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Delusional profiles among young adults: A latent class analysis of delusion proneness

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ABSTRACT

Delusional beliefs and experiences can predict the development of mental disorders within the spectrum of psychosis. The nature, content and prevalence of delusional experiences in the general population are still disputed topics. This study investigates the latent structure of delusion proneness in the non-clinical population. Eight hundred young adults (400 from Italy and 400 from the United Kingdom) completed the Peters et al. delusions inventory, a general population measure of delusional proneness. Latent class analysis was used to explore the latent structure of delusion proneness. Four classes were identified: low delusion proneness (including 28% of the sample), grandiosity (13%), paranoid thinking (41%) and positive psychotic beliefs (18%). Latent structures of sub-clinical symptoms can be observed also in non-clinical population; paranoid thinking is the most common delusional theme.

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1. Introduction

Psychotic experiences and beliefs are largely reported in the general population with prevalence between 5 to 25% (Stip and Letourneau, 2009). Similarly to other psychopathological traits (e.g. depression) it has been hypothesized that psychotic traits may be distributed in a dimensional fashion between general and clinical populations (Johns and van Os, 2001; van Os et al., 2009). Such subjective experiences that can be ascribed to the sphere of psychoses may therefore predict the future onset of mental disorders such as schizophrenia, manic-depression, or schizoaffective disorder (Chapman et al., 1994; Krabbendam et al., 2004; Hanssen et al., 2005).

Patients diagnosed with psychosis are extremely variable in their symptoms presentation; in particular within the dimension of positive symptoms, high levels of heterogeneity have often been observed contributing to the idea that meaningful typologies of patients could be difficultly achieved. Latent class analysis (LCA) was initially applied to the psychosis spectrum to explore the contribution of latent traits to heterogeneous symptoms presentation (Jørgensen and Jensen, 1990; Shevlin et al., 2007). LCA posits that a heterogeneous group can be reduced to several homogeneous sub-groups by evaluating and then minimizing the associations among responses across multiple variables (Lazarsfeld and Henry, 1968; McCutcheon, 1987). Latent class analyses therefore empirically tests for the existence of discrete groups with a similar symptom or item endorsement profile, distinguishing it from factor analysis which assumes the presence of continuous latent variables (Hudziak et al., 1998).

Studies using LCA on patients suffering from schizophrenia suggested the existence of several latent classes such as the schizoaffective class (Castle et al., 1994), the disorganized class (Murray et al., 2005), the positive and negative classes (McGrath et al., 2004) and the paranoid class (Castle et al., 1994). A number of investigations have tried to evaluate the consistency of these latent dimensions in mixed clinical samples and in the general population finding good correspondence between clinical and non-clinical classes for positive symptoms (Kendler et al., 1998; Rocchi et al., 2008). When confined to non-clinical populations, LCA studies on positive psychotic experiences found four classes: a normative class, an intermediate class (considered as a transition state towards psychosis), a "paranoid" or global psychosis class and a positive symptoms or hallucinatory class (Shevlin et al., 2007; Murphy et al., 2007).

This study aims to investigate the latent structure of delusion proneness in non-clinical samples recruited from different countries and evaluate the consistency of the 4-class solution in young adult samples.

2. Method

2.1. Participants

Eight hundred young adults were recruited for this study, 400 in the United Kingdom, at Swansea University, and 400 in Italy, at Cagliari University. All participants

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were aged between 18 and 30 and did not report a diagnosis of schizophrenia, schizoaffective disorder, schizophreniform disorder or delusional disorder, nor had any history of brain injury or neurological disorders, on a preliminary checklist. Participants were approached at various sites of the university campus and invited to take part in the study; compensation or study credits were not offered as an incentive to take part in the study. The institutional review board approved the study in both sites.

2.2. Measure of delusional proneness

Delusional proneness was assessed using the Peters et al. delusions inventory (PDI), in both the original (Peters et al., 1999, 2004), and the Italian translated versions (Preti et al., 2007a). The PDI is a self-report questionnaire assessing the multidimensionality of delusional ideation in the general population (Peters et al., 1999). The scale is composed of 21 items to be rated as present (yes) or absent (no). For each item endorsed participants are required to rate the degree of distress, preoccupation and conviction associated on a five-point Likert scale. Every item negatively endorsed automatically leads to a score of 0 for each sub-scale, therefore the number of endorsed items influences the scores in the three sub-scales. To minimize the effect of the number of items endorsed on the distress, preoccupation and conviction sub-scales, a "weighted" score was calculated by dividing the scores reported in the 3 sub-scales by the total PDI score (i.e. the absolute number of unusual psychic experiences admitted among those listed in the inventory).

The 21-item PDI has been used reliably in a large body of research showing good psychometric properties (Lincoln, 2007; Peters et al., 1999, 2004; Verdoux et al., 1998). Cronbach alpha coefficient was 0.82 in the original study (Peters et al., 2004), remaining consistently above 0.70 across samples, ranging from 0.85 in a German general population study (Lincoln, 2007), to 0.75 in Spain (Lopez-Ilundain et al, 2006) and 0.76 in Italy (Preti et al., 2007a). The PDI proved to discriminate accurately between patients diagnosed with psychosis and controls devoid of mental disorders at cut-off = 8 (Peters et al., 2004; Preti et al., 2007b).

2.3. Statistical analysis

Data were coded and analyzed using the Statistical Package for Social Sciences (SPSS) ver.15. LCA was conducted with Mplus 3 (Muthén and Muthén, 2004). All tests were two-tailed ($\alpha = 0.05$). PDI scores and its sub-scales were compared with multivariate analysis of covariance (MANCOVA); location and gender were entered as predictors and covariate by age.

LCA was used to determine delusion proneness typologies and their prevalence. Model selection was conducted according to fitting indices such as likelihood ratio ($-2*\mathrm{Ln}(L)$), the Akaike information criterion (AIC: Akaike, 1987), the Bayesian information criterion (BIC: Schwarz, 1978), and the sample-size adjusted BIC (SSABIC: Sclove, 1987). For each of these indexes, lower values indicate better fit. The Lo–Mendell–Rubin's adjusted likelihood ratio test (LRT: Lo et al., 2001) was also used to compare models with different numbers of latent classes. Standardized entropy measure was used to assess accuracy in participants' classification (values range from 0 to 1), with higher values indicating better classification. Finally multinomial logistic regression was used to assess the association between classes' membership and demographic variables (i.e. gender and age).

3. Results

3.1. General results

Internal consistency of the PDI assessed by Cronbach alpha coefficient was 0.74 (95% C.I.: 0.70 to 0.77) for the UK sample and 0.78 (95% C.I.: 0.74 to 0.81) for the Italian sample.

Sample composition and PDI-21 scores are reported in Table 1. Only the mean weighted distress, preoccupation and conviction and the total number of item endorsed were used in the analysis. PDI total scores did not differ by location (MANCOVA; Table 2). Distress and preoccupation scores were higher in the Italian sample ($P<0.001$). Further, in both samples distress co-varied with gender, with higher scores in females ($P = 0.004$) and preoccupation co-varied with age, with younger more preoccupied ($P = 0.015$). No other significant differences were identified.

Table 2
Associations between demographic factors and the multidimensional delusional attributes (MANCOVA). Significant results ($P<0.05$) in bold.

Source	Dependent variable	Sum of squares	*df*	Mean square	*F*	Sig.
Corrected model	PDI	129.66	3	43.222	3.687	**0.012**
	Distress	32.71	3	10.905	9.442	**0.000**
	Preoccupation	16.77	3	5.592	5.859	**0.001**
	Conviction	5.14	3	1.713	1.502	0.213
Location	PDI	1.31	1	1.307	0.111	0.739
	Distress	20.71	1	20.709	17.929	**0.000**
	Preoccupation	12.42	1	12.416	13.010	**0.000**
	Conviction	1.76	1	1.764	1.547	0.214
Gender	PDI	29.49	1	29.494	2.516	0.113
	Distress	9.40	1	9.401	8.139	**0.004**
	Preoccupation	2.45	1	2.451	2.568	0.109
	Conviction	0.05	1	0.053	0.046	0.829
Age	PDI	49.24	1	49.244	4.201	**0.041**
	Distress	4.12	1	4.122	3.568	0.059
	Preoccupation	5.70	1	5.702	5.974	**0.015**
	Conviction	0.66	1	0.663	0.581	0.446

3.2. Latent class analysis

The 4-class solution presented the best compromise between all the considered indexes (Fig. 1). In particular the AIC and the SSABIC were lower than in the 2- and 3-class solutions, while the BIC was equal to the 3-class solution. Finally, entropy was slightly higher in the 4-class (0.73) compared to the 3-class (0.71) and the 5-class solutions (0.70).

In the 4-class solution, Class I included 222 individuals (27.7%), and was characterized by the lowest chance of PDI items endorsement. Class II included 104 individuals (13%), and was characterized by a higher endorsement of grandiosity theme items (e.g. "to be someone very important", "to be a special or unusual person"); Class III included 330 individuals (41.3%), and was characterized by a higher endorsement of item with a paranoid theme (e.g. "Worrying about one's partner's unfaithfulness" and "People looking oddly at you"). Finally, Class IV includes 144 individuals (18%), and was characterized by a relatively high probability of item endorsing irrespectively of content (Fig. 2).

3.3. Associations among latent classes, demographics and multidimensional factors

In the multinomial logistic regression, three age classes were compared to study the effect of age. Criteria for the age class subdivision were: a similar number of participants in each age group and age groups with similar age range. Three age groups were created: 18–21, 22–25 and, 26–30.

No differences by location or gender were found between the age groups. Age discriminate among classes: compared to the youngest (18–21 years old), those in the 22–25 years old range were more likely to belong to Class II, and those aged between 26 and 30 were more likely to belong to the Class III (Table 3).

Table 1
General characteristics of the sample. YES = number of item endorsed; TOT = PDI total score; DIS = Distress; PRE = Preoccupation; CON = conviction.

Mean scores (Standard deviation)										
Country	Gender	Age	YES	TOT	DIS	PRE	CON	Mean DIS	Mean PRE	Mean CON
Italy	Male $n = 171$	23.5 (2.5)	4.76 (3.46)	46.25 (36.28)	13.73 (10.94)	13.11 (10.74)	14.66 (12.11)	2.48 (1.29)	2.33 (1.17)	2.60 (1.24)
	Female $n = 229$	22.9 (2.4)	5.27 (3.48)	51.27 (38.14)	15.7 (12.4)	14.39 (11.28)	15.91 (12.06)	2.65 (1.2)	2.41 (1.03)	2.68 (1.1)
UK	Male $n = 166$	20.9 (2.1)	5.16 (3.47)	44.55 (33.78)	11.9 (10.05)	11.87 (9.66)	15.61 (11.96)	2.09 (0.92)	2.05 (0.87)	2.27 (1.07)
	Female $n = 234$	19.9 (1.7)	5.65 (3.33)	50.46 (33.32)	14.59 (10.25)	13.82 (9.96)	16.39 (10.79)	2.43 (0.85)	2.27 (0.82)	2.78 (0.85)

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