Latent profile analysis of healthy schizotypy within the extended psychosis phenotype

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ABSTRACT

Converging evidence suggests that psychosis exists on a continuum, and that even mentally "healthy" individuals may experience subclinical psychotic experiences. However, little research has examined the subjective and psychological well-being of individuals in the putatively healthy end of the continuum. This study explored the latent profile structure of schizotypy in a non-clinical sample and compared subjective and psychological well-being across schizotypy profiles. Latent profile analysis was conducted on participants' responses ($N=420$) to the Oxford-Liverpool Inventory of Feelings and Experiences. Six latent profiles emerged: Low Schizotypy, Average, High Schizotypy, High Unusual Experiences (UE), High Introvertive Anhedonia, and High Introvertive Anhedonia/Cognitive Disorganization. Individuals in the profile characterized by high UE without negative, disorganized or impulsive features tended to endorse similar levels of well-being as the Average and Low Schizotypy profiles. With some exceptions, all three profiles also demonstrated significantly greater subjective and psychological well-being when compared to negative/disorganized schizotypy profiles. The UE profile most closely aligns with previous conceptualizations of "healthy schizotypy." Future research should investigate how individuals in this profile make sense of unusual or ambiguous experiences that may lead to distress in clinical populations.

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1. Introduction

Recent research on the extended psychosis phenotype demonstrates that psychosis can be conceptualized on a continuum with clinically-defined psychotic disorders at one extreme and subclinical psychotic experiences at the other. Psychotic experiences are relatively common in the general population and the majority of these experiences are transitory in nature (Hanssen et al., 2005; van Os et al., 2009; Dominguez et al., 2011). A large body of literature has evaluated the relationship between subclinical psychosis, help-seeking behavior (Murphy et al., 2012), and transition to psychotic disorders, (Chapman et al., 1994; Poulton et al., 2000; Hanssen et al., 2005), yet less research has focused on examining the subjective and psychological well-being of individuals who report subclinical psychotic experiences and do not develop psychotic disorders. Within this non-clinical end of the spectrum, some researchers have suggested that there is a subset of individuals with a certain profile of subclinical psychosis, labeled "healthy schizotypy," which is characterized by the experience of positive psychotic experiences in the absence of negative or disorganized schizotypy and mental health concerns (Maier et al., 2002; McCreery and Claridge, 2002).

The healthy schizotypy model draws from two main lines of research. First, positive schizotypal experiences exist in "healthy" populations without evidence of psychopathology (McCreery and Claridge, 1996; Peters et al., 1999; van Os and Linscott, 2012). Therefore, it is possible that schizotypy can be uncoupled from the disease concept of schizophrenia and the same individuals who experience subclinical psychosis may also experience subjective and psychological well-being. Second, negative and disorganized schizotypy features precede (Cornblatt et al., 2003) and predict (Dominguez et al., 2010) positive psychotic symptoms and thus may be more closely associated with developmental impairment and genetic risk for a clinical syndrome (Thaker et al., 1993; Kendler et al., 1995; Dominguez et al., 2010). In turn, negative and disorganized schizotypy features may be more discriminating between healthy and pathological presentations than positive psychotic experiences. For this reason, one would expect a "healthy schizotypy" profile to include individuals who report subclinical positive psychotic experiences without negative or disorganized schizotypy.

Studying self-reported subjective and psychological well-being of individuals in the putatively "health schizotypy" profile is important for two reasons: (1) it will guide a more complete understanding of the extended psychosis phenotype and (2) it may motivate further research on identifying protective cognitive mechanisms within this population and may inform clinical interventions for subclinical and clinical psychosis. There were two main goals of the present study.

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First, to conduct a latent profile analysis (LPA) on the Oxford-Liverpool Inventory of Feelings and Experiences (O-LIFE) to statistically classify discrete schizotypy profiles within the present "healthy" population, while taking the multidimensional nature of the construct into account. LPA methodology was selected based on evidence that discontinuous latent subpopulations may underlie the psychometric continuum of psychosis (Linscott and van Os, 2010). The O-LIFE assesses four domains of psychosis-proneness in healthy individuals (Mason and Claridge, 2006): Unusual Experiences (UE), Introvertive Anhedonia (IA) Cognitive Disorganization (CD), and Impulsive Non-conformity (IN). Three of the four O-LIFE domains have demonstrated reliability and validity in assessing schizotypal factors, while the Impulsive Nonconformity scale has been criticized as an unstable factor and has been excluded from some studies utilizing the O-LIFE (Cochrane et al., 2010; Lin et al., 2013).

The second goal of the present study was to compare subjective and psychological well-being across latent schizotypy profiles derived from the LPA. It was hypothesized that a healthy schizotypy group would emerge (characterized by high UE/positive psychotic experiences and average or below average scores on IA, CD and IN) and that individuals in this group would have similar psychological functioning when compared to individuals with low O-LIFE scores. It was further hypothesized that this profile would have greater subjective and psychological well-being than those in schizotypy profiles characterized by negative or disorganized features.

2. Methods

2.1. Participants

The sample included 420 undergraduate students (264 males; Age: $M=19.18$, S.D.$=2.73$) at University of Miami, who participated in partial fulfillment of Introduction to Psychology course requirements. This study was approved by the University's Internal Review Board and participants provided informed consent prior to participation. Self-report measures were completed in small groups, supervised by research assistants.

2.2. Measures

Means, standard errors and coefficient alphas for all measures are presented in Table 1.

2.2.1. Schizotypy

The Oxford-Liverpool Inventory of Feelings and Experiences (O-LIFE) includes four scales with 104 true/false self-report questions (Mason et al., 1995). The UE scale measures subclinical positive psychotic experiences (perceptual aberrations, magical thinking and hallucinations). The CD scale assesses disordered thinking and attention, concentration and decision-making deficits. The IA scale measures negative schizotypy, including lack of social and physical enjoyment and the IN scale assesses

impulsive, anti-social and eccentric behaviors. Internal consistency in the current study was good for all four subscales (UE $\alpha=0.87$, CD $\alpha=0.86$, IA $\alpha=0.80$, IN $\alpha=0.70$).

2.2.2. Psychological well-being

The Psychological Well-Being (PWB) Scale includes 84 items from six subscales: Self-Acceptance, Positive Relations with Others, Autonomy, Environmental Mastery, Purpose in Life, and Personal Growth (Ryff, 1989). Items are rated on a scale from one (strongly disagree) to six (strongly agree). Internal consistency in the current study was good for all PWB scales (Self-Acceptance $\alpha=0.91$, Positive Relations $\alpha=0.90$, Autonomy $\alpha=0.85$, Environmental Mastery $\alpha=0.88$, Purpose in Life $\alpha=0.87$, and Personal Growth $\alpha=0.84$).

2.2.3. Subjective well-being

Subjective well-being was assessed with 22 items of the Quality of Life Inventory (QOLI), which measures respondents' perceived importance and satisfaction with different life domains (Frisch et al., 1992). The scale defines each domain (e.g., health, self-esteem, love) and asks participants two related questions. Importance items (e. g., How important is HEALTH to your happiness?) are rated from zero (not important) to two (extremely important). Satisfaction items (e.g., How satisfied are you with your HEALTH?) are rated from zero (very dissatisfied) to five (very satisfied). Total scores were calculated in two steps; importance items were multiplied by satisfaction items for each domain to obtain 11 sub-scores, then total scores were derived by summing across all sub-scores to obtain total scores for participants ($\alpha=0.78$).

2.2.4. Substance use

Alcohol and cannabis use in the past year were measured and included as control variables when indicated. Total scores for the past year were rated on a scale from zero (did not use) to eight (used every day) and were normally distributed in the present sample.

2.3. Statistical analyses

2.3.1. Preliminary analyses

To test for potential covariates, preliminary analyses assessed whether age, gender or substance use were related to dependent variables. For continuous variables (age, alcohol and cannabis use), Pearson correlation coefficients were calculated. Independent sample t-tests were used to test gender differences. Any variable that was significantly related to dependent variables was statistically controlled for in primary analyses.

2.3.2. Latent profile analysis

Latent profile analysis (LPA) using Mplus version 6.0 (Muthén and Muthén, 1998–2010) was conducted to classify participants into discrete schizotypy profiles. LPA provides an advantage over previous methods because it groups individuals based on naturally-occurring patterns within the sample and then uses those patterns as independent variables (Muthén, 2001; Magidson and Vermunt, 2002; Vermunt and Magidson, 2002). LPA is a person-centered and model-based cluster analytic approach. Unique model parameters are estimated for each cluster based on maximum likelihood estimation, which approximates parameters with the highest likelihood of having given rise to the sample data. In this approach, participants are members of a particular profile to a certain degree (based on probabilities), which provides an advantage over traditional cluster analysis approaches that operate on an all-or-none basis (Pastor et al., 2007).

LPA Class enumeration was guided by several statistical information criteria, including Akaike's Information Criterion (AIC), Bayesian Information Criterion (BIC), the Lo-Medell-Rubin test (LMRT) and the bootstrap likelihood ratio test (BLRT). The BIC has proven to be the most consistent test for identifying the correct

Table 1
Psychometric properties of major study variables.

	Sample N=420 M (S.D.)	α	LP1 Low S n=140 M (SE)	LP2 High UE n=30 M (SE)	LP3 High IA n=40 M (SE)	LP4 IA/CD n=43 M (SE)	LP5 Average n=161 M (SE)	LP6 High S n=6 M (SE)
UE	8.82 (5.97)	0.87	3.53 (0.35)	20.22 (0.82)	6.58 (0.67)	14.65 (0.71)	9.56 (0.46)	24.66 (1.96)
CD	9.45 (5.54)	0.86	5.27 (0.51)	13.10 (1.12)	10.04 (1.10)	16.27 (0.77)	10.07 (0.44)	17.58 (1.70)
IA	4.86 (4.08)	0.80	3.05 (0.26)	3.49 (0.40)	12.20 (0.74)	9.93 (0.67)	3.21 (0.24)	10.05 (1.68)
IN	7.94 (3.66)	0.70	6.09 (0.27)	9.19 (0.72)	7.49 (0.70)	11.47 (0.68)	8.11 (0.33)	17.07 (1.01)
QoL	66.64 (17.90)	0.78	72.67 (1.33)	69.03 (2.86)	51.53 (2.54)	51.03 (2.40)	69.81 (1.24)	41.95 (6.43)
Positive Relations with others	64.94 (12.22)	0.90	70.45 (0.81)	67.55 (1.74)	53.32 (1.53)	50.54 (1.46)	67.26 (0.75)	41.52 (3.90)
Personal growth	67.57 (9.48)	0.84	69.69 (0.69)	69.82 (1.49)	58.08 (1.31)	58.74 (1.25)	69.96 (0.65)	68.99 (3.35)
Purpose in life	65.51 (11.15)	0.87	69.62 (0.84)	65.67 (1.79)	58.18 (1.59)	54.85 (1.50)	66.97 (0.78)	55.45 (4.02)
Environmental mastery	59.90 (11.39)	0.88	65.41 (0.84)	55.81 (1.78)	55.36 (1.56)	46.73 (1.50)	61.12 (0.77)	45.00 (3.99)
Autonomy	58.79 (10.86)	0.85	61.55 (0.83)	59.83 (1.49)	55.20 (1.78)	49.98 (1.82)	59.17 (0.83)	65.67 (3.57)
Self-acceptance	62.70 (12.99)	0.91	68.05 (0.81)	61.13 (2.29)	54.85 (2.23)	48.91 (1.90)	64.60 (0.92)	46.17 (4.34)