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Environmental and psychopathological predictors of clinical high-risk of psychosis in adolescence

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Abstract

Objectives: Clinical high-risk of psychosis (CHRp) samples can be heterogeneous, consisting essentially of people with not only psychotic-like experiences but also nonspecific symptoms that may reflect common mental disorders such as depression, anxiety, or substance abuse pathologies. Few studies have attempted to analyze and understand psychosis risk in relation to both environmental (ER) and psychopathological risk (PsR) factors. This study aimed to determine the clinical risk of psychosis in adolescents.

Methods: A representative sample of 1824 Spanish adolescents from the general population was evaluated using different scales to thoroughly examine the possible interaction of CHRp with various ER and PsR factors. Partial correlations were calculated to assess the relationships between the variables. A series of hierarchical linear regression models were then used to obtain a CHRp predictor model.

Results: The CHRp predictor model indicated that PsR was the most significant determining factor, explaining 22% of the total associated variance of CHRp. However, the ER factor also emerged as a significant predictor of high-risk psychosis (accounting for 9% of the variance).

Conclusions: A predictive model for CHRp in adolescents was found, in which common psychological problems were presented as more determinant risk factors than ER disruptors. Furthermore, certain transdiagnostic processes, such as psychological inflexibility, may play a central role in the development of mental health problems, including psychosis. Specifying the mechanisms underlying the emergence of CHRp in adolescence is the key to optimizing the focus of preventive therapeutic interventions in these early stages.

KEYWORDS

adolescence, environmental influences, psychosis, risk factors, symptomatology

1 | INTRODUCTION

Early detection of the risk of transition to psychosis in young people may be an appropriate preventive action to tackle the risk of developing psychosis. Therefore, a systematic procedure for the early, effective, and accurate detection of clinical high-risk psychosis (CHRp) in educational settings was developed for implementing initial preventive measures (Paino et al., 2022). It comprises an online assessment system and a three-track algorithm that integrates symptoms from the main high-risk approaches—ultra-high risk (UHR), basic symptoms (BS), and anomalous self-experiences (ASE)—and combines them with the presence of global functioning (GF) deficits.

However, according to the model of psychosis propensity, persistence, and deterioration (Van Os & Guloksuz, 2017), the definition of CHRp in the early stages also requires the interaction of multiple risk factors, such as environmental (ER) factors (Davis et al., 2016). These include the following: (a) *early traumatic experiences* (Loewy et al., 2011; Villagrá Lanza et al.,2019): a recent meta-analysis corroborated that childhood trauma has an estimated 33% attributable risk for psychosis, even after controlling for potential confounding variables (Kraan et al., 2015), and a greater presence of early traumatic experiences has been reported by patients with psychosis in comparison with nonclinical populations (Paino et al., 2020); (b) *academic performance problems*: recent research showed a link between poor school performance and CHRp; that is, a meta-analysis involving more than four million individuals revealed that by age 16, those who later developed schizophrenia had poorer academic and mathematics achievement (Dickson et al., 2020); (c) *migration*: CHRp was 1.5–3 times higher in migrant populations (Morgan et al., 2019), and the cumulative effects of social disadvantage during and after migration were associated with increased odds of psychosis (Tarricone et al., 2021); and (d) *low socioeconomic status*: a longitudinal study in Denmark (Hakulinen et al., 2019) involving a cohort of over 1 million participants showed an association between prolonged low-income circumstances and an increased risk of developing psychosis, with a 4.1% higher risk of being diagnosed with schizophrenia by age 37 years among individuals from families in the lowest income quintile at age 15; moreover, it appears that only children from families experiencing prolonged and persistent joblessness elevate CHRp (Cordero, 2024), linking the effects of poverty on interacting biological systems underlying child development (Jensen et al., 2017).

However, a review of other studies indicated that CHRp samples may consist essentially of people with nonspecific psychological symptoms that may reflect common mental disorders such as depression, anxiety, and cannabis use, as well as psychotic-like experiences (PLEs) per se (Schultze-Lutter et al., 2018). Diffuse symptom

patterns in the early stages of psychosis should be addressed using a broader transdiagnostic approach to refine the definition of CHRp and open avenues for preventive interventions. These nonspecific symptoms (hereafter, "psychopathological risks" [PsR]) include (a) *depression*: high rates of depression (28.6%) have been found in patients with psychotic disorders (Li et al., 2020), and in adolescence, PLEs and CHRp appeared to be strongly related to depressive symptomatology (Fonseca-Pedrero et al., 2011; Zavos et al., 2016); (b) *anxiety*: a clear association has been observed between anxiety and CHRp, for example, in a sample of help-seeking teenagers, Granö et al. (2014) found that the total anxiety score was higher for those in the at-risk group for psychosis (mean 8.33 vs. 13.34, $p = .000$); in some cases it is defined as a fundamental dimension for the psychosis continuum, with anxiety acting as a mediator between PLEs and social functioning in the general population (Deng et al., 2020); (c) *stress*: greater stress sensitivity was associated with increased odds for psychotic experiences and this association was consistent and significant across nearly every country studied, translating into a difference in psychotic experiences prevalence ranging from 6.4% among those with the lowest levels of stress sensitivity to 22.2% among those with the highest levels (DeVylder et al., 2016); moreover, stressful events that exceed a person's coping capacity may promote psychobiological changes facilitating the expression of psychotic symptoms (Nuechterlein & Dawson, 1984); and (d) *cannabis use*: individuals exposed to cannabis during adolescence are 2–4 times more likely to develop a schizophrenia spectrum disorder in adulthood (Hall & Degenhardt, 2000); specifically, cannabis use was shown to advance the first psychotic experience, increase the likelihood of later psychotic experiences, and was associated with greater persistence of these experiences (Large et al., 2011). Moreover, psychological inflexibility (PI) may play a key role in the predisposition and development of psychosis. PI has been often proposed as a mediator of psychopathological processes (Mellick et al., 2019), as it refers to an individual's tendency to suppress or change the form and frequency of undesirable private events, such as emotions, thoughts, behaviors, or bodily sensations, to cope with and regulate rising negative emotions (Hayes et al., 1996). Previous studies showed a relationship between PI and symptoms of psychosis, especially as a predictor of paranoia (Udachina et al., 2009); furthermore, people with PI were more likely to experience delusions in response to stressful situations (Goldstone et al., 2011).

Currently, the mechanism underlying the association between nonspecific symptoms or ER variables and CHRp is unclear (McGrath et al., 2016). Therefore, the main goal of this study was to refine the definition of CHRp in adolescence by analyzing the risk of psychosis in relation to various ER and PsR factors in a representative sample of adolescents. To the best of our knowledge, this is the first study to analyze and understand CHRp in relation to many ER and PsR factors that also occur in adolescence. Specifying the mechanisms in the emergence of CHRp during adolescence is key to optimizing the focus of preventive therapeutic interventions. At this early stage, interventions can be established to positively impact individuals' long-term development.

2 | MATERIALS AND METHODS

2.1 | Participants

The initial sample consisted of 1824 adolescents from northern Spain, selected using stratification clusters and probability sampling procedures, with the classroom as the sampling unit, from a population of 32,000 students. The sample was representative of the education models in the country (public and privately subsidized) and secondary school levels (middle school, high school, and vocational training). Gender distribution indicated a slightly higher percentage of girls in the sample (981; 53.81%). Students' ages ranged from 14 to 19 years (mean = 15.79, standard deviation = 1.25). Nationality was used as a proxy for migration status. Although this approach is not free of possible errors, it was considered appropriate based on previous studies (Cantor-Graae & Pedersen, 2013) and the Spanish legislation on dual nationality.

2.2 | Measures

To classify CHRp in our database, we used a previously developed three-track algorithm (Paino et al., 2022) that integrates symptoms of the main risk approaches—UHR (Yung & Mcgorry, 1996), BS (Huber & Gross, 1989), and ASE (Koren et al., 2020)—and combines them with the presence of GF deficits. The algorithm was developed based on the selection of valid and brief instruments specifically developed for the evaluation of UHR, BS, and ASE: (1) the *Oviedo Schizotypy Assessment*-Abbreviated (ESQUIZO-Q-A; Fonseca-Pedrero et al., 2010) and *Prodromal Questionnaire-Brief Version* (PQ-B; Loewy et al., 2011) for UHR measurement; (2) the *Frankfurt-Pamplona Subjective Experience Scale* (EEFP; Cuesta et al., 1995) for BS measurement; and (3) the *Self-Experience Lifetime Frequency Scale* (SELF; Heering et al., 2016) for ASE. For GF, the *Global Functioning: Social and Role* (GF: Social & Role; Cornblatt et al., 2007) was used. The algorithm consists of a combination of the cutoff points of the original scales or weighted scores based on extreme values. A score of 0 (low risk) on all three risk indicators (*UHR*, SB, and *ASE)* was considered *low CHRp*, a score of 1 (moderate risk) for any of the three indicators as *medium CHRp*, and a score of 2 (high risk) for any of the three indicators as *high CHRp*.

Algorithm FORMULA :

(T1 ≈ UHR + low GF) OR (T2 ≈ BS + low GF) OR (T3 ≈ ASE + low GF) = CHRp (2/1/0)

Note: T1 = Track 1; T2 = Track 2; T3 = Track 3; (CHRp (2/1/0) = psychosis risk levels (2 = high risk; 1 = moderate risk; 0 = low risk)

The *Traumatic Experiences Screening Questionnaire* (*ExpTra-S*; Paino et al., 2020) is a brief, simple, and useful instrument for assessing early traumatic experiences usually found during childhood in patients with severe mental disorders. The *ExpTra-S* consists of a frequency scale and a distress scale, both consisting of 18 Likert-formatted items in four categories (0 = "never," 1 = "sometimes," 2 = "frequently," 3 = "almost always"). The questions cover different types of child abuse, namely sexual abuse, physical and psychological abuse, and physical and emotional neglect, with the last item added for any *other type of traumatic event*. The reliability estimation yielded an internal consistency value of 0.96.

The *Family Affluence Scale* (*FAS-II*; Boyce et al., 2006) is an indicator of family socioeconomic status based on four items, and classifies it into eight categories, 0 being the lowest and 7 the highest. It offers a correlation of 0.87 with the *Gross Domestic Product* of the country and an adequate Kappa index of validity (0.57; Boyce et al., 2006). An indicator of *academic performance* was added to this measure, which was assessed by the following question: *What was your average mark last year?* with a Likert scale from 0 to 4 for *Fail*, *Pass*, *Good*, *About average*, and *Outstanding*.

The *Depression, Anxiety and Stress Scale-21* (*DASS-21*; Lovibond & Lovibond, 1995) includes three scales for emotional symptoms (stress, anxiety, and depression). The scale has been validated in Spanish (López et al., 2005) with adequate reliability (Cronbach's α = 0.91). It consists of 21 items with 7 per subscale. Responses were collected on a Likert scale ranging from 0 (*Did not apply to me at all*) to 3 (*Applied to me very much, or most of the time*). The scale correction also provided ranges of scores for the severity levels of the three types of symptoms.

The *Alcohol, Smoking, and Substance Involvement Screening Test* (*ASSIST*; Ali et al., 2002) was developed by the WHO ASSIST Working Group and is used to detect drug use. The ASSIST assesses the frequency of substance use in the 3 months preceding the completion of the questionnaire, with kappa coefficients across the items for each substance ranging from 0.61 to 0.78. This study employed an abbreviated modification of two items of the ASSIST 3.0, previously validated with Spanish youngsters (Fonseca-Pedrero et al., 2016; Soto Brandt et al., 2014). The Spanish version has high internal consistency for high-risk scores, with a Cronbach's α coefficient of .93 (Rubio Valladolid et al., 2014).

The *Acceptance and Action Questionnaire* (*AAQ-II*; Bond et al., 2011) assesses PI and has been validated with a Spanish population (Ruiz et al., 2013) with good reliability (Cronbach's α = .88). Data were collected on seven items

rated on a 7-point Likert scale that reflects the degree to which the person tries to avoid unwanted thoughts and emotions. Higher scores indicate a greater degree of PI. According to the authors, the average scores of participants without clinical problems were usually between 18 and 23 points, and the average scores of clinical participants were higher than 29-points.

The *Oviedo Infrequency Scale (INF-OV*; Fonseca-Pedrero et al., 2010) detects participants' random or dishonest responses. It is a self-report instrument composed of 12 items rated on a Likert scale. Participants with more than two incorrect responses to the INF-OV were excluded. This instrument has been used in previous studies (Fonseca-Pedrero et al., 2010; Paino et al., 2022).

2.3 | Procedure

Thirty-seven of the contacted schools agreed to participate in the study. Online questionnaires were administered via a computer or tablet by the school class, with three researchers in charge. Adolescents were informed in writing and orally about the voluntary nature of their participation and confidentiality of their answers. Written parental consent was obtained for all minors. No compensation was provided for participation in the study. This study was approved by the local Ethics Committee of the Clinical Research (see Ethical approval).

2.4 | Data analysis

First, we eliminated participants with incomplete data (missing values) using the listwise method (in all cases, the loss was owing to the telematic download of data and represented a very small percentage of the total sample). Descriptive statistical analyses were performed on a sample of nonclinical adolescents.

Second, the correlations between the analyzed variables were calculated using Spearman's coefficients given the categorical nature of the CHRp variable. The multiple tests performed in this part of the study increased the probability of false positives (type I errors). As shown in the *Supporting Information table for online publication only*, the statistical significance thresholds found for the most decisive variables in our study ($p < .001$) avoided the need to apply Bonferroni correction and the corresponding increase in the probability of false negatives (type II error).

Finally, to further evaluate the accuracy of the CHRp, we attempted to determine which of the analyzed variables had the greatest predictive power for CHRp. Hierarchical linear regression calculations using JASP software (JASP software version 0.16.1; JASP Team, 2020) were performed separately for ER and PsR factors. In each multiple regression analysis, the potential of each variable to predict the dependent variable, CHRp, was determined separately. The variables were entered in the order of their correlation coefficients, and in the case of equality in absolute values between two variables (migration and academic performance), the two possibilities were tested and ordered according to the highest predictive value for CHRp. The two variables analyzed for trauma (frequency and distress) were considered a single variable when calculating the regression, given the high correlation between them ($r = 0.88$).

3 | RESULTS

3.1 | Descriptive statistics

Based on the algorithm for identifying CHRp, 29.12% ($n = 516$) of the adolescents presented a moderate-to-high risk of psychosis.

The participant-reported ER and PsR rates are summarized in the *Supporting Information table for online publication only*. Regarding ER factors, 789 (51.27%) adolescents indicated that they had suffered previous trauma, and 606 (39.63%) reported that trauma caused high discomfort. Further, 76 (4.88%) reported poor academic performances. Ninety-two (6.13%) adolescents were foreigners. Finally, 44 (2.84%) families had low socioeconomic status.

PsR rates indicate that a total of 312 (17.61%), 442 (24.90%), and 276 (15.59%) participants had high levels of depression, anxiety, and stress, respectively. Fifty (10.48%) participants had used cannabis in the last month (including weekly and daily use). Finally, more than 20% ($n = 359$) of participants had PI scores within the clinical population range.

3.2 | Relationship of CHRp with ER and PsR factors

The results (Table 1) showed statistically significant correlations ($p < .001$) between the CHRp and all ER factors analyzed. Positive correlations were found between CHRp and trauma; specifically, the highest correlation was with trauma frequency ($r = 0.25$, $p < .001$). There was also a significant positive correlation between CHRp and migration. Furthermore, negative correlations were found between CHRp, academic performance, and social status.

Meanwhile, PsR, nonspecific symptoms of depression, anxiety, stress, and PI were positively correlated ($p < .01$) with CHRp, but no statistically significant correlation between CHRp and cannabis use was found (see Table 1).

3.3 | Environmental disruptors as predictors of CHRp

Multiple hierarchical regression analysis was conducted to determine the ER that best predicted CHRp in adolescents. Table 2 shows that the variables entered the regression equation that explained CHRp were trauma, academic performance, migration, and socioeconomic status. CHRp predictor Model 1, including the trauma variable, explained 6.6% of the variance in CHRp ($R^2 = 0.066$). The addition of academic performance (Model 2), migration (Model 3), and socioeconomic status (Model 4) variables improved the fit by a small value (3%) (R^2 change model 2 + 3 + 4 = 0.026). The final model with the four variables was statistically significant (F change model 4 = 37.42, $p < .001$) and predicted an increase in CHRp with increasing presence of trauma ($\beta = .24$, $p < .001$), decreased academic performance ($\beta = -.09$, $p < .001$), migration ($\beta = .08$, $p = .001$), and decreasing socioeconomic status ($\beta = -.08$, $p = .003$).

3.4 | Psychopathological symptoms and processes as predictors of CHRp

The results of the multiple hierarchical regression calculations for PsR are presented in Table 3. The CHRp predictor model, including only PI, explained 19% (R^2 model 1 = 0.187) of the variance, and depression (Model 2) and anxiety (Model 3) variables improved the fit by a small value (3%) (R^2 change model 2 + 3 = 0.032). The final CHRp predictor model was significant (F-change model 3 = 162.05, $p < .001$) for only three variables: PI, depression, and anxiety. In all three cases, an increase in symptomatology produced an increase in the CHRp in adolescents. The stress and cannabis use variables were not included in the final predictor model due to their lack of CHRp prediction power (Table 3).

TABLE 1 Correlations between CHRp[a] and environmental and psychopathological risk factors.

	Environmental risks					Psychopathological risks				
	2	3	4	5	6	7	8	9	10	11
1. CHRp[a]	0.25***	0.22***	−0.12***	0.12***	−0.10***	0.41***	0.40***	0.38***	0.07	0.42***
2. Trauma f	1	0.88***	−0.09***	0.02	−0.04	0.38***	0.38***	0.38***	0.14***	0.47***
3. Trauma d		1	−0.05	−0.01	−0.03	0.35***	0.34***	0.36***	0.14***	0.48***
4. Academic p			1	−0.11***	0.25***	−0.18***	−0.12***	−0.05	−0.18***	−0.04
5. Migration				1	−0.21***	−0.06	0.06	0.10***	−0.06	0.06
6. Socioeconomic s					1	−0.10***	−0.07***	−0.03	−0.01	−0.05
7. Depression[b]						1	0.77***	0.77***	0.13***	0.70***
8. Anxiety[b]							1	0.70***	0.10***	0.60***
9. Stress[b]								1	0.11***	0.66***
10. Cannabis use									1	0.14***
11. PI[c]										1

Abbreviations: d, distress; f, frequency; p, performance; PI, psychological inflexibility. s, status.

***$p < 0.001$;

[a]Clinical high-risk of psychosis;

[b]Symptoms of depression, anxiety and stress Scale-21 items (DASS-21);

[c]Acceptance and Action Questionnaire (AAQ-II).

TABLE 2 Hierarchical regression for environmental risks predicting CHRp.

Model	Predictors	R^2	R^2 change	F change	β	t
1	Trauma[a]	0.066	0.066	104.35***	.26***	10.22
2	Trauma[a]	0.078	0.012	62.88***	.24***	9.67
	Academic p				−.11***	−4.51
3	Trauma	0.087	0.009	47.29***	.24***	9.68
	Academic p				−.11***	−4.23
	Migration				.10***	3.86
4	Trauma	0.092	0.005	37.42***	.24***	9.45
	Academic p				−.09***	−3.37
	Migration				.08**	3.19
	Socioeconomic s[b]				−.08**	−2.95

Abbreviations: β, standardized coefficient; CHRp, clinical high-risk of psychosis; p, performance; s, status; t, predictive power.

Note: Explained variance for the final model (4): $R^2 = 0.092$, $F = 37.42$, $p < .001$.

***$p < .001$; **$p < .01$;

[a]Screening of Early Traumatic Experiences in Patients with Severe Mental Illness (ExpTra-S);

[b]Family Affluence Scale (FAS).

4 | DISCUSSION

The main objective of this study was to refine the definition of CHRp in adolescence by thoroughly examining the possible interaction with other variables that may play a predictive role, using a representative sample of 1824 Spanish adolescents from the general population.

First, the prevalence rates of CHRp, ER, and PsR were analyzed. The high CHRp rate found in our sample, close to 4%, is in line with that found in previous findings (McGrath et al., 2016). In that study, the mean prevalence of PLE was 5.8%, based on a sample of 31,261 adults from 18 countries. Surprisingly, 12% of adolescents experienced early traumatic experiences with relative frequency, and 39% described frequent discomfort associated with trauma. It is important to highlight the importance of the coping strategy employed by the adolescents; an inadequate coping of the traumatic experience will lead to greater distress in the long term (Boyda et al., 2018; Marulanda & Addington, 2014). Importantly, PI was significantly associated with stress symptoms (Meyer et al., 2018). PI has also been theorized as a handicap for people attempting to heal from past stressors and cope with new contexts (Hinton & Kirmayer, 2017). PI appears to prevent adaptive processing and functioning following traumatic experiences (Gray et al., 2021).

In relation to the presence of PsR, we observed high rates of depression, anxiety, stress, and cannabis use as well as nonspecific symptoms and signs that may reflect common mental disorders. These data are in line with the latest studies, where Spain appears to be the European country with the highest prevalence of mental health problems diagnosed among minors (Spanish Ministry of Health Ministerio de Sanidad, 2023). Regarding the lifetime prevalence of cannabis use (ever used in one's life), the values of 20.2% found in our sample and 10.48% observed for monthly use are also in line with the values of the Spanish Health 2023 Survey (Spanish Ministry of Health Ministerio de Sanidad, 2023).

These results should also be analyzed and discussed in line with the levels of PI observed in the sample. Anxiety, depression, and many other psychological disorders can be considered effects of destructive PI in

TABLE 3 Hierarchical regression for psychopathological risk factors predicting CHRp.

Model	Predictors	R^2	R^2 change	*F* change	*β*	*t*
1	PI[a]	0.187	0.187	398.04***	.43***	19.95
2	PI[a]	0.214	0.027	234.88***	.24***	7.71
	Depression[b]				.26***	8.21
3	PI[a]	0.219	0.005	162.05***	.22***	6.95
	Depression[b]				.17***	4.36
	Anxiety[b]				.13***	3.82
4	PI[a]	0.218	−0.001	120.29***	.23***	7.04
	Depression[b]				.18***	4.23
	Anxiety[b]				.15***	4.07
	Stress[b]				−.04	−1.09
5	PI[a]	0.218	0.00	95.93***	.23***	7.03
	Depression[b]				.18***	4.23
	Anxiety[b]				.15***	4.07
	Stress[b]				−.042	−1.10
	Cannabis use[c]				−.004	−0.18

Note: Explained variance for the final model (3): $R^2 = 0.219$, $F = 162.05$, $p < .001$.

Abbreviations: β, standardized coefficient; CHRp, clinical high-risk of psychosis; t, predictive power.

***$p < .001$;

[a]Acceptance and Action Questionnaire (AAQ-II);

[b]Depression, Anxiety, and Stress Scale- 21 items (DASS-21);

[c]Alcohol, Smoking, and Substance Involvement Screening Test (ASSIST 3.0).

adolescence functions as a vulnerability factor for other disorders, especially common mental disorders such as anxiety and depressive pathologies (Mellick et al., 2019).

The correlation data confirmed that higher CHRp was associated with ER risk factors. The best predictor model for CHRp included the four ER factors analyzed in the following order: trauma, academic performance, migration, and socioeconomic status. Trauma was the first ER predictor for CHRp. A recent meta-analysis found that childhood adversity and trauma increased the likelihood of psychosis by 2.8% (Varese et al., 2012).

However, regarding psychopathological symptoms, a higher CHRp correlated positively with these variables, except for cannabis use. To date, the findings of studies investigating the relationship between cannabis use in CHRp individuals and the subsequent incidence of psychosis have been inconsistent. A recent meta-analysis (Farris et al., 2020) did not find a significant difference in the risk of transition to psychosis between CHRp cannabis users and non-users, but highlighted the need to assess cannabis use in more detail. Future studies should examine the possible mediating roles of certain variables between cannabis use and the risk of psychosis in adolescents.

Regression analysis indicated that, in addition, these psychological variables (except in this case, also for stress) have a predictive value for CHRp in the following order: PI, depression, and anxiety. The high percentage of variance explained by PI (18.7%) compared to the rest of the variables, which only added 3.2%, indicates the power of this variable to predict the presence of CHRp. In the specific framework of psychosis, recent research studying and analyzing psychosis in this transdiagnostic framework has observed how different symptoms of the disorder can be considered examples of such PI. Various maladaptive regulatory strategies have been associated with

paranoia, delusions, and depersonalization (Núñez et al., 2021). Depressive and anxiety symptoms added a 3.2% fit to the predictor model. Although a clear association between CHRp and symptoms of depression and anxiety has been observed (Nelson et al., 2018), the results support the hypothesized role of PI as a transdiagnostic process that may be relevant not only for depression, anxiety, and posttraumatic stress (Akbari et al., 2022) but also for CHRp.

Overall, ER predicted only 9% of CHRp cases, compared with 22% predicted by PsR. Although it is necessary to consider the risk factors added by the socioeconomic context, in our case, PsR, which may be at the root of common mental disorders, was the most decisive. It is worth noting that stress did not appear as a predictor in the hierarchical regression model, and the correlation observed with cannabis use was not significant. These results demonstrate the central role of certain transdiagnostic processes, such as PI, in the development of mental health problems including psychosis, and underscore the importance of further investigation of variables that may mediate or moderate the relationship between PI and CHRp.

The present study had some limitations. First, sociodemographic, and clinical indicators were measured from self-reports, with limitations accompanying these instruments (possible lack of understanding of the items or response bias). Second, the sample corresponds to a single autonomous community (Principality de Asturias), and although selected by stratified random sampling through clusters, it limits the generalization of the results to the entire Spanish population. Third, the statistical analysis performed did not allow the establishment of causality between the variables studied. A longitudinal study to assess the evolution of adolescents with CHRp would help specify the relationship between variables. Fourth, the predictive model presented should be interpreted with caution, given the lack of consideration of other possible moderating or mediating variables and contextual factors, such as social isolation, stigma, family relationships, and attachment styles, that also influence the progression of the pathology (González-Menéndez et al., 2021). Nevertheless, a large percentage of the psychopathology encountered is likely due to ER factors, in which case these nonspecific symptoms and psychological processes may act as mediators of ER risk. Future studies that include these contextual factors in the model, as well as the study of the mediating effect of the variables, will shed light on the complex mechanisms of schizophrenia development. Fifth, the correlations observed among academic performance, migration, and social status ($r < 0.2$) were low, although significant. Finally, it is possible that the assignment of the migration variable from student nationality data does not correctly define the migration status of adolescents.

5 | CONCLUSIONS

Our results show the specific contributions of psychopathological and ER factors in predicting a high clinical risk of psychosis in adolescents. The CHRp predictor model indicated that PsR factors were the most significant determinants of a higher risk of psychosis (accounting for 22% of the variance), while ER factors also emerged as a significant predictor (accounting for 9% of the variance). These findings have preventive implications for the treatment of adolescents with CHRp. Understanding ER associated with psychotic spectrum disorders is key to improving the focus of therapeutic interventions. Reducing ER faced by children (trauma, low socioeconomic status, low academic achievement, and migration) is an appropriate preventive target to reduce adolescent CHRp. Therefore, efforts should be made to develop appropriate psychosocial interventions. Moreover, the strong predictive value of common psychological problems guides future treatment focusing on emotional symptoms and enhances psychological flexibility using a transdiagnostic approach.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

ETHICS STATEMENT

This study was approved by the local Ethics Committee of Clinical Research of Cantabria (IDIVAL) on October 28, 2016 (reference number: 17/2016). Adolescents or their parents were informed in writing and orally regarding the voluntary nature of participation and confidentiality of their answers. No compensation was provided for participation in the study.

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PEER REVIEW

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