

# Three-factor structure of self-report schizotypal traits in a French nonclinical sample

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## ABSTRACT

Evidence suggests that the structure of psychosis-proneness in the general population may involve three distinct related dimensions. Therefore we conducted a study, using a wider range of measures, to explore the factorial structure of schizotypy assessed by a mixed self-report Schizotypal Traits Questionnaire (mSTQ) in young French healthy individuals. Raine's Schizotypal Personality Questionnaire [SPQ] and four of the Chapman's scales [Magical Ideation Scale-MIS; Perceptual Aberration Scale-PAS; Revised Physical Anhedonia Scale-PhA and Revised Social Anhedonia Scale-SA] were combined to form a mSTQ which was administered to 232 French undergraduate students aged from 18 to 25 years old. A Principal Component Analysis [PCA] was carried out on scores for each scale to examine the factorial structure of schizotypal traits in this sample. PCA evidenced a three-factor model of schizotypy in the sample as a whole and even in the lower score subsample. The three factors were "positive or cognitive-perceptual", "negative or social-interpersonal" and "disorganization" latent. Schizotypy, as assessed by these scales, is a multidimensional construct composed by at least three dimensions in this nonclinical sample. This factorial structure is similar to those of schizophrenia symptoms which raise the hypothesis of a continuum from normality to schizophrenia via schizotypal traits

**Keywords:** Schizotypy; Psychosis Proneness Scales; Schizotypal Personality Questionnaire; Three-Factor Structure; Schizophrenia

## 1. INTRODUCTION

Many researchers acknowledges the existence of a schizophrenia spectrum, from normality to psychosis, of which

schizophrenia is considered to be one extreme. Recognition of a schizophrenia spectrum received impetus from the genetic "high-risk" approach of studying the relatives of patients with schizophrenia [1,2]. Another strategy consists in the study of psychotic-like traits in the general population [3-5] through the development of schizotypy and psychosis-proneness scales [6-8] stemmed from the idea that traits which may predispose to schizophrenia can be identified in non-clinical populations [9]. However, schizophrenia itself can no longer be viewed as a unitary construct; rather there is a growing consensus that the clinical symptoms seem to cluster into at least three distinct syndromes [10-12]. In turn, schizotypy in non clinical samples has been shown to have a similar dimensional structure, with factors resembling at least 3 dimensions of schizophrenia: positive, negative, and cognitive-disorganisation [3,4,13]. However, some authors have evoked the possible influence of sociocultural context in schizotypal construct [14].

The aim of the present study was to look at schizotypal symptoms factorial structure in a French non clinical sample as measured by a mixed Schizotypal Traits Questionnaire (mSTQ). Factor analyses were conducted on a sample of undergraduate students. It was expected that the factors usually identified in schizophrenia and in studies using the SPQ: Schizotypal Personality Questionnaire in other population [4,15] would appear; namely, a factor that predominantly reflects positive symptoms, a factor that predominantly reflects negative symptoms, and a disorganized factor, suggesting a continuum from normal to psychosis.

## 2. METHOD

### 2.1. Subjects

Non clinical undergraduate students (n = 232) of both genders (Females = 125; Males = 107), from 18 to 25 years old (Age  $\pm$  standard deviation: 21.17  $\pm$  1.47), were

recruited through campus public advertising which called for “a 50 euros paid study on character traits and personality”. Written informed consent was obtained from all participants and the study was approved by the Ethical Committee of Lyon B. All participants were free of serious somatic illness (including diabetes and neurological disorders), mood disorder, suicidal risk and of DSM-IV axis I psychotic personal history as explored through SADS examination [16]; none of them had ever received antipsychotic or antidepressant medications. Moreover, because of the genetic part of schizophrenia, subjects with family history of schizophrenia were not included in the study. Subjects with current or past history of substance abuse were not included in this study. However, knowing relationship between cannabis and schizotypal traits [17], cannabis consumers were included.

## 2.2. Psychometric Investigations

Among various instruments proposed to measure Schizotypal traits in clinical and non clinical samples, we have chosen five French-version [18-21] separate self-report scales widely used in this field.

- Four of the Psychosis Proneness Scales [PPS] developed by Chapman and colleagues to measure traits known to be more frequent in subjects who later developed psychotic disorders, *i.e.*: The Magical Ideation Scale [MIS] [18,19] measures the acceptance of causal relationships not widely held by the dominant culture (e.g. “at times I perform certain little rituals to ward off negative influences”); the Perceptual Aberration Scale [PAS] [18,19] measures body image and object-related perceptual distortions (e.g. “at times I have wondered if my body was really my own”), the revised Physical Anhedonia Scale [PhA] [20,21] measures a lack of responsiveness to sensory experiences (e.g. “I have had very little desire to try new kinds of food”) and the Revised Social Anhedonia Scale [SA] [21] reflects the negative aspects of psychosis, and consists of items assessing the lack of enjoyment from social contact, physical activities, coupled with aversion to emotional and physical intimacy (e.g., “Are you much too independent to get involved with other people?”).
- The Schizotypal Personality Questionnaire [SPQ] [22,23] which contains 74 items evaluating the nine SPD DSM-IV criteria leading to a total score and nine possible sub-scores (Ideas of reference; Excessive social anxiety; Odd beliefs or magical thinking; Unusual perceptual experiences; Odd or eccentric behavior; No close friends; Odd speech; Constricted affect; Suspiciousness). These allow both categorical

and dimensional approaches of Schizotypal Personality Disorder.

Participants have to check all the 240 items of the 5 scales. Items were presented in a in a combined order [24] as a mixed Schizotypal Traits Questionnaire (mSTQ). To limit the risk of contamination of questionnaire responses by drug effects, we instructed subjects not to report drug-related experiences when they completed the questionnaires.

## 2.3. Statistical Analysis

Pearson correlations were used to examine relationships between scores on PPS and SPQ sub-scales. Then, scores of the 232 participants on the SPQ sub-scales, PAS, MIS, PhA and SA were subjected to Principal Component Analysis (PCA). The number of extracted factors was decided using Kaiser’s criteria and the Cattell’s scree test before subsequent VARIMAX rotation. Then, an exploratory factor analysis of the SPQ sub-scales, PAS, MIS, PhA and SA was conducted with only the low scorers ( $n = 183$ ), identified as subjects who scored under the cut-off score on one or more of the five psychometric scales (Scale—lower cut-off score— $n =$ ; PAS—3/35— $n = 82$ ; MIS—5/30— $n = 87$ ; PhA—9/61— $n = 78$ ; SA—7/40— $n = 80$ ; and SPQ—7/74— $n = 29$ ; see [19,23] for more information about cut-off score calculation).

## 3. RESULTS

PCA has been carried out on the correlation matrix for scores at each PPS and each of the nine SPQ subscales. PCA revealed three factors with an eigenvalue of 1 or greater. The model accounted for 65.4% of the variance.

The first factor, which consisted of MIS, PAS, and four SPQ subscales (“Suspiciousness”, “Odd or eccentric behavior”, “Unusual perceptual experiences”, and “Ideas of reference”) accounted for 39.1% of the total variance. This factor is clearly consistent with a positive syndrome factor.

The second component, which consisted of SA, PhA, and three SPQ subscales evaluating “Excessive social anxiety”, “No close friends” and “Constricted affect”, accounted for 18.1% of the total variance. This factor is predominantly a negative syndrome factor.

The third component accounted for 8.2% of the total variance and consisted of the “Odd speech” SPQ subscale scores. This factor is most consistent with disorganization.

An exploratory factor analysis of the SPQ, PAS, MIS, PhA and SA was conducted on just the low scorers, identified as any student who scored under the cut-off score on any of the five scales ( $n = 183$ ). The PCA again revealed the same 3 factors with an eigenvalue of 1 or greater (see **Table 1**).

### 4. DISCUSSION

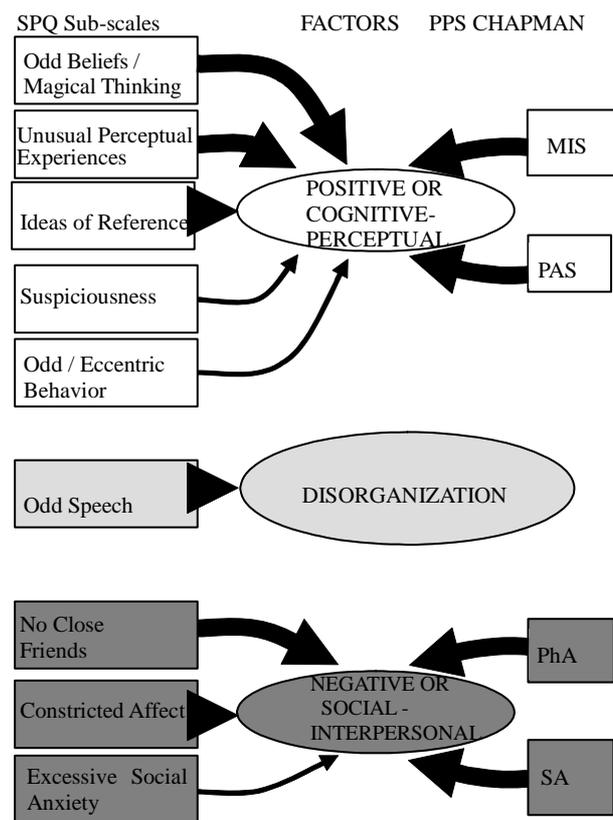
The present study aimed, to explore the factorial structure of schizotypal traits in young French healthy individuals by the mean of self-report scales. PCA yielded three factors that paralleled highly with previously reported factors; namely, negative or social-interpersonal factor (*i.e.* “Excessive social anxiety”, “No close friends”, and “Constricted affect”, and Physical and Social anhedonia), positive or cognitive-perceptual (*i.e.* “Magical ideation”, “Perceptual aberration”, “Unusual perceptual experiences”, “Ideas of reference”, “Suspiciousness”, and “Odd or eccentric behavior”) and disorganization (*i.e.* “Odd speech”). Strikingly, factor analyses with only the nonclinical low scorers revealed the same three-factors too, thus supporting the

**Table 1.** Percentage of total variance and factor solution for the 9 subscales of the schizotypal personality questionnaire (SPQ), the perceptual aberration scale (PAS), the magical ideation scale (MIS), the revised physical anhedonia scale (PhA), and the revised social anhedonia scale (SA) using the total sample (n = 232) and the low scorers (n = 183).

	Total sample (n = 232)			Low scorers (n = 183)		
	Factor 1	Factor 2	Factor 3	Factor 1	Factor 2	Factor 3
<b>Percentage of total variance</b>	<b>39.1</b>	<b>18.1</b>	<b>8.2</b>	<b>33.2</b>	<b>17.4</b>	<b>8.8</b>
1 Ideas of Reference (SPQ)	<b>0.821</b>	-0.182	0.073	<b>0.768</b>	-0.159	-0.165
2 Excessive Social Anxiety (SPQ)	0.486	0.320	0.359	0.354	0.369	-0.253
3 Odd Beliefs or Magical thinking (SPQ)	0.574	<b>-0.541</b>	-0.313	0.572	<b>-0.5</b>	0.404
4 Unusual Perceptual Experiences (SPQ)	<b>0.788</b>	-0.348	-0.098	<b>0.788</b>	-0.243	0.062
5 Odd or Eccentric Behavior (SPQ)	<b>0.716</b>	0.040	0.137	<b>0.632</b>	0.199	-0.169
6 No Close Friends (SPQ)	0.464	<b>0.680</b>	-0.121	0.330	<b>0.712</b>	0.137
7 Odd Speech (SPQ)	0.526	-0.074	<b>0.458</b>	0.479	-0.085	<b>-0.478</b>
8 Constricted Affect (SPQ)	0.527	<b>0.577</b>	0.264	0.414	<b>0.663</b>	-0.226
9 Suspiciousness (SPQ)	<b>0.713</b>	0.171	0.179	<b>0.633</b>	0.221	-0.126
10 PAS	<b>0.791</b>	-0.214	-0.218	<b>0.751</b>	-0.202	0.22
11 MIS	<b>0.775</b>	-0.382	-0.248	<b>0.765</b>	-0.322	0.266
12 PhA	0.029	<b>0.593</b>	<b>-0.509</b>	-0.218	<b>0.459</b>	<b>0.523</b>
13 SA	0.448	<b>0.657</b>	-0.330	0.376	<b>0.634</b>	0.387

continuity view of psychosis and the multidimensionality of psychosis-proneness (**Figure 1**). These findings further replicate and support the three-factor model of schizotypal personality, as measured by the SPQ and PPS, in non clinical undergraduates students. These results also support previous findings suggesting that different proneness and schizotypal traits scales relate to different underlying aspects of schizophrenia [7].

Some methodological issues should be considered that may have influenced our results. First, subjects were not randomly selected leading to a possible concentration of pathological individuals. However, this bias was limited because subjects were clearly informed that no diagnosis would be delivered; Moreover, the study was very attractive for every students given they were paid for participation. Second, schizotypy was evaluated only through self-report scales leading to a possible misestimating of some schizotypal traits like oddness, although the use of a combined scale diminishes this bias. Conversely,



**Figure 1.** Path diagram illustrating the three factor structure of self-report schizotypy in a nonclinical sample of 232 students SPQ = schizotypal personality questionnaire; PPS = psychosis proneness scales; PAS = perceptual aberration scale; MIS = magical ideation scale; PhA = physical anhedonia scale; SA = social anhedonia scale. Observed variables are represented by squares, latent factors by circles. Single-headed arrows represent factor loadings.

this method limits the rater's subjectivity. On the other hand, one can hypothesize that analysing of other proneness scales would permit the discrimination of other factors seen in schizophrenia like anxiety/depression or impulsivity/excitation [12]. Finally, as previously reported [17], our sample could be divided into three groups according to cannabis use typology: those who had never used cannabis ( $n = 126$ ), those who were past or occasional users ( $n = 65$ ), and those who were regular users ( $n = 41$ ). Higher scores on the SPQ and the MIS were characterized by regular and past or occasional users compared with those who had never used cannabis. The fact that lower scorers were also non cannabis users is in accordance with recent report that the onset of schizotypal symptoms generally precedes the onset of cannabis use [25].

These remarks being taken into account, the results of the present study are consistent with prior research. Indeed, researchers have devised many questionnaires and structured interviews to measure schizotypal traits and, when various combinations of these measures have been subjected to factor analytic procedures, with either normal or clinical samples, three factors generally emerge [4,9,13,15,26-28]. Moreover, this three-factor model of schizotypal personality seems invariant across age and gender [29]. An alternative, four-factor model was suggested by the results of several large-scale factor-analytic studies of psychosis-proneness scales [3,24,30] or of other scales [31]. Nevertheless, most studies are based on measures of schizotypal symptoms given to non-clinical groups, mostly undergraduates and few studies have done factor analyses with non-normal samples. However, factor analyses with schizotypal and other clinical samples also support a three-dimensional model, though a paranoid [32,33] or an impulsivity [31] dimension is sometimes also seen. Although findings differ in detail across analyses, they appear to converge on the three-factor solution both in clinical and non-clinical samples. In a theoretical conceptualization of dimensionality in schizophrenia, a continuum of behaviors from normal to schizophrenic was often suggested (for review see [5]). Strikingly enough, in accordance with this continuum hypothesis, three-factor structure was also showed in the low scores sample. Interestingly, as with schizophrenia, the evidence for dimensionality in schizotypy is primarily found in factor analytic studies and the three schizotypal dimensions were close to some schizophrenic dimensions.

Our results suggest that schizotypal traits in a French non clinical sample, as measured with SPQ, MIS, PAS, PhA, and SA, are a three-dimensional construct as seen in schizophrenia itself and in people with Schizotypal Personality Disorder. Future studies should examine the stability of those three schizotypal dimensions over time,

by following schizotypal subjects well into the age of potential onset of schizophrenia. Moreover, questionnaires and structured interviews to measure schizotypal characteristics may take into account these factors.

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