**Internal Validation Of The Latvian Version Of 16-Item Prodromal Questionnaire In A Help-Seeking Adolescent Population:** **Psychometric Analysis And Associated Factors**

**Ilana Germanenko1,2\*, Jelena Vrublevska1,4, Nikita Bezborodovs1,2, Elmars Rancans1,3**

1Riga Stradins University, Department of Psychiatry and Narcology, Riga, Latvia

2Children’s Clinical University Hospital, Child Psychiatry Clinic, Riga, Latvia

3Riga Psychiatry and Narcology Centre, Riga, Latvia

4University of Latvia, Riga, Latvia

**\*Correspondence:**

Ilana Germanenko

ilana.germanenko@gmail.com

**Keywords: psychosis; at-risk mental state; attenuated symptoms; screening; PQ-16**

**Abstract**

**Objectives:** The prodromal phase of a psychotic disorder is a period of altered functioning before the onset of the acute state; several interviews have been developed to determine whether individuals present with prodromal symptoms. The 16-item Prodromal Questionnaire (PQ-16) is a screening tool for evaluating those at risk of developing a psychotic disorder. The study aimed to evaluate the psychometric properties of the Latvian version of the PQ-16 in a sample of help-seeking adolescents referred for diagnostic assessment and look for possible associated socio-demographic and health-related factors. **Methods:** A cross-sectional study included patients admitted for evaluation between November 2022 and February 2023 in Riga's Children's Clinical University Hospital Child Psychiatry clinic. The data were collected during outpatient consultations by mental health professionals. We used the Latvian translation of PQ-16 and the socio-demographic and health-related factors questionnaire. Data were analyzed with IBM SPSS 28; the scale's diagnostic accuracy and internal validity were examined. **Results:** The study involved 107 adolescents aged 12 to 17, 80.5% female, with a mean age of 14.98 (CI 14.70-15.26). Socio-demographic data and health-related variables did not significantly differ between the sexes (p>.05). The Latvian PQ-16 demonstrated excellent internal reliability with a Cronbach's Alpha of 0.890. All 16 items were found to be valid with p<.001. A significant number of participants (73.8%) scored above the current cut-off of ≥6 with a mean of 9.17 (95% CI 8.41-9.93). Certain socio-demographic factors, such as female gender (p<.001), fair school performance (p=.048), and recent changes in school performance (p<.001), demonstrated a significant association with higher scores. Additionally, there were found significant associations between positive screening and health-related factors such as obstetric complications (p=.044), smoking (p=.002), alcohol consumption (p=.021), history of bullying in school (p<.001), and emotional abuse at home (p=.011). **Conclusions:** Latvian translation of PQ-16 showed high internal reliability and validity levels. Positive PQ-16 screening was associated with female gender, worsened school performance, obstetric complications, substance abuse, and experienced emotional violence. The average score of 9.17 positive answers and 73.8% of participants screening positive for attenuated psychotic symptoms is significantly higher than in recent studies under similar conditions.

**Introduction**

Psychosis is a disabling mental disorder characterized by an altered state of mind, hallucinations, delusional ideas, and disorganized behavior (Singh et al., 2005) that usually manifests in adolescence or young adulthood (Solmi et al., 2022). It has become a significant public health issue lately, affecting up to 3% of the world's population (McGrath et al., 2004).

Over the last few decades, the research focus moved from early recognition and phase-specific intervention of first-episode psychosis to the prodromal phase (Schultze-Lutter et al., 2015). As early detection and treatment of psychotic diseases have been linked to better prognosis results (Van Os et al., 2009), there has been an increase in interest in identifying those who are at risk of developing psychosis, especially among adolescents, who are a high-risk population (Pantelis et al., 2009). Psychotic-like experiences (PLEs), characterized as subclinical delusions and transitory hallucinations, are relatively common in the general adolescent population, with reported prevalence rates ranging from 5% to 20% (Kelleher & Cannon, 2011). Although the symptoms are less frequent and persistent, they qualitatively match those of active psychosis. Most often, they are mild and do not cause considerable functional impairment or distress; however, they could increase the risk of having a psychotic disorder later in life (Kelleher et al., 2012). Around 20% of adolescents with PLEs may develop persistent psychotic experiences, and half of this group develop a psychotic disorder (Linscott & van Os, 2013).

The prodromal phase of psychosis is a period of altered functioning before the onset of the acute state, which can present with a progression of negative symptoms like blunted affect, avolition or social impairment (Correll & Schooler, 2020) and increasing cognitive impairment, which includes difficulty in abstract thinking, poor attention, and stereotyped thinking (McCutcheon et al., 2023). In 1996, the concept of ultra-high risk (UHR) of developing a psychotic disorder was introduced (A. Yung et al., 1996). UHR criteria mainly concentrate on present attenuated positive symptoms and divide at-risk individuals into three groups: attenuated psychotic symptoms, brief limited intermittent psychotic symptoms, and genetic risk and deterioration syndrome. Since then, several semi-structured diagnostic clinical interviews like Comprehensive Assessment of At-Risk Mental State (CAARMS) and Structured Interview of Prodromal/Psychosis-Risk Syndromes (SIPS) have been developed to determine whether individuals present with UHR. (Miller et al., 2003; A. R. Yung et al., 2005). It has commonly been assumed that UHR state has a particular predictive value of developing full-blown psychosis (Fusar-Poli et al., 2012)

Over the last two decades, the UHR approach to psychosis risk has had a tremendous impact on the field, prompting researchers and clinicians to consider the prospect of early detection and, perhaps, prevention of a psychotic disorder. However, there has been little research on how this practice works with children and adolescents. According to a recent meta-analysis, the transition rate from UHR status to full-blown psychosis in adolescents is from 9.5% after one year to 16.1% after five years (Lång et al., 2021).

Despite being crucial for the proper diagnosis of UHR states, diagnostic interviews typically demand additional training for mental health specialists and are very time-consuming (Brandizzi et al., 2014; Fusar-Poli et al., 2012). For that reason, self-report screening tools have been designed to identify candidates for later comprehensive clinical evaluation (Addington et al., 2015). The 16-item Prodromal Questionnaire (PQ-16) is a screening tool for evaluating those at risk of developing a psychotic disorder (Ising et al., 2012). According to the literature, PQ-16 is the most frequently employed instrument before conducting structured clinical interviews (Kline & Schiffman, 2014). It consists of 16 statements that the respondent evaluates by the True/False Likert scale. This questionnaire evaluates two negative symptoms, nine perceptual abnormalities, and six unusual thought contents. In case of a positive answer, the respondent should evaluate their experienced distress on a scale from "0" to "3". A total symptom count of 6 and more and a distress score of 9 and more points predicted UHR state in previous studies with excellent sensitivity (87%) and specificity (87%) 19

At the moment, there is a lack of data on the applicability of PQ-16 on the adolescent population and on associated factors that may contribute to the UHR state's development (Gandhi & Cullen, 2022). Moreover, in spite of the validation of PQ-16 in multiple countries (Aguiar et al., 2021; Kim et al., 2018; Pelizza et al., 2019), its suitability for the Latvian population has not yet been determined. Our study aims to evaluate the psychometric properties of the Latvian version of the PQ-16 in a sample of help-seeking adolescents referred for diagnostic assessment and look for possible associated socio-demographic and health-related factors.

**Materials and Methods**

*Setting*

The present study was conducted at Riga's Children's Clinical University Hospital Child Psychiatry clinic. Riga's Children's Clinical University Hospital is the only specialized pediatric facility in Latvia, providing in-patient care for 30,000 children each year, with over 160,000 children receiving outpatient medical care (Children’s Clinical University Hospital, 2023). Child Psychiatry Clinic is a single clinic that provides 7400 state-funded child and adolescent psychiatrists consultations annually, both primary and follow-up visits. The primary catchment region of the hospital consists of 989 525 inhabitants as of the beginning of 2022, with 195127 being under 18 years old (Official Statistics of Latvia, 2023)

*Procedure*

The study implicated a cross-sectional design and included patients admitted for the first time between November 2022 and March 2023. Participants in the study were help-seeking adolescents aged 12 to 17 years who were referred for assessment to the Child Psychiatry Clinic by a general practitioner or other specialist doctor. Every adolescent referred during the mentioned period was invited to participate in a study. It was indicated to the patients and their families that refusal to participate would have no consequences regarding the assessment or treatment.

The exclusion criteria for partaking were as follows: previous known psychotic episodes, a history of prior antipsychotic exposure, intellectual disability (IQ <70), known neurological disorders, including brain injury or any other medical condition associated with psychiatric symptoms, as well as a lack of fluency in Latvian language.

The first of evaluation step consisted of filling out the PQ-16 and socio-demographic questionnaires before seeing a psychiatrist. We used the Latvian translation of PQ-16, which underwent linguistic validation by bi-lingual translators, ensuring the translated tool retained its original intent and semantic meaning while being contextually relevant and understandable for the Latvian population. The original English version of the PQ-16 was translated into Latvian by a fluent speaker of both English and Latvian languages, then translated back into English by a different translator who had no prior knowledge of the original document. The back-translated English version of the PQ-16 is then compared to the original version. The differences in meaning were identified and addressed by a third translator. The revised translation is then given to a small group of target language speakers for pilot testing. We referred to the screening process as "screening for unusual experiences" rather than "screening for psychotic symptoms" to avoid stigma. Participants were asked to provide scores based on their experience within the last six months. Clinicians involved in the patient's therapy had access to the PQ-16 scores; additional questions regarding health-related conditions were asked during the second step assessment with a psychiatrist. Based on the symptoms recognized by a psychiatrist or named by the parents or the adolescent, the diagnosis was established according to ICD-10 criteria (World Health Organization, 2016).

In the context of psychiatric research and clinical practice in Latvia, it is noteworthy to mention the lack of validated psychometric tools, which significantly narrows the opportunities to validate new instruments. This issue particularly applies to external validation. Consequently, diagnoses in Latvia are predominantly established based on the ICD-10 diagnostic criteria. While this approach ensures alignment with global standards, the absence of localized tools underlines the need to develop and validate culturally tailored psychometric instruments in the region. This study is part of a project for implementing various screening instruments in clinical practice, like PQ-16 and CAARMS.

In accordance with the Helsinki Declaration, proper ethical permissions were sought for the study. The data were used anonymously for research purposes only; written informed consent was obtained from each study participant. The permission has been granted by the Riga Stradins University Research Ethics Committee (Number 2-PEK-4/566/2022).

*Statistical analyses*

In this study we implemented the approach previously used in similar studies of validation of the PQ-16 tool. The statistical approach to the evaluation of the reliability and internal consistency of the instrument was identical to de Jong et al. and Pelizza et al. (de Jong et al., 2022; Pelizza et al., 2019).

As a reliability indicator, Cronbach's alpha statistics were used to analyze the internal consistency of the Latvian version of PQ-16 within the study sample (Pelizza et al., 2019). The correlation between each PQ-16 item and the overall questionnaire score was also examined. Then, with each removed item, we again checked Cronbach's alpha score. Removal of this item would be thought to improve the reliability of the questionnaire if this score improved after the item was removed (S. B. Green et al., 2016).

The statistical analysis was performed with SPSS 28.0. Descriptive statistics were used to calculate odds ratio and chi-square statistics to explore differences in gender, socio-demographic and health-related characteristics, and samples above or below the distress and total answer PQ-16 cut-off scores, which were determined as >=9 and >=6, respectively (19, 29). We used Mann-Whitney U tests to examine whether any of the above traits were associated with the PQ-16 total score. **Associations between the PQ-16 scores and age was calculated using bivariate correlations.**Kendall’s τ was used for ordinal data and Spearman’s ρ for continuous skewed data. A Mann–Whitney U test examined the difference between boys and girls on the PQ-16 total score. Correction for multiple testing was performed using the Benjamini–Hochberg procedure.

**Results**

*Sample characteristics*

The socio-demographic characteristics of the participants and the diagnoses after the assessment are shown in *Table 1.*107 participants aged 14.98 (CI 14.70-15.26) were included during the study period. Most participants were female, resided in Riga, and lived in a family with both parents. The most frequent diagnosis, established in 34% of cases, was a depressive episode (F32, according to ICD-10). If a diagnosis was established for less than four patients, it was included in the category “Other.”

Among health-related factors, the most frequent ones were COVID-19 infection within two last years (74.8%), self-harming behaviour (46.7%), family history of mental disorder (31.8%), and smoking (27.1%). The complete list of explored factors is shown in *Table 2*.

*PQ-16 inner validity*

Cronbach’s alpha for the total answer score on the Latvian translation of PQ-16 was 0.890. All 16 items were found to be valid with p<.001. Removing item 7, “I get extremely anxious when meeting people for the first time,” slightly improved Cronbach’s Alpha to 0.895, consistent with a recent Italian study (Pelizza et al., 2019). All item-total correlations and Cronbach’s alpha if the item was deleted can be observed in *Table 3*.

*PQ-16 scores*

In the current study, the average count of PQ-16 positive answers was 9.17 (95% CI 8.41-9.93), and participants scored an average of 16.57 (95% CI 14.59-18.55) points on the distress scale. 79.4% of participants screened positive according to the answer count criteria and 73.8% according to the distress score.

Item 15 (OR 49.179, 95% CI 6.341-381.432), item 5 (OR 37.091, 95% CI 10.783-127.580), and item 10 (OR 27.692, 95% CI 3.586-213.842) had the highest odds ratios for scoring positive on the total score scale, item 6 (OR 1.583, 95% CI 1.344-1.880) and item 9 (OR 1.609, 95% CI 1.347-1.922) had the lowest ones.

*PQ-16 association with socio-demographic and health-related factors*

No significant correlations were found between age and PQ-16 scores in distress (p = .271) and total answer (p = .317) scores.**Patients diagnosed with a disorder other than depressive episode (F32, ICD-10), neurotic and stress-related disorders (F4, ICD-10), or depressive conduct disorder (F92, ICD-10) scored significantly lower than those with the abovementioned diagnoses.** Associations between socio-demographic and health-related factors are presented in Table 4 and Table 5, respectively. We explored differences in mean distress and total answer scores and compared the groups by scoring positive or negative on each scale.

Female gender, worsening school performance within last year, history of bullying at school and home, smoking, and self-harming behaviour were significantly associated with higher scores on the distress scale, answering “True” to more statements and scoring positive both by distress and answer count criteria.

There was found a significant difference in mean PQ-16 distress score between participants with fair and other school performances (p =.048), and the mean total answer count was higher in participants with regular alcohol consumption (p = 0.021). Drug use was associated with a higher probability of scoring positive according to the total answer scale (p = 0.049).

Obstetric complications were associated with higher mean distress scores (p = .050) and a probability of scoring positive according to distress criteria (p = .044).

**Discussion**

This study aimed to assess the psychometric properties of the Latvian translation of PQ-16 in a sample of help-seeking adolescents referred to psychiatric assessment and to identify potential socio-demographic and health-related factors related to the possible ultra-high-risk state. Validating the PQ-16 in the Latvian context is critical as it provides a culturally sensitive tool for the early identification of psychosis risk in the Latvian adolescent population. This study, though focused on Latvia, carries global relevance. The unique symptomatology and risk factors identified can inform more culturally nuanced mental health practices worldwide. Based on these findings, the potential broader age applicability of the PQ-16 could advance universal screening and prevention efforts. Overall, the study contributes valuable insights into global psychosis prevention.

In our study, we focused on a help-seeking sample to test the psychometric properties of the PQ-16 in a clinical setting. The chosen cohort was based on prior studies by international colleagues. The first and most influential study on the topic by Ising et al. (Ising et al., 2012), which established the cut-off points for positive screening, was also conducted in the clinical setting (secondary mental health care service "PsyQ Haaglanden" in the Hague area); therefore, this cohort is more applicable to this particular study. In the recent systematic review by Savill et al. (Savill et al., 2018), the group of studies with populations seeking help for non-specific mental health concerns recruited in secondary mental health care settings were considered eligible.

The high internal consistency of the scale (Cronbach's alpha of 0.890) aligns with previous studies validating PQ-16 in different populations (de Jong et al., 2018; Kim et al., 2018; Savill et al., 2018), attesting to its reliability for the Latvian adolescent population. The removal of item 7 slightly improved the score, suggesting that this item may not be culturally sensitive and might need adaptation or further elucidation in non-English-speaking populations (Addington et al., 2015).

Our findings demonstrate high odds ratios for items 5, 10, and 15, which differs from previous studies (Pelizza et al., 2019), suggesting that these symptoms could be cultural-specific and crucial in identifying UHR states among adolescents in Latvia. Notably, no significant correlations were found between age and PQ-16 scores, which may indicate the potential use of this instrument in a broader age range.

The study further identified a significant association between several socio-demographic and health-related factors with higher PQ-16 scores. For instance, female gender, declining school performance, bullying, smoking, drug use, and self-harming behavior are linked with higher scores on the distress scale, aligning with prior research establishing these factors as stressors and probable risk factors for psychosis (Fusar-Poli et al., 2017; M. J. Green et al., 2014; Pantelis et al., 2005). Moreover, the associations of obstetric complications with higher PQ-16 scores echo previous studies emphasizing the role of biological factors in the development of UHR states and psychosis (Kappelmann et al., 2022; Wahbeh & Avramopoulos, 2021)

The gender discrepancy in this study, where many more girls participated, may be influenced by several factors specific to the children population. Some research suggests that girls may be more likely to internalize problems, making them more aware of their symptoms and more likely to seek help (Zahn-Waxler et al., 2008). Furthermore, societal gender norms can play a role, as girls are often socialized to be more expressive about their emotions (Chaplin & Aldao, 2013). In addition, parental perception and influence could play a significant role. Some studies suggest that parents are more likely to identify and respond to mental health issues in girls than in boys (Mackenzie et al., 2012). This parental influence also could contribute to a higher representation of females in this project.

The notably increased positive screening rates in the Latvian adolescent help-seeking population, 78.9% according to the total answer scale and 78.6% according to the distress scale is a significant finding that warrants further investigation. The transcultural applicability of psychometric screening tools poses challenges due to varying cultural interpretations of mental health symptoms and socioeconomic disparities. Tools developed in one cultural context may unintentionally incorporate invalid or inappropriate assumptions in another, leading to potential biases (Canino & Alegría, 2008). Language translation poses issues, as literal translations may fail to express the original intended meanings, particularly when considering idioms and cultural nuances (Gjersing et al., 2010). It is worth noting that in the validation process, socioeconomic conditions and contextual factors should also be considered, as they can significantly impact the interpretation and relevance of certain items (Betancourt & López, 1993).

Recently, there has been a concerted effort to increase awareness and understanding of psychosis and its risk factors among both healthcare providers and the general public. This increased awareness might lead to higher rates of individuals seeking help and being screened, which could contribute to the higher positive screening rates. Moreover, the changes in social environment, such as the impact of the pandemic, could potentially affect our population's mental health (Smith et al., 2021). Stressful life events, increased isolation, and changes in routine may contribute to higher rates of individuals exhibiting signs of psychosis risk (Hossain et al., 2020; Meherali et al., 2021).

It should be noted that the current study has several limitations, which should be acknowledged when interpreting the results. Firstly, the study applied a cross-sectional design, and thus we cannot infer any causal relationships between identified factors and positive screening. Longitudinal follow-up data were unavailable, so the actual conversion rates to psychosis among participants could not be determined. Secondly, the sample comprised help-seeking adolescents referred for diagnostic assessment, which might limit the generalizability of the findings to the general population. As healthcare professionals referred all the participants, this population might present with more pronounced or severe symptoms than the general adolescent population, potentially leading to overestimating the PQ-16's performance (Schultze-Lutter et al., 2015). Lastly, the lack of a 'gold standard clinical interview for ultra-high risk, such as CAARMS or SIPS, validated for the Latvian population, may have impacted the validity of the results. The PQ-16, while a valuable tool, is a self-report measure; its results can be influenced by subjective interpretation and are potentially less accurate than a structured clinical interview (Kline & Schiffman, 2014). While these limitations must be considered, this study provides essential preliminary findings that can guide future research efforts and aid in developing effective strategies for early detection and intervention in psychosis.

In conclusion, although our results offer valuable insights into the utility of PQ-16 for the Latvian adolescent population, further longitudinal studies and assessment with semi-structured clinical interviews are necessary to establish the tool's predictive value for the transition to psychosis in light of the high rates of false positives reported in the literature (de Jong et al., 2022; Howie et al., 2022; Savill et al., 2018). Furthermore, future research could investigate potential cultural and contextual factors that might influence the perception and reporting of prodromal symptoms. The increase in positive screening rates in our population is a complex issue that requires a multifaceted approach to understand fully. Continued research into this trend is vital to enhance our understanding of psychosis risk and to improve prevention and intervention strategies.

# Conflict of Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

**References**

Addington, J., Stowkowy, J., & Weiser, M. (2015). Screening tools for clinical high risk for psychosis. *Early Intervention in Psychiatry*, *9*(5), 345–356. https://doi.org/10.1111/EIP.12193

Aguiar, A. P., Vistorte, A. O. R., Akiba, H. T., Oliveira, P., Ruiz, D. P. P., Gadelha, A., Bressan, R. A., & Pan, P. M. (2021). Translation and cross-cultural adaptation to Brazilian Portuguese of two brief screening tools for at-risk psychosis youth: the Prodromal Questionnaire (PQ-16) and the PRIME-Screen. *Trends in Psychiatry and Psychotherapy*. https://doi.org/10.47626/2237-6089-2021-0276

Betancourt, H., & López, S. R. (1993). The study of culture, ethnicity, and race in American psychology. *American Psychologist*, *48*(6), 629–637. https://doi.org/10.1037/0003-066X.48.6.629

Brandizzi, M., Schultze-Lutter, F., Masillo, A., Lanna, A., Curto, M., Lindau, J. F., Solfanelli, A., Listanti, G., Patanè, M., Kotzalidis, G., Gebhardt, E., Meyer, N., Di Pietro, D., Leccisi, D., Girardi, P., & Fiori Nastro, P. (2014). Self-reported attenuated psychotic-like experiences in help-seeking adolescents and their association with age, functioning and psychopathology. *Schizophrenia Research*, *160*(1–3), 110–117. https://doi.org/10.1016/j.schres.2014.10.005

Canino, G., & Alegría, M. (2008). Psychiatric diagnosis – is it universal or relative to culture? *Journal of Child Psychology and Psychiatry*, *49*(3), 237–250. https://doi.org/10.1111/j.1469-7610.2007.01854.x

Chaplin, T. M., & Aldao, A. (2013). Gender differences in emotion expression in children: A meta-analytic review. *Psychological Bulletin*, *139*(4), 735–765. https://doi.org/10.1037/a0030737

’Chen, F. ’, ’Wang, L., & ’Zhao, Z. (2014). Validity and reliability of the 16-item prodromal questionnaire in screening psychosis risk of help-seekers. *Chinese Mental Health Journal*, *28*, 667–673.

Children’s Clinical University Hospital. (2023, June 26). *About the hospital*. Https://Www.Bkus.Lv/Old/En/Content/about-Hospital.

Correll, C. U., & Schooler, N. R. (2020). Negative Symptoms in Schizophrenia: A Review and Clinical Guide for Recognition, Assessment, and Treatment. *Neuropsychiatric Disease and Treatment*, *Volume 16*, 519–534. https://doi.org/10.2147/NDT.S225643

de Jong, Y., Boon, A. E., Gouw, D., van der Gaag, M., & Mulder, C. L. (2022). Improving screening methods for psychosis in an adolescent help-seeking population using the Child Behavior Checklist (CBCL) and the Youth Self Report (YSR) versus the Prodromal Questionnaire -16 items version (PQ-16). *Child and Adolescent Psychiatry and Mental Health*, *16*(1). https://doi.org/10.1186/s13034-022-00459-w

de Jong, Y., Mulder, C. L., Boon, A. E., Deen, M., van ’t Hof, M., & van der Gaag, M. (2018). Screening for psychosis risk among adolescents in Child and Adolescent Mental Health Services: a description of the first step with the 16-item version of the Prodromal Questionnaire (PQ-16). *Early Intervention in Psychiatry*, *12*(4), 669–676. https://doi.org/10.1111/eip.12362

Fusar-Poli, P., Bonoldi, I., Yung, A. R., Borgwardt, S., Kempton, M. J., Valmaggia, L., Barale, F., Caverzasi, ; Edgardo, & Mcguire, P. (2012). *Predicting Psychosis Meta-analysis of Transition Outcomes in Individuals at High Clinical Risk*.

Fusar-Poli, P., Tantardini, M., De Simone, S., Ramella-Cravaro, V., Oliver, D., Kingdon, J., Kotlicka-Antczak, M., Valmaggia, L., Lee, J., Millan, M. J., Galderisi, S., Balottin, U., Ricca, V., & McGuire, P. (2017). Deconstructing Vulnerability for Psychosis: Meta-Analysis of Environmental Risk Factors for Psychosis in Subjects at Ultra High-Risk. *European Psychiatry*, *40*, 65–75. https://doi.org/10.1016/j.eurpsy.2016.09.003

Gandhi, R., & Cullen, K. R. (2022). Editorial: Can At-Risk Mental State (ARMS) Diagnosis in Children and Adolescents Predict Transition to a Psychotic Disorder? We Are Not There Yet. *Journal of the American Academy of Child & Adolescent Psychiatry*, *61*(5), 595–596. https://doi.org/10.1016/j.jaac.2021.10.007

Gjersing, L., Caplehorn, J. R., & Clausen, T. (2010). Cross-cultural adaptation of research instruments: language, setting, time and statistical considerations. *BMC Medical Research Methodology*, *10*(1), 13. https://doi.org/10.1186/1471-2288-10-13

Green, M. J., Chia, T. Y., Cairns, M. J., Wu, J., Tooney, P. A., Scott, R. J., & Carr, V. J. (2014). Catechol-O-methyltransferase (COMT) genotype moderates the effects of childhood trauma on cognition and symptoms in schizophrenia. *Journal of Psychiatric Research*, *49*(1), 43–50. https://doi.org/10.1016/J.JPSYCHIRES.2013.10.018

Green, S. B., Yang, Y., Alt, M., Brinkley, S., Gray, S., Hogan, T., & Cowan, N. (2016). Use of internal consistency coefficients for estimating reliability of experimental task scores. In *Psychonomic Bulletin and Review* (Vol. 23, Issue 3, pp. 750–763). Springer New York LLC. https://doi.org/10.3758/s13423-015-0968-3

Hossain, M. M., Tasnim, S., Sultana, A., Faizah, F., Mazumder, H., Zou, L., McKyer, E. L. J., Ahmed, H. U., & Ma, P. (2020). Epidemiology of mental health problems in COVID-19: a review. *F1000Research*, *9*, 636. https://doi.org/10.12688/f1000research.24457.1

Howie, C., Hanna, D., Shannon, C., Davidson, G., & Mulholland, C. (2022). The Structure of the Prodromal Questionnaire-16 (PQ-16): Exploratory and confirmatory factor analyses in a general non-help-seeking population sample. *Early Intervention in Psychiatry*, *16*(3), 239–246. https://doi.org/10.1111/eip.13147

Ising, H. K., Veling, W., Loewy, R. L., Rietveld, M. W., Rietdijk, J., Dragt, S., Klaassen, R. M. C., Nieman, D. H., Wunderink, L., Linszen, D. H., & Van Der Gaag, M. (2012). The validity of the 16-item version of the prodromal questionnaire (PQ-16) to screen for ultra high risk of developing psychosis in the general help-seeking population. *Schizophrenia Bulletin*, *38*(6), 1288–1296. https://doi.org/10.1093/schbul/sbs068

Kappelmann, N., Perry, B. I., & Khandaker, G. M. (2022). Prenatal and Childhood Immuno-Metabolic Risk Factors for Adult Depression and Psychosis. *Harvard Review of Psychiatry*, *30*(1), 8–23. https://doi.org/10.1097/HRP.0000000000000322

Kelleher, I., & Cannon, M. (2011). Psychotic-like experiences in the general population: Characterizing a high-risk group for psychosis. In *Psychological Medicine* (Vol. 41, Issue 1, pp. 1–6). https://doi.org/10.1017/S0033291710001005

Kelleher, I., Keeley, H., Corcoran, P., Ramsay, H., Wasserman, C., Vladimir Carli, M., Sarchiapone, M., Hoven, C., Danuta Wasserman, D., & Cannon, M. (2012). *Childhood Trauma and Psychosis in a Prospective Cohort Study: Cause, Effect, and Directionality*.

Kim, S. W., Chung, Y. C., Kang, Y. S., Kim, J. K., Jang, J. E., Jhon, M., Lee, J. Y., Kim, J. M., Shin, I. S., & Yoon, J. S. (2018). Validation of the korean version of the 16-item prodromal questionnaire in a non-help-seeking college population. *Psychiatry Investigation*, *15*(2), 111–117. https://doi.org/10.30773/pi.2017.04.24

Kline, E., & Schiffman, J. (2014). Psychosis risk screening: A systematic review. *Schizophrenia Research*, *158*(1–3), 11–18. https://doi.org/10.1016/J.SCHRES.2014.06.036

Lång, U., Yates, K., Leacy, F. P., Clarke, M. C., McNicholas, F., Cannon, M., & Kelleher, I. (2021). *Systematic Review and Meta-analysis: Psychosis Risk in Children and Adolescents With an At-Risk Mental State*. www.jaacap.org

Linscott, R. J., & van Os, J. (2013). An updated and conservative systematic review and meta-analysis of epidemiological evidence on psychotic experiences in children and adults: on the pathway from proneness to persistence to dimensional expression across mental disorders. *Psychological Medicine*, *43*(6), 1133–1149. https://doi.org/DOI: 10.1017/S0033291712001626

Mackenzie, C. S., Reynolds, K., Cairney, J., Streiner, D. L., & Sareen, J. (2012). Disorder-specific mental health service use for mood and anxiety disorders: associations with age, sex, and psychiatric comorbidity. *Depression and Anxiety*, *29*(3), 234–242. https://doi.org/10.1002/da.20911

McCutcheon, R. A., Keefe, R. S. E., & McGuire, P. K. (2023). Cognitive impairment in schizophrenia: aetiology, pathophysiology, and treatment. *Molecular Psychiatry*. https://doi.org/10.1038/s41380-023-01949-9

McGrath, J., Saha, S., Welham, J., El Saadi, O., MacCauley, C., & Chant, D. (2004). A systematic review of the incidence of schizophrenia: the distribution of rates and the influence of sex, urbanicity, migrant status and methodology. *BMC Medicine*, *2*(1), 13. https://doi.org/10.1186/1741-7015-2-13

Meherali, S., Punjani, N., Louie-Poon, S., Abdul Rahim, K., Das, J. K., Salam, R. A., & Lassi, Z. S. (2021). Mental Health of Children and Adolescents Amidst COVID-19 and Past Pandemics: A Rapid Systematic Review. *International Journal of Environmental Research and Public Health*, *18*(7), 3432. https://doi.org/10.3390/ijerph18073432

Miller, T. J., Mcqlashan, T. H., Rosen, J. L., Cadenhead, K., Ventura, J., Mcfarlane, W., Perkins, D. O., Pearlson, Q. D., & Woods, S. W. (2003). *Prodromal Assessment With the Structured Interview for Prodromal Syndromes and the Scale of Prodromal Symptoms: Predictive Validity, Interrater Reliability, and Training to Reliability*. http://schizophreniabulletin.oxfordjournals.org/

Official Statistics of Latvia. (2023, June 26). *Statistics database*. Https://Data.Stat.Gov.Lv/Pxweb/Lv/OSP\_PUB/START\_\_POP\_\_IR\_\_IRS/IRS030/Table/TableViewLayout1/).

Pantelis, C., Yücel, M., Bora, E., Fornito, A., Testa, R., Brewer, W. J., Velakoulis, D., & Wood, S. J. (2009). Neurobiological markers of illness onset in psychosis and schizophrenia: The search for a moving target. In *Neuropsychology Review* (Vol. 19, Issue 3, pp. 385–398). https://doi.org/10.1007/s11065-009-9114-1

Pantelis, C., Yücel, M., Wood, S. J., Velakoulis, D., Sun, D., Berger, G., Stuart, G. W., Yung, A., Phillips, L., & McGorry, P. D. (2005). Structural brain imaging evidence for multiple pathological processes at different stages of brain development in schizophrenia. In *Schizophrenia Bulletin* (Vol. 31, Issue 3, pp. 672–696). https://doi.org/10.1093/schbul/sbi034

Pelizza, L., Azzali, S., Paterlini, F., Garlassi, S., Scazza, I., Chiri, L. R., Poletti, M., Pupo, S., & Raballo, A. (2019). Screening for psychosis risk among help-seeking adolescents: Application of the Italian version of the 16-item prodromal questionnaire (iPQ-16) in child and adolescent neuropsychiatry services. *Early Intervention in Psychiatry*, *13*(4), 752–760. https://doi.org/10.1111/eip.12554

Savill, M., D’Ambrosio, J., Cannon, T. D., & Loewy, R. L. (2018). Psychosis risk screening in different populations using the Prodromal Questionnaire: A systematic review. In *Early Intervention in Psychiatry* (Vol. 12, Issue 1, pp. 3–14). Blackwell Publishing. https://doi.org/10.1111/eip.12446

Schultze-Lutter, F., Michel, C., Schmidt, S. J., Schimmelmann, B. G., Maric, N. P., Salokangas, R. K. R., Riecher-Rössler, A., van der Gaag, M., Nordentoft, M., Raballo, A., Meneghelli, A., Marshall, M., Morrison, A., Ruhrmann, S., & Klosterkötter, J. (2015). EPA guidance on the early detection of clinical high risk states of psychoses. *European Psychiatry*, *30*(3), 405–416. https://doi.org/10.1016/J.EURPSY.2015.01.010

Singh, S. P., Cooper, J. E., Fisher, H. L., Tarrant, C. J., Lloyd, T., Banjo, J., Corfe, S., & Jones, P. (2005). Determining the chronology and components of psychosis onset: The Nottingham Onset Schedule (NOS). *Schizophrenia Research*, *80*(1), 117–130. https://doi.org/10.1016/J.SCHRES.2005.04.018

Smith, C. M., Gilbert, E. B., Riordan, P. A., Helmke, N., von Isenburg, M., Kincaid, B. R., & Shirey, K. G. (2021). COVID-19-associated psychosis: A systematic review of case reports. *General Hospital Psychiatry*, *73*, 84–100. https://doi.org/10.1016/j.genhosppsych.2021.10.003

Solmi, M., Radua, J., Olivola, M., Croce, E., Soardo, L., Salazar de Pablo, G., Il Shin, J., Kirkbride, J. B., Jones, P., Kim, J. H., Kim, J. Y., Carvalho, A. F., Seeman, M. V., Correll, C. U., & Fusar-Poli, P. (2022). Age at onset of mental disorders worldwide: large-scale meta-analysis of 192 epidemiological studies. *Molecular Psychiatry*, *27*(1), 281–295. https://doi.org/10.1038/s41380-021-01161-7

Van Os, J., Linscott, R. J., Myin-Germeys, I., Delespaul, P., & Krabbendam, L. (2009). A systematic review and meta-analysis of the psychosis continuum: Evidence for a psychosis proneness-persistence-impairment model of psychotic disorder. *Psychological Medicine*, *39*(2), 179–195. https://doi.org/10.1017/S0033291708003814

Wahbeh, M. H., & Avramopoulos, D. (2021). Gene-Environment Interactions in Schizophrenia: A Literature Review. *Genes*, *12*(12), 1850. https://doi.org/10.3390/genes12121850

World Health Organization. (2016). *International statistical classification of diseases and related health problems (10 ed.)*. Https://Icd.Who.Int/Browse10/2016/En.

Yung, A., Mcgorry, P. D., Mcfarlane, C. A., Jackson, H. J., Patton, G. C., & Rakkar, A. (1996). *Monitoring and Care of 2 Young People at Incipient Risk of Psychosis* (Vol. 22, Issue 2). https://academic.oup.com/schizophreniabulletin/article/22/2/283/1928306

Yung, A. R., Yuen, P., Mcgorry, P. D., Phillips, L. J., Kelly, D., Dell’olio, M., Francey, S. M., Cosgrave, E. M., Killackey, E., Stanford, C., Godfrey, K., & Buckby, J. (2005). Mapping the onset of psychosis: the Comprehensive Assessment of At-Risk Mental States. In *Australian and New Zealand Journal of Psychiatry* (Vol. 39).

Zahn-Waxler, C., Shirtcliff, E. A., & Marceau, K. (2008). Disorders of Childhood and Adolescence: Gender and Psychopathology. *Annual Review of Clinical Psychology*, *4*(1), 275–303. https://doi.org/10.1146/annurev.clinpsy.3.022806.091358

**Tables**

***Table 1.*** *Socio-demographic characteristics of the participants*

|  |  |  |
| --- | --- | --- |
|  | **n** | **%** |
| *Gender* |  |  |
| Male | 20 | 18.7 |
| Female | 87 | 81.3 |
| *Area of residence* |  |  |
| Capital | 73 | 68.2 |
| City <100.000 inh. | 34 | 31.8 |
| *Family* |  |  |
| Single-parent | 46 | 43.0 |
| Full | 61 | 57.0 |
| *School performance* |  |  |
| Good | 27 | 25.2 |
| Fair | 66 | 60.7 |
| Bad | 14 | 12.1 |
| *Diagnosis* |  |  |
| Depressive episode | 34 | 32.1 |
| Depressive conduct disorder | 15 | 14.2 |
| Anxiety disorder | 30 | 28.3 |
| Other | 28 | 25.5 |

***Table 2****.* *Prevalence of health-related factors in the study population*

|  |  |  |
| --- | --- | --- |
| **Factor** | **n** | **%** |
| Obstetric complications | 23 | 21.5 |
| Infection during the first year of life | 13 | 12.1 |
| Chronic somatic illness | 23 | 21.5 |
| COVID-19 infection | 80 | 74.8 |
| Smoking | 29 | 27.1 |
| Alcohol consumption | 11 | 10.3 |
| Drug usage | 16 | 15.0 |
| Family history of psychotic spectrum disorder | 7 | 6.5 |
| Family history of any mental disorder | 34 | 31.8 |
| History of bullying in school | 56 | 52.3 |
| History of emotional abuse at home | 34 | 31.8 |
| Self-harming behaviour | 50 | 46.7 |

***Table 3*.** *Internal consistency of the Latvian translation of PQ-16*

|  |  |  |  |
| --- | --- | --- | --- |
| **Nr.** | **Item** | **Item-total correlation** | **Cronbach’s alpha if item deleted** |
| 1 | *I feel uninterested in the things I used to enjoy.* | 0.594 | 0.884 |
| 2 | *I often seem to live through events exactly as they happened before (deja-vu).* | 0.578 | 0.885 |
| 3 | *I sometimes smell or taste things that other people can't smell or taste.* | 0.639 | 0.882 |
| 4 | *I often hear unusual sounds like banging, clicking, hissing, clapping or ringing in my ears.* | 0.750 | 0.877 |
| 5 | *I have been confused at times whether something I experienced was real or imaginary.* | 0.676 | 0.880 |
| 6 | *When I look at a person, or look at myself in a mirror, I have seen the face change right before my eyes.* | 0.615 | 0.883 |
| 7 | *I get extremely anxious when meeting people for the first time.* | 0.382 | **0.895** |
| 8 | *have seen things that other people apparently can't see.* | 0.644 | 0.882 |
| 9 | *My thoughts are sometimes so strong that I can almost hear them.* | 0.699 | 0.879 |
| 10 | *I sometimes see special meanings in advertisements, shop windows, or in the way things are arranged around me.* | 0.538 | 0.886 |
| 11 | *Sometimes I have felt that I'm not in control of my own ideas or thoughts.* | 0.725 | 0.875 |
| 12 | *Sometimes I feel suddenly distracted by distant sounds that I am not normally aware of.* | 0.675 | 0.881 |
| 13 | *I have heard things other people can't hear, like voices of people whispering or talking.* | 0.528 | 0.886 |
| 14 | *I often feel that others have it in for me.* | 0.506 | 0.888 |
| 15 | *I have had the sense that some person or force is around me, even though I could not see anyone.* | 0.705 | 0.879 |
| 16 | *I feel that parts of my body have changed in some way, or that parts of my body are working differently than before.* | 0.551 | 0.885 |

***Table 4.*** *PQ-16 scores and association with socio-demographic factors*

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **PQ-16 distress score, Mean (95% CI)** | **P value** | **PQ-16 total answer score, Mean (95% CI)** | **P value** | **Distress-positive, n, %** | **P value** | **Answers- positive, n, %** | **P value** |
| **Sex** | Male | 8.50 (CI 4.88-12.12) | **<.001** | 5.85 (CI 3.98-7.72) | **<.001** | 8 (40.0%) | **<.001** | 11 (55.0%) | **.005** |
| Female | 18.43 (CI 16.30-20.55) | 9.93 (CI 9.17-10.69) | 71 (81.6%) | 74 (85.1%) |
| **Area of residence** | Riga | 16.84 (CI 14.31-19.36) | .997 | 9.12 (CI 8.13-10.11) | .836 | 54 (74.0%) | .961 | 57 (78.1%) | .408 |
|  | Other city | 16.00 (CI 12.78-19.22) | 9.26 (CI 8.10-10.42) | 25 (73.8%) |  | 28 (82.4%) |  |
| **Family** | Full | 15.33 (CI 12.79-17.87) | .150 | 8.80 (CI 7.81-9.79) | .228 | 45 (73.8%) | .566 | 50 (82.0%) | .286 |
|  | Single-parent | 18.29 (CI14.98-21.60) | 9.60 (CI 8.35-10.85) | 33 (73.3%) |  | 34 (75.6%) |  |
| **Changes in school performance within last year** | Stable | 12.77 (CI 9.90-15.63) | **<.001** | 7.62 (CI 6.46-8.78) | **<.001** | 28 (59.6%) | **.004** | 31 (66.0%) | **.003** |
| Worsened | 19.71 (CI 17.09-22.32) | 10.38 (CI 9.43-11.33) | 49 (84.5%) |  | 52 (89.7%) |  |
| **School performance** | Good | 12.67 (CI 9.22-16.11) | **.048** | 8.07 (CI 6.86-9.29) | .080 | 17 (63.0%) | .143 | 22 (81.5%) | .245 |
| Fair | 18.57 (CI 15.96-21.18) | 9.72 (CI 8.70-10.74) | 52 (80.0%) |  | 53 (81.5%) |  |
| Bad | 14.92 (CI 8.19-21.65) | 8.46 (5.61-11.32) | 8 (61.5%) |  | 8 (61.5%) |  |
| **Diagnosis after the first evaluation †** | F32 | 19.68 (CI 16.37-22.98) | **<.001** | 10.29 (CI 9.06-11.53) | **.004** | 30 (88.2%) | **<.001** | 30 (88.2%) | **.006** |
| F92 | 19.67 (CI 13.61-25.73) | 10.33 (CI 8.32-12.35) | 12 (80.0%) | 13 (86.7%) |
| F4 | 17.97 (CI 14.04-21.89) | 9.70 (CI 8.46-10.94) | 24 (80.0%) | 26 (86.7%) |
| Other | 9.48 (CI 6.44-12.52) | 6.59 (CI 4.87-8.31) | 12 (44.4%) | 15 (55.6%) |

*† F32: Depressive episode (ICD-10), F4: Neurotic and stress-related disorders (ICD-10), F92: Depressive conduct disorder (ICD-10)*

***Table 5.*** *PQ-16 scores and association with health-related factors*

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **PQ-16 distress score, Mean (95% CI)** | **P value** | **PQ-16 total answer score, Mean (95% CI)** | **P value** | **Distress-positive (n, %)** | **P value** | **Answers- positive (n, %)** | **P value** |
| **Obstetric complications** | Yes | 20.93 (CI 16.75-25.15) | .**050** | 10.47 (CI 8.78-12.15) | .162 | 14 (93.3%) | **.044** | 14 (93.3%) | .118 |
| No | 15.88 (CI 13.59-18.16) | 8.86 (CI 7.99-9.74) | 61 (69.3%) |  | 67 (76.1%) |  |
| **Infection during the first year of life** | Yes | 18.77 (CI 13.81-23.70) | .298 | 9.92 (CI 7.67-12.18) | .382 | 12 (92.3%) | .090 | 12 (92.3%) | .196 |
|  | No | 16.48 (CI 14.28-18.69) | 9.11 (CI 8.27-9.95) | 66 (71.0%) |  | 72 (77.4%) |  |
| **Chronic somatic illness** | Yes | 17.43 (CI 13.06-21.81) | .670 | 9.43 (CI 7.76-11.11) | .794 | 18 (78.3%) | .388 | 19 (82.6%) | .450 |
|  | No | 16.58 (CI 14.27-18.89) | 9.15 (CI 8.25-10.04) | 60 (72.3%) |  | 65 (78.3%) |  |
| **COVID-19 infection** | Yes | 16.27 (CI 13.96-18.57) | .364 | 9.08 (CI 8.18-9.97) | .487 | 58 (72.5%) | .320 | 64 (80.0%) | .623 |
|  | No | 18.36 (CI 14.04-22.68) | 9.64 (CI 7.99-11.29) | 20 (80.0%) |  | 20 (80.0%) |  |
| **Smoking** | Yes | 21.07 (CI 18.13-24.01) | **.002** | 11.07 (CI 9.94-12.20) | **.003** | 27 (93.1%) | **.003** | 27 (93.1%) | **.024** |
| No | 14.94 (CI 12.49-17.38) | 8.45 (CI 7.52-9.38) | 51 (66.2%) |  | 57 (74.0%) |  |
| **Alcohol consumption** | Yes | 20.55 (CI 14.76-26.33) | .105 | 11.49 (CI 9.04-13.86) | **.021** | 9 (81.8%) | .403 | 10 (90.0%) | .285 |
| No | 16.32 (CI 14.17-18.48) | 8.91 (CI 8.10-9.71) | 69 (72.6%) |  | 74 (77.9%) |  |
| **Drug use** | Yes | 19.73 (CI 15.26-24.21) | .131 | 10.87 (CI 9.42-12.31) | .075 | 14 (87.5%) | .143 | 15 (93.8%) | **.049** |
|  | No | 16.27 (CI 14.03-18.51) | 8.93 (CI 8.06-9.80) | 64 (71.1%) |  | 69 (76.8%) |  |
| **Family history of psychotic spectrum disorder** | Yes | 16.43 (CI 5.51-27.34) | .879 | 8.71 (CI 5.76-11.67) | .623 | 5 (71.4%) | .596 | 6 (85.7%) | .553 |
|  | No | 16.79 (CI 14.72-18.87) | 9.25 (CI 8.43-10.06) | 73 (73.7%) |  | 78 (78.8%) |  |
| **Family history of any mental disorder** | Yes | 18.44 (CI 14.47-22.42) | .237 | 9.74 (CI 8.34-11.13) | .254 | 26 (76.5%) | .400 | 28 (82.4%) | .381 |
|  | No | 15.96 (CI 13.63-18.28) | 8.96 (CI 8.01-9.91) | 51 (71.8%) |  | 55 (77.5%) |  |
| **History of bullying at school** | Yes | 19.80 (CI 17.26-22.35) | **<.001** | 10.70 (CI 9.84-11.55) | **<.001** | 50 (89.3%) | **<.001** | 52 (92.9%) | **<.001** |
| No | 13.04 (CI 10.15-15.93) | 7.46 (CI 6.29-8.63) | 28 (56.0%) |  | 32 (64.0%) |  |
| **History of emotional violence at home** | Yes | 20.12 (CI 16.76-23.48) | **.013** | 10.68 (CI 9.62-11.73) | **.011** | 30 (88.2%) | **.014** | 31 (91.2%) | **.030** |
| No | 14.96 (CI 12.53-17.39) | 8.46 (CI 7.47-9.44) | 48 (66.7%) |  | 53 (73.6%) |  |
| **Self-harming behaviour** | Yes | 21.38 (CI 18.76-24.00) | **<.001** | 11.04 (CI 10.18-11.90) | **<.001** | 47 (94.0%) | **<.001** | 48 (96.0%) | **<.001** |
| No | 12.31 (CI 9.73-14.89) | 7.49 (CI 6.40-8.59) | 30 (54.5%) |  | 35 (63.6%) |  |