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ORIGINAL ARTICLE

A cross-sectional survey of psychotic symptoms in the community: The GRANAD∑P psychosis study

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Abstract
Background and objectives: Psychotic symptoms (PS) can be ascertained in the general population suggesting the existence of a wide psychosis phenotype. We aim to investigate the prevalence and correlates of PS in the province of Granada (Spain) in the absence of previous data. Our objectives were to establish the prevalence of PS, i.e. delusions and hallucinations, and identifying correlates with PS in search of plausible risk factors.
Methods: This is a cross-sectional study (GRANAD∑P study) including assessments of 809 individuals who were selected randomly from the Unified Database of the Andalusian Health System, a census covering about 98% of the entire regional population. PS were assessed by the MINI Neuropsychiatric International Interview Psychosis Subscale. A variety of potential risk factors for PS were also assessed including socio-demographics, cognitive function, psychiatric comorbidity and physical health issues.
Results: The prevalence of any PS in the province of Granada was 10.3% (hallucinations were detected in 6.1% of the sample and delusions in 7.4%). PS was correlated with increased suicide risk, lower functionality, having suffered childhood abuse, cannabis use, lower working memory and higher impulsivity.

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Conclusions: The prevalence of PS in this Southern Spanish sample is similar to that found in other European populations. This may indicate that an extended subclinical psychotic phenotype can be detectable on general populations and that it associates to a variety of cognitive deficits, personality traits and environmental factors upon which we can direct preventative measures to prevent transition from subclinical non-cases to clinical cases states.

Introduction

Delusional and hallucinatory experiences have historically been defined as psychotic symptoms (PS). PS have been traditionally used clinically as a turning point for a diagnosis of psychotic disorder. However, a large body of literature shows now that PS can be ascertained in the general population among people who do not fulfil clinical criteria for psychotic disorder,[1] thus suggesting a broader concept of a ''wide psychosis phenotype''.[2,3] Such notion has been supported by epidemiological, genetic, neuroimaging and clinical investigation findings.[4] Hence, a kind of gradient would exist were healthy individuals without any psychotic experience would be situated at one end and those with a clinical psychosis would be at the other, being the latter ''the visible tip of the iceberg''.[4] Indeed, section II of DSM-V assumes this concept in some of its descriptions of psychosis.[5] Few instruments have been validated to evaluate PS in community samples but the most commonly used instrument so far has been the Composited International Diagnosis Interview (CIDI) (PS section). Other studies have also used the Mini International Neuropsychiatric Interview that also contains its own PS section.[6,7]

Prevalence of psychotic symptoms in the general population

The occurrence of PS is not uncommon in non-clinical community samples. Thus, a recent meta-analysis suggests that PS in population based studies are about ten times higher than the prevalence of diagnosed psychotic disorders,[8] estimating a median prevalence of 7.2% (4.9% hallucinations, 6.0% delusions). Among the most important studies included are the Dutch NEMESIS-I study[2] reporting a prevalence of PS of 17.5% (8.2% for hallucinations and 12.2% for delusions), and the NEMESIS-II study reporting that 16% of participants exhibit some PS.[9] Conversely, the British National Comorbidity Survey reported in 2004 a 5.5% PS prevalence in a British sample of 8850 individuals as measured with the Psychosis Screening Questionnaire (PSQ) (4.2% reported hallucinations and 9.1% delusions).[10] In the United States, the National Comorbidity Survey reported 11.6% as PS prevalence (10.7% hallucinations, 2.2% delusions) in a sample of 5877 individuals using an expanded version of the CIDI.[11] In addition, another cross-sectional study including 52 countries worldwide taking part in the World Health Organization's World Health Survey, reported more recently that the prevalence of having at least one PS ranged from 0.8% to 31.4%[12] among participating countries. Other relevant recent studies have been the Singapore Mental Health Study (SMHS)[13] reporting a 3.8% of PS (4.3% hallucinations, 1.1% delusions), and similar studies in Tanzania,[14] South Africa[15] or Spain (Catalonia)[16] showing prevalences of 3.9%, 12.7% and a 11.2%, respectively (Table 1).

Factors associated with of psychotic symptoms

Among social factors associated with PS by previous epidemiological studies are younger age, ethnic minorities, migrant status, lower pay, poorer education, unemployment, not being married, alcohol and cannabis abuse, experience of stressful events, urban upbringing and family history of mental.[8,12] On the other hand, recent studies pose an ''affective pathway'' to early psychosis mediated by two synergistic potential risk factors: childhood trauma and ''social defeat''.[17] Additionally, higher risk for PS have been reported in sexual minority groups,[18] bullying victims,[19,20] advanced paternal (but not maternal) age at birth,[21] Latino race-ethnicity[22] and lower cognitive speed processing.[23] Finally, many recent studies have focused on clarifying the neurodevelopmental factors associated with the expression of a continuum psychotic phenotype[24–26] lending some support to the notion of a psychotic dimension in the general population.

The aims of this study are to investigate the prevalence and correlates of PS (delusions and/or hallucinations) in a representative community sample living in the province of Granada (Southern Spain) and to identify a multivariate explanatory model of potential risk correlates for PS.

Methods

Design and sampling method

The GRANADΣP study is a cross sectional survey of general population in the province of Granada (Spain). A more detailed description of its methodology is described elsewhere.[27] The study protocol was approved by the Granada University Hospitals Research Ethics Committee. Sampling was performed in a two-stage cluster sampling with stratification of the primary sampling units (PSUs) depending on whether they were rural or urban. To be able to estimate a 2% mental disorder prevalence, with ±0.8% accuracy at a 95% confidence interval, the target sample was

Table 1 Main previous cross-sectional studies prevalences of psychotic symptoms.

Author (year)	Country/name of the study	Measure instrument	*n*	Prevalence of PS%	Hallucinations%	Delusions%
Kendler et al. (1996)	United States National Comorbidity Survey	Computer interv/senior clinician	5877	28.0	10.7	2.2
Van Os et al. (2000)	Netherlands NEMESIS-1	CIDI	7076	17.5	8.2	12.3
Johns et al. (2004)	England National Survey of Psychiatric Morbidity	PSQ	8580	10.9	4.2	9.1
Chant et al. (2006)	Australia National Survey of Mental Health and Wellbeing	CIDI	10,641	11.7		
Kollanagi et al. (2015)	England Adults Psychiatric Morbidity Survey 2007	PSQ	7403		5.15	3.84
Mohr et al. (2008)	Czech Republic Prague	PSQ MINI	3244	17.9	1.7	16.7
Ochoa et al. (2008)	Spain ESEMeD-Catalonia Study	CIDI	1645	11.2		
Alptekin et al. (2009)	Turkey Izmir Mental Health Survey	CIDI	1268	3.6		
Jenkins et al. (2010)	Tanzania	PSQ	899	3.9	1.1	3.9
Leiderman et al. (2010)	Argentina Buenos Aires	SCL-90-R	1036		7.9	17.1
Loch et al. (2011)	Brazil Sao Paolo Epid. Catchment Area Study	CIDI	1464	38.0		
Temming et al. (2011)	South Africa South African Stress and Health Study	CIDI	4250	12.7		
Van Nierop et al. (2012)	Netherlands NEMESIS-2	CIDI	6646	16.0		
Gace et al. (2012)	New Zealand New Zealand Mental Health Survey	CIDI	7435	7.3		
Binbay et al. (2012)	Turkey Izmir Mental Health Survey		4.011	10.1		
Mamah et al. (2012)	Kenia	PRIME screen	2758	45.5		
Soosay et al. (2012)	Timor Leste	PSQ	1245	12.3		
Nuevo et al. (2012)	World Health Organization World Health Survey 52 countries	WHS WHO	224,254	0.8–31.4		
Van Os et al. (2013)	Meta-analysis	CIDI, PSQ, SCL-90-R, WHS, etc.	61 Cohorts	7.2		
Subramanian et al. (2014)	Singapore Singapore Mental Health Survey	CIDI	23,248	3.8	4.3	1.1

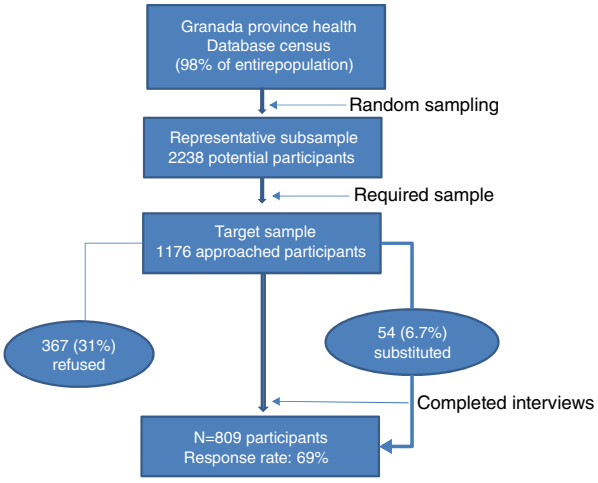

Figure 1 GRANADΣP study sampling procedure and response.

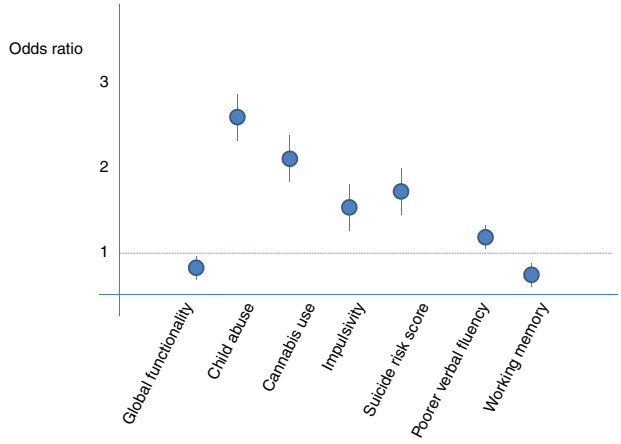

Figure 2 Factors multivariately associated to psychotic symptoms.

estimated at 1176 participants. The sample was selected randomly from the National Health Service Users Database from Andalucía, which is estimated to cover 98% of the population. Interviews were conducted by fully trained psychologists who were specifically trained to administer the GRANDΣP battery of assessments and took place either in the participant's local primary health care centre or in their homes (at participant's convenience). All living participants between the ages of 18 and 80 were selected for participation in the study, divided into four age groups. Exclusion criteria were: being outside the age range, having lived in Granada province for less than a year, not being able to communicate fluently in Spanish, being too ill to be able to complete the interview, having a diagnosis of dementia or mental retardation, living in an institution (hospital, prison, etc.), having moved or not living normally at the address we had been given by the Users Database, and erroneous data from the Users Database (for example an incomplete address). Excluded participants were replaced with another individual matched for age, sex and location. Eight hundred and nine ($n = 809$) non-institutionalized community-based participants living in the province of Granada agreed to take part in the survey, all interviews were performed between October 2011 and September 2012. Fig. 1 shows a flowchart on the cohort substitution procedure and response rates (Fig. 2).

Assessment of psychotic symptoms

The psychiatric interview section was composed of the MINI International Neuropsychiatric Interview, which generates Axis I DSM-IV, and ICD-10 diagnoses for 16 mental disorders.[28] It includes a screening section for psychotic disorder that was used to ascertain PS in this study (see Table 2 that includes all actual PS items). For the purpose of this study we considered as our main outcome having at least one PS as measured on this MINI psychotic subscale, following a similar procedure to previous studies.[7,9]

Other assessments

Sociodemographic data were collected using the indications described in previous studies.[29,30] Information on psychiatric family history was gathered using a modified version of the family interview for genetic studies (FIGS)[31] in which we collected data on parents and siblings. We also assessed childhood experiences of abuse in which participants answered questions about sexual, psychological and physical abuse.[32] Information about stressful life events was collected using the List of Threatening Experiences Schedule, a validated 12-item questionnaire, which determines whether a person has been exposed to a highly threatening life event in the past year.[33] General health was assessed using the SF12 questionnaire, which produces information about both emotional and physical health during the past four weeks.[34] Functional impairment was assessed using the Global Assessment of Functioning (GAF).[35] Exposure to Cannabis and other substance of abused was accomplished by using the relevant section (section K) in the MINI interview.[7,9]

Neuropsychological assessments were performed using the Screen for Cognitive Impairment in Psychiatry (SCIP) interview which provides scores on immediate and delayed verbal learning, working memory, verbal fluency and processing speed. The Spanish version has shown to have good test–retest reliability (0.74–0.90) and internal consistency Cronbach's alpha value of 0.73.[36]

We also administered the Standardized Assessment of Personality-Abbreviated Scale (SAPAS) to establish whether participants had high probability of personality disorder (HPPD) (90% or higher).[37] The SAPAS is a personality disorder screening mini-interview composed of eight dichotomous questions. In addition, two personality traits (Neuroticism-anxiety and Impulsivity-Sensation Seeking) were also assessed using the appropriate sections of the Zuckerman–Kuhlman Personality Questionnaire (ZKPQ).[38] An overall score of suicidal ideation was also evaluated using the appropriate section of the MINI.

Table 2 Sample's sociodemographic and clinical characteristics.

Variable	% (*N*)/Mean (SD)
Gender	Male 48.1% (389) Female 51.9% (420)
Education level	Illiterate 2.9% (23) Read and write 13.2% (107) Primary 37.8% (300) Secondary 26.8% (217) University 20.1% (160) Other 0.4% (3)
Marital status	Married/coupled 72.3% (585) Separate 2.5% (20) Widowed 4.3% (35) Divorced 3.9% (31) Single 17.1% (138)
Urbanicity	Urban 60% (486) Medium 29.8% (241) Rural 10.2% (82)
Working status	Employed 42.8% (346) Unemployed 21.2% (172) Retired 13.3% (107) Disabled 3.3% (27) Housewife 11.3% (92) Student 6.0% (49) Other 2.1% (17)
Cognitive measures	
Total SCIP	96.4 SD 30.5
Learning	0.6 SD 0.17
Working memory	0.67 SD 0.21
Verbal fluency	15.1 SD 6.7
Long-term memory	56.7 SD 29.1
Visual motor skills	0.30 SD 0.17
Personality measures	
SAPAS personality disorder	3.04 SD 1.45
Neuroticism score	2.1 SD 1.1
Impulsivity score	−1.2 SD 1.2
Social risk measures	
GAF functionality	90.5 SD 12.7
Child abuse (mean score)	0.15 SD 0.40
Mean number of TLEs	1.60 SD 1.50
Cannabis use	9.2% (74)
Mean Suicide Risk Score	0.17 SD 0.53

Statistical analyses

Explorative assessment of data distributions, descriptive analyses including frequencies and mean values of all independent variables were calculated using SPSS. Pooled estimates of prevalence of PS were calculated with 95% confidence intervals. Chi-squared and *t*-Student tests were performed to explore univariate associations between PS and potential qualitative and quantitative correlates respectively. The potential confounding effects of age and gender were examined using binary logistic regression using having any PS as the main outcome variable. A multivariable model using logistic regression was also used to determine the most parsimonious explanatory model for PS. Odds ratios for quantitative independent variables represents the risk change for one-unit increase in the scale. All analyses were pondered using a weighting factor that took into account the population's structure in terms of gender, age and rurality/urbanicity index.

Results

Sample description

Out of 2338 potential participants in our census, 1176 were finally approached of whom 367 refused to take part 31% and 54 subjects were substituted for a variety of exclusion criteria reasons (see Fig. 1). Consequently, 809 (69%) were included as our final study sample (response rate = 69%). Thus, the final sample was one of 809 participants. 48.1% were men and 51.9% women. Individuals were aged between 18 and 80 years whose average age was 47.16 years (SD 16.72). Most of them were married (72.3%), less than 50% had more than primary educational level and about 10% lived in a rural area. Table 2 shows a detailed summary of the sample's socio-demographic and clinical characteristics.

Eighty-three individual out of 809 were positive for the presence of any PS. Thus, the 1-month prevalence for any PS in the sample was 10.26% (95% CI 8.16−12.35). Hallucinations and delusions were analysed separately. Fifty-nine individuals reported to have delusions (7.4% (95% CI 5.55−9.15)) and 50 reported hallucinations (6.1% (4.50−7.80)). Table 3 details the individual prevalence of each PS on the MINI.

Univariate analysis

PS were not associated with gender or age in this sample. Conversely, PS did associate univariately with cannabis consumption ($\chi^2 = 14.520$; $p = 0.001$), having suffered some kind of childhood abuse ($\chi^2 = 19.846$; $p < 0.001$), having a positive family history of mental illness ($\chi^2 = 11.514$; $p < 0.001$), having experienced stressful life event ($\chi^2 = 16.441$; $p < 0.001$), being screened as a probable personality disorder by the on the SAPAS personality scale ($\chi^2 = 18.225$; $p < 0.001$) and living in an intermediate area rather than on a rural or urban area ($\chi^2 = 10.806$; $p = 0.005$). Significant associations were also found between having PS and higher mean scores on impulsivity ($t = -4.371$; $p < 0.001$), neuroticism ($t = -4.736$; $p < 0.001$), higher scores on the suicide risk MINI subscale ($t = -5.175$; $p < 0.001$), TLEs ($t = -6.112$; $p < 0.001$) and global SAPAS personality disorder score ($t = 4.880$; $p < 0.001$). PS was also associated univariately to lower educational level ($t = 2.012$; $p = 0.04$) and poorer physical ($t = 2.595$; $p = 0.01$) and emotional scores ($t = 5.341$; $p < 0.001$) on the respective SF12 subscales. Although all SCIP Neuropsychological scores showed poorer cognitive functions among people with PS, none of the differences were found to univariately associate with PS.

Table 3 Positive answers to MINI psychotic symptoms subscale (prevalences/95% CI).

Question	%	95% CI
1. Have you ever believed that people were spying on you, or that someone was plotting against you, or trying to hurt you?	4.44	0.30–0.59
2. Have you ever believed that someone was reading your mind or could hear your thoughts or that you could actually read someone's mind or hear what another person was thinking?	3.46	0.22–0.47
3. Have you ever believed that someone or some force outside of yourself put thoughts in your mind that were not your own, or made you act in a way that was not your usual self? Have you aver felt that you were possessed?	1.45	0.63–2.27
4. Have you ever believed that your were being sent special messages through the TV, radio, or newspaper, or that a person you did not personally know was particularly interested in you?	0.99	0.30–1.68
5. Have your relatives or friends ever consider any of your beliefs strange or inusual?	1.77	0.86–2.68
6. Have you ever heard things other people couldn't hear, such as voices?	1.86	0.93–2.80
7. Have you ever had visions when you were awake or have you ever seen things other people couldn't see?	4.88	0.34–6.37
Prevalence of having any delusion on the MINI PS subscale	7.4	5.55–9.15
Prevalence of having any hallucination on the MINI PS subscale	6.1	4.50–7.80
Prevalence of having any psychotic symptom on the MINI PS subscale	10.26	8.16–12.35

Multivariate analysis

When potential risk factors or correlates for PS were considered on a multivariate analysis, we found that PS was independently associated to a most parsimonious model including: having an increased score on the risk of suicide MINI subscale (OR = 1.69; 95% CI (1.193–2.389); $p = 0.003$), lower GAF functionality mean score (OR = 0.97; 95% CI (0.953–0.988); $p = 0.001$), having suffered any childhood abuse (OR = 2.52; 95% CI (1.327–4.780); $p = 0.005$), being a cannabis user (OR = 2.12; 95% CI (1.0–4.9); $p = 0.047$), showing a poorer performance on the SCIP working memory task (OR = 0.5; 95% CI (0.01–0.244); $p < 0.001$) and on the verbal fluency task (OR = 1.1; 95% CI (1.05–1.15); $p < 0.001$), and having higher scores on the impulsivity personality trait subscale (OR = 1.45; 95% CI (1.193–1.765); $p < 0.001$).

Discussion

The main objective of this study was to estimate the prevalence rate of PS in the province of Granada based on data from the representative sample participating in the GRANAD∑P Cross-Sectional Study. We also set for identifying correlates of PS in our area. Of the sample, 10.3% had at least one PS, 7.4% had at least one delusion and 6.1% had at least one hallucination. We also found independent associations between PS and a higher suicidal risk, poorer performance on working memory, lower verbal fluency, lower functionality, higher impulsivity and having suffered any type of abuse during the childhood.

Prevalence of psychotic symptoms

Our findings are consistent with most previous prevalence studies using an extended psychotic phenotype such as our PS outcome. Thus, we report very similar results to those obtained in the Catalonia study,[16] the only other specific study on Spanish population. This is in spite that the Catalonia study used a different measuring tool such as the CIDI to categorize PS and that both Spanish regions are fairly different in economic development and cultural issues. Furthermore, our results are also congruent with average prevalences of PS reported by most of the previous European studies[9,10] but higher than the average 7.2% obtained in the Van Os et al. (2013) meta-analysis that included the majority of similar reports. On the whole, our findings support the notion that a ''psychosis phenotype'' may exist to a varying degree across the general population. Thus, this phenotype seem to exist among many people who seem to express it mildly or sub-clinically compared to those few exhibiting more severe clinical cases, such as people suffering full-blown clinical psychosis.

We also report a prevalence of 6.1% for hallucinations, an intermediate finding among more extreme ones such as 4.2% or 10.7% found in Dutch or American studies, respectively.[10,11] The prevalence of delusions in our sample was 7.4%, quite similar to 6% found in the van Os et al. meta-analysis.[8] Such minor variation in prevalence figures can be accountable for by differences in random sampling and/or by the use of different diagnostic tools but, globally, seem to convey a solid message in favour of a continuum between clinical and subclinical cases[4] when PS are explored in general population. Our finding that delusions seem to be more prevalent than hallucinations also streams in with most previous reports with few exceptions.[9–11]

Childhood abuse and PS

Despite the associations between child trauma and psychosis is not entirely consistent in the light of previous systematic reviews,[7,39,40] there is a large body of literature, during the last few years, showing a robust association between childhood maltreatment and development of adult psychosis.[41,42] Maltreatment not only influences the child's

psychological wellbeing but also inhibits domains of social development that, in turn, have been found to predate the onset of psychosis.[42,43] Furthermore, some studies have demonstrated a dose–response association between childhood maltreatment and psychosis in both prospective and cross-sectional studies.[41,42] In addition to this, synergistic pathways of risk have recently been defined showing that childhood trauma, bullying and experience of discrimination do associate with PS.[19] Our finding that child abuse is a robust risk correlates for PS favours the view that child trauma may indeed increase risk for psychosis. It is also important to highlight that cannabis use joined to childhood maltreatment has also been defined as a synergic factor too that impact on PS risk, which is compatible with our univariate findings of excess risk for PS among cannabis users.[44]

Cannabis use and PS

We found cannabis used to be independently associated to PS, which replicates findings from a recent meta-analysis looking at similar population based studies.[7] Cannabis use is a well-established risk factor for clinical psychosis.[45,46] Moreover, randomized experimental studies have demonstrated that cannabis used-induced biochemical effects in the brain[47] and genetic liability for schizophrenia may interact increasing the risk for PS.[3,48] Moreover, a study shows that delta-9-tetrahidrocannabinol, cannabis main psychotropic component, causes transitory PS in healthy volunteers and triggers an exaggerated psychotic response in individuals with genetic risk for psychotic disorder. Overall, there is also evidence that the influence of cannabis on PS may be mediated through effects on dopamine processing in certain brain areas.[49,50]

Impulsivity and PS

Patients with clinical psychosis often display behavioural problems that suggest impaired impulse control.[51] To our Knowledge, there are no previous studies reporting Personality Disorders measured by SAPAS questionnaire in individuals with PS and there is a relative scarcity of epidemiological studies looking at personality traits into PS.[52] Neuroticism has been reported as linked to PS in other study[9] and it is plausible that other personality traits may also represent a potential psychological risk factor for PS. Indeed we found that neuroticism (univariately) and impulsivity (multivariately) associate with PS in our sample. This finding could be explained by common genetic predisposition, common psychological components and/or common environmental risk factors between both personality traits and PS.[53,54] In our sample, individuals with PS report higher levels of impulsivity, something that has been reported earlier in an African-American general population sample where impulsivity was measured with the Barratt Impulsiveness Scale (BIS-11).[52] Higher impulsivity has also been found among subject considered as ultra-high-risk subjects for psychosis.[53] This association has been posed to suggest a possibly altered capacity for conflict processing, which, in turn, has been proposed to stem from functional abnormalities at the Anterior Cingulate Cortex.[53]

Suicide risk and PS

Clinical psychosis such as schizophrenia is the second most frequent psychiatric disorder among people who commit suicide.[55] Our finding that PS is associated with an increased score on the suicide risk MINI subscale is congruent with a notion of higher suicide risk among people with PS and also replicates previous findings in similar studies.[14,56–58] Although, this association had been posed[59] as a confounder for the association between personality disorder or impulsivity with both PS and suicide risk. However this explanation would be ruled out in our study provided that we included such variables in our multivariate model, suggesting that the association maybe mediated by other co-factors.[58] In sum, we consider that our finding here supports the idea that assessment and management of suicide risk in individuals reporting PS may be relevant for suicide prevention.

Cognitive deficits and PS

Cognitive deficits are generally considered a core feature of psychotic disorders. A recent meta-analysis has documented impairment in psychotic patients on a range of cognitive functions, including verbal memory and fluency, executive functions, working memory, and sustained attention.[60] Our findings replicate some of these findings, such as poorer verbal fluency and working memory, when community-dwelling subjects with PS, rather than psychotic patients, are compared with controls for PS. We interpret this finding as supportive of the concept of continuum PS phenotype where patients with more severe psychotic disorder exhibit a larger degree of cognitive impairment, mainly frontal, that is more moderately evident in subclinical cases with PS.[61] A recent Spanish 5-year-follow-up study of first-episode psychosis patients has shown that working memory impairment is associated to negative PS and poor functional outcomes, explaining that the association between these cognitive deficits (verbal fluency and working memory) and PS/Disfunctionality is mediated by negative PS.[62] Our finding on working memory and verbal fluency and PS also replicates similar reports.[63,64] A plausible common psychological process explaining poorer working memory in PS is that deficits in working memory are linked to the ''jumping to conclusions'' bias which is typical for psychosis, particularly abnormal belief formation.[65] A potential common genetic link for both PS and poor working memory has been suggested as a 22q11.2 deletion syndrome (22q11DS).[66] Targeting cognitive symptoms in people with PS can improve prevention of such subclinical cases and maybe their progress to clinical psychosis.

GAF and PS

Many studies have demonstrated that people with PS show a diminished global functionality.[15,21] Our finding that lower functionality is associated with PS add support to PS as a valid outcome provided that both, clinical and non-clinical cases of psychosis are elicitable in the community and all seem to have some functional impact, as could be expected in a continuous phenotype. Furthermore, a study comprising

three meta-analyses shows that functionality is impaired not only in psychotic cases but also in those at high-risk state.[67]

Strengths and limitations

Strengths of the study are the relative good sample size and representativeness of the sample. This is one of the few existing community-based studies developing a formal assessment of cognitive functions and personality traits in a broad non-clinical sample. The main limitation is the cross-sectional design that cannot define cause-effect associations and the non-clinical screening characterization of PS. However, all interviewers were clinical psychologists with specific training on PS detection, which may have improved the quality of PS eliciting as compared to other general population studies typically using lay interviewers. Secondary limitations of representativeness are that individuals who live in institutions or were hospitalized were not included in the survey.

Conclusions

The prevalence of PS in the Andalusian community is similar to that reported among comparable European populations and is clearly higher than that of psychotic disorders. This may indicate that an extended subclinical psychotic phenotype can be detectable in the general population. PS associates with social adversity and environmental factors, cognitive deficits, dysfunctionality and a higher suicide risk. Clinical targeting these potential risk correlates among people with PS may prove of some assistance in the effort of preventing transition from subclinical non-cases to clinical psychotic states.

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Conflict of interest

The authors declare no conflicts of interest.

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