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Impact of childhood adversity on the onset and course of subclinical psychosis symptoms — Results from a 30-year prospective community study

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ABSTRACT

The study objective was to examine childhood adversity in association with intra-individual changes and inter-individual differences in subclinical psychosis in a representative community cohort over a 30-year period of observation.

We analyzed two psychosis syndromes derived from the SCL-90-R – schizotypal signs and schizophrenia nuclear symptoms – in 335 participants. Participants were repeatedly assessed between 1978 (around age 20) and 2008 (around age 50). We focused specifically on inter-individual differences and intra-individual changes over time by applying structural equation modeling, generalized linear models, and generalized estimating equations.

Several weak inter-individual differences revealed that increased schizotypal signs are related to various childhood adversities, such as being repeatedly involved in fights and parents having severe conflicts among themselves. We also found a significant positive association between schizotypal signs and the total number of adversities a subject experienced. This pointed toward a modest dose–response relationship. The intra-individual change in schizotypal signs over time was rather weak, although some adjustment did occur. In contrast, inter-individual schizophrenia nuclear symptoms were mainly unrelated to childhood adversity. However, some striking intra-individual changes in distress were noted over time, especially those linked with severe punishment and the total adversity score.

In conclusion, we have confirmed previous positive findings about the association between childhood adversity and subsequent subclinical psychosis symptoms: An increase in adversity is weakly related to an increase of the psychosis symptom load. However, depending on the kind of adversity experienced the psychosis symptom load decreases gradually in adult life.

1. Introduction

How one's environment impacts the onset and course of schizophrenia has garnered longstanding interest within the field of psychiatry. Although at times the question of heritability has prevailed, much evidence has been found in the last two decades for factors that increase the risk of schizophrenia, in particular the effects of growing up in an urban setting, belonging to a minority group, or using cannabis (van Os et al., 2010).

Childhood adversity is another putative risk factor for schizophrenia (Read et al., 2005), but evidence for this has been inconsistent until recently (Morgan and Fisher, 2007). In light of several meta-analyses, i.e., case–control, prospective, and cross-sectional studies, childhood adversity was recently endorsed on a much broader empirical basis (Varese et al., 2012; Matheson et al., 2013). Such adversity also seems to be a risk factor for other psychiatric disorders (Angst et al., 2011; Hengartner et al., 2013a) including subclinical states in general and subclinical psychosis symptoms in particular (Kessler et al., 2010).

Keen interest is growing about subclinical psychosis, with research focusing on attenuated symptoms as part of programs for early recognition, psychosis prevention, and intervention. Subclinical symptoms are quite frequent in the general population (Scott et al., 2006; Rössler et al., 2007) as well as in socio-culturally different countries (Loch et al., 2011). A recent systematic review of 61 reported incidence and prevalence studies of population rates for those symptoms revealed a median prevalence rate of 7.2% and a median annual incidence rate of 2.5%, albeit with significant variation in those rates (Linscott and van Os, 2013).

We have previously assessed subclinical psychosis with higher-order syndromes, as derived from the SCL-90-R, in several independent

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community samples and populations (Rössler et al., 2007, 2011a, 2013a), and have especially relied upon data from the "Zurich Study" (Angst et al., 2005). Within that unique, small community sample, followed longitudinally over 30 years, we have identified subclinical psychosis syndromes with relevant distress and functional disability (Rössler et al., 2007). None of the participating individuals in that study developed a full-blown psychotic disorder (Rössler et al., 2013b). However, many participants with persistent subclinical psychosis syndromes were considered at risk of developing other mental disorders (Rössler et al., 2011b).

As mentioned above several investigations have already focused on the relationship between childhood adversity and psychosis, but no investigation could rely on such a long observational period after participants' exposure to childhood adversities. Thus, the aims of this study were 1) to detect associations of childhood adversity with intra-individual changes (i.e., within-subject effects) and inter-individual differences (between-subject effects) in subclinical psychosis syndromes and 2) to analyze any possible dose–response relationships, i.e., whether several adversities lead to a larger symptom load in a longitudinal community cohort over a 30-year period.

2. Methods

2.1. Sampling

The screening procedure in the Zurich Study took place in 1978 with a sample of 4547 subjects (2201 males; 2346 females) born in 1958 and 1959 and representative of the canton of Zurich in Switzerland. At that time, the male participants were 19 years old (at mandatory conscription) and the females 20 years old (complete electoral register). In Switzerland each male citizen has to present himself for military conscription. With permission from the authorities and independently of the military procedure, we could screen randomly half of the conscripts. The refusal rate was 0.3%. The females were identified at the age of 20 by the complete electoral register; half of the women chosen randomly received mailed questionnaires and 75% of them responded. A lower educational level was over-represented among non-responding women; in order to correct for that the female interview sample was matched by educational level to the male sample. All subjects received the Symptom Checklist 90-R (SCL-90-R) (Derogatis, 1977), a comprehensive self-report questionnaire consisting of 90 questions, which covers a broad range of psychiatric symptoms, and a demographic questionnaire.

With regard to the second phase, a stratification procedure was applied in order to enrich the interview sample with cases at risk for the development of psychiatric syndromes. Stratification was based on a cut-off value of the SCL-90-R global severity index (GSI) score. Two-thirds of the interview sample comprised high scorers (defined by the 85th percentile or above on the SCL-90-R GSI scores) and one-third of the interview sample were randomly selected from the rest of the initial sample (GSI scores below the 85th percentile). 591 subjects (292 males, 299 females) were selected for interview. 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.

Face-to-face interviews were conducted in 1979 (N = 591), 1981 (N = 456), 1986 (N = 457), 1988 (N = 424), 1993 (N = 407), 1999 (N = 367), and 2008 (N = 335). Over that span of seven assessment waves, 57% of the original cohort continued to participate. The initial allocation into the two groups according to the 85th percentile cut-off value did not change over the study interview period, although dropouts were rather extremely high or low scorers on the GSI (Eich et al., 2003). When we repeated those dropout analyses for the last interview in 2008, we also found that those participants who dropped out did not differ significantly in their socio-economic status and education at the onset of the study from subjects who remained for the entire study. Neither did their initial psychopathologic impairments differ according to the nine SCL-90-R subscales. However, a moderate bias existed with respect to sex: dropouts were more frequently male (OR = 1.82; 95%-CI = 1.31–2.53; $p < 0.001$). A detailed description of the sampling procedure has been provided elsewhere (Angst et al., 1984; Rössler et al., 2012). For the investigation described here, we considered only subjects who also participated until 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 address a wide variety of psychiatric symptoms. Subjects respond according to a five-point Likert scale of distress that ranges from 1, "not at all" to 5, "extremely". The SCL-90-R is intended to cover the most recent four-week period of psychopathology on each measurement occasion. Its 90 items are grouped along nine subscales that reflect a broad spectrum of symptoms. We applied two subscales relevant to subclinical psychosis — "paranoid ideation" and "psychoticism". The SCL-90-R has historically shown good internal consistency and test–retest reliability (Derogatis, 2000; 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. The modification of those two psychosis dimensions has been detailed previously (Rössler et al., 2007).

Our first new subscale was used to evaluate 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 criteria required for diagnosing a schizotypal personality disorder. Thus, we named this new subscale "schizotypal signs" (STS). 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 and we named this subscale "schizophrenia nuclear symptoms" (SNS). Since their introduction, those subscales of subclinical psychosis have been replicated and applied in other samples (Breetvelt et al., 2010; Rössler et al., 2011a, 2013a). Here, 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). Pearson *r* values for the associations of STS with the SPQ-B subscales "cognitive-perceptual", "interpersonal", and "disorganized" were 0.370, 0.485, and 0.357, respectively. Correlation coefficients for SNS with the same SPQ-B subscales were 0.319, 0.249, and 0.228. Those associations were obtained using the same data from the Zurich Study.

We additionally employed a longitudinal measure of subclinical psychosis by computing the area under the curve with respect to the ground (AUC_G). The following formula, proposed by Pruessner et al. (2003), was applied:

$$AUC_G = \sum_{i=1}^{n-1} \frac{\left(m_{(i+1)} + m_i\right) t_i}{2}$$

where t_i is the time interval between two measurements; m_i, an individual measurement value; and n, the total number of repeated measures. The AUC_G value increases when a subject reports several high scores on the psychosis subscales. By contrast, an individual with consistently low