (being frank). The FPI has shown good reliability and validity (Fahrenberg et al., 1984).

All other covariates were obtained with the “Structured Psychopathological Interview and Rating of the Social Consequences of Psychological Disturbances for Epidemiology” (SPIKE) (Angst et al., 1984). This semi-structured interview, developed for epidemiological surveys in psychiatric research, evaluates data about socio-demography, somatic syndromes, psychopathology, substance use, medication, health services, impairment, and social activity. Its reliability and validity have been reported elsewhere (Angst et al., 2005). We applied the following variables related to psychosocial problems that may potentially have an immediate effect on sub-clinical psychosis symptoms: distress because of employment, partnership problems, or parents; and drug use. All variables covered the 12-month period prior to a measurement occasion and were assessed at every interview. “Employment” comprised severe conflicts at workplace, dismissal or demotion, or unemployment. “Partnership” covered severe conflicts with a partner, being left by one's partner,