Variance in Prodromal Schizophrenia Symptoms, Environmental Risk Factors, and Stigma as Potential Contributions to the Discrepancies in Global Schizophrenia Prevalence Rates: a Small-Scale Cross-Cultural Study

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Abstract

Schizophrenia is a complex and debilitating mental disorder, the etiological causes of which are still inconclusive. The disease is highly heritable, but some environmental and cultural risk factors have been identified that may contribute to its development. Moreover, there is a lack of consistency in the current understanding of global schizophrenia prevalence, which is difficult to accurately assess due to a low manifestation of the disorder in populations. Schizophrenia prodrome has been identified as one of the best predictors of the future development of schizophrenia and transition to psychosis, which is prevalent in the general population on a continuum at a much higher rate than schizophrenia, making it more feasible to assess. Understanding the cause of the discrepancies in global schizophrenia prevalence rates may be a step toward a better understanding of the etiology of the disorder.

A cross-sectional online survey was administered to 79 female and 121 male participants ($N = 200$) from Brazil, India, Italy, and the USA via Amazon's Mechanical Turk. Prodromal symptoms were measured based on their overall presence and their associated distress using the Prodromal Questionnaire - Brief Version (PQ-B). Attitudes toward schizophrenia were measured with the Stereotypes of Schizophrenia Scale. It was hypothesized that lower income economies would show higher rates of schizophrenia prodrome symptoms, and the predictive associations between prodromal symptoms and attitudes toward schizophrenia, immigration status, substance use, cannabis use, income, gender, and age were examined. Chronbach's alpha for the PQ-B in the current sample was 0.97, and Chronbach's alpha for the Stereotypes of Schizophrenia Scale was 0.87.

In line with my hypothesis, India, which is currently classified as a lower-middle income economy, had the highest PQ-B distress and PQ-B total scores, followed by Brazil and Italy, while the USA scored the lowest on both PQ-B distress and PQ-B total components. India also scored the highest on the Stereotypes of Schizophrenia Scale, substance use, cannabis use, and negative attitudes toward immigrants. No significant gender differences in prodromal symptoms were found. The sample size of immigrant participants in the current study was too small to properly analyze; however, immigrants showed higher rates of substance use, cannabis use, and a lower average income.

This study examined a relatively large sample size from geographic regions that have not previously been compared, and elucidated areas that need further exploration. Having a more accurate representation of the variance of psychotic symptoms across populations and their interplay with environmental and cultural factors may allow for a greater understanding of the global differences in predisposition to schizophrenia and provide an opportunity for developing more culture-specific prevention strategies.

Introduction

Schizophrenia Characteristics

Schizophrenia is a highly heterogeneous illness and remains a challenging disorder to understand from both the etiological and therapeutic perspectives. The disorder is characterized by behavioral, emotional, and cognitive impairments, with presenting symptoms broadly divided into positive, negative, and cognitive groups (Haro et al., 2015). Positive symptoms represent exaggerations of normal functions and include hallucinations, delusions, disorganized speech, and disorganized behavior (APA, 2013). Negative symptoms include social withdrawal, anhedonia, and avolition; their presence has been associated with poor prognosis more so than positive symptoms (APA, 2013). Cognitive impairments are characterized by memory deficits, attention deficits, and lower-than-average intelligence (Bowie & Havey, 2006). Schizophrenia typically emerges between late adolescence and mid-thirties, with men generally experiencing their first psychotic episode in their early twenties, and women in their mid-to-late twenties (APA, 2013). A sudden developmental shift characterized by an emergence of cognitive and behavioral complications that manifest prior to the onset of clinical schizophrenia symptoms is classified as the prodromal stage of schizophrenia (Cornblatt et al, 2007). The diagnostic definition of the prodrome is still not clearly defined, but some studies have shown that intervention during the early stages of the illness showed promising functioning outcomes for patients (George et al., 2017). Antipsychotic medications used for the treatment of schizophrenia have complex side effects including motor, endocrine, cardiovascular, and metabolic complications. A recent study indicated that the average rate of treatment adherence for

schizophrenic patients is 42%, which may significantly affect outcomes and risk of relapse (García et al., 2016).

The direct causality of schizophrenia is unknown, but it is understood that an interplay of genetic, epigenetic, and environmental factors together contribute to its development. Genetic predisposition remains the most significant risk factor by far, with heritability rates estimated to be about 80% (Gareeva & Khusnutdinova, 2018). The concordance rate is around 50% with monozygotic twins and decreases to about 2% with more distant relatives (Trifu et al., 2020). The nature of schizophrenia heritability, however, is complicated. There is no one gene that would be sufficient for determining schizophrenia; instead, there is a variety of genes with low penetrance that constitute the genetic basis of schizophrenia, with more than 108 genes already found to be associated with the disorder (Gareeva & Khusnutdinova, 2018). Moreover, genome-wide association studies (GWAS) have distinctly identified over 8000 single nucleotide polymorphisms (SNPs) that contribute to the risk of developing schizophrenia, and their interactions may explain over 50% of schizophrenia heritability (Ripke et al., 2013). Individually, the risk SNPs are largely non-coding, don't have major effects, and do not explain the full scope of the genetic predisposition (Harrison, 2015). Even with the recent advances in the genetic underpinnings of the disorder, a lot of questions about using these genetic markers for prognosis or diagnosis remain unanswered (Gareeva & Khusnutdinova, 2018).

Heritability of 80% implies that 80% of the variation in schizophrenia diagnosis can be attributed to genetics, while 20% is attributable to variance in environmental factors. The influence of environmental factors remains inconclusive; however, higher rates of schizophrenia have been noted among migrant populations, populations in urban environments, cannabis users, and males (APA, 2013). While increased risk has been noted in males, a recently published

meta-analysis of schizophrenia prevalence indicated that the sex differences, on average, were not significant (Simeone et al, 2015). Additionally, migrants from cultures with predominantly white and black populations have been found to be at the highest risk. It has been proposed that less diverse populations may potentially increase paranoid feelings and ultimately lead to psychosis (Werbeloff et al., 2012). However, there is a lack of understanding of the extent of the risk variation cross-culturally. The results from studies examining the sex differences among migrants diagnosed with schizophrenia have also been inconclusive (Werbeloff et al., 2012).

Prevalence

The current estimates of the global schizophrenia prevalence are indeterminate. Although the general agreement within the field is that the disorder manifests consistently in about 1% of populations worldwide, regardless of geography, many cross-cultural prevalence studies and systematic literature reviews challenge the current estimates of the global variability of schizophrenia (Saha et al., 2005). The Diagnostic and Statistical Manual-5 (DSM-5), used as the primary diagnostic tool for psychiatric disorders, states that schizophrenia prevails at a rate between 0.3-0.7%, which does not fully reflect the current understanding of lifetime prevalence.

One of the largest cross-cultural schizophrenia prevalence studies was conducted in 2003 by analyzing the results of the World Health Organization's World Health survey, which estimated prevalence rates among 256,000 individuals in 52 countries divided into different economic categories. For high-income economies, the prevalence was estimated to be 1.00%. For middle to low-income economies, the average prevalence was estimated to be higher than that of upper-income economies, at 1.38%. The total schizophrenia prevalence among all 52 countries was established to be 1.11%. Individual percentages between the assessed countries varied from 0.70% to 5.70% (Nuevo et al., 2012).

A systematic literature review conducted by Saha et al. (2005) indicated that prevalence estimates traditionally arise from prevalence studies based on populations living within specifically determined areas, which may ultimately prevent researchers from detecting informative variations in prevalence both within and between populations. Elements such as age distribution, migration, and mortality rates are not homogenous across populations and may influence schizophrenia prevalence estimates (Saha et al, 2005). Saha et al. (2005) also found that schizophrenia patients from developing countries are more likely to have more positive outcomes when compared to schizophrenia patients from developed countries. For lifetime prevalence, the median was estimated to be 0.40%. An unexpected result of their findings suggested that there were no significant differences in prevalence rates between males and females.

In a more recent systematic review conducted by Simeone et al. (2013), the overall median lifetime prevalence estimate across the examined studies was 0.48%, slightly greater than the 0.40% estimate of Saha et al. (2005). Simeone et al. (2013) indicated that the data revealed information gaps in the current literature. Large population samples are needed to accurately estimate schizophrenia prevalence considering the rarity of the disorder. However, along with many studies being outdated, several large and densely populated countries, including Brazil, Japan, Russia, Germany, and France currently do not have enough prevalence studies available. Prevalence data from Central and South America, for instance, have last been assessed in 2003 (Simeone et al., 2013). An incomplete understanding of variation in schizophrenia cases in large geographic regions of the world does not allow for an accurate understanding of the disorder as a whole. Having more up-to-date information can illuminate the significance of the effect environmental factors on the development of the disorder (Comer et al., 2020), and may allow

not only for the implementation of more effective healthcare strategies, but also for gaining more insight into the etiology of the disease (Saha et al., 2005).

The Prodrome

The DSM-5 emphasizes insight, or awareness of one's psychopathology, as the most crucial factor in determining treatment adherence, overall functioning, and prognosis (APA, 2013). However, a recent study indicated that long-term outcome has been associated with functioning in the early stages of disease development more so than insight (Johnson et al., 2013). The recent transition from the DSM-IV and the ICD-10 as the main diagnostic tools has challenged the view of symptoms, including psychosis, as categorical entities, which are now more commonly viewed as dimensional (Nuevo et al, 2012). This has been supported by more recent findings that psychotic symptoms are present in general populations on a continuum, and may not necessitate a particular psychiatric diagnosis (Nuevo et al., 2012). The current understanding lacks a coherent cross-cultural assessment of psychosis, with the majority of studies examining psychotic symptom distribution focused only on one geographic region (Nuevo et al., 2012). Furthermore, most GWAS studies have been conducted in populations of European descent, and more diverse populations are necessary to comprehensively characterize global psychosis variation (Rosenberg et al., 2010). The gaps in the current understanding and the lack of consistent information from many geographic regions prompt for a more in-depth examination of cross-cultural differences in psychosis and the risk factors that may contribute to such differences.

Establishing more accurate global schizophrenia prevalence estimates is a particularly challenging task due to a relatively low manifestation of the disorder across populations. In a study examining the transition from schizophrenia prodrome to schizophrenia, Cannon (2008) found that the risk for transition from schizophrenia prodrome to psychosis was 35% in North American patients. Cannon (2008) stated that prodromal symptoms are the best predictor of future psychosis, with a predictive power between three and four times higher than family history of illness. Moreover, prodromal symptoms were shown to be sensitive to the development of schizophrenia within 2.5 years (Cannon, 2008).

With the inconsistencies in our understanding of schizophrenia, cultural components are often neglected. For instance, bias toward individuals suffering from schizophrenia has not yet been explored in the context of global prevalence, but stigma associated with schizophrenia has been shown to vary among some cultures (Angermeyer & Matschinger, 2004). Schizophrenia remains a highly stigmatized disorder, and, considering different cultural attitudes toward mental illness, attitudes toward schizophrenia may contribute to structural discrimination (Angermeyer & Matschinger, 2004). Structural discrimination can manifest itself through a reduction of funding allocated toward healthcare and a reluctance for schizophrenia patients to seek appropriate help, which may ultimately contribute to discrepancies in prevalence estimates.

This study attempts to examine cross-cultural differences in prodromal symptoms of schizophrenia in Brazil, India, Italy, and the USA, and their interplay with other cultural and environmental factors that have either not been previously explored in a consistent manner, or have yielded conflicting conclusions. I hypothesize that in lower-income countries we will observe increased levels of schizophrenia prodromal symptoms. To test this hypothesis, I am using online questionnaires to determine the effects of stigma toward schizophrenia patients,

gender, age, immigration status, substance use, cannabis use, and income on the differences in the presence of prodromal schizophrenia symptoms. This study allows for a significant collection of data from different geographic locations using consistent methodology, and explores the implications of the data for our understanding of prevalence disparities, elucidates gaps in our current knowledge of schizophrenia that may need further exploration, and creates opportunities for establishing more effective and culturally-sensitive prevention strategies.

Materials and Methods

Participants

905 participants were originally recruited via Amazon's Mechanical Turk (MTurk) to complete the survey. After all the elimination procedures, 200 participants remained for further analysis. Participants in this study were 71 females and 129 males ($N = 200$) ranging in age from 18 to 69 years old ($M = 33.46$, $SD = 10.74$). The participants were recruited from four countries, with 60 participants from India (30.0%), 57 from Italy (28.5%), 43 from Brazil (21.5%), and 40 from the United States of America (20.0%). The mean age for participants from Brazil was 29.47 years (SD = 8.37), 31.18 years (SD = 5.88) for participants from India, 32.46 years (SD = 10.38) for participants from Italy, and 42.60 (SD = 13.90) for the US participants. The majority of participants were white (n=118, 59.0%), 63 (31.50%) were asian, 7 (3.50%) were black, and 12 (6.00%) were of other or mixed race. Eleven (5.50%) participants were immigrants, and the majority of immigrants ($N = 9$, 81.81%) resided in Italy at the time the study was conducted.

Measures

Prodromal Questionnaire – Brief version (PQ-B). The brief PQ-B (Loewy et al., 2011) is a self-report measure with 21 items assessing preliminary risk for psychosis. Participants were asked to indicate whether they have experienced any of the 21 items in the last three months. If they have not experienced it, participants responded to an item by selecting "I have not experienced this" (0). If participants have experienced an item on the questionnaire in the last three months, they were asked to indicate whether each statement caused distress through a 5-item Likert-type scale (1 = strongly disagree, 5 = strongly agree). A sample item reads, "Do you find yourself feeling mistrustful or suspicious of other people?" The questionnaire is scored based on the total score (the sum of all 21 items with "I have not experienced this" = 0 and any response on the Likert-type scale = 1), and the distress score (the sum of all 21 "I have not experienced this" (0) or strongly disagree (1) to strongly agree (5) items). The maximum possible PQ-B score is 21, and the maximum PQ-B distress score is 105. Higher scores acquired through the PQ-B are not equated with unavoidable psychosis or a definite prognosis for schizophrenia. However, the PQ-B showed significant concurrent validity when compared with the Structured Interview for Prodromal Syndromes (SIPS), a clinical interview used to assess psychosis risk (Loewy et al., 2011). Cronbach's alpha for the total PQ-B score was 0.85 (Loewry et al., 2011). The Cronbach's alpha in the present sample was 0.97.

Stereotypes of Schizophrenia Scale. The Stereotypes of Schizophrenia Scale (Angermeyer & Matschinger, 2004) assesses both positive and negative stereotypes of schizophrenia on 5 different dimensions — dangerousness, attribution of responsibility, creativity, unpredictability/incompetence, and poor prognosis. The questionnaire consisted of a total of 27 items rated on a 5-point Likert-type scale from strongly disagree (1) to strongly agree (5). The measure allows for the differentiation between varying components of stigma, and the

establishment of dominant cultural beliefs regarding stereotypes about schizophrenia among the four different countries. Cronbach's alpha for the questionnaire was estimated to be between 0.70 and 0.87 (Angermeyer & Matschinger, 2004). The Cronbach's alpha in the present sample was 0.87.

Along with the Prodromal Questionnaire and the Stereotypes of Schizophrenia Scale, data was collected from assessments incorporated into the current study by other members of the Hodges-Simeon lab. The data acquired from their questions was used to establish relationships between previously established environmental and cultural risk factors of schizophrenia, such as immigration status, attitudes toward immigrants, drug use, cannabis use, age, income, and gender. The questions assessing substance use contained 40 items and examined the frequency, craving, and impairment caused by different substances including tobacco, cannabis, cocaine, amphetamines, inhalants, sedatives, hallucinogens, and opioids. The questions on attitudes toward immigrants assessed negative stereotypes toward immigrant populations (see Appendix).

Design and Procedures

The questionnaire for the study was constructed in Qualtrics, and participants were recruited through MTurk. An analysis by Casler et al. (2013) concluded that participants recruited via MTurk are more socio-economically and ethnically diverse, as MTurk provides an opportunity to recruit participants worldwide. Data acquired from MTurk has similar reliability when compared with traditional recruitment methods (Casler et al., 2013).

For this study, participants were recruited from four countries: USA, Brazil, India, and Italy. According to World Bank definitions of income economies, for the 2022 fiscal year, India is classified as a lower-middle-income economy, with GNI per capita *between $1,046 and*

$4,095. Brazil falls within the upper-middle-income economy denomination, which is classified

as that with a GNI per capita between *$4,096 and $12,695*. Italy and the US fall within the

high-income economy classification, with a GNI per capita of $12,696 or more. The consent

procedure consisted of informing participants that no identifying information was collected,

participation in the study was voluntary, and they had the ability to withdraw at any time. Each

participant was compensated 4.00 USD for completing the survey. This study and its

methodology were approved by the Boston University Institutional Review Board.

Analysis

Analysis was conducted using SPSS statistics software. One-way ANOVA was run to

establish differences in all major variables as well as differences in the five dimensions of the

Stereotypes of Schizophrenia Scale among the four countries. Correlation analysis was

conducted to establish relationships among the major study variables. An independent samples

t-test was run to explore gender differences in the major study variables among all participants,

participants within individual countries, as well as differences in the major study variables

between immigrants and non-immigrants. Cronbach's alpha was calculated to test the internal

consistency of the PQ-B and the Stereotype of Schizophrenia Scale.

Results

One-way ANOVA indicated a significant difference among the four countries with

regards to PQ-B distress scores ($F = 39.15$, $df = 3$, $p < 0.001$), PQ-B total scores ($F = 40.09$, $df = 3$,

$p < 0.001$), attitudes toward schizophrenia ($F = 22.32$, $df = 3$, $p < 0.001$), substance use ($F = 20.51$,

$df = 3$, $p < 0.001$), cannabis use ($F = 9.47$, $df = 3$, $p < 0.001$), attitudes toward immigrants (F

=22.40, df =3, $p < 0.001$), income (F =26.32, df =3, $p < 0.001$), and age (F =15.47, df = 3, $p <$

0.001), but there was no significant differences in gender distribution among participants of the

four countries (F =2.60, df =3, $p = 0.053$). Table 1 provides one-way ANOVA results for all the

major study variables, separated by country. Participants that resided in India scored significantly

higher on both the total and distress components of the PQ-B, Stereotypes of Schizophrenia

Scale, substance use, cannabis use, and attitudes towards immigrants. Participants from the USA

scored significantly lower on both the total and distress scores for the PQ-B, had a significantly

higher income than the rest of the participants, and were significantly older. Brazil scored

significantly lower on the assessment of negative attitudes towards immigrants.

Table 2 provides the correlation matrix for the correlations among the major study

variables. PQ-B distress scores were positively correlated with PQ-B total scores ($r(200) = 0.90$,

$p < 0.001$), substance use ($r(200) = 0.38$, $p < 0.001$), cannabis use ($r(200) = 0.31$, $p < 0.001$),

stereotypes of schizophrenia ($r(200) = 0.58$, $p < 0.001$), and negative attitudes toward

immigrants ($r(200) = 0.37$, $p < 0.001$). PQ-B distress scores were negatively correlated with

reported income ($r(200) = -0.19$, $p < 0.001$) and age ($r(200) = -0.23$, $p < 0.001$). The Stereotype

of Schizophrenia Scale scores were significantly positively correlated with substance use ($r(200)$

$= 0.35$, $p < 0.001$), cannabis use ($r(200) = 0.30$, $p < 0.001$), negative attitudes toward immigrants

($r(200) = 0.40$, $p < 0.001$), and negatively correlated with income ($r(200) = -0.19$, $p < 0.001$).

Substance use was significantly positively correlated with cannabis use ($r(200) = 0.89$, $p <$

0.001). Income was significantly positively correlated with age ($r(200) = 0.19$, $p = 0.01$). There

was no significant correlation between income and substance use ($r(200) = 0.90$, $p =0.08$),

cannabis use ($r(200) = 0.90$, $p =0.10$) or attitudes towards immigrants ($r(200) = 0.90$, $p = 0.35$).

Moreover, there was no significant correlation between age and Stereotypes of Schizophrenia

scores ($r(200) = -0.11$, $p = 0.11$), substance use ($r(200) = -0.14$, $p = 0.06$), cannabis use ($r(200) = -0.11$, $p = 0.12$), and attitudes towards immigrants ($r(200) = 0.02$, $p = 0.84$).

An independent samples t-test was conducted to determine whether there were gender differences in the major study variables among all participants (Table 3). The independent samples t-test demonstrated that there was a significant difference in substance use ($t(189.4) = 2.53$, $p < 0.001$) and cannabis use ($t(160.83) = 1.47$, $p = 0.02$) among men and women. There was no significant difference in PQ-B distress ($t(146.83) = 0.74$, $p = 0.54$) or PQ-B total scores ($t(144.40) = 0.72$, $p = 0.83$), Stereotypes of Schizophrenia scores ($t(140.88) = 3.24$, $p = 0.63$), immigration attitudes ($t(133.89) = 1.95$, $p = 0.16$), income ($t(153.14) = -0.02$, $p = 0.36$), or age ($t(138.00) = -0.19$, $p = 0.86$). An independent samples t-test was also run to determine whether there were gender differences within individual countries (Tables 4 - 7). The results demonstrated that there was a significant difference between men and women in immigration attitudes in Brazil ($t(40.56) = 1.88$, $p = 0.02$), as well as immigration attitudes ($t(41.94) = -0.49$, $p = 0.02$) and age ($t(54.83) = 0.36$, $p = 0.02$) in Italy.

Moreover, an independent samples t-test was conducted to determine whether there were differences in the major study variables between immigrants and non-immigrants (Table 8). The analysis demonstrated that immigrant participants had significantly higher scores on the substance use scale ($t(72.19) = 5.65$, $p = 0.01$), cannabis use scale ($t(186.91) = 6.66$, $p < 0.001$), and significantly lower average income ($t(14.48) = 0.87$, $p = 0.03$). There were no significant differences in PQ-B distress scores ($t(11.23) = -0.66$, $p = 0.72$), PQ-B total scores ($t(11.15) = -0.44$, $p = 0.77$), Stereotypes of Schizophrenia Scale ($t(12.56) = -1.67$, $p = 0.14$), attitudes toward immigrats ($t(11.59) = -0.27$, $p = 0.18$), and age ($t(10.84) = -2.10$, $p = 0.61$). The sample size of

immigrants in this study was very small ($N = 9$), and the results may have insufficient power to be extrapolated and undermine the validity of the findings.

One-way ANOVA was run to determine differences in the five components of the Stereotypes of Schizophrenia Scale among participants (Table 9). The results demonstrated that Indian participants scored significantly higher on the dangerousness (F = 18.61, df =3, p < 0.001), attribution of responsibility (F = 51.99, df =3, p < 0.001), and unpredictability/incompetence (F = 4.02, df =3, p = 0.008) subscales when compared to individuals from other countries. No significant differences were found among participants from Brazil, Italy, and the USA.

Discussion

Increased PQ-B Scores in Lower-Income Countries

In support of my initial hypothesis, the presence of prodromal symptoms in the assessed population was more prominent in lower-income countries and showed a decrease in higher-income countries. India scored significantly higher on the PQ-B, both for the total and the distress scores. There is not a consistent estimate of schizophrenia prevalence in India, especially in how India compares to other countries, so the implications of the questionnaire are difficult to assess. Moreover, the PQ-B scores from participants in the US were significantly lower than the rest of the participants. While a self-report questionnaire assessing prodromal symptoms of schizophrenia cannot be a determining factor in assessing diagnostic discrepancies, the results have interesting implications. Xu et al (2016), in their study assessing PQ-B scores among the Chinese population, also noted that it may be complicated to differentiate between the prodromal

phase of schizophrenia and psychosis using the PQ-B, since it is a preliminary screening

measure. In a clinical setting, participants with total scores greater than 6 need to be followed up

with a clinician interview for further assessment, which was not possible with this study (Loewy

et al., 2011). The PQ-B scores across all countries were much higher than 6, so clinician

interviews could have provided a more accurate assessment on the predisposition of participants

to exhibit schizophrenia symptoms. However, Xu et al (2016) noted that subjects in the

prodromal stage of schizophrenia scored significantly higher on the 12th item of the PQ-B than

both psychotic and non-psychotic individuals. When compared, a similar rank order was

observed between overall PQ-B scores and responses to the 12th item in the present sample, with

India scoring significantly higher, the USA scoring significantly lower, and no significant

difference between Italy and Brazil.

In a meta-analysis, Nuevo et al. (2012) found that the average prevalence of at least one

psychotic symptom present in their cross-cultural analysis was 11.78%; however, the individual

variation was from 0.66% in Vietnam to 45.84% in Nepal. The average prevalence was lower for

high-income economies (8.83%) when compared with low and middle-income economies

(12.90%). This is consistent with the findings of the present study, with India falling within the

lower-middle income economy category, and the USA being classified as a high-income

economy. Moreover, a study by Karbhari et al (2016) indicated that South Asian populations are

experiencing a rise in the prevalence of psychotic disorders, as well as suicide and self-harm.

However, there have not been any psychological interventions developed for these populations,

which was further supported by healthcare professionals acknowledging the lack of appropriate

services for South Asian individuals suffering from psychosis (Karbhari et al., 2016). There is a

need for implementing more culturally sensitive services and more effective educational

resources on psychosis for South Asian individuals, as well as addressing social bias and language barriers in healthcare settings (Karbhari et al., 2016).

Brazil and Italy showed no significant differences in prodromal symptoms. Moreover, the two countries showed no significant difference in any other variables assessed in this study. To my knowledge, no study currently exists that would directly compare prodromal symptom prevalence between Brazil and Italy. The only measured difference between Brazil and Italy in the current study was their economic classification, with Brazil falling within the upper-middle-income category, and Italy within the upper-income category. The USA, similar to Italy, is considered an upper-income economy; however, participants from the United States scored significantly lower on the PQ-B questionnaire. American participants were significantly older and had a higher average reported income when compared with participants from other countries. Perhaps these differences played a role in a decrease of PQ-B scores observed in the American sample. The participants of this study, on average, were at the upper end of the peak age of onset of schizophrenia, which is between 15 and 25 years in males and 15 to 30 years in females (Häfner, 2019). Considering that prodromal symptoms manifest several years prior to schizophrenia development (Häfner, 2019), a younger sample of individuals would be needed to conduct a more accurate analysis.

Moreover, the use of antipsychotic medication has not been assessed in the current study, which may have reduced the presence of prodromal or positive symptoms in some participants (Cannon et al., 2002). In the USA specifically, antipsychotic use has been found to increase from 0.93% of the population between the ages of 25-34 to 1.46% in the 35-59 age group (Olfson et al., 2015). Considering the older average age of American participants in the current study, the use of antipsychotic medication may have clarified the lower rates of prodromal symptoms

observed within the US sample. Moreover, it is necessary to examine the differences in antipsychotic use cross-culturally to further understand their influence on the discrepancies in prodromal symptoms.

Positive Correlation Between Substance Use and PQ-B Scores

Comorbid use of drugs and alcohol has been found to be associated with poor clinical outcomes for schizophrenia patients. Most of the data exploring the influence of drug and alcohol use on schizophrenia prognosis are obtained in the USA, which signals the need for more exploration of cross-cultural factors (Carrà & Johnson, 2009). Moreover, patients suffering from schizophrenia with a history of cannabis use have been found to show increased schizophrenia rates and burden associated with the disease when compared with patients that did not use cannabis. It has also been noted that cannabis users diagnosed with schizophrenia may have a poorer prognosis and a more severe course of illness (Manrique-Garcia, 2014).

Based on the results of the present study, India scored almost twice as high on the substance use assessment scale and cannabis use scale as compared to the US, Brazil, and Italy, and there was no significant difference among the latter three. A 2019 report published by the Ministry of Social Justice and Empowerment of India has stated that the prevalence of opioid use is three times higher in India than the global average (Singh, 2020). Moreover, this study also found a significant positive association between tobacco use and PQ-B distress scores ($r(200) = 0.26$, $p < 0.001$). Previous research has shown that there may be a link between nicotine use and the onset of prodromal symptoms of schizophrenia, supplemented by the temporal relationship between psychosis and smoking onset, as well as a high rate of tobacco use in prodromal patients (Gogos et al., 2019). However, more research is needed to understand the effects of nicotine use

on the onset of prodromal symptoms. While the correlation between higher drug use and increased scores on the prodromal questionnaire is not indicative of a causal link, this further highlights the importance of exploring the interplay of substance use and risk for schizophrenia development (Hunt et al., 2018), especially in lower-income economies, as well as implementing preventative measures for drug use in individuals that may be at risk for schizophrenia.

It is difficult to determine the extent to which the differences in environmental risk factors contributed to the distribution of prodromal symptoms. These findings emphasize the complexity of the influence of environmental risk factors on the manifestation of prodromal symptoms of schizophrenia, and a more controlled environment would be needed to determine more accurate relationships. Perhaps there is a certain threshold imposed by environmental stressors that needs to be reached for them to have a more prominent influence on psychotic symptom manifestation, but this needs further exploration (Comer et al., 2020).

Understanding global variabilities in prodromal symptom manifestations can be a step towards a better understanding of cultural factors that contribute to a predisposition for psychotic symptoms, which makes it possible to explore more appropriate preventative treatment strategies (Chien et al., 2013). Identifying and incorporating prevention strategies during the prodromal phase of schizophrenia may reduce the risk for the development of more severe malfunctioning associated with the disease, easing the burden for individuals predisposed to schizophrenia (Tandon et al., 2010). Some approaches in managing the early stages of schizophrenia have been proposed and produced promising outcomes; however, there are still concerns associated with the exact characteristics of prodromal schizophrenia, and the possibilities of unneeded involvement in false-positive cases as a result (Tandon et al., 2010). Moreover, a more comprehensive understanding of molecular mechanisms underlying the predisposition for

schizophrenia is needed, and a combination of schizophrenia biomarker detection and representative cross-cultural surveys may be a better approach for early schizophrenia intervention (Schwartz et al., 2012). Thus, the findings of the PQ-B in the current study reinforce the need for early psychosis detection, which can allow for a better prognosis for individuals at risk for psychotic-spectrum disorders, including schizophrenia.

Stereotypes of Schizophrenia Scale and Structural Discrimination

Indian participants scored significantly higher on the Stereotypes of Schizophrenia Scale than the rest of the countries studied, with no significant difference between Brazil, Italy, and the USA. In a previous study using the same assessment scale, Angermeyer & Matschinger (2004) found that the most popular stereotype of schizophrenia among the German sample was that persons suffering from schizophrenia were unpredictable and incompetent, followed by perceived dangerousness, anticipated poor prognosis, and the positive perception that schizophrenic patients have higher levels of creativity and intelligence. The least common perception was that schizophrenia patients should be blamed for developing the illness (Angermeyer & Matschinger, 2004). They noted that the same rank order of the five components of stigma was observed in the UK. Interestingly, the overall rank order differed in the current study. Similar to the results pointed out by Angermeyer & Matschinger (2004), unpredictability was the most prevalent stereotype dimension reported among the four countries, but the second most prevalent was creativity, followed by poor prognosis and dangerousness. Another similarity is that attribution of responsibility was the least common belief. When I examined each country individually, the most and least common beliefs were the same in the USA, Italy, and Brazil; however, the least common belief in India was poor prognosis. While there is a lack of trained

mental health professionals in India, the presence of traditional healers may contribute to less anticipation of poor prognosis. A study conducted by Kapur (1975) in rural India found that half of participants experiencing symptoms of psychosis have only consulted a traditional healer, a quarter consulted a healer together with a doctor, and a quarter only consulted a doctor. Perhaps the availability of more culture-specific treatment options allows for more positive attitudes toward the course of illness. Since the study by Kapur (1975) was conducted in rural areas of India and urbanity was not assessed in the current study, further exploration is needed. Moreover, India scored significantly higher on perceived dangerousness, attribution of responsibility, and unpredictability/incompetence subscales of the questionnaire when compared to participants from other countries, while no significant differences were observed among Brazil, Italy, and the USA. Angermeyer & Matschinger (2004) found a strong association between unpredictability/incompetence and the desire to socially distance from schizophrenic individuals. Moreover, they found a significant association between attribution of responsibility and acceptance of structural discrimination. The dangerousness subscale was found to be associated with both social distance and structural discrimination. The close association of these components of the Stereotypes of Schizophrenia Scale with prejudice toward schizophrenic patients urges for more effective anti-stigma interventions in efforts to improve cultural attitudes and treatment options for individuals seeking help.

Understanding the variability of attitudes toward schizophrenia patients, particularly symptom perception and causal attribution of the disorder, may improve treatment opportunities and adherence, and identify appropriate strategies to target stigma both in the general population and among healthcare professionals (del Toledo Piza Peluso et al., 2007). There is a significant treatment disparity for mental health disorders, particularly among low- and middle-income

economies, where a scarcity of mental health professionals, lack of proper educational resources, and stigma have been found to contribute to the disparity (Kaur et al., 2021). In India, the treatment gap is estimated to be at about 95%, and almost a third of Indian patients seeking treatment have been faced with stereotyped labels within mental health facilities (Kaur et al., 2021). There is currently a lack of research on stigma in large parts of India, and previously implemented intervention strategies have not been successful (Kaur et al., 2021). In São Paulo, Brazil, del Toledo Piza Peluso et al. (2007) found that around 70% of individuals suffering from schizophrenia do not receive appropriate treatment. They also noted that Brazil has a lack of psychiatrists and psychiatric nurses, which may partially explain the higher numbers of untreated individuals. Similar findings have been noted by a study of the Italian population by Magliano et al. (2002) where, along with a lack of mental health providers, mental healthcare is community-oriented, with most of the burden falling on the families of the mentally ill. Only 31% of the sample received appropriate healthcare and 35% attended rehabilitation programs (Magliano et al., 2002). Moreover, del Toledo Piza Peluso noted that treatment options may be further obstructed by negative stereotypes about mental health. In the del Toledo Piza Peluso et al. (2007) study, Brazilian participants were much less likely to attribute symptoms of schizophrenia they were presented with to mental illness than participants from other countries explored, including the USA, revealing a more narrow conception of mental disorders among the Brazilian population. There is a lack of medical and educational information about mental health available in Brazil, and perhaps a lack of understanding was a contributing factor to lower scores on the Stereotypes of Schizophrenia Scale in the current study.

A future direction for research in this field could be exploring cross-cultural differences in bias toward persons with schizophrenia specifically among healthcare providers and

diagnosticians in the same countries. Acquiring such a comparison point could further illuminate whether such bias may be a contributing factor to global prevalence rate discrepancies. Perhaps it is not the bias towards schizophrenia patients themselves, but towards those seeking a schizophrenia diagnosis that should be explored more, which is difficult to assess in a cross-cultural survey of this type. Moreover, the majority of participants in this study were asian and white, but there was no significant ethnic diversity within each country, making it difficult to explore ethnic bias specifically. Exploring the role ethnic and cultural bias may play in attitudes toward people with schizophrenia specifically would be difficult in a survey-based cross-cultural study, considering the different cultural conceptions of race and ethnicity, as well as varying ethnic populations. However, cultural and ethnic bias is an important factor to evaluate when it comes to symptom misinterpretation by healthcare professionals, where a behavior can potentially be taken out of cultural context and identified as a psychological symptom. For instance, a study conducted by Hickling et al. (1999) used a structured Present State Examination (PSE) along with an unstructured clinical diagnosis for the same subset of patients. The unstructured method incorporated cultural consideration into the patients' symptoms, and the proportion of schizophrenia diagnoses obtained using this method was lower when compared to the PSE (Hickling et al., 1999). In this case, rigid adherence to diagnostic criteria may be insufficient, especially in populations with a high degree of ethnic variation.

Assessment of Immigration Status

Immigrants scored higher on both the total and the distress components of the prodromal questionnaire than non-immigrant participants, but the immigrant sample size was too small to make any significant conclusions. The limited number of observations creates an obstacle in

assessing whether the data follows a normal distribution (Bland, 2009). However, because there

exist previous observations concluding that immigrants may be more prone to psychosis and

schizophrenia (Simeone et al., 2015), some suggestions can be made based on this data. For

example, future studies could explore the implications of immigration status in schizophrenia

development cross-culturally. A study by Mulè et al. (2017) conducted in Italy found that

immigrants were three times more likely to develop psychosis, and almost four times more likely

to develop schizophrenia when compared to non-immigrant participants. It is important to note

that 9 out of the 11 immigrant participants in the current study resided in Italy, and while no

significant difference in prodromal symptoms was found, a more representative sample would be

needed to elucidate both country-specific and global differences in the significance of

immigration status as a risk factor. Immigration attitude survey results indicated a significant

difference in negative attitudes toward immigrant populations among the four countries,

specifically showing that India, on average, had the highest presence of negative attitudes, and

Brazil was significantly lower than the rest of the countries. These findings suggest the need to

further explore bias toward immigrant populations and its relationship to increased rates of

schizophrenia diagnosis in migrant populations.

　　　For future research, it is also important to differentiate between native and migrant ethnic

populations. For instance, African-Americans, according to Whaley (2004), can be considered

part of a caste-like minority group, while black persons in many U.K. studies are immigrants

from the Caribbean or African countries. The difference lies in the fact that migrant populations

have a separate culture prior to their exposure to the dominant culture, while caste-like

populations are largely affected by their experiences in the dominant culture (Whaley, 2004).

Providing appropriate, culture-specific care for immigrant patients struggling with psychotic symptoms can be a step toward improving schizophrenia outcomes for risk groups.

No Gender Differences in PQ-B Scores

Similar to what Simeone et al. (2015) have noted in their systemic schizophrenia prevalence review, there was no significant difference in the PQ-B scores among men and women in the current study. Similar results were found when prodromal symptoms among Chinese individuals were assessed using the PQ-B, where there were no significant differences found between males and females in either the PQ-B distress scores or PQ-B total scores (Xu et al., 2016). In the current study, the mean scores were slightly higher for males, but not enough for the results to be significant. This may be influenced by the sample size of women being much lower (N=71) than men (N=129). A more accurate estimate of predisposition for psychosis differences could be obtained through assessing more representative sample sizes. Out of all the major variables, there was a significant difference in substance use and cannabis use between men and women, with men using substances, and cannabis specifically, more frequently and experiencing more craving and impairment as a result. However, the differences in substance use have not manifested themselves in gender differences in prodromal symptoms. Current knowledge of the gender differences in the effects of cannabis use is limited, especially when it comes to effects on women. However, it has been noted that while men tend to use cannabis more frequently, they may be less susceptible to its adverse effects (Nia et al., 2018). More frequent cannabis use has been shown to be linked to earlier onset of psychosis in women, but no significant differences in age of onset for men were observed (Nia et al., 2018). Thus, an

assessment of psychosis differences among men and women with similar rates of cannabis use is needed for a more comprehensive understanding of the findings in this study. When I analyzed participants based on their country of residence, however, the only significant gender differences were found in age in Italy and attitudes toward immigrants in both Brazil and Italy, with men being older in Italy and holding more negative attitudes toward immigrant populations than women in both countries.

There have been several previous studies conducted that have identified gender differences in predisposition to psychosis. For instance, a study conducted in Italy by Mulè et al. (2017) has found that men had a higher risk for developing psychotic symptoms compared to women, which was not observed in the current study. While a direct comparison with the findings of Mulè et al. (2017) cannot be made due to differences in methodology, it's important to note that some discrepancies in gender differences associated with the characteristics and course of schizophrenia may be a result of gender bias (Hambrecht et al, 1992). For instance, in studies examining the efficacy of antipsychotic medication, women are largely underrepresented in study samples. Moreover, men suffering from schizophrenia may exhibit more maladaptive behaviors, such as increased aggression, which results in increased hospitalization and can contribute to some of the variability in prevalence assessment (Hambrecht et al, 1992).

Limitations

As indicated by the systemic review conducted by Simeone et al. (2015), the most feasible method of assessment of cross-cultural differences in schizophrenia prevalence would be conducting representative surveys followed up by clinician interviews. Incorporating clinician

interviews was not feasible in a study with a cross-sectional design, and the lack of a clinical

analysis may have affected prodromal symptom discrepancies. Moreover, cross-sectional

analysis does not allow for the establishment of direct relationships among variables, and a more

longitudinal approach is needed to understand the impact of non-genetic risk factors on the

disorder. Further, urbanicity has previously been indicated as a significant environmental risk

factor in developing schizophrenia (McGrath et al., 2004), which was not assessed in the current

study. Immigration populations have also been demonstrated to be at a higher risk for

schizophrenia development, and while immigration status was assessed in the present study, the

sample size was not large enough to draw any definitive conclusions. Understanding the

variation in the urbanicity of the environment and obtaining a more representative sample of

immigrant populations within different geographic regions may have better explained the

observed differences in prodromal symptoms. Moreover, the average age of participants

recruited for this study was higher than the peak age of onset of schizophrenia, and especially the

average age of onset of the schizophrenia prodrome (Häfner, 2019). This may have contributed

to lower rates of prodromal symptoms among older participants, and a younger sample of

individuals is needed for more accurate results.

Conclusions

Global variability of schizophrenia remains difficult to accurately assess, which does not

allow for a complete understanding of the etiology of the illness and culturally relevant risk

factors. I have explored schizophrenia prodrome symptoms, stereotypes of schizophrenia, and

other previously indicated environmental risk factors among participants from Brazil, India, Italy, and the USA, which have not previously been compared.

The findings of this study supplement the current understanding of schizophrenia with more extensive cross-cultural data from geographically different populations. Significant differences were found in prodromal symptoms, stereotypes of schizophrenia, substance use, cannabis use, income, attitudes toward immigrants, and age, particularly among Indian participants. The results of the prodromal questionnaire were significantly positively correlated with stereotypes of schizophrenia, substance use, and cannabis use, and significantly negatively correlated with age and income. These findings prompt for further analysis of the interplay of environmental and cultural components of schizophrenia. Specifically, there is currently not enough research on schizophrenia prevalence in India, and significantly higher scores on the prodromal questionnaire for Indian participants in the current study highlight the need for more understanding of psychosis variability in South Asian populations and lower-income economies. It is important to note that populations within particular economic classifications are not homogenous. One direction for future research could be exploring how the variability in socioeconomic status, ethnic variation, and urbanicity within lower-income populations impacts the risks of schizophrenia development. Additionally, the Covid-19 pandemic has made it more challenging for patients to access healthcare for non-Covid illnesses (Pramesh et al., 2021), and it is important to explore how variation in healthcare services may impact treatment options for schizophrenia patients cross-culturally .

Overall, the findings of this study highlight important areas to explore for culturally sensitive healthcare planning and preventative strategies. Early intervention may be the most effective method of reducing the burden of schizophrenia and improving the course of the illness,

and having a more accurate representation of the variance of psychotic symptoms and cultural risk factors across populations may allow for developing more appropriate intervention strategies. Moreover, a greater understanding of the global differences in predisposition to schizophrenia can further expand our knowledge of the etiology of the disease.

Acknowledgements

Appendix

Demographics

1. **What is your sex?**

   Male (1)
   Female (2)
   Prefer not to answer (3)

2. **What is your age? (In years)**

   1 (1) - 100 (100)

3. **Please indicate the answer that includes your entire household income before taxes (previous year). If you are not sure, please give your best guess.**

   Less than $10,000 (1)
   $10,000 to $19,999 (2)
   $20,000 to $29,999 (3)
   $30,000 to $39,999 (4)
   $40,000 to $49,999 (5)
   $50,000 to $59,999 (6)
   $60,000 to $69,999 (7)
   $70,000 to $79,999 (8)
   $80,000 to $89,999 (9)
   $90,000 to $99,999 (10)
   $100,000 to $149,999 (11)
   $150,000 or more (12)

4. **Choose one or more races that you consider yourself to be:**

   White (1)
   Black or African American (2)
   American Indian or Alaska Native (3)
   Asian (4)
   Native Hawaiian or Pacific Islander (5)
   Other (6)

5. **Which country were you born in?**

Afghanistan (1) - Zimbabwe (185)

6. **Which country did you grow up in?**

Afghanistan (1) - Zimbabwe (185)

7. **In which country do you currently reside?**

Afghanistan (1) - Zimbabwe (185)

Attitudes Toward Immigrants

Total scores were calculated by finding the average of all 9 items.

Please rate the following questions on a scale of 1 (strongly disagree) to 6 (strongly agree).

1. Immigration in my country is out of control.

Strongly disagree (1)
Somewhat disagree (2)
Slightly disagree (3)
Slightly agree (4)
Somewhat agree (5)
Strongly agree (6)

2. Immigrants cause an increase in crimes.

Strongly disagree (1)
Somewhat disagree (2)
Slightly disagree (3)
Slightly agree (4)
Somewhat agree (5)
Strongly agree (6)

3. Immigrants take jobs from people who are here already.

Strongly disagree (1)
Somewhat disagree (2)
Slightly disagree (3)
Slightly agree (4)
Somewhat agree (5)
Strongly agree (6)

4. Interacting with immigrants makes me uneasy.

Strongly disagree (1)
Somewhat disagree (2)
Slightly disagree (3)
Slightly agree (4)
Somewhat agree (5)
Strongly agree (6)

5. I worry that immigrants may spread unusual diseases.

Strongly disagree (1)
Somewhat disagree (2)
Slightly disagree (3)
Slightly agree (4)
Somewhat agree (5)
Strongly agree (6)

6. I am afraid that in case of war or political tension, immigrants will be loyal to their country of origin.

Strongly disagree (1)
Somewhat disagree (2)
Slightly disagree (3)
Slightly agree (4)
Somewhat agree (5)
Strongly agree (6)

7. With increased immigration I fear that our way of life will change for the worse.

Strongly disagree (1)
Somewhat disagree (2)
Slightly disagree (3)

Slightly agree (4)
Somewhat agree (5)
Strongly agree (6)

8. I doubt that immigrants will put the interest of my country first.

Strongly disagree (1)
Somewhat disagree (2)
Slightly disagree (3)
Slightly agree (4)
Somewhat agree (5)
Strongly agree (6)

9. I am afraid that our own culture will be lost with an increase in immigration

Strongly disagree (1)
Somewhat disagree (2)
Slightly disagree (3)
Slightly agree (4)
Somewhat agree (5)
Strongly agree (6)

Substance Use Assessment

Every item was answered on a Likert-types scale by choosing "never," "once or twice," "monthly," "weekly," "daily or almost daily." Total scores were calculated by finding a sum of all 40 items with never = 1, once or twice = 2, monthly = 3, weekly = 4, daily or almost daily = 5. Cannabis use was assessed through finding the sum of all items that specifically asked about cannabis.

We are going to ask you some questions about your experience of using these substances across your lifetime and in the past three months. These substances can be smoked, swallowed, snorted, inhaled, injected or taken in the form of pills.
Some of the substances listed may be prescribed by a doctor (like amphetamines, sedatives, pain medications). For this interview, do not record medications that are used as prescribed by your doctor. However, if you have taken such medications for reasons other than prescription, or taken them more frequently or at higher doses than prescribed, please list them.
While we are also interested in knowing about your use of various illicit drugs, please be assured this information on such use will be treated as strictly confidential.

1.In the past three months, how often have you used the following substances?

      (1). Tobacco products (cigarettes, chewing tobacco, cigars, etc.)
      (2). Alcoholic beverages (beer, wine, spirits, etc.)
      (3). Cannabis (marijuana, pot, grass, hash, etc.)
      (4). Cocaine (coke, crack, etc.)
      (5). Amphetamine type stimulants (speed, diet pills, ecstasy, etc.)
      (6). Inhalants (nitrous, glue, petrol, paint thinner, etc.)
      (7). Sedatives or Sleeping Pills (Valium, Serepax, Rohypnol, etc.)
      (8) Hallucinogens (LSD, acid, mushrooms, PCP, Special K, etc.)
      (9) Opioids (heroin, morphine, methadone, codeine, etc.)
      (10) Other

2.During the past three months, how often have you had a strong desire or urge to use the substances you mentioned?

      (1). Tobacco products (cigarettes, chewing tobacco, cigars, etc.)
      (2). Alcoholic beverages (beer, wine, spirits, etc.)
      (3). Cannabis (marijuana, pot, grass, hash, etc.)
      (4). Cocaine (coke, crack, etc.)
      (5). Amphetamine type stimulants (speed, diet pills, ecstasy, etc.)
      (6). Inhalants (nitrous, glue, petrol, paint thinner, etc.)
      (7). Sedatives or Sleeping Pills (Valium, Serepax, Rohypnol, etc.)
      (8) Hallucinogens (LSD, acid, mushrooms, PCP, Special K, etc.)
      (9) Opioids (heroin, morphine, methadone, codeine, etc.)
      (10) Other

3.During the past three months, how often has your use of the substances you mentioned led to health, social, legal or financial problems?

      (1). Tobacco products (cigarettes, chewing tobacco, cigars, etc.)
      (2). Alcoholic beverages (beer, wine, spirits, etc.)
      (3). Cannabis (marijuana, pot, grass, hash, etc.)
      (4). Cocaine (coke, crack, etc.)
      (5). Amphetamine type stimulants (speed, diet pills, ecstasy, etc.)
      (6). Inhalants (nitrous, glue, petrol, paint thinner, etc.)
      (7). Sedatives or Sleeping Pills (Valium, Serepax, Rohypnol, etc.)
      (8) Hallucinogens (LSD, acid, mushrooms, PCP, Special K, etc.)

(9) Opioids (heroin, morphine, methadone, codeine, etc.)
(10) Other

4.During the past three months, how often have you failed to do what was normally expected of you because of your use of the substances you mentioned?

    (1). Tobacco products (cigarettes, chewing tobacco, cigars, etc.)
    (2). Alcoholic beverages (beer, wine, spirits, etc.)
    (3). Cannabis (marijuana, pot, grass, hash, etc.)
    (4). Cocaine (coke, crack, etc.)
    (5). Amphetamine type stimulants (speed, diet pills, ecstasy, etc.)
    (6). Inhalants (nitrous, glue, petrol, paint thinner, etc.)
    (7). Sedatives or Sleeping Pills (Valium, Serepax, Rohypnol, etc.)
    (8) Hallucinogens (LSD, acid, mushrooms, PCP, Special K, etc.)
    (9) Opioids (heroin, morphine, methadone, codeine, etc.)
    (10) Other

Prodromal Questionnaire - Brief Version (PQ-B) (Loewy et al., 2011)

Total scores were calculated through a sum of all 21 items with "I have not experienced this'' = 0 and any responses from "strongly disagree" to "strongly agree" = 1. Distress scores were calculated through a sum of all 21 items with "I have not experienced this" = 0, "strongly disagree" = 1, "disagree" = 2, "neutral" = 3, "agree" = 4, "strongly agree" = 5

If you have experienced any of the following in the past month, please indicate the extent to which each experience made you feel frightened, concerned, or caused problems for you ("strongly disagree" — "strongly agree"). Do not include experiences that occur only while under the influence of alcohol, drugs or medications that were not prescribed to you.

1. Do familiar surroundings sometimes seem strange, confusing, threatening, or unreal to you?

    I have not experienced this (0)
    Strongly disagree (=1 for distress score / =1 for total score)
    Disagree (=2 for distress score / =1 for total score)
    Neutral (=3 for distress score / =1 for total score)
    Agree (=4 for distress score / =1 for total score)
    Strongly agree (=5 for distress score / =1 for total score)

2. Have you heard unusual sounds like banging, clicking, hissing, clapping, or ringing in your ears?

I have not experienced this (0)
Strongly disagree (=1 for distress score / =1 for total score)
Disagree (=2 for distress score / =1 for total score)
Neutral (=3 for distress score / =1 for total score)
Agree (=4 for distress score / =1 for total score)
Strongly agree (=5 for distress score / =1 for total score)

3. Do things that you see appear different from the way they usually do (brighter or duller, larger or smaller, or changed in some other way)?

I have not experienced this (0)
Strongly disagree (=1 for distress score / =1 for total score)
Disagree (=2 for distress score / =1 for total score)
Neutral (=3 for distress score / =1 for total score)
Agree (=4 for distress score / =1 for total score)
Strongly agree (=5 for distress score / =1 for total score)

4. Have you had experiences with telepathy, psychic forces, or fortune telling?

I have not experienced this (0)
Strongly disagree (=1 for distress score / =1 for total score)
Disagree (=2 for distress score / =1 for total score)
Neutral (=3 for distress score / =1 for total score)
Agree (=4 for distress score / =1 for total score)
Strongly agree (=5 for distress score / =1 for total score)

5. Have you felt that you are not in control of your own ideas or thoughts?

I have not experienced this (0)
Strongly disagree (=1 for distress score / =1 for total score)
Disagree (=2 for distress score / =1 for total score)
Neutral (=3 for distress score / =1 for total score)
Agree (=4 for distress score / =1 for total score)
Strongly agree (=5 for distress score / =1 for total score)

6. Do you have difficulty getting your point across because you ramble or go off the track a lot when you talk?

I have not experienced this (0)
Strongly disagree (=1 for distress score / =1 for total score)
Disagree (=2 for distress score / =1 for total score)
Neutral (=3 for distress score / =1 for total score)
Agree (=4 for distress score / =1 for total score)
Strongly agree (=5 for distress score / =1 for total score)

7. Do you have strong feelings or beliefs about being unusually gifted or talented in some way

I have not experienced this (0)
Strongly disagree (=1 for distress score / =1 for total score)
Disagree (=2 for distress score / =1 for total score)
Neutral (=3 for distress score / =1 for total score)
Agree (=4 for distress score / =1 for total score)
Strongly agree (=5 for distress score / =1 for total score)

8. Do you feel that other people are watching you or talking about you?

I have not experienced this (0)
Strongly disagree (=1 for distress score / =1 for total score)
Disagree (=2 for distress score / =1 for total score)
Neutral (=3 for distress score / =1 for total score)
Agree (=4 for distress score / =1 for total score)
Strongly agree (=5 for distress score / =1 for total score)

9. Do you sometimes get strange feelings on or just beneath your skin, like bugs crawling?

I have not experienced this (0)
Strongly disagree (=1 for distress score / =1 for total score)
Disagree (=2 for distress score / =1 for total score)
Neutral (=3 for distress score / =1 for total score)
Agree (=4 for distress score / =1 for total score)
Strongly agree (=5 for distress score / =1 for total score)

10. Do you sometimes feel suddenly distracted by distant sounds that you are not normally aware of?

I have not experienced this (0)

Strongly disagree (=1 for distress score / =1 for total score)
Disagree (=2 for distress score / =1 for total score)
Neutral (=3 for distress score / =1 for total score)
Agree (=4 for distress score / =1 for total score)
Strongly agree (=5 for distress score / =1 for total score)

11. Have you had the sense that some person or force is around you, although you couldn't see anyone?

I have not experienced this (0)
Strongly disagree (=1 for distress score / =1 for total score)
Disagree (=2 for distress score / =1 for total score)
Neutral (=3 for distress score / =1 for total score)
Agree (=4 for distress score / =1 for total score)
Strongly agree (=5 for distress score / =1 for total score)

12. Do you worry at times that something may be wrong with your mind?

I have not experienced this (0)
Strongly disagree (=1 for distress score / =1 for total score)
Disagree (=2 for distress score / =1 for total score)
Neutral (=3 for distress score / =1 for total score)
Agree (=4 for distress score / =1 for total score)
Strongly agree (=5 for distress score / =1 for total score)

13. Have you ever felt that you don't exist, the world does not exist, or that you are dead?

I have not experienced this (0)
Strongly disagree (=1 for distress score / =1 for total score)
Disagree (=2 for distress score / =1 for total score)
Neutral (=3 for distress score / =1 for total score)
Agree (=4 for distress score / =1 for total score)
Strongly agree (=5 for distress score / =1 for total score)

14. Have you been confused at times whether something you experienced was real or imaginary?

I have not experienced this (0)
Strongly disagree (=1 for distress score / =1 for total score)
Disagree (=2 for distress score / =1 for total score)

Neutral (=3 for distress score / =1 for total score)
Agree (=4 for distress score / =1 for total score)
Strongly agree (=5 for distress score / =1 for total score)

15. Do you hold beliefs that other people would find unusual or bizarre?

I have not experienced this (0)
Strongly disagree (=1 for distress score / =1 for total score)
Disagree (=2 for distress score / =1 for total score)
Neutral (=3 for distress score / =1 for total score)
Agree (=4 for distress score / =1 for total score)
Strongly agree (=5 for distress score / =1 for total score)

16. Do you feel that parts of your body have changed in some way, or that parts of your body are working differently?

I have not experienced this (0)
Strongly disagree (=1 for distress score / =1 for total score)
Disagree (=2 for distress score / =1 for total score)
Neutral (=3 for distress score / =1 for total score)
Agree (=4 for distress score / =1 for total score)
Strongly agree (=5 for distress score / =1 for total score)

17. Are your thoughts sometimes so strong that you can almost hear them?

I have not experienced this (0)
Strongly disagree (=1 for distress score / =1 for total score)
Disagree (=2 for distress score / =1 for total score)
Neutral (=3 for distress score / =1 for total score)
Agree (=4 for distress score / =1 for total score)
Strongly agree (=5 for distress score / =1 for total score)

18. Do you find yourself feeling mistrustful or suspicious of other people?

I have not experienced this (0)
Strongly disagree (=1 for distress score / =1 for total score)
Disagree (=2 for distress score / =1 for total score)
Neutral (=3 for distress score / =1 for total score)
Agree (=4 for distress score / =1 for total score)
Strongly agree (=5 for distress score / =1 for total score)

19. Have you seen unusual things like flashes, flames, blinding light, or geometric figures?

I have not experienced this (0)
Strongly disagree (=1 for distress score / =1 for total score)
Disagree (=2 for distress score / =1 for total score)
Neutral (=3 for distress score / =1 for total score)
Agree (=4 for distress score / =1 for total score)
Strongly agree (=5 for distress score / =1 for total score)

20. Have you seen things that other people can't see or don't seem to see?

I have not experienced this (0)
Strongly disagree (=1 for distress score / =1 for total score)
Disagree (=2 for distress score / =1 for total score)
Neutral (=3 for distress score / =1 for total score)
Agree (=4 for distress score / =1 for total score)
Strongly agree (=5 for distress score / =1 for total score)

21. Do people sometimes find it hard to understand what you are saying?

I have not experienced this (0)
Strongly disagree (=1 for distress score / =1 for total score)
Disagree (=2 for distress score / =1 for total score)
Neutral (=3 for distress score / =1 for total score)
Agree (=4 for distress score / =1 for total score)
Strongly agree (=5 for distress score / =1 for total score)

Stereotypes of Schizophrenia Scale (Angermeyer & Matschinger, 2004)

The scores were calculated by finding the average score of all items, as well as the average
scores for the five individual subscales.

Subscales:
Factor 1 (Dangerousness) includes items 1 through 7. Item 7 is reverse-coded.
Factor 2 (Attribution of responsibility) includes items 8 through 13.
Factor 3 (Creativity) includes items 14 through 17.
Factor 4 (Unpredictability / Incompetence) incudes items 18 through 23.
Factor 5 (Poor prognosis) includes questions 24 through 27. Items 24 and 25 are reverse-coded.

Please indicate to which degree you agree with the following statements.

1. Most sex crimes are committed by people with schizophrenia.

       Strongly disagree (1)
       Disagree (2)
       Neutral (3)
       Agree (4)
       Strongly agree (5)

2. People with schizophrenia commit particularly brutal crimes.

       Strongly disagree (1)
       Disagree (2)
       Neutral (3)
       Agree (4)
       Strongly agree (5)

3. In recent years, the number of violent crimes committed by people with schizophrenia has been increasing more and more.

       Strongly disagree (1)
       Disagree (2)
       Neutral (3)
       Agree (4)
       Strongly agree (5)

4. If all patients with schizophrenia were admitted to locked wards, the number of violent crimes could be markedly reduced.

       Strongly disagree (1)
       Disagree (2)
       Neutral (3)
       Agree (4)
       Strongly agree (5)

5. People with schizophrenia are a great threat to small children

Strongly disagree (1)
Disagree (2)
Neutral (3)
Agree (4)
Strongly agree (5)

6. The only thing you can do with patients with schizophrenia is put them in hospital for a long time.

Strongly disagree (1)
Disagree (2)
Neutral (3)
Agree (4)
Strongly agree (5)

7. Only a few dangerous criminals have schizophrenia.

Strongly disagree (5)
Disagree (4)
Neutral (3)
Agree (2)
Strongly agree (1)

8. Anyone who gets schizophrenia is a failure.

Strongly disagree (1)
Disagree (2)
Neutral (3)
Agree (4)
Strongly agree (5)

9. Schizophrenia is the penalty for bad deeds.

Strongly disagree (1)
Disagree (2)
Neutral (3)
Agree (4)
Strongly agree (5)

10. Whether you get schizophrenia is a question of willpower and self-discipline.

Strongly disagree (1)
Disagree (2)
Neutral (3)
Agree (4)
Strongly agree (5)

11. Schizophrenia takes its tragic course. There is thus no point in treating it.

Strongly disagree (1)
Disagree (2)
Neutral (3)
Agree (4)
Strongly agree (5)

12. Successful people rarely get schizophrenia.

Strongly disagree (1)
Disagree (2)
Neutral (3)
Agree (4)
Strongly agree (5)

13. You can get schizophrenia if you lead an immoral life.

Strongly disagree (1)
Disagree (2)
Neutral (3)
Agree (4)
Strongly agree (5)

14. People with schizophrenia are generally highly intelligent.

Strongly disagree (1)
Disagree (2)
Neutral (3)
Agree (4)
Strongly agree (5)

15. People who have schizophrenia are often more creative than other people.

Strongly disagree (1)
Disagree (2)
Neutral (3)
Agree (4)
Strongly agree (5)

16. Genius and madness go hand in hand.

Strongly disagree (1)
Disagree (2)
Neutral (3)
Agree (4)
Strongly agree (5)

17. Artists have a high risk of getting schizophrenia.

Strongly disagree (1)
Disagree (2)
Neutral (3)
Agree (4)
Strongly agree (5)

18. People with schizophrenia are completely unpredictable.

Strongly disagree (1)
Disagree (2)
Neutral (3)
Agree (4)
Strongly agree (5)

19. People with schizophrenia are not capable of making important decisions about their lives.

Strongly disagree (1)
Disagree (2)
Neutral (3)
Agree (4)
Strongly agree (5)

20. People with schizophrenia definitely need a guardian.

       Strongly disagree (1)
       Disagree (2)
       Neutral (3)
       Agree (4)
       Strongly agree (5)

21. You never know what a patient with schizophrenia is going to do next.

       Strongly disagree (1)
       Disagree (2)
       Neutral (3)
       Agree (4)
       Strongly agree (5)

22. People with schizophrenia are quick to lose their self-control.

       Strongly disagree (1)
       Disagree (2)
       Neutral (3)
       Agree (4)
       Strongly agree (5)

23. People with schizophrenia can't think logically.

       Strongly disagree (1)
       Disagree (2)
       Neutral (3)
       Agree (4)
       Strongly agree (5)

24. With modern treatment methods these days, many patients with schizophrenia can be cured.

       Strongly disagree (5)
       Disagree (4)
       Neutral (3)
       Agree (2)
       Strongly agree (1)

26. Nowadays treatment for schizophrenia is just as good as it is for diabetes

Strongly disagree (5)
Disagree (4)
Neutral (3)
Agree (2)
Strongly agree (1)

27. Rehabilitation schemes designed to get patients back to work are usually doomed to failure.

Strongly disagree (1)
Disagree (2)
Neutral (3)
Agree (4)
Strongly agree (5)

28. There is still no effective treatment for schizophrenia.

Strongly disagree (1)
Disagree (2)
Neutral (3)
Agree (4)
Strongly agree (5)

Tables and Figures

Table 1

Characteristics of All Major Study Variables for Brazil, India, Italy, and the USA

	Brazil		India		Italy		USA		*F*(200)	η²
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*		
PQ-B distress	23.77	22.49	52.68	25.54	26.54	20.92	7.13	12.53	39.15***	.38
PQ-B total	8.47	7.66	17.97	6.26	10.75	7.30	3.50	5.33	40.09***	.38
SCZ stereotype	2.52	.46	3.10	.52	2.48	.48	2.48	.46	22.32***	.26
Substance use	47.63	8.80	82.28	45.58	47.93	13.22	52.00	31.45	20.51***	.24
Cannabis use	4.88	2.15	7.77	4.95	4.81	2.21	5.58	3.59	9.47***	.13
IMM attitudes	2.21	1.03	4.02	1.01	2.92	1.27	2.72	1.37	22.40***	.26
Income	2.91	2.42	2.92	2.01	3.32	2.02	6.55	2.64	26.32***	.29
Age	29.47	8.37	31.18	5.88	32.46	10.38	42.60	13.90	15.47***	.19
Gender	1.37	.49	1.22	.42	1.44	.50	1.43	.50	2.60	.04

Note. *** = p < .001. PQ-B = Prodromal Questionnaire - Brief Version. SCZ stereotype = Stereotypes of Schizophrenia Scale. IMM attitudes = Immigration Attitudes Scale.

Table 2

Intercorrelations for All Major Study Variables Among All Participants (N=200)

	1.	2.	3.	4.	5.	6.	7.	8.
1. PQ-B distress	--	.904***	.575***	.381***	.307***	.372**	-.192***	-.225***
2. PQ-B total		--	.559***	.369***	.291***	.354***	-.215***	-.228***
3. SCZ stereotype			--	.352***	.298***	.396***	-.186***	-.094
4. Substance use				--	.892***	.380***	-.123	-.136
5. Cannabis use					--	.293***	-.117	-.111
6. IMM attitudes						--	-.067	.015
7. Income							--	.185***
8. Age								--

*Note. ** = p < .01, *** = p < .001. PQ-B = Prodromal Questionnaire - Brief Version. SCZ stereotype = Stereotypes of Schizophrenia Scale. IMM attitudes = Immigration Attitudes Scale.*

Table 3

Differences In Major Study Variables Between All Female and Male Participants

	Gender		*t*	*df*
	Females (n=71)	Males (n=121)		
PQ-B distress	28.01 (26.63)	30.95 (27.19)	.74	146.83
PQ-B total	10.39 (8.49)	11.29 (8.49)	.72	144.40
SCZ stereotype	2.51 (.55)	2.77 (.54)	3.24	140.88
Substance use	52.25(23.48)	62.69 (34.60)	2.53***	189.37
Cannabis use	5.38 (3.28)	6.13 (3.74)	1.47*	160.83
IMM attitudes	2.80 (1.41)	3.20 (1.29)	1.95	133.89
Income	3.76 (3.76)	3.75 (2.70)	-.02	153.14
Age	33.66 (11.13)	33.35 (10.56)	-.19	138.00

Note. * = p < 0.05, *** = p < 0.001. PQ-B = Prodromal Questionnaire - Brief Version. SCZ stereotype = Stereotypes of Schizophrenia Scale. IMM attitudes = Immigration Attitudes Scale.

Table 4

Differences In Major Study Variables Between Female and Male Participants from Brazil

	Gender		*t*	*df*
	Females (n=16)	Males (n=27)		
PQ-B distress	22.19 (23.98)	24.70 (21.97)	.34	29.44
PQ-B total	8.38 (8.17)	8.52 (7.50)	.06	29.46
SCZ stereotype	2.33 (.46)	2.64 (.43)	2.20	29.82
Substance use	47.50 (8.00)	47.70 (9.39)	.08	35.75
Cannabis use	4.81 (2.01)	4.93 (2.27)	.17	34.80
IMM attitudes	1.88 (.74)	2.41 (1.13)	1.88*	40.56
Income	3.31 (2.50)	2.67 (2.39)	-.83	30.49
Age	28.50 (7.53)	30.04 (8.93)	.60	36.00

*Note. * = p < .05. PQ-B = Prodromal Questionnaire - Brief Version. SCZ stereotype = Stereotypes of Schizophrenia Scale. IMM attitudes = Immigration Attitudes Scale.*

Table 5

Differences In Major Study Variables Between Female and Male Participants from India

| | Gender | | *t* | *df* |
	Females (n=13)	Males (n=47)		
PQ-B distress	58.77 (25.08)	51.00 (25.68)	-.98	19.54
PQ-B total	19.31 (5.81)	17.60 (6.39)	-.92	20.76
SCZ stereotype	3.03 (.57)	3.13 (.51)	.58	17.60
Substance use	72.69 (44.66)	84.94 (45.94)	.87	19.61
Cannabis use	6.92 (4.89)	8.00 (4.99)	.70	19.48
IMM attitudes	3.93 (1.13)	4.05 (.99)	.34	17.52
Income	3.31 (2.43)	2.81 (1.90)	-.69	16.27
Age	30.77 (3.56)	31.30 (6.40)	.39	35.58

Note. PQ-B = Prodromal Questionnaire - Brief Version. SCZ stereotype = Stereotypes of Schizophrenia Scale. IMM attitudes = Immigration Attitudes Scale.

Table 6

Differences In Major Study Variables Between Female and Male Participants From Italy

	Gender			
	Females (n=25)	Males (n=32)	*t*	*df*
PQ-B distress	29.36 (22.74)	24.34 (19.46)	-.88	47.33
PQ-B total	11.24 (7.59)	10.38 (7.17)	-.44	50.23
SCZ stereotype	2.40 (.47)	2.55 (.48)	1.11	52.38
Substance use	48.16 (15.53)	47.75 (11.35)	-.11	42.46
Cannabis use	4.80 (2.68)	4.81 (1.80)	.02	40.14
IMM attitudes	3.02 (1.50)	2.84 (1.08)	-.49*	41.94
Income	2.96 (1.57)	3.59 (2.30)	1.24	54.12
Age	31.92 (8.61)	32.88 (11.71)	.36*	54.83

*Note. * = p < .05. PQ-B = Prodromal Questionnaire - Brief Version. SCZ stereotype = Stereotypes of Schizophrenia Scale. IMM attitudes = Immigration Attitudes Scale.*

Table 7

Differences In Major Study Variables Between Female and Male Participants From the USA

	Gender		*t*	*df*
	Females (n=17)	Males (n=23)		
PQ-B distress	8.00 (9.23)	6.48 (14.68)	-.40	37.19
PQ-B total	4.24 (5.55)	2.96 (5.22)	-.74	33.37
SCZ stereotype	2.44 (.54)	2.51 (.41)	.48	28.54
Substance use	47.12 (8.87)	55.61 (23.63)	1.58	29.71
Cannabis use	5.59 (3.45)	5.57 (2.57)	-.02	28.39
IMM attitudes	2.50 (1.35)	2.88 (1.39)	.87	35.17
Income	5.71 (2.91)	7.17 (2.29)	1.72	29.50
Age	43.29 (15.22)	42.09 (13.17)	-.26	31.58

Note. PQ-B = Prodromal Questionnaire - Brief Version. SCZ stereotype = Stereotypes of Schizophrenia Scale. IMM attitudes = Immigration Attitudes Scale.

Table 8

Differences In Major Study Variables Between Immigrants and Non-immigrants

| | Immigration status | | | |
	Immigrants (n=11)	Non-immigrants (n=189)	*t*	*df*
PQ-B distress	35.09 (26.62)	29.60 (27.01)	-.66	11.23
PQ-B total	12.09 (8.64)	10.91 (8.49)	-.44	11.15
SCZ stereotype	2.87 (.39)	2.67 (.56)	-1.67	12.56
Substance use	43.63 (5.55)	59.88 (32.11)	5.65*	72.19
Cannabis use	4.09 (.30)	5.97 (3.67)	6.66***	186.91
IMM attitudes	3.15 (1.18)	3.05 (1.36)	-.27	11.59
Income	3.36 (1.43)	3.78 (2.69)	.87*	14.48
Age	40.73 (11.86)	33.04 (10.55)	-2.10	10.94

Note. PQ-B = Prodromal Questionnaire - Brief Version. SCZ stereotype = Stereotypes of Schizophrenia Scale. IMM attitudes = Immigration Attitudes Scale.

Table 9

Characteristics of the Five Dimensions of the Stereotypes of Schizophrenia Scale for Brazil, India, Italy, and the USA

	Brazil		India		Italy		USA		$F(200)$	η^2
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*		
Dangerousness	2.37	.80	3.12	.58	2.32	.74	2.25	.73	18.61***	.22
Responsibility	1.86	.75	3.19	.71	1.84	.73	1.72	.67	51.99***	.44
Creativity	2.75	.78	2.99	.81	2.69	.75	2.80	.73	1.68	.03
Unpredictability	2.86	.75	3.29	.65	2.92	.79	2.85	.88	4.02*	.06
Poor Prognosis	2.78	.50	2.93	.52	2.64	.60	2.76	.78	2.26	.03

*Note. ***p = <0.001, *p = <0.05.*

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