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Positive and negative subclinical symptoms and MCCB performance in non-psychiatric controls

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ABSTRACT

Considerable data support the phenomenological and temporal continuity between subclinical psychosis and psychotic disorders. In recent years, neurocognitive deficits have increasingly been recognized as a core feature of psychotic illness but there are few data seeking to elucidate the relationship between subclinical psychosis and neurocogntive deficits in non-clinical samples. The goal of the present study was to examine the relationship between subclinical positive and negative symptoms, as measured by the Community Assessment of Psychic Experiences (CAPE) and performance on the MATRICS Consensus Cognitive Battery (MCCB) in a large ($n = 303$) and demographically diverse non-clinical sample. We found that compared to participants with low levels of subclinical positive symptoms, participants with high levels of subclinical positive symptoms performed significantly *better* in the domains of working memory ($p < .001$), verbal learning ($p = .007$) and visual learning ($p = .014$). Although comparison of participants with high and low levels of subclinical negative symptoms revealed no differences in MCCB performance, we found that individuals with high levels of subclinical negative symptoms performed significantly better on a measure of estimated IQ (WRAT-3 Reading subtest; $p = .02$) than those with low levels of subclinical negative symptoms. These results are at odds with prior reports that have generally shown a negative relationship between neurocognitive functioning and severity of subclinical psychotic symptoms, and suggest some potential discontinuities between clinically significant psychotic symptoms and sub-syndromal manifestations of psychosis.

1. Introduction

Considerable data support the phenomenological and temporal continuity between psychotic disorders and subclinical manifestations of psychotic symptoms. Subclinical psychotic symptoms are common in the general population with an estimated prevalence of 7.2% and an annual incidence of 2.5% (Linscott and van Os, 2013). The continuity between subclinical psychosis and psychotic disorders is supported by longitudinal studies demonstrating that high levels of subclinical psychotic symptoms predate the onset of psychotic illness (Cannon et al., 2002; Chapman et al., 1994; Fisher et al., 2013; Hanssen et al., 2005; Poulton et al., 2000; Welham et al., 2009) as well as studies demonstrating substantial overlap in genetic predisposition for clinical and subclinical levels of psychotic symptoms (Kendler et al., 1993; Schulsinger, 1976; Tienari et al., 2003). Moreover, a recent review and meta-analysis of the literature on subclinical psychosis spanning over 2 decades (Linscott and van Os, 2013) found that nearly all of the demographic and experiential risk factors for psychotic disorders predicted greater risk of subclinical psychosis.

Over the last several decades, deficits across a range of cognitive skills have increasingly been recognized as a core feature of psychotic illness (e.g. Barch and Ceaser, 2012) but to date, only a limited number of studies have examined whether similar deficits are associated with subclinical psychosis in non-clinical samples. Data derived from studies of patients with schizotypal personality disorder (SPD), however, have reported considerable overlap in the neurocogntive deficits observed in SPD relative to schizophrenia (SZ) (Siever and Davis, 2004 for a review). Because SPD is believed to represent an underlying predisposition for SZ or "psychosis-proneness" (Claridge et al., 1996), these data suggest that neurocogntive deficits may be present across the lower ends of the psychosis continuum.

Studies examining the relationship between subclinical psychosis and neurocognitive functioning in non-clinical samples have yielded inconsistent results and have been limited in terms of the cognitive domains assessed (Giakoumaki, 2012). For example, Van Os et al. (2005)

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found that in males, but not females, deficits in verbal fluency were associated with severity of overall levels of subclinical psychosis. However, these authors did not assess other domains of cognitive function. Contrary to the sex effect reported by Van Os et al. (2005), Simons et al. (2007) measured speed of processing and verbal learning in an all female sample and found a significant association between both positive and negative subclinical symptoms and decreased speed of processing. Laurent et al. (2001) examined only set-shifting with the Wisconsin Card Sorting Test (WCST) and concluded that first-degree relatives of patients with SZ who had high scores of negative schizotypy on the Chapman scales scored significantly worse than relatives who had low scores and worse than healthy controls. Finally, Barnett et al. (2013) recently investigated whether childhood cognitive function was associated with adult subclinical psychotic symptoms in a large prospective birth cohort. They found that general cognitive ability (g) assessed at age 8, 11 and 15 was significantly predictive of subclinical psychotic symptoms in middle age. Specifically, lower cognitive scores were associated with a greater likelihood of endorsing subclinical psychotic symptoms. In this study, however, the association between current cognitive function and endorsement of subclinical psychotic symptoms was not assessed.

Several limitations of the aforementioned studies should be noted. First, most of these studies did not examine the effects of subclinical positive and negative symptoms separately. Cross-sectionally, the relationship between symptom severity and cognitive impairment in patients with SZ suggests that negative symptoms are more closely related to cognitive deficits than positive symptoms (Harvey et al., 2006). Thus, it is possible that the mixed findings on the relationship between subclinical psychosis and cognitive function are related, in part, to the focus on overall levels of subclinical psychosis. Additionally, the cognitive domains examined have been limited and do not provide a comprehensive assessment of the relation between subclinical psychosis and cognitive function across the full range of domains typically observed to be impaired in SZ.

Thus, the goal of the present study was to examine this relationship in a large and demographically diverse non-clinical sample comprehensively characterized for the presence of subclinical psychotic symptoms and comprehensively assessed for neurocogntive performance. Specifically, we aimed to evaluate whether the presence of high levels of subclinical positive or negative symptoms as measured by the Community Assessment of Psychic Experiences (CAPE) (Stefanis et al., 2002) would be associated with differential performance across the 7 neurocognitive domains assessed by the MATRICS Consensus Cognitive Battery (MCCB) (Kern et al., 2008).

2. Method

2.1. Participants

The present sample comprised 303 healthy adult volunteers (53.13% female, 60.40% Caucasian, $M_{age} = 38.12 \pm 14.29$ years, M_{IQ} (based on WRAT-3 Reading) $= 103.14 \pm 8.43$) recruited from the general population via word of mouth, newspaper and internet advertisements and posted flyers for an NIMH-funded study of subclinical psychosis in the general population (MH086756 to PD). Participants were excluded if they had a past or present affective or psychotic disorder diagnosis, active or recent substance abuse, or if they had a history of CNS trauma, neurological disorder, or previously diagnosed learning disability.

2.2. Diagnostic assessments

Participants were initially administered the Structured Clinical Interview for the DSM-IV, Non-Patient edition (SCID-I/NP) to rule out a past or present affective or psychotic disorder. Information obtained from the SCID was compiled into a narrative case summary and lifetime diagnosis was determined by two senior members of the ZHH faculty.

2.3. Assessment of subclinical psychosis

Participants were administered the Community Assessment of Psychic Experiences (CAPE) (Stefanis et al., 2002), a 42-item, self-report questionnaire that measures three dimensions of subclinical psychopathology including positive, negative and depressive symptoms. In the present study, the positive and negative frequency dimensions were examined for relation to neurocogntive functioning. Consistent with prior reports (van Os et al., 2009), the positive and negative subscale scores derived from the CAPE were not normally distributed. Indeed, inspection of the data in our sample indicated that the CAPE subscale scores produced a half-normal distribution. Thus, because standard statistical techniques could not be utilized, we chose to dichotomize the subscale scores to facilitate the use of parametric tests. Initially, scores were divided into quartiles for both the negative and positive dimensions of subclinical psychotic symptoms. Any participant with a score at or above the 75th percentile was assigned to the high symptom group while those falling below the 75th percentile were assigned to the low symptom group. Thus, participants with a negative symptom subscale score greater than 20, representing on average, a score 1.23 standard deviations above the sample mean were considered to have high levels of negative symptoms. This score is consistent with participants experiencing several infrequent negative psychotic-like experiences or experiencing 2–3 recurrent experiences. Participants with a raw positive symptom subscale score greater than 24, representing on average, a score 1.10 standard deviations above the sample mean were considered to have high levels of positive symptoms. This score is consistent with participants experiencing several infrequent positive psychotic-like experiences or experiencing 1–2 recurrent experiences. It should also be noted that the CAPE provides a measure of the distress associated with the experience of positive and negative subclinical symptoms. In our data, these distress scores are highly correlated with the frequency scores (rho > .9). Thus, these data were not examined as we believed they were redundant with analyses based on the frequency scores.

2.4. Neurocognitive assessment: the MCCB

To assess neurocognitive functioning, The MATRICS Consensus Cognitive Battery (MCCB) was administered to all participants. The MCCB is comprised of 10 standardized cognitive measures that collectively capture functioning within seven cognitive domains that are reliably impaired in schizophrenia (Nuechterlein et al., 2004) including: Speed of Processing, Attention/Vigilance, Working Memory, Verbal Learning, Visual Learning, Reasoning/Problem-solving, and Social Cognition. Participants in the current study completed the MCCB in one visit. In the present study, T scores, corrected for age and sex, derived from the MCCB scoring program were utilized as the primary dependent measures. Additionally, we utilized the Wide Range Achievement Test-Third Edition-Reading Subtest (WRAT-3) as an estimate of IQ. The WRAT-3 Reading subtest is a test that assesses single word reading skill and is highly correlated with full scale IQ (Kremen et al., 2006).

2.5. Statistical analyses

We initially sought to rule out differences between participants with high and low levels of symptoms on age, sex, race and estimated IQ (based on WRAT-3 Reading subtest score). Thus, we utilized t-tests or chi square tests, as appropriate, to examine the distributions of these variables in those characterized as having high levels of positive symptoms vs. those with low levels of positive symptoms and in those characterized as having high levels of negative symptom vs. those with low levels of negative symptoms. Following these analyses, we carried out two multivariate analyses of covariance (MANCOVAs) comparing the high and low positive symptom groups and the high and low negative symptoms groups on all 7 MCCB domains. Because both race and general intelligence level have been shown to influence performance on the