Original Paper

Characterization of Psychopathology in Latin American Adolescents Using a Web-Based Screening Tool: Cross-Sectional Study

Susana Campos[1,2], MSc; Daniel Nuñez[2,3,4], PhD; J Carola Pérez[5], PhD; Jo Robinson[6,7], PhD

[1]Center of Applied Psychology, Faculty of Psychology, University of Talca, campus Talca, Talca, Chile

[2]Millennium Nucleus to Improve the Mental Health of Adolescents and Youths (Imhay), Santiago, Chile

[3]Center of Cognitive Sciences, Faculty of Psychology, University of Talca, Talca, Chile

[4]Faculty of Psychology, University of Talca, Campus Talca, Talca, Chile

[5]Instituto de Bienestar Socioemocional, Facultad de Psicología, Universidad del Desarrollo, Santiago, Chile

[6]Orygen, Parkville, Victoria, Australia

[7]Centre for Youth Mental Health, The University of Melbourne, Parkville, Victoria, Australia

Corresponding Author:
Daniel Nuñez, PhD
Center of Cognitive Sciences
Faculty of Psychology
University of Talca
Avenida Lircay s/n
Talca, 3460000
Chile
Phone: 56 712201782
Email: dnunez@utalca.cl

Abstract

Background: Mental health problems and suicide ideation are common in adolescents. Early detection of these issues could prevent the escalation of mental health–related symptoms in the long term. Moreover, characterizing different profiles of prevalent symptoms in conjunction with emotional regulation strategies could guide the design of specific interventions. The use of web-based screening (WBS) tools has been regarded as a suitable strategy to timely detect symptomatology while improving the appeal, cost, timeliness, and reach of detection in young populations. However, the evidence regarding the accuracy of these approaches is not fully conclusive.

Objective: The study aims (1) to examine the capability of a WBS to identify adolescents with psychiatric symptoms and suicidality and (2) to characterize the mental health profiles of a large sample of adolescents using WBS.

Methods: A total of 1599 Latin American Spanish-speaking adolescents (mean age 15.56, SD 1.34 years), consisting of 47.3% (n=753) female, 98.5% Chilean (n=1570), and 1.5% Venezuelan (n=24) participants, responded to a mental health WBS. A randomized subsample of participants also responded to the Mini International Neuropsychiatric Interview for Children and Adolescents (MINI-KID). McNemar χ^2 and receiver-operating characteristic curves tested the detection accuracy of WBS contrasted with the MINI-KID. Latent profile analyses explored the symptomatic and emotional regulation profiles of participants.

Results: Both measures showed an adequate level of agreement (area under the curve per symptom domain ranging from 0.70 to 0.89); however, WBS yielded a higher prevalence than MINI-KID for all psychiatric symptoms, except suicide ideation and depression. Latent profile analyses yielded 4 profiles—one of them presented elevated psychopathological symptoms, constituting 11% of the sample (n=175). Rumination (odds ratio [OR] 130.15, 95% CI 51.75-439.89; *P*<.001), entrapment (OR 96.35, 95% CI 29.21-317.79; *P*<.001), and defeat (OR 156.79, 95% CI 50.45-487.23; *P*<.001) contributed significantly to the prediction of latent profile memberships, while cognitive reappraisal did not contribute to the prediction of any latent profile memberships, and expressive suppression was only associated to profile-2 membership.

Conclusions: WBS is acceptable for the timely detection of adolescents at risk of mental health conditions. Findings from the symptomatic and emotional regulation profiles highlight the need for comprehensive assessments and differential interventions.

Introduction

Mental disorders and suicidal-related behaviors (SRBs) are prevalent in adolescents [1,2] and represent a major global health burden [3]. Developing and reinforcing evidence-based preventive approaches to actively identify this phenomenon in adolescents is a well-recognized need, as it could lead to timely interventions [4,5]. This is particularly relevant for adolescents from Latin American countries, where the gaps for mental health treatment are very high [6] and SRBs are one of the greatest health concerns [7,8]. Barriers to accessing mental health support, combined with a preference for self-reliance when experiencing psychological and emotional problems [9], may lead youth to search for alternatives to more traditional means of obtaining care, such as digital support or information concerning their mental health state [10].

Moreover, a relevant proportion of school-aged youth face mental health problems that go undetected [11]. Digital screening technologies could help overcome this obstacle, as they are currently regarded as suitable for assessing a broad range of psychopathological variables while improving the appeal, cost, timeliness, and reach of detection programs and preventive strategies [12-14]. Overall, digital mental health screening approaches have been reported as a preferred method for self-disclosure, which has been well-received among young people [15]. Some web-based screening (WBS) tools for mental health symptoms and SRBs have been recently and successfully developed for different populations [16], such as individuals in community settings [17], youth in emergency departments [18], university students [19], and school-aged Latin American youth [17].

Moreover, digital approaches seem to be promising for the implementation of current tools of psychological risk stratification that guide decision-making for care pathways, such as the clinical staging model [20]. This model uses a transdiagnostic perspective that allows for the comprehension of the interrelation existent between psychopathology [21], suicidality [22], and other mechanisms (ie, emotional regulation strategies). Accordingly, this approach suggests that the assessment of a broad range of clinical and subclinical symptoms, along with other individual factors, is helpful in identifying different symptomatic profiles in young people and ultimately improves early detection and intervention strategies [23]. One of the statistical techniques suitable to integrate this perspective is latent profile analysis (LPA), a latent variable modeling approach [24,25] that allows for classifications of individuals into latent subgroups based on their scoring patterns on a range of manifest variables.

In this context and based on literature encouraging the use of digital technology to improve the screening for mental disorders and suicide ideation (SI) [19], we examined the capability of a

WBS to identify adolescents and school-aged youth with high levels of psychiatric symptoms and SI. We expected to find that the WBS detects a similar proportion of at-risk individuals compared to a standardized clinical interview. Subsequently, we conducted an LPA to characterize the mental health profiles of a large sample of adolescents using WBS. We hypothesized that a small percentage of adolescents could display a profile characterized by severe psychiatric symptomatology and SI. Additionally, we explored whether emotional regulation strategies could predict the adscription to the identified symptomatologic profiles. We hypothesized that adolescents with higher levels of symptoms could mostly use emotional regulation strategies associated with experiences of psychological distress (eg, rumination, emotional suppression, defeat, and entrapment) than adolescents with lower or without symptoms who use adaptive strategies (eg, cognitive reappraisal).

Methods

Participants

We conducted a cross-sectional study with 1599 Latin American adolescents recruited between April and September 2019 in 11 urban public secondary schools in Chile. The inclusion criteria were that the students and their caregivers voluntarily agreed to participate in the study and signed written informed consent. We excluded 5 individuals who wrongly defined their ages (out of the range of 12-19 years). We performed the analyses with a final sample of 1594 adolescents (mean age 15.56, SD 1.34 years), where 47.3% (n=753) was female. Of the total sample, 98.5% was Chilean (n=1570), and 1.5% Venezuelan (n=24).

Measures

SI Measurement

We used 7 items of the Columbia-Suicide Severity Rating Scale [26], adapted as a self-report questionnaire in the Chilean population [27]. The severity of lifetime SI was rated on a 7-item binary scale (1=yes and 0=no). All items were added to obtain a total score. Adolescents who denied ideation received a score of 0. Scores of 3 and over were deemed as "at-risk." The internal consistency of SI was good for the current population (Cronbach α=0.88; McDonald ω=0.90).

Criteria and Severity of Depressive Disorder and Symptoms

We used the Patient Health Questionnaire [28] for adolescents [29]. It uses a 4-point scale ranging from 0=not at all to 3=nearly every day. Overall scale scores are computed as a sum of the 9 items (possible range 0-27). Scores can be divided into 5 severity categories: none, mild, moderate, moderately severe, and severe [30]. This scale was adapted to Chilean adolescents [31]. In our sample, its reliability was good (α=0.89; ω=0.90).

Criteria and Severity of Generalized Anxiety Disorder and Symptoms

We used the Generalized Anxiety Disorder-7 (GAD-7) [32], a 7-item self-report questionnaire where respondents indicate how often they have been bothered by 7 core symptoms of the generalized anxiety disorder. The answers are rated on a 4-point scale as 0=not at all, 1=several days, 2=more than half the days, and 3=nearly every day. GAD-7 sum scores range from 0 to 21. The cutoff for moderate anxiety is 10 points, and 15 or more points represent severe anxiety symptoms (ASs). This scale was validated in the Chilean population [33]. In our sample, its reliability was excellent (α=0.93; ω=0.93).

Psychotic Experiences

We addressed psychotic experiences (PE) with the Chilean adaptation of the Community Assessment of Psychic Experiences-Positive [34,35]. Responses to the 15 items range from 1=never to 5=nearly always and are summed to obtain a total score. The Community Assessment of Psychic Experiences-Positive addresses paranoid ideation (5 items), bizarre experiences (7 items), and perceptual abnormalities (3 items). The reliability in our sample was excellent for the complete measure (α=0.901; ω=0.903) and good for its subscales (paranoid ideation: α=0.917; ω=0.92; bizarre experiences: α=0.846; ω=0.853; and perceptual abnormalities: α=0.795; ω=0.815).

Posttraumatic Stress Disorder

The brief posttraumatic stress disorder (PTSD) scale, Chilean adaptation [36] is a list of PTSD symptoms (5 items) and complex PTSD symptoms (3 items). The measure format is a 5-point Likert scale (1=never to 5=very often). The total score is estimated by adding the score obtained in each item. In our sample, its reliability was excellent (α=0.921; ω=0.922).

Mini International Neuropsychiatric Interview for Children and Adolescents

The Mini International Neuropsychiatric Interview for Children and Adolescents (MINI-KID) version 6.0 in Spanish [37] is a short structured diagnostic interview for people aged 4-17 years. We assessed the presence of the 24 specific *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition* child and adolescent psychiatric disorders it encompasses, as well as the suicide risk. The interview was led and coded by trained psychologists, who were blind to the results of the WBS at this stage.

Procedure

We first developed a web-based platform for screening purposes. This WBS allows the programming of questionnaires, defines custom cutoff points for each, and identifies those users who are above the cutoff points as being at risk. All public schools in the central Maule region that had secondary education were invited to participate, and 11 agreed. Once written informed consent was obtained from students and their caregivers, participants completed a series of self-administered questionnaires included in the WBS on desktops in their school laboratories, while under the supervision of trained psychologists. Based on WBS alerts, psychologists conducted feedback interviews with adolescents showing high SI and their caregivers within 48 hours after the detection. The purpose was to assess the current risk, to alert caregivers, and to offer psychological intervention where appropriate. These participants were referred to primary care centers, where a protocol for managing SI defined by the Chilean Ministry of Health was applied when possible. To expedite the mental health referrals, 5 primary care health centers were contacted and agreed to participate in the study, providing psychotherapy to the adolescents identified as being at risk. Additionally, in a simple random subsample of 217 students, we assessed psychiatric symptoms through the MINI-KID within a month after the completion of the WBS. A computer-based number randomization was used to establish this subsample, through simple random sampling.

Data Analysis

Descriptive statistics were calculated, followed by an assessment of the agreement between the WBS and the MINI-KID, comparing respective prevalences using the McNemar χ^2. Additionally, we used a series of receiver-operating characteristic curves. Specifically, we tested agreement on SI, depressive symptoms (DS), PTSD, AS, and PE. Area under the curve (AUC) values were categorized as slight (0.50-0.59), fair (0.6-0.69), moderate (0.7-0.79), substantial (0.8-0.89), and almost perfect (>0.9) [38]. All analyses were run with SPSS (version 18, IBM Corporation).

The identification of profiles was performed through LPA. In LPA, 2 sets of parameters are of interest: (1) latent profile membership probabilities (ie, prevalence) that describe the distribution of profiles and (2) item-response means (and variances) that provide profile-specific means (and variances) based on symptomatology. Item-response means are used to interpret and label the profiles.

The model was estimated by the maximum likelihood restricted method using Mplus (version 8.6; Muthén & Muthén) [39]; estimation and model identification for all LPA models were checked using 1000 initial stage starts and 250 final stage starts. An assessment of solutions consisting of 1 to 7 profiles was performed considering indicators of model fit and interpretability of the clustering solution [40,41]. Theoretical and clinical interpretations were emphasized in the model selection because it is common in LPA that model fit indices continue to decrease as additional profiles are added [42]. Model fit indicators used were the Akaike information criterion [43], Bayesian information criterion [44], and sample size–adjusted Bayesian information criterion [45], on which lower values indicate better relative fit [46]. Additionally, the Lo-Mendell-Rubin adjusted likelihood ratio test and Vuong-Lo-Mendell-Rubin likelihood ratio test [47] were used to compare models that differ in the number of classes by indicating that the model with K − 1 classes should be rejected in favor of the model with K classes [48]. Entropy is reported as further evidence for profile selection, with 0.80 or greater providing evidence that profiles occur with minimal uncertainty [49,50]. A post hoc power analysis using Monte Carlo simulation was done. Following recommendations, 10,000 replications were estimated [51].

Between-profile differences on the continuous indicators based on posterior probabilities were investigated using a multivariate analysis of variance. Significant univariate effects were probed further using the Games-Howell post hoc test, which is robust to heterogeneity in the variance-covariance matrix.

Last, to explore whether emotional regulation strategies could predict the ascription to the previously identified symptomatologic profiles, multinomial logistic regression identified the profile membership on emotion regulation strategies (Multimedia Appendix 1).

Ethical Considerations

This study and all associated documents were approved by the scientific ethics committee of the University of Talca (40.001.103-0; July 7, 2020), complying with American Psychological Association ethical standards in the treatment of the sample. Written informed consent was obtained from all participants and their legal guardians. This document emphasized the voluntary nature of the study and their ability to opt out at any moment. The collected data were completely deidentified and stored in secure servers before the analysis process began to ensure the privacy of participant data. Participants did not receive any type of compensation for their participation in the study at any point.

Results

Sample Characterization

Table 1 shows sociodemographic data and the prevalence of symptoms. Participants deemed as "at risk" (ie, moderate or high SI) had scores of 3 points and over on the Columbia-Suicide Severity Rating Scale. Accordingly, 269 (16.9%) of the 1594 participants (170/269, 63.2% female; 97/269, 36.1% male; and 2/269, 0.7% nonbinary) comprised the at-risk group. DS and AS were the most prevalent symptoms in both the total and the at-risk samples.

Table 1. Sociodemographic data and symptomatology in the WBS[a] and MINI-KID[b] samples.

Sociodemographic data and symptomatology	WBS				Clinical interview (MINI-KID)			
	Total cohort (n=1594)		At-risk[c] cohort (n=269)		Total cohort (n=217)		At-risk[d] cohort (n=53)	
	Mean (SD)	n (%)	Mean (SD)	n (%)	Mean (SD)	n (%)	Mean (SD)	n (%)
Age (years)	15.5 (1.3)	__e	15.8 (1.3)	—	15.5 (1.2)	—	15.4 (1.3)	—
Sex (female)	—	753 (47.3)	—	170 (63.2)	—	92 (42.4)	—	32 (60.4)
Fail grade	—	336 (21.1)	—	60 (22.3)	—	46 (21.2)	—	13 (24.6)
Previous psychiatric treatment	—	36.4 (36.4)	—	177 (65.8)	—	65 (30)	—	24 (45.3)
Family configuration								
Biparental home	—	871 (54.7)	—	118 (44.2)	—	123 (57)	—	25 (47.2)
Single parent home (mother)	—	575 (36.1)	—	111 (41.3)	—	70 (32.3)	—	22 (41.5)
Living with other relatives	—	97 (6.1)	—	24 (8.9)	—	12 (5.5)	—	5 (9.4)
Foster home	—	11 (0.7)	—	2 (0.7)	—	2 (0.9)	—	0
Monthly house income								
Lesser minimum wage	—	749 (47)	—	119 (44.3)	—	109 (50.3)	—	46 (86.8)
Greater minimum wage	—	843 (52.9)	—	889 (55.8)	—	108 (49.7)	—	7 (13.2)
Drug use	—	156 (9.8)	—	29 (10.8)	—	13 (6)	—	10 (18.9)
Alcohol use	—	312 (19.6)	—	100 (37.2)	—	32 (14.8)	—	12 (22.6)
Psychiatric treatment relative	—	456 (28.6)	—	113 (42)	—	49 (22.6)	—	19 (35.8)
Suicide attempts relative	—	162 (10.2)	—	68 (25.3)	—	22 (10.1)	—	10 (18.9)
Relative committed suicide	—	124 (7.8)	—	38 (14.1)	—	16 (7.4)	—	7 (13.2)
Depression	9.4 (6.8)	465 (29.2)	15.1 (5.8)	209 (77.7)	7.7 (7.4)	45 (20.7)	15.4 (8.6)	36 (67.6)
Anxiety	8.1 (5.3)	758 (47.6)	21.1 (8.4)	203 (75.5)	6.7 (5.3)	82 (37.8)	17.2 (8.9)	26 (48.6)
Posttraumatic stress	16.5 (7.7)	377 (23.7)	25.1 (7.6)	146 (54.3)	—	42 (19.4)	21.7 (9.5)	21 (40.5)
PTSD[f]	10.9 (5.2)	—	16.3 (5.1)	—	14 (7.7)	—	14.5 (6.5)	—
Complex PTSD	6 (3)	—	9.2 (3.1)	—	5.3 (3)	—	8.2 (3.6)	—
Psychotic experiences	25 (9.1)	334 (21)	34.1 (12)	145 (53.9)	23.1(10.8)	34 (15.7)	34 (15.1)	23 (43.2)
Paranoid ideation	9.7 (3.8)	260 (16.3)	11.3 (4.1)	123 (45.7)	8.7 (4.1)	30 (13.8)	12.6 (5.7)	18 (35.1)
Bizarre experiences	11 (4.7)	145 (9.1)	12.8 (5.5)	73 (27.1)	10.3 (5.4)	19 (8.8)	15.6 (7.8)	18 (35.1)
Perceptual anomalies	4.1 (2)	70 (4.4)	4.7 (2.4)	35 (13)	4.3 (3.2)	119 (5.5)	5.9 (3.4)	13 (24.3)

[a]WBS: web-based screening.

[b]MINI-KID: Mini International Neuropsychiatric Interview for Children and Adolescents.

[c]At-risk WBS sample: participants with scores of 3 or more on Columbia-Suicide Severity Rating Scale.

[d]At-risk MINI-KID sample: participants positive for suicidality according to the MINI-KID.

[e]Not applicable.

[f]PTSD: posttraumatic stress disorder.

Agreement of Measures

Table 2 shows the symptom prevalence of the subsample of participants assessed by the WBS and the MINI-KID. McNemar tests yielded significant differences between the proportion of cases in all variables except for DS (SI: P=.03; DS: P>.99; all others: P<.001). Moreover, the WBS showed higher detection rates than the MINI-KID for all psychiatric symptoms, except for DS, where it identified a comparable number of cases, and SI, where it identified fewer cases. Moreover, we observed robust values of AUC for DS (AUC=0.818), PTSD (AUC=0.89), and PE (AUC=0.893). The AUC for SI was 0.782, and for AS, the AUC reached 0.702, which represents moderate criterion validity. Sensitivity and specificity levels for DS (86.4% and 57%, respectively), PTSD (80% and 82.9%), PE (83.3% and 78.6%), SI (73.6% and 74.4%), and AS (78.3% and 44%) were acceptable (Table S1 in Multimedia Appendix 1).

Table 2. Comparison of symptom prevalence in the subsample assessed by WBS[a] and MINI-KID[b] (n=217).

Symptoms	WBS		Clinical interview (MINI-KID)		McNemar test	
	n (%)	95% CI	n (%)	95% CI	Chi-square (df)	P value
Suicidal ideation	37 (17.1)	12.1-22.1	53 (24.4)	18.6-30.1	4.68 (1)	.03
Depression	45 (20.7)	15.2-26.1	44 (20.3)	15-25.5	000 (1)	>.99
Anxiety	57 (26.3)	20.4-32.1	23 (10.6)	6.5-14.6	20.07 (1)	<.001
Posttraumatic stress	34 (15.7)	10.8-20.5	5 (2.3)	0.3-4.2	25.29 (1)	<.001
Psychotic experiences	27 (12.4)	8-16.7	6 (2.8)	0.6-4.9	22.78 (1)	<.001

[a]WBS: web-based screening.

[b]MINI-KID: Mini International Neuropsychiatric Interview for Children and Adolescents.

Profile Analysis

Table 3 summarizes the results of the model fit statistics of LPA. The results indicate that 4- and 5-profiles solutions are plausible. The 5-profile solution outperforms the 4-profile solution according to Lo-Mendell-Rubin adjusted likelihood ratio test and Vuong-Lo-Mendell-Rubin likelihood ratio test indicators ($P<.05$), but this solution has a lower level of entropy (0.79 vs 0.81). Also, it is not recommended to include clusters with less than 5% of participants, to avoid retention of "rare" or spurious clusters [41,52]. Additionally, the most significant decrease in the other model fit indicators occurred at the 4-profiles solution.

Table 3. Model fit statistics of latent profile analysis on adolescent's symptomatology.

Model	AIC[a]	BIC[b]	SABIC[c]	Entropy	Smaller class (%)	VLMR[d]	LMR[e]
1-profile	20,863.34	20,927.83	20,889.71	__[f]	—	—	—
2-profiles	16,956.69	17,074.91	17,005.02	.91	31	<.001	<.001
3-profiles	15,902.69	16,074.66	15,973.00	.86	17	<.001	<.001
4-profiles[g]	15,581.35	15,807.05	15,673.63	.81	12	<.001	<.001
5-profiles	15,465.09	15,744.53	15,579.34	.79	5	<.05	<.05
6-profiles	15,342.05	15,657.24	15,460.28	.81	4	.14	.15
7-profiles	15,259.88	15,646.81	15,418.08	.81	2	.85	.85

[a]AIC: Akaike information criterion.

[b]BIC: Bayesian information criterion.

[c]SABIC: Sample-size adjusted Bayesian information.

[d]VLMR: Vuong-Lo-Mendell-Rubin adjusted likelihood ratio test.

[e]LMR: Lo-Mendell-Rubin adjusted likelihood ratio test.

[f]Not applicable.

[g]Latent profile analysis (LPA) model.

Description of Profiles

Profile characteristics are detailed in Table 4, Figure 1, Figure 2, and Table S2 in Multimedia Appendix 1. Multivariate analysis of variance results indicated that the 4 profiles differed significantly from one another on each of the continuous variables (Pillai trace=0.94; $F_{3,4761}$=240.50; $P<.001$). Based on these results, clusters have been characterized as follows.

Profile 1 (no symptomatology; 32% of the subsample, [n=509]) showed very low depressive, anxious, and PTSD symptomatology and low probability of presenting PEs and reporting the absence of perceptual abnormalities (none=89%), none or scarce paranoid ideation (74%), and no risk of SI.

Profile 2 (low internalizing symptomatology; 34% of the subsample, [n=541]) presented low depressive, anxious, and PTSD symptomatology. In this profile, adolescents rarely reported having paranoid ideation (76%) and bizarre experiences (86%). Moreover, adolescents of this profile presented no risk of SI.

Profile 3 (low internalizing symptomatology and moderate posttraumatic stress symptomatology; 21% of the subsample, [n=334]) displayed low levels of anxiety and depression but moderate PTSD symptoms. Additionally, only 7% had a low probability of not reporting bizarre experiences. Adolescents in this group presented a high chance of not reporting SI, although this pattern is not as clear as in clusters 1 and 2.

Profile 4 (at-risk adolescents; 11% of the subsample, [n=175]) presented moderate depression symptoms, moderate anxiety, and high levels of PTSD symptoms. Moreover, this group has the highest probability of reporting more frequent bizarre

experiences (72%) and paranoid ideation (90%). Also, adolescents of this profile have a higher probability of showing elevated SI (63%) compared to the other clusters.

The post hoc power results indicated that a minimum recommended power of 0.80 was obtained for most of the parameters estimated in the 4 profiles LPA with actual sample size, except for the bizarre experiences "sometimes (or more frequent)" category in profile 1 and profile 3.

Table 4. Profile description. Means and probabilities of latent class indicators (n=1591).

| | LPA[a] solution | | | | | | | | Grand mean | |
| | Profile 1 (32%) | | Profile 2 (34%) | | Profile 3 (21%) | | Profile 4 (11%) | | Variable | P value |
	Variable	P value	Variable	P value	Variable	P value	Variable	P value		
Symptoms of depression[b]; means comparison (probability)	0.37[c] (0.35)	<.001	0.76[d] (0.35)	<.001	1.33[e] (0.35)	<.001	2.14[f] (0.35)	<.001	0.92 (0.67)	<.001
Symptoms of anxiety[g]; means comparison (probability)	0.46[c] (0.41)	<.001	1.06[d] (0.41)	<.001	1.71[e] (0.41)	<.001	2.33[f] (0.41)	<.001	1.15 (0.75)	<.001
Symptoms of post-traumatic stress[g]; means comparison (probability)	1.31[c] (0.53)	<.001	1.94[d] (0.53)	<.001	2.85[e] (0.53)	<.001	4.07[f] (0.53)	<.001	2.18 (1.04)	<.001
SI[h]: none (≤2); categorical variables	0.99	<.001	0.93	<.001	0.67	<.001	0.37	<.001	0.83	<.001
SI: risk (≥3); categorical variables	0.00[c]	.198	0.07[d]	<.001	0.33[e]	<.001	0.63[f]	<.001	0.17	<.001
PI[i]: none and rarely; categorical variables	0.98	<.001	0.76	<.001	0.32	<.001	0.10	<.001	0.66	<.001
PI: sometimes (or more frequent); categorical variables	0.02[c]	.03	0.24[d]	<.001	0.67[e]	<.001	0.90[f]	<.001	0.34	<.001
BE[j]: none; categorical variables	0.55	<.001	0.10	<.001	0.07	<.001	0.01	.47	0.23	<.001
BE: rarely; categorical variables	0.45[c]	<.001	0.86[d]	<.001	0.61[e,f]	<.001	0.27[f]	<.001	0.60	<.001
BE: sometimes (or more frequent); categorical variables	0.00[c]	>.99	0.04[c,d]	<.001	0.32[c,e]	<.001	0.72[c,f]	<.001	0.17	<.001
PA[k]: None; categorical variables	0.89	<.001	0.52	<.001	0.42	<.001	0.29	<.001	0.59	<.001
PA: rarely; categorical variables	0.11[c]	<.001	0.42[d]	<.001	0.40[e]	<.001	0.33[f]	<.001	0.30	<.001
PA: sometimes (or more frequent); categorical variables	0.01[c]	.10	0.06[d]	<.001	0.18[e]	<.001	0.38[f]	<.001	0.11	<.001

[a]LPA: latent profile analysis.

[b]Likert scale (0=Never to 3=Nearly every day).

[c,d,e,f]Indicates statistical differences between profiles' means or odds ratio (Table S3 in Multimedia Appendix 1).

[g]Likert scale (1=Never, 5=Very often). Categories for paranoid ideation, bizarre experiences, and perceptual abnormalities: none=1; rarely=1.1 to 2; sometimes (or more frequent)=3.1 to 5.

[h]SI: suicide ideation.

[i]PI: paranoid ideation.

[j]BE: bizarre experiences.

[k]PA: perceptual abnormalities.

XSL•FO

RenderX

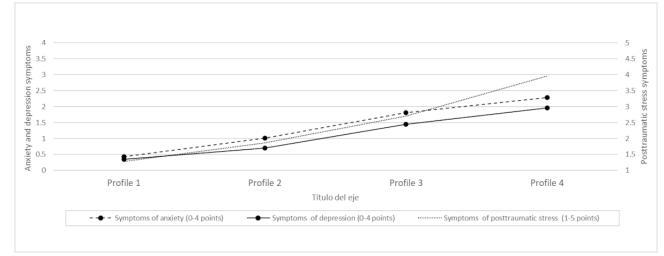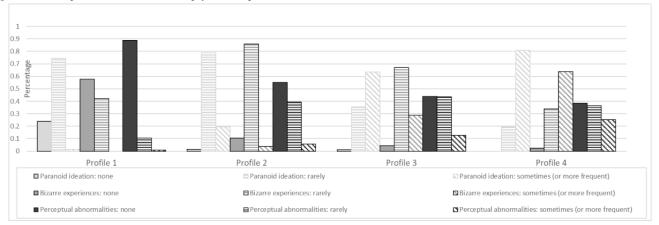**Figure 1.** Latent profile characteristics for anxiety, depression, and posttraumatic stress disorder.

Figure 2. Latent profiles characteristics for psychotic experiences.

Exploring the Predictive Role of Emotional Regulation Strategies

When compared to the profile without symptomatology, the results indicated that cognitive reappraisal did not contribute to the prediction of latent profile memberships. Only the "low internalizing symptomatology" (profile 2) membership was associated with the expressive suppression emotion regulation strategy. Teenagers who say they often use expressive suppression had a higher chance of being in this latent profile (odds ratio [OR] 1.39, 95% CI 1.15-1.68; $P<.001$) compared to teens who did not have any symptoms.

In contrast, rumination, entrapment, and defeat contribute significantly to the prediction of latent profile memberships. If teenagers say they use these strategies more often, they are more likely to be in the profiles with some symptoms (profiles 2, 3, or 4) than in the first latent profile, which has no symptoms. For example, adolescents who were in the "at-risk profile" were more likely to ruminate (OR 130.15, 95% CI 51.75-439.89; $P<.001$), feel trapped (OR 96.35, 95% CI 29.21-317.79; $P<.001$), and being defeated (OR 156.79, 95% CI 50.45-487.23; $P<.001$; Table S3 in Multimedia Appendix 1).

Discussion

Principal Findings

First, we examined the capability of a WBS tool to identify adolescents with high levels of psychiatric symptoms and suicide risk in school-aged youth. Second, we characterized the mental health profiles of a large sample of adolescents using WBS.

The prevalence of SI, DS, and AS in our study was slightly lower than that found in previous studies [27], although it was relatively similar for PTSD [53]. Additionally, we found that SI was the only symptom domain to display a lower prevalence in the WBS than in the MINI-KID, which is contrary to previous findings [19]. Considering the significant short-term fluctuations of SI levels in this population [54], some of these differences could be explained by the assessment time gap between the WBS and MINI-KID (eg, 1- to 8-week gap). Additionally, the receiver-operating characteristic curves showed some level of agreement between the WBS and the MINI-KID for most of the assessed symptoms, particularly for depression symptoms, which have similar detection rates in both the WBS and MINI-KID. These findings show that, while not identical, there is some coincidence between measures. However, WBS appears to overdiagnose ASs. This is in accordance with previous evidence showing that the GAD-7 tends to show false positives in the nonclinical population [55].

According to our second aim, we found 4 distinct symptomatic profiles with the WBS tool. Most of them showed low symptom levels. However, we observed high levels of PTSD, AS, and DS in a small proportion of participants ("at-risk adolescents"; 11% of the sample). This group also showed a high probability of experiencing PE (mainly paranoid ideation and bizarre experiences). The higher presence of paranoid ideation followed by bizarre experiences mirrors the recent evidence found at the primary care level [56]. Regarding SI, adolescents in this cluster present the highest rates of SI in the sample. However, this pattern is not markedly clear within the profile. This phenomenon could be explained by the presence of high paranoid ideation that might have led to adolescents being reluctant to report SI in the digital questionnaire. This could also explain the lower rates of SI found in the WBS compared to the MINI-KID; adolescents may not disclose SI through a digital questionnaire (instead of a person), as they are unaware of the use that could be made of such information, and possibly fear being judged or labeled [57]. This is an implementation issue that would require further investigation to clarify; however, this escapes the aim of the current research. In cluster 3, adolescents display moderate levels of PTSD while having low levels of other symptomatology. This was a somewhat unexpected finding, particularly because PTSD symptoms are commonly found along somewhat similar levels of comorbid anxiety and DSs [58,59].

Regarding our findings on PE, the prevalence of these experiences (21%) was similar to those reported by Hafeez and Yung [60]; however, because self-report may lead to overestimations [61], further research is needed. We found a general pattern for paranoid ideation and bizarre experiences of PE: the endorsement rates of high scores systematically increased from clusters 1 to 4. This fits with prior research showing clear associations and overlaps between PE health conditions [62] and overall psychopathology [63] in the general population [64] and in clinical samples [56]. Moreover, these findings highlight both their role as early markers for psychopathology [65] and the need to regularly screen and deliver timely interventions for PE in young people [66,67]. As suggested by preliminary evidence, screening and referral of students were associated with a significant reduction in PEs [68].

Last, our exploratory examination of the role of emotional regulation strategies as potential predictors of the ascription to the identified profiles showed that rumination, defeat, and entrapment were associated with a higher probability of belonging to profiles with higher levels of symptomatology and SI (profiles 3 and 4). This fits with literature showing that these strategies are associated with the experience of emotional distress, depression, anxiety [69,70], PTSD symptoms [71], and SI [72]. By contrast, cognitive reappraisal was not associated with any symptom, and emotional suppression only differentiated between individuals presenting mild and no depression and ASs and was not a significant predictor of more severe symptom levels. This may seem counterintuitive, but the role of these 2 regulation strategies has not been completely clarified yet, as shown by a recent review and meta-analysis [73].

Limitations

Our cross-sectional design does not allow us to establish causality among variables. Furthermore, the clinician-administered psychiatric interview could have increased social desirability in the answers [74], which in turn could have contributed to a lower prevalence of most disorders in the MINI-KID compared to the self-report [19]. Future research could attempt to comprehensively measure the psychopathological domains through a thorough self-report measure rather than a clinical interview. Additionally, social, and contextual variables (ie, perceived social support) were not included, and as their inclusion in future research could enrich study findings, it is advised. Last, although the application of the MINI-KID occurred anywhere from 1 week to 2 months after the use of WBS, longer times elapsed between measures could negatively affect the specificity and sensitivity reported for the web-based measure.

Prevention Implications

WBS can improve the accessibility of evidence-based screening tools for the early detection of mental health problems in adolescents [75]. This can be particularly useful when access to health care can be restricted due to public health-related contingencies (eg, during the COVID-19 pandemic). Moreover, our finding revealing a relevant presence of common mental disorders and subthreshold psychopathological manifestations such as PEs in the cluster with higher levels of psychopathology, provides further support to include these phenomena in preventive programs for young people. This study is in line with the growing interest in the field to develop and test web-based tools for screening SRB and SI in young people [76], along with other mental health symptoms and psychological processes [77], diverging from the original approach of excluding individuals with suicidal risk from accessing updated screening techniques.

The identified profiles suggest that different interventions could be delivered to the adolescent population depending on their symptomatic levels or characteristics. For instance, universal programs to improve social and emotional well-being [78] might be useful for individuals in profiles 1 and 2. However, these interventions should be tailored and delivered with caution, as evidence has shown neutral to small effects [79]. Moreover, targeted (selective) interventions such as school-based programs for anxiety and DSs could be delivered for adolescents in profile 3, although further evidence is still needed for this approach, particularly regarding the temporal stability of their results [80].

Finally, given their symptomatology levels and fewer use of adequate emotional regulation strategies, indicated interventions and referrals to primary care centers for assessments and specialized care could be suitable for adolescents in profile 4.

In conclusion, we provide evidence about the suitability of a WBS as a tool for the timely detection of mental health risk, and the usefulness of developing symptomatic profiles in school-aged youth. Our findings support the use of WBS in this population but also suggest it is necessary to further improve the sensibility of digital screening tools.

Acknowledgments

Data Availability

The data sets generated or analyzed during this study are available from the corresponding author on reasonable request.

Authors' Contributions

Conceptualization and methodology were handled by DN. Funding acquisition was also the responsibility of DN. Both DN and SC conducted the investigation. SC and JCP performed the formal analysis. DN wrote the original draft. SC, JCP, and JR contributed to the review and editing process.

Conflicts of Interest

None declared.

Multimedia Appendix 1

Receiver operating characteristic for web-based screening (WBS) subsample (n=217).
[PDF File (Adobe PDF File), 426 KB-Multimedia Appendix 1]

References

1. Silva SA, Silva SU, Ronca DB, Gonçalves VSS, Dutra ES, Carvalho KMB. Common mental disorders prevalence in adolescents: a systematic review and meta-analyses. PLoS One. 2020;15(4):e0232007. [FREE Full text] [doi: 10.1371/journal.pone.0232007] [Medline: 32324835]

2. Campisi SC, Carducci B, Akseer N, Zasowski C, Szatmari P, Bhutta ZA. Suicidal behaviours among adolescents from 90 countries: a pooled analysis of the global school-based student health survey. BMC Public Health. 2020;20(1):1102. [FREE Full text] [doi: 10.1186/s12889-020-09209-z] [Medline: 32772922]

3. GBD 2019 Mental Disorders Collaborators. Global, regional, and national burden of 12 mental disorders in 204 countries and territories, 1990-2019: a systematic analysis for the Global Burden of Disease Study 2019. Lancet Psychiatry. 2022;9(2):137-150. [FREE Full text] [doi: 10.1016/S2215-0366(21)00395-3] [Medline: 35026139]

4. Busby DR, Hatkevich C, McGuire TC, King CA. Evidence-based interventions for youth suicide risk. Curr Psychiatry Rep. Jan 18, 2020;22(2):5. [doi: 10.1007/s11920-020-1129-6] [Medline: 31955248]

5. Wasserman D, Carli V, Iosue M, Javed A, Herrman H. Suicide prevention in psychiatric patients. Asia Pac Psychiatry. 2021;13(3):e12450. [doi: 10.1111/appy.12450] [Medline: 33605074]

6. Vicente B, Saldivia S, Pihán R. [Prevalence and gaps today; mental health tomorrow]. Acta Bioeth. 2016;22(1):51-61. [doi: 10.4067/s1726-569x2016000100006]

7. Dávila-Cervantes CA. Suicide burden in Latin America, 1990-2019: findings from the Global Burden of Disease Study 2019. Public Health. 2022;205:28-36. [doi: 10.1016/j.puhe.2022.01.014] [Medline: 35219840]

8. Elia C, Karamanos A, Dregan A, O'Keeffe M, Wolfe I, Sandall J, et al. Association of macro-level determinants with adolescent overweight and suicidal ideation with planning: a cross-sectional study of 21 Latin American and Caribbean countries. PLoS Med. 2020;17(12):e1003443. [FREE Full text] [doi: 10.1371/journal.pmed.1003443] [Medline: 33373361]

9. Pretorius C, Chambers D, Coyle D. Young people's online help-seeking and mental health difficulties: systematic narrative review. J Med Internet Res. Nov 19, 2019;21(11):e13873. [FREE Full text] [Medline: 31742562]

10. Gowen LK. Online mental health information seeking in young adults with mental health challenges. J Technol Hum Serv. 2013;31(2):97-111. [doi: 10.1080/15228835.2013.765533]

11. Kim J, Kim D, Kamphaus R. Early detection of mental health through universal screening at schools. Georgia Educ Res. 2022;19(1):4. [doi: 10.20429/ger.2022.190104]

12. Balcombe L, de Leo D. Digital mental health challenges and the horizon ahead for solutions. JMIR Ment Health. 2021;8(3):e26811. [FREE Full text] [doi: 10.2196/26811] [Medline: 33779570]

13. de Witte NAJ, Joris S, van Assche E, van Daele T. Technological and digital interventions for mental health and wellbeing: an overview of systematic reviews. Front Digit Health. 2021;3:754337. [FREE Full text] [doi: 10.3389/fdgth.2021.754337] [Medline: 35005695]

14. Garrido S, Millington C, Cheers D, Boydell K, Schubert E, Meade T, et al. What works and what doesn't work? a systematic review of digital mental health interventions for depression and anxiety in young people. Front Psychiatry. 2019;10:759. [FREE Full text] [doi: 10.3389/fpsyt.2019.00759] [Medline: 31798468]

15. Bradford S, Rickwood D. Young people's views on electronic mental health assessment: prefer to type than talk? J Child Fam Stud. 2015;24(5):1213-1221. [FREE Full text] [doi: 10.1007/s10826-014-9929-0] [Medline: 25960628]

16. Mann JJ, Michel CA, Auerbach RP. Improving suicide prevention through evidence-based strategies: a systematic review. Am J Psychiatry. 2021;178(7):611-624. [FREE Full text] [doi: 10.1176/appi.ajp.2020.20060864] [Medline: 33596680]

17. Arenas-Castañeda PE, Aroca Bisquert F, Martinez-Nicolas I, Castillo Espíndola LA, Barahona I, Maya-Hernández C, et al. Universal mental health screening with a focus on suicidal behaviour using smartphones in a Mexican rural community: protocol for the smart-screen population-based survey. BMJ Open. 2020;10(7):e035041. [FREE Full text] [doi: 10.1136/bmjopen-2019-035041] [Medline: 32690505]

18. King CA, Brent D, Grupp-Phelan J, Casper TC, Dean JM, Chernick LS, et al. Prospective development and validation of the computerized adaptive screen for suicidal youth. JAMA Psychiatry. 2021;78(5):540-549. [FREE Full text] [doi: 10.1001/jamapsychiatry.2020.4576] [Medline: 33533908]

19. Ballester L, Alayo I, Vilagut G, Almenara J, Cebrià AI, Echeburúa E, et al. Accuracy of online survey assessment of mental disorders and suicidal thoughts and behaviors in Spanish university students. results of the WHO world mental health—international college student initiative. PLoS One. 2019;14(9):e0221529. [FREE Full text] [doi: 10.1371/journal.pone.0221529] [Medline: 31487306]

20. Iorfino F, Scott EM, Carpenter JS, Cross SP, Hermens DF, Killedar M, et al. Clinical stage transitions in persons aged 12 to 25 years presenting to early intervention mental health services with anxiety, mood, and psychotic disorders. JAMA Psychiatry. 2019;76(11):1167-1175. [FREE Full text] [doi: 10.1001/jamapsychiatry.2019.2360] [Medline: 31461129]

21. Chong MK, Hickie IB, Cross SP, McKenna S, Varidel M, Capon W, et al. Digital application of clinical staging to support stratification in youth mental health services: validity and reliability study. JMIR Form Res. 2023;7:e45161. [FREE Full text] [doi: 10.2196/45161] [Medline: 37682588]

22. Schechter MA, Goldblatt MJ. Suicide: a transdiagnostic phenomenon. Psychiatric Ann. 2020;50(4):136-137. [doi: 10.3928/00485713-20200310-02]

23. Sawrikar V, Stewart E, LaMonica HM, Iorfino F, Davenport TA, Cross S, et al. Using staged care to provide "right care first time" to people with common affective disorders. Psychiatr Serv. 2021;72(6):691-703. [doi: 10.1176/appi.ps.202000145] [Medline: 33765863]

24. Collins LM, Lanza ST. Latent Class and Latent Transition Analysis: With Applications in the Social, Behavioral, and Health Sciences. Hoboken, New Jersey. Wiley; 2013.

25. Spurk D, Hirschi A, Wang M, Valero D, Kauffeld S. Latent profile analysis: a review and "how to" guide of its application within vocational behavior research. J Vocat Behav. Aug 2020;120:103445. [doi: 10.1016/j.jvb.2020.103445]

26. Posner K, Brown GK, Stanley B, Brent DA, Yershova KV, Oquendo MA, et al. The Columbia-suicide severity rating scale: initial validity and internal consistency findings from three multisite studies with adolescents and adults. Am J Psychiatry. 2011;168(12):1266-1277. [FREE Full text] [doi: 10.1176/appi.ajp.2011.10111704] [Medline: 22193671]

27. Núñez D, Arias V, Méndez-Bustos P, Fresno A. Is a brief self-report version of the Columbia severity scale useful for screening suicidal ideation in Chilean adolescents? Compr Psychiatry. 2019;88:39-48. [FREE Full text] [doi: 10.1016/j.comppsych.2018.11.002] [Medline: 30471550]

28. Kroenke K, Spitzer RL. The PHQ-9: a new depression diagnostic and severity measure. Psychiatric Ann. 2002;32(9):509-515. [doi: 10.3928/0048-5713-20020901-06]

29. Johnson JG, Harris ES, Spitzer RL, Williams JBW. The patient health questionnaire for adolescents: validation of an instrument for the assessment of mental disorders among adolescent primary care patients. J Adolesc Health. 2002;30(3):196-204. [doi: 10.1016/s1054-139x(01)00333-0] [Medline: 11869927]

30. Richardson LP, McCauley E, Grossman DC, McCarty CA, Richards J, Russo JE, et al. Evaluation of the Patient Health Questionnaire-9 item for detecting major depression among adolescents. Pediatrics. 2010;126(6):1117-1123. [FREE Full text] [doi: 10.1542/peds.2010-0852] [Medline: 21041282]

31. Borghero F, Martínez V, Zitko P, Vöhringer PA, Cavada G, Rojas G. [Screening depressive episodes in adolescents. validation of the Patient Health Questionnaire-9 (PHQ-9)]. Rev Med Chil. 2018;146(4):479-486. [FREE Full text] [doi: 10.4067/s0034-98872018000400479] [Medline: 29999123]

32. Spitzer RL, Kroenke K, Williams JBW, Löwe B. A brief measure for assessing generalized anxiety disorder: the GAD-7. Arch Intern Med. 2006;166(10):1092-1097. [doi: 10.1001/archinte.166.10.1092] [Medline: 16717171]

33. Crockett MA, Martínez V, Ordóñez-Carrasco JL. [Psychometric properties of the Generalized Anxiety Disorder 7-item (GAD-7) scale in Chilean adolescents]. Rev Med Chil. 2022;150(4):458-464. [FREE Full text] [doi: 10.4067/S0034-98872022000400458] [Medline: 36155755]

34. Capra C, Kavanagh DJ, Hides L, Scott J. Brief screening for psychosis-like experiences. Schizophr Res. 2013;149:104-107. [doi: 10.1016/j.schres.2013.05.020] [Medline: 23830544]

XSL·FO

RenderX

35. Núñez D, Arias V, Vogel E, Gómez L. Internal structure of the Community Assessment of Psychic Experiences-Positive (CAPE-P15) scale: evidence for a general factor. Schizophr Res. 2015;165(2-3):236-242. [doi: 10.1016/j.schres.2015.04.018] [Medline: 25935814]

36. Campos S, Núñez D, Bravo P, Fresno A, Olff M. Preliminary evidence for internal structure, sensitivity, and specificity of a brief PTSD and complex PTSD measure in adolescents. Can J Behav Sci. 2023;55(4):341-347. [doi: 10.1037/cbs0000322]

37. Sheehan DV, Sheehan KH, Shytle RD, Janavs J, Bannon Y, Rogers JE, et al. Reliability and validity of the mini international neuropsychiatric interview for children and adolescents (MINI-KID). J Clin Psychiatry. 2010;71(3):313-326. [doi: 10.4088/JCP.09m05305whi] [Medline: 20331933]

38. Landis JR, Koch GG. The measurement of observer agreement for categorical data. Biometrics. Mar 1977;33(1):159-174. [Medline: 843571]

39. Muthen L, Muthen B. Mplus user's guide: statistical analysis with latent variables. Mplus. 1998. URL: https://www.statmodel.com/download/usersguide/MplusUserGuideVer_8.pdf [accessed 2024-07-03]

40. Berlin KS, Williams NA, Parra GR. An introduction to latent variable mixture modeling (part 1): overview and cross-sectional latent class and latent profile analyses. J Pediatr Psychol. 2014;39(2):174-187. [doi: 10.1093/jpepsy/jst084] [Medline: 24277769]

41. Nylund-Gibson K, Choi AY. Ten frequently asked questions about latent class analysis. Transl Issues Psychol Sci. 2018;4(4):440-461. [doi: 10.1037/tps0000176]

42. Fosco GM, Bray BC. Profiles of cognitive appraisals and triangulation into interparental conflict: implications for adolescent adjustment. J Fam Psychol. 2016;30(5):533-542. [FREE Full text] [doi: 10.1037/fam0000192] [Medline: 26963695]

43. Akaike H. A new look at the statistical model identification. IEEE Trans Automatic Control. 1974;19(6):716-723. [doi: 10.1109/tac.1974.1100705]

44. Schwarz G. Estimating the dimension of a model. Ann Stat. 1978;6(2):461-464. [doi: 10.1214/aos/1176344136]

45. Sclove SL. Application of model-selection criteria to some problems in multivariate analysis. Psychometrika. 1987;52(3):333-343. [doi: 10.1007/bf02294360]

46. Vermunt J, Magidson J. Latent GOLD® 5.1. Statistical Innovations. URL: https://www.statisticalinnovations.com/latent-gold-5-1/ [accessed 2024-02-02]

47. Vuong QH. Likelihood ratio tests for model selection and non-nested hypotheses. Econometrica. 1989;57(2):307-333. [doi: 10.2307/1912557]

48. Lo Y, Mendell NR, Rubin DB. Testing the number of components in a normal mixture. Biometrika. 2001;88(3):767-778. [doi: 10.1093/biomet/88.3.767]

49. Ferguson SL, G. Moore EW, Hull DM. Finding latent groups in observed data: a primer on latent profile analysis in Mplus for applied researchers. Int J Behav Dev. 2019;44(5):458-468. [doi: 10.1177/0165025419881721]

50. Tein J, Coxe S, Cham H. Statistical power to detect the correct number of classes in latent profile analysis. Struct Equ Model. 2013;20(4):640-657. [FREE Full text] [doi: 10.1080/10705511.2013.824781] [Medline: 24489457]

51. Muthén LK, Muthén BO. How to use a Monte Carlo study to decide on sample size and determine power. Struct Equ Model. 2002;9(4):599-620. [doi: 10.1207/S15328007SEM0904_8]

52. Hipp JR, Bauer DJ. Local solutions in the estimation of growth mixture models. Psychol Methods. 2006;11(1):36-53. [doi: 10.1037/1082-989X.11.1.36] [Medline: 16594766]

53. Hemelrijk E, van Ballegooijen W, Donker T, van Straten A, Kerkhof A. Internet-based screening for suicidal ideation in common mental disorders. Crisis. 2012;33(4):215-221. [doi: 10.1027/0227-5910/a000142] [Medline: 22713975]

54. Czyz EK, Horwitz AG, Arango A, King CA. Short-term change and prediction of suicidal ideation among adolescents: a daily diary study following psychiatric hospitalization. J Child Psychol Psychiatry. 2019;60(7):732-741. [FREE Full text] [doi: 10.1111/jcpp.12974] [Medline: 30246870]

55. Zhong Q, Gelaye B, Zaslavsky AM, Fann JR, Rondon MB, Sánchez SE, et al. Diagnostic validity of the Generalized Anxiety Disorder-7 (GAD-7) among pregnant women. PLoS One. 2015;10(4):e0125096. [FREE Full text] [doi: 10.1371/journal.pone.0125096] [Medline: 25915929]

56. Wiedemann A, Stochl J, Russo D, Patel U, Ashford P, Ali N, et al. Clinical presentation of psychotic experiences in patients with common mental disorders attending the UK primary care improving access to psychological therapies (IAPT) programme. J Affect Disord. 2024;344:233-241. [FREE Full text] [doi: 10.1016/j.jad.2023.10.073] [Medline: 37838262]

57. Pretorius C, Chambers D, Coyle D. Young people's online help-seeking and mental health difficulties: systematic narrative review. J Med Internet Res. 2019;21(11):e13873. [FREE Full text] [doi: 10.2196/13873] [Medline: 31742562]

58. Adams ZW, Danielson CK, Sumner JA, McCauley JL, Cohen JR, Ruggiero KJ. Comorbidity of PTSD, major depression, and substance use disorder among adolescent victims of the spring 2011 tornadoes in Alabama and Joplin, Missouri. Psychiatry. 2015;78(2):170-185. [FREE Full text] [doi: 10.1080/00332747.2015.1051448] [Medline: 26168094]

59. Kar N, Bastia B. Post-traumatic stress disorder, depression and generalised anxiety disorder in adolescents after a natural disaster: a study of comorbidity. Clin Pract Epidemiol Ment Health. 2006;2:17. [FREE Full text] [doi: 10.1186/1745-0179-2-17] [Medline: 16869979]

60. Hafeez D, Yung AR. Early persistence of psychotic-like experiences in a community sample of adolescents. Early Interv Psychiatry. 2021;15(6):1575-1583. [doi: 10.1111/eip.13096] [Medline: 33283458]

XSL•FO
RenderX

61. Nelson B, Fusar-Poli P, Yung AR. Can we detect psychotic-like experiences in the general population? Curr Pharm Des. 2012;18(4):376-385. [doi: 10.2174/138161212799316136] [Medline: 22239568]

62. Oh H, DeVylder JE, Koyanagi A. Psychotic experiences as a health indicator: a provisional framework. Int J Soc Psychiatry. 2022;68(2):244-252. [doi: 10.1177/0020764021992809] [Medline: 33554709]

63. Ratheesh A, Hammond D, Gao C, Marwaha S, Thompson A, Hartmann J, et al. Empirically driven transdiagnostic stages in the development of mood, anxiety and psychotic symptoms in a cohort of youth followed from birth. Transl Psychiatry. 2023;13(1):103. [FREE Full text] [doi: 10.1038/s41398-023-02396-4] [Medline: 36990979]

64. Staines L, Healy C, Murphy F, Byrne J, Murphy J, Kelleher I, et al. Incidence and persistence of psychotic experiences in the general population: systematic review and meta-analysis. Schizophr Bull. 2023;49(4):1007-1021. [FREE Full text] [doi: 10.1093/schbul/sbad056] [Medline: 37402250]

65. Nuevo R, van Os J, Arango C, Chatterji S, Ayuso-Mateos JL. Evidence for the early clinical relevance of hallucinatory-delusional states in the general population. Acta Psychiatr Scand. 2013;127(6):482-493. [doi: 10.1111/acps.12010] [Medline: 22943634]

66. Ashford P, Knight C, Heslin M, Clark AB, Kanaan M, Patel U, et al. Treating common mental disorder including psychotic experiences in the primary care improving access to psychological therapies programme (the TYPPEX study): protocol for a stepped wedge cluster randomised controlled trial with nested economic and process evaluation of a training package for therapists. BMJ Open. 2022;12(6):e056355. [FREE Full text] [doi: 10.1136/bmjopen-2021-056355] [Medline: 35732378]

67. Hinterbuchinger B, Mossaheb N. Psychotic-like experiences: a challenge in definition and assessment. Front Psychiatry. 2021;12:582392. [FREE Full text] [doi: 10.3389/fpsyt.2021.582392] [Medline: 33854445]

68. Staines L, Healy C, Corcoran P, Keeley H, Coughlan H, McMahon E, et al. Investigating the effectiveness of three school based interventions for preventing psychotic experiences over a year period—a secondary data analysis study of a randomized control trial. BMC Public Health. 2023;23(1):219. [FREE Full text] [doi: 10.1186/s12889-023-15107-x] [Medline: 36726107]

69. Aldao A, Nolen-Hoeksema S, Schweizer S. Emotion-regulation strategies across psychopathology: a meta-analytic review. Clin Psychol Rev. 2010;30(2):217-237. [doi: 10.1016/j.cpr.2009.11.004] [Medline: 20015584]

70. Dauvermann MR, Schmaal L, Colic L, van Velzen LS, Bellow S, Ford TJ, IMPACT Consortium, et al. Elevated cognitive rumination and adverse life events are associated with lower cortical surface area and suicidal ideation in adolescents with major depressive disorder. J Affect Disord. Mar 15, 2023;325(3):93-101. [FREE Full text] [doi: 10.1016/j.jad.2022.12.087] [Medline: 36584707]

71. Panagioti M, Gooding P, Tarrier N. Hopelessness, defeat, and entrapment in posttraumatic stress disorder: their association with suicidal behavior and severity of depression. J Nerv Ment Dis. 2012;200(8):676-683. [doi: 10.1097/NMD.0b013e3182613f91] [Medline: 22850302]

72. Teismann T, Forkmann T. Rumination, entrapment and suicide ideation: a mediational model. Clin Psychol Psychother. 2017;24(1):226-234. [doi: 10.1002/cpp.1999] [Medline: 26663149]

73. Rogier G, Chiorri C, Beomonte Zobel S, Muzi S, Pace CS, Cheung MWL, et al. The multifaceted role of emotion regulation in suicidality: systematic reviews and meta-analytic evidence. Psychol Bull. 2024;150(1):45-81. [doi: 10.1037/bul0000415] [Medline: 38376911]

74. Lewis G. Assessing psychiatric disorder with a human interviewer or a computer. J Epidemiol Community Health. 1994;48(2):207-210. [FREE Full text] [doi: 10.1136/jech.48.2.207] [Medline: 8189180]

75. Wood BJ, McDaniel T. A preliminary investigation of universal mental health screening practices in schools. Child Youth Serv Rev. 2020;112:104943. [doi: 10.1016/j.childyouth.2020.104943]

76. Perry Y, Werner-Seidler A, Calear AL, Christensen H. Web-based and mobile suicide prevention interventions for young people: a systematic review. J Can Acad Child Adolesc Psychiatry. 2016;25(2):73-79. [FREE Full text] [Medline: 27274742]

77. Islam MS, Rahman ME, Moonajilin MS, van Os J. Prevalence of depression, anxiety and associated factors among school going adolescents in Bangladesh: findings from a cross-sectional study. PLoS One. 2021;16(4):e0247898. [FREE Full text] [doi: 10.1371/journal.pone.0247898] [Medline: 33793610]

78. Barry MM, Clarke AM, Jenkins R, Patel V. A systematic review of the effectiveness of mental health promotion interventions for young people in low and middle income countries. BMC Public Health. 2013;13:835. [FREE Full text] [doi: 10.1186/1471-2458-13-835] [Medline: 24025155]

79. Mackenzie K, Williams C. Universal, school-based interventions to promote mental and emotional well-being: what is being done in the UK and does it work? a systematic review. BMJ Open. 2018;8(9):e022560. [FREE Full text] [doi: 10.1136/bmjopen-2018-022560] [Medline: 30196267]

80. Zbukvic I, McKay S, Cooke S, Anderson R, Pilkington V, McGillivray L, et al. Evidence for targeted and universal secondary school-based programs for anxiety and depression: an overview of systematic reviews. Adolescent Res Rev. 2024;9:53-73. [FREE Full text] [doi: 10.1007/s40894-023-00211-1]

Abbreviations

AS: anxiety symptom
AUC: area under the curve

DS: depressive symptoms
GAD-7: Generalized Anxiety Disorder-7
LPA: latent profile analysis
MINI-KID: Mini International Neuropsychiatric Interview for Children and Adolescents
OR: odds ratio
PE: psychotic experience
PTSD: posttraumatic stress disorder
SI: suicide ideation
SRB: suicidal-related behavior
WBS: web-based screening

XSL•FO
RenderX