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Psychotic symptoms in non-clinical populations and the continuum of psychosis

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Abstract

A growing body of evidence suggests that delusional or hallucinatory experiences are much more frequent in subjects from the general population than the prevalence of cases of psychotic disorders, thereby suggesting the existence of a symptomatic continuum between subjects from the general population and clinical cases of psychosis. Exploring the risk factors modulating the expression of psychosis-like signs in non-clinical populations may better contribute to elucidate the etiology of psychosis than research restricted to subjects at the endpoint of the distribution of the psychotic dimension. The aim of this paper is to briefly review research investigating the distribution of psychotic symptoms in non-clinical populations, the developmental aspects of psychosis proneness, and the outcome characteristics of psychosis-prone subjects.

Keywords: Psychosis proneness; Psychotic continuum; Development; Outcome

1. Introduction

Dichotomization of psychotic symptoms as either absent or present is a convenient concept for diagnostic process and medical decision-making (Rose, 1992). Medical research on psychosis has been strongly influenced by this categorical approach, and has been mainly focused on subjects identified as ''case of psychosis'' according to these medical criteria, i.e., as ''case in need of treatment'' (van Os et al., 1999a; van Os and Verdoux, in press).

A challenging approach initiated several decades ago postulates that light may be shed on the etiology of psychosis by studying subjects presenting psychosis-like experiences (or ''schizotypal'' signs) without reaching the clinical threshold of being defined as ''case in need of treatment'' (Meehl, 1962; Venables, 1995; Venables et al., 1990). Two complementary strategies have been used to explore schizotypal phenomena in non-clinical populations (Claridge, 1997; Claridge and Beech, 1995; Venables and Rector, 2000). A first approach is based upon a ''fully'' dimensional model taking ''normality'' as the reference point (Claridge, 1997; Claridge and Beech, 1995), and conceptualizing schizotypy/psychosis proneness as a

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dimensional trait ranging from ''normality'' to clinical cases of psychosis. A slightly different approach is based upon a ''quasi''-dimensional model taking the abnormal state as the reference point (Claridge, 1997; Claridge and Beech, 1995), and focused on the exploration of attenuated or full-blown psychotic symptoms in non-clinical populations.

The aim of this paper is to briefly review research based upon the quasi-dimensional model of psychosis investigating the distribution and the characteristics associated with psychotic symptoms in non-clinical populations.

2. Distribution of psychotic symptoms in non-clinical populations

According to the continuum hypothesis, psychotic symptoms should be present not only in subjects identified as ''cases of psychosis'', but also in a proportion of subjects from the general population that does not fulfill the clinical criteria of ''case of psychosis''. Studies carried out in non-clinical populations using structured diagnostic interviews have demonstrated that psychotic experiences and beliefs are quite common in these samples (van Os and Verdoux, in press; van Os et al., 1999a). For example, using data from the Epidemiological Catchment Area study, Tien (1991) reported that the lifetime prevalence of hallucinations not related to organic causes was 10% for men and 15% for women. In the subjects from the Eastern Baltimore Mental Health Survey, three paranoid symptoms and hallucinations were reported in 10% and 5% of the subjects, respectively (Eaton et al., 1991). In the National Comorbidity Survey, more than one out of four subjects (28.4%) from the general population answered positively to at least one of the questions exploring psychotic symptoms, while the lifetime prevalence rates of narrowly and broadly defined psychosis assessed by clinicians were 0.2% and 0.7%, respectively (Kendler et al., 1996). In the Dutch NEMESIS study (van Os et al., 2000), at least 1 of the 17 Composite International Diagnostic Interview positive psychotic items was endorsed by 17.5% of individuals from the general population, while the prevalence of DSM-III-R diagnosis of nonaffective psychosis was 2.1% in this sample. A study carried out in a birth cohort showed that 20.1% and 13.2% of subjects, respectively, assessed at age 26 reported at least one delusional or hallucinatory experience (Poulton et al., 2000).

Converging findings have been obtained by studies using self-report questionnaires to explore delusions and hallucinations in non-clinical populations. Peters et al. (1999) developed the Peters Delusions Inventory (PDI) to measure delusional ideation in subjects from the general population. The questions are derived from items used in the Present State Examination (Wing et al., 1974) to assess delusional symptoms, but are toned down and aimed to explore a lifetime experience using the introductory expression ''do you ever feel as if...''. The PDI questionnaire also allows a multidimensional assessment of delusional ideation: when an item is endorsed, three five-point scales exploring distress, preoccupation, and beliefs are filled in. Two versions of this questionnaire, the PDI-40 and the PDI-21, have been developed and validated according to the number of items.

We carried out a study on delusional ideation in primary care patients in collaboration with the Aquitaine Sentinel Network of GPs (Verdoux et al., 1998a). GPs were asked to include consecutive attenders aged over 18 to ask them to complete a self-report questionnaire. The questionnaire included the PDI-21 and three questions exploring auditory hallucinations (verbal hallucinations, voice conversations, command hallucinations). Seven hundred ninety patients filled in the PDI-21, of whom 11 (1.2%) had a diagnosis of psychotic disorder according to the GPs. Persecutory, mystic, guilty ideas, thought echo, and conversation of voices were more frequent in psychotic patients than in patients with no psychiatric history (Table 1). However, positive answers to questions exploring delusional ideation or hallucinatory experiences were frequent in those with no psychiatric history. For example, 1 out of 10 subjects with no psychiatric history reported that they had already felt as if there was a conspiracy against them, and 16% of these subjects reported that they had experienced verbal hallucinations. Subjects with no history of psychiatric disorders scored lowest, those with a history of mood disorder had intermediate scores, and subjects with psychotic disorders scored highest for most PDI-21 and hallucinatory items (van Os et al., 1999b).

These findings suggest that delusional or hallucinatory experiences are rather frequent in subjects from the

Table 1
Delusional and hallucinatory items discriminating subjects with no psychiatric history and subjects with psychosis (from Verdoux et al., 1998a)

PDI-21 and hallucinatory items	No psychiatric disorder, $n=462$	Psychotic disorder, $n=11$	OR (95% CI)
Hints/double meaning	195 (42.2%)	8 (72.7%)	3.7 (1.0–14.1), $p=0.04$
Being persecuted in some way	118 (25.5%)	8 (72.7%)	7.8 (2.0–29.9), $p=0.001$
Conspiracy against you	48 (10.4%)	7 (63.6%)	15.2 (4.3–53.7), $p=0.00005$
To be a special or unusual person	56 (12.1%)	4 (36.4%)	4.2 (1.2–14.6), $p=0.04$
To be especially close to God	99 (21.4%)	7 (63.7%)	6.4 (1.9–22.4), $p=0.003$
To have sinned more than the average people	28 (6.1%)	3 (27.3%)	5.8 (1.5–23.2), $p=0.03$
People looking oddly at you	83 (18.0%)	5 (45.5%)	3.8 (1.1–12.8), $p=0.04$
Thought echoing back	43 (9.3%)	4 (36.4%)	5.6 (1.6–19.7), $p=0.02$
Hearing voices conversing	22 (4.8%)	4 (36.4%)	11.4 (3.1–42.0), $p=0.001$

general population, and that a symptomatic continuum may exist between ''normal'' subjects, those with mood disorder, and subjects with psychotic disorder. However, the validity of self-reported psychotic symptoms or experiences has been questioned, since overreporting may occur in subjects from the general population due to misinterpretation of some questions. This limitation can be encountered with self-report questionnaires as well as with structured clinical interviews (Eaton et al., 1991; Jablensky, 1995). A large percentage of self-report psychotic symptoms are not identified as clinically relevant when the interview is performed by a clinician (Eaton et al., 1991). Using data from the NEMESIS study, van Os et al. (2000) reported that the patterns of associations with demographic risk factors and clinical variables were similar with clinically relevant symptoms on the one hand, and with ''clinically nonrelevant'' or ''plausible'' psychotic symptoms on the other. Clinically ''nonrelevant'' and ''plausible'' psychotic symptoms were more frequent in subjects of lower age, with single marital status, lower level of education, lower quality of life, higher depressive symptoms, and blunting of affect. Thus, the clinically based distinction between ''true'' (or clinically relevant) and ''false'' psychotic symptoms may be misleading since these two kinds of experiences or beliefs, which are associated with similar risk factors, more probably lie on a continuum (Strauss, 1969).

3. Characteristics associated with psychosis proneness in non-clinical populations

If a symptomatic continuum exists between subjects from the general population and clinical cases of psychosis, this continuum should also be apparent for the developmental aspects of delusional formation. In clinical cases of psychosis, age has a strong influence on the symptomatic expression of the disease. In functional psychoses, the likelihood to present with delusion increases with age at onset from puberty to early adulthood (Galdos and van Os, 1995). During adulthood, delusional symptoms are less prominent in elderly patients with schizophrenia than in younger ones (McGlashan, 1998; Schultz et al., 1997). In organic psychoses, positive psychotic symptoms are more frequent in subjects with onset in the second or third decades (Weinberger, 1987). Age may also influence the delusional content, e.g., persecutory delusions are more frequent in late-onset subjects with schizophrenia (Hafner et al., 1998).

Some studies have reported a negative association between age and psychosis proneness in subjects from the general population (Claridge et al., 1996; Peters et al., 1999; Venables and Bailes, 1994). For example, Venables and Bailes (1994) showed that adolescents scored higher than adults on the ''positive schizotypy'' dimension (unusual perceptual experiences/paranoid and magical ideation), for ''social anxiety/disorganization'', and for ''social anhedonia''.

We replicated the negative association between age and psychosis proneness in subjects with no history of psychiatric disorder included in the Aquitaine Survey (Verdoux et al., 1998b) (Fig. 1). A factorial analysis of the PDI-21 individual items was then used to identify delusional dimensions and to explore the association between age and delusional dimension scores (Table 2). Scores of ''persecution'' (Fig. 2), ''grandiosity'', ''thought disturbances'', and ''paranormal beliefs'' dimensions decreased with age. ''Religiosity'' was

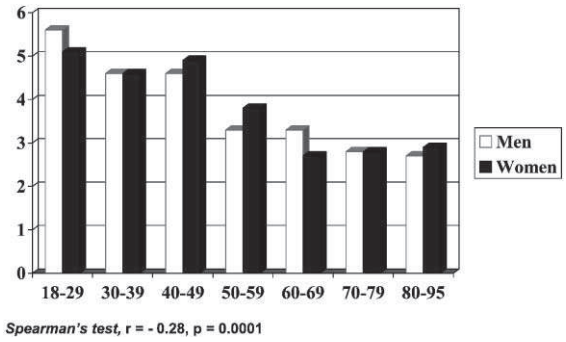

Fig. 1. Age and PDI-21 total scores.

the only dimension that is positively associated, i.e., increasing with age. This latter finding is probably partly explained by the strong influence of environmental factors on religiosity, which may be more influenced than the other dimensions by a major culture effect (Kendler et al., 1997; Eaves et al., 1990).

The age decrease in positive symptoms in subjects with psychotic disorders may reflect an exaggeration of the increased propensity of younger subjects from the general population to present unusual ideas or strange beliefs. Common physiological brain maturational processes making adolescence and early adulthood a critical period for the expression of psychosis (De Lisi, 1997; Weinberger, 1987) may underlie the influence of age on delusional formation in clinical samples on the one hand, and on psychosis proneness in non-clinical samples on the other.

Comparable findings have been obtained in studies which examined sex differences in schizotypy. It has been found that women score higher on ''positive'' schizotypy while men score higher on ''negative'' schizotypy (Raine, 1992; Venables and Bailes, 1994). These findings suggest that there may be a continuity between ''normal'' sex differences in the general population and sex differences in subjects with schizophrenia, in which negative symptoms are more severe in men.

4. Psychiatric outcome of subjects with psychosis proneness

Although psychosis proneness is considered as a risk factor for schizophrenia, few studies have explored the psychiatric outcome of psychosis-prone subjects. Chapman et al. (1994) reported that high baseline scores on the perceptual aberration and/or the magical ideation (Per-Mag) scales predicted not only a higher frequency of psychosis or psychosis-like experiences over the next 10 years, but also a higher rate of mood disorders. Among the 182 subjects with high Per-Mag scores, 10 (0.5%) presented a psychotic disorder during the follow-up period (including three subjects with psychotic bipolar disorder) compared to 2 (0.1%) of the 153 control subjects. During the same period, more than one out of three (35.2%) of the subjects with high Per-Mag scores presented a nonpsychotic major depression (vs. 20.3% of the controls), and 7.8% subjects presented mania/hypomania (vs. 1.3% of the controls). Kwapil et al. (1997) replicated these findings in a follow-up study of subjects with baseline high vs. low magical ideation scores. Subjects with high Magical Scores were more likely, than subjects with low scores, to present, at follow-up, with psychosis (7% vs. 0%), with psychosis-like experiences (mean 2.43 vs. 0.4), and also with major depressive disorder (32% vs. 5%) or bipolar spectrum disorder (29% vs. 5%). A birth cohort study (Poulton et al., 2000) showed that children reporting delusional or hallucinatory experiences at age 11 are at increased risk of schizophreniform disorder and anxiety disorder at age 26. However, no association was found in this sample between baseline psychotic symptoms and a subsequent increased risk of mood disorder.

A follow-up study of the subjects included in the Aquitaine survey was performed 1 year after the baseline assessment (Verdoux et al., 1999). Due to the low

Table 2
Associations between age and delusional dimension scores in subjects with no psychiatric history (Verdoux et al., 1998b)

Dimensions	% Variance explained	B[a]	Significance
Persecution	19	− 0.008	$p = 0.003$
Thought disturbances	7.8	− 0.009	$p = 0.001$
Grandiosity	7.0	− 0.011	$p = 0.0001$[b]
Religiosity	6.0	0.01	$p = 0.0001$
Paranormal beliefs	5.4	− 0.012	$p = 0.0001$
Reference-guilt	5.3	− 0.001	$p = 0.72$
Apocalypse	4.8	0.001	$p = 0.56$

[a] Multiple regression coefficient adjusted for sex and place of birth.

[b] Confined to male subjects.

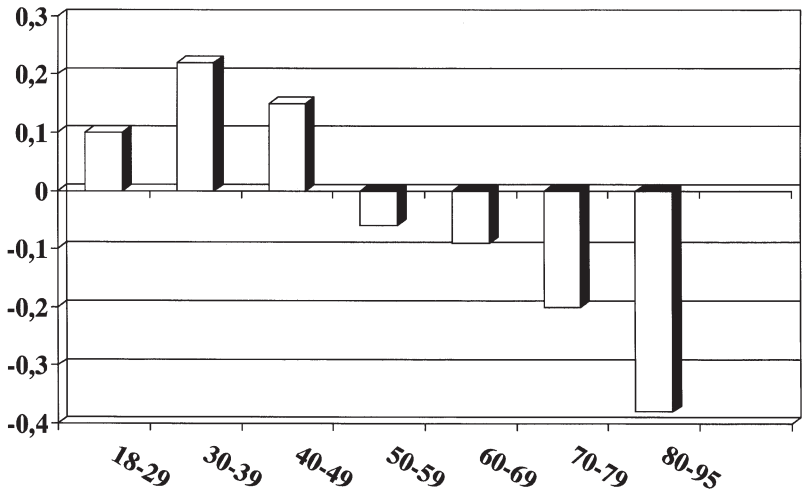

Fig. 2. Age and "persecution" scores.

incidence of psychosis and the relatively short duration of the follow-up, we could not assess in this sample whether psychosis-prone subjects were at greater risk of psychotic disorder. Since previous studies have reported that psychosis proneness is a risk factor for mood disorder, we examined the links between baseline psychosis proneness and incident depression in subjects with no lifetime history of depression at baseline. Subjects with very high PDI-21 score (above the 90th percentile) at baseline were nine times more likely to present an incident depression during the follow-up period than those with a very low PDI-21 score (below the 10th percentile). Most items exploring delusional beliefs and hallucinations were more frequently endorsed at baseline by subjects with incident depression over the follow-up.

In accordance with previous results reported by Chapman et al. (1994) and Kwapil et al. (1997), the Aquitaine Survey confirmed that «positive» psychosis proneness is associated with an increased risk of affective disorder. These convergent findings were obtained with two different questionnaires, i.e., the Per-Mag questionnaire and the PDI-21. Thus, it is unlikely that the association between psychosis proneness and increased risk of affective disorder is fully explained by the limitations of the instruments used to measure psychosis proneness. However, replication of these findings using other scales such as the SPQ is required. The fact that positive psychosis proneness may be a risk factor for affective disorder has major theoretical implications for categorizations of "at-risk" mental states. «Positive» psychosis proneness may be a nonspecific marker of psychological disturbance, and aberrant perceptions and odd beliefs may be a sort of psychic equivalent of fever for infectious diseases with little diagnostic specificity. Even if some degree of diagnostic specificity exists, i.e., if the risk of affective disorder is lower than the risk of schizophrenia in psychosis-prone subjects, the incidence of affective disorder is much higher than that of schizophrenia in the general population. This may partly explain why the number of incident cases of mood disorder is higher than the number of incident cases of psychotic disorder in psychosis-prone subjects. The relative lack of diagnostic specificity of psychosis proneness has different implications for etiological research and for prevention. The fact that several outcomes may be associated with a similar risk factor does not preclude the existence of a causal relationship between this risk factor and a specific outcome. For example, smoking is associated with a large range of negative consequences on health, but few people would now contest that a causal relationship exists between smoking and lung cancer. The relative lack of diagnostic specificity of psychosis proneness does not preclude etiological studies from focusing on a specific outcome such as psychotic disorder. The issue is different with regards to prevention, because the lack of diagnostic specificity

makes the prediction of psychiatric outcome in psychosis-prone subjects hazardous, at least on an individual basis. Therefore, further studies are required before applying this research model to public health preventive strategies.

5. Conclusion

Although the clinically driven categorical model of psychosis has strongly influenced psychiatric research on psychotic phenomena, a growing body of evidence has now confirmed the heuristic interest of the alternative concept which takes psychosis as a dimensional phenomenon lying on a continuum with normality. Exploring the distribution of psychosis-like signs in non-clinical populations and the risk factors modulating their expression may better contribute to elucidate the risk factors for psychosis than research restricted to subjects at the endpoint of the distribution of the psychotic dimension. This latter approach may be paralleled to a research strategy restricting the search for the risk factors for atherosclerosis in samples of subjects with severe stroke or massive myocardial infarction. Exploration of the factors modulating the cholesterol levels or blood pressure in the general population has been a prerequisite for elucidating the pathophysiology of atherosclerosis and for developing preventive treatments. To apply this strategy to research on psychosis, it is nevertheless necessary to further clarify whether psychosis proneness is, for psychotic diseases, the equivalent of hypertension for myocardial infarction, i.e., a relatively nonspecific risk factor also associated with an increased occurrence of other diseases, or the equivalent of angina pectoris, i.e., an attenuated and remittent form of the same pathophysiological process.

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References

Chapman, L., Chapman, J., Kwapil, T., Eckblad, M., Zinser, M., 1994. Putatively psychosis-prone subjects 10 years later. J. Abnorm. Psychol. 103, 171–183.

Claridge, G., 1997. Theorical background and issues. In: Claridge, G. (Ed.), Schizotypy. Implications for Illness and Health. Oxford Univ. Press, Oxford, pp. 3–19.

Claridge, G., Beech, T., 1995. Fully and quasi-dimensional constructions of schizotypy. In: Raine, A., Lencz, T., Mednick, S.A. (Eds.), Schizotypal Personality. Cambridge Univ. Press, Cambridge, pp. 192–216.

Claridge, G., McCreery, C., Mason, O., Bentall, R., Boyle, G., Slade, P., Popplewel, I.D., 1996. The factor structure of "schizotypal" traits: a large replication study. Br. J. Clin. Psychol. 35, 103–115.

De Lisi, L., 1997. Is schizophrenia a lifetime disorder of brain plasticity, growth and aging. Schizophr. Res. 23, 119–129.

Eaton, W., Romanoski, A., Anthony, J.C., Nestadt, G., 1991. Screening for psychosis in the general population with a self-report interview. J. Nerv. Ment. Dis. 179, 689–693.

Eaves, L., Martin, N., Heath, A., 1990. Religious affiliation in twins and their parents: testing a model of cultural inheritance. Behav. Genet. 20, 1–22.

Galdos, P., van Os, J., 1995. Gender, psychopathology, and development: from puberty to early adulthood. Schizophr. Res. 14, 105–112.

Hafner, H., Hambrecht, M., Loffler, W., Munk-Jorgensen, P., Riecher-Rossler, A., 1998. Is schizophrenia a disorder of all ages? A comparison of first episodes and early course across the lifecycle. Psychol. Med. 28, 351–365.

Jablensky, A., 1995. Schizophrenia: recent epidemiologic issues. Epidemiol. Rev. 17, 10–20.

Kendler, K.S., Gallagher, T.J., Abelson, J.M., Kessler, R.C., 1996. Lifetime prevalence, demographic risk factors, and diagnostic validity of nonaffective psychosis as assessed in a US community sample. The National Comorbidity Survey. Arch. Gen. Psychiatry 53, 1022–1031.

Kendler, K.S., Gardner, C.O., Prescott, C.A., 1997. Religion, psychopathology, and substance use and abuse: a multimeasure, genetic–epidemiologic study. Am. J. Psychiatry 154, 322–329.

Kwapil, T., Miller, M., Zinser, M., Chapman, J., Chapman, L., 1997. Magical ideation and social anhedonia as predictors of psychosis proneness: a partial replication. J. Abnorm. Psychol. 106, 491–495.

McGlashan, T.H., 1998. The profiles of clinical deterioration in schizophrenia. J. Psychiatr. Res. 32, 133–141.

Meehl, P., 1962. Schizotaxia, schizotypy, schizophrenia. Am. Psychol. 17, 827–838.

Peters, E.R., Joseph, S.A., Garety, P.A., 1999. Measurement of delusional ideation in the normal population: introducing the PDI (Peters et al. Delusions Inventory). Schizophr. Bull. 25, 553–576.

Poulton, R., Caspi, A., Moffitt, T., Cannon, M., Murray, R., Harrington, H., 2000. Children's self-reported psychotic symptoms and adult schizophreniform disorder. Arch. Gen. Psychiatry 57, 1053–1058.

Raine, A., 1992. Sex differences in schizotypal personality in non-clinical population. J. Abnorm. Psychol. 101, 361–364.

Rose, G., 1992. The Strategy of Preventive Medicine. Oxford Univ. Press, Oxford.

Schultz, S.K., Miller, D.D., Oliver, S.E., Ardnt, S., Flaum, M., Andreasen, N., 1997. The life course of schizophrenia: age and symptoms dimensions. Schizophr. Res. 23, 15–23.

Strauss, J., 1969. Hallucinations and delusions as points on continua function. Arch. Gen. Psychiatry 21, 581–586.

Tien, A., 1991. Distributions of hallucinations in the population. Soc. Psychiatry Psychiatr. Epidemiol. 26, 287–292.

van Os, J., Verdoux, H., in press. Diagnosis and classification: categories versus dimensions: distributions versus disease. In: Cannon, M., van Os, J., Murray, R., Jones, P. (Eds.), The Epidemiology of Schizophrenia. Cambridge: Cambridge Univ. Press.

van Os, J., Verdoux, H., Bijl, R., Ravelli, A., 1999a. Psychosis as an extreme of continuous variation in dimensions of psychopathology. In: Häfner, H., Gattaz, W. (Eds.), Search for the Causes of Schizophrenia, vol. 4. Springer, Berlin, pp. 59–79.

van Os, J., Verdoux, H., Maurice-Tison, S., Gay, B., Liraud, F., Salamon, R., Bourgeois, M., 1999b. Self-reported psychosis-like symptoms and the continuum of psychosis. Soc. Psychiatry Psychiatr. Epidemiol. 34, 459–463.

van Os, J., Hanssen, M., Bijl, R., Ravelli, A., 2000. Strauss (1969) revisited: a psychosis continuum in the general population? Schizophr. Res. 45, 11–20.

Venables, P., 1995. Schizotypal personality as a developmental stage in studies of risk for schizophrenia. In: Raine, A., Lencz, T., Mednick, S.A. (Eds.), Schizotypal Personality. Cambridge Univ. Press, Cambridge, pp. 107–131.

Venables, P., Bailes, K., 1994. The structure of schizotypy, its relation to subdiagnoses of schizophrenia and to sex and age. Br. J. Clin. Psychol. 33, 277–294.

Venables, P., Rector, N., 2000. The content and structure of schizotypy: a study using confirmatory factor analysis. Schizophr. Bull. 26, 587–602.

Venables, P., Wilkins, S., Mitchell, D., Raine, A., Bailes, K., 1990. A scale for the measurement of schizotypy. Pers. Individ. Differ. 11, 481–495.

Verdoux, H., Maurice-Tison, S., Gay, B., van Os, J., Salamon, R., Bourgeois, M., 1998a. A survey of delusional ideation in primary care patients. Psychol. Med. 28, 127–134.

Verdoux, H., van Os, J., Maurice-Tison, S., Gay, B., Salamon, R., Bourgeois, M., 1998b. Is early adulthood a critical developmental stage for psychosis proneness? A survey of delusional ideation in normal subjects. Schizophr. Res. 29, 247–254.

Verdoux, H., van Os, J., Maurice-Tison, S., Gay, B., Salamon, R., Bourgeois, M., 1999. Increased occurrence of depression in psychosis-prone subjects: a follow-up study in primary care settings. Compr. Psychiatry 40, 462–468.

Weinberger, D.R., 1987. Implications of normal brain development for the pathogenesis of schizophrenia. Arch. Gen. Psychiatry 44, 660–669.

Wing, J., Cooper, J., Sartorius, N., 1974. Measurements and Classification of Psychiatric Symptoms. Cambridge Univ. Press, Cambridge.