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# Protecting young minds: insights on pre-adolescents' mental health from a school-based study in Argentina

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ABSTRACT

*Background:* Childhood and adolescent mental health is in crisis globally, emphasizing the need for early detection and prevention strategies. Children from marginalized neighborhoods are particularly vulnerable, yet data on their psychological well-being is still limited in Argentina.
*Objectives:* We aimed to explore mental health characteristics of vulnerable school children and assess the feasibility of a psychological well-being promoting program.
*Participants and setting:* This study was conducted in a primary school in a disadvantaged neighborhood of Buenos Aires, Argentina, involving 35 children aged 11.
*Methods:* Participants completed validated Spanish versions of scales assessing perceived stress (PSS-14), PTSD symptoms (CPSS), empathy, mindfulness (MAAS-A), and self-compassion (SCS-SF). Sex differences and correlations between scales were explored.
*Findings:* Significant sex disparities were found in perceived stress, with girls reporting higher scores ($p = 0.002$). PTSD symptoms were alarmingly high, with 74 % of participants exceeding the clinical cut-off of 16 (girls: mean = 27.48, SD = 9.45; boys: mean = 17.36, SD = 12.76; $p = 0.017$). Boys scored higher in self-compassion ($p = 0.003$). Positive correlations were found between stress and PTSD symptoms ($r = 0.597$, $p < 0.001$) and between mindfulness and self-compassion ($r = 0.439$, $p = 0.008$). Both dispositional mindfulness and self-compassion negatively correlated with perceived stress ($r = -0.526$, $p = 0.001$; $r = -0.595$, $p < 0.001$, respectively) and PTSD symptoms ($r = -0.616$, $p < 0.001$; $r = -0.561$, $p < 0.001$, respectively).
*Conclusion:* Our study highlights the significant vulnerability of this population, emphasizing the urgency for early detection and gender- and trauma-sensitive prevention efforts. Notably, our findings suggest that mindfulness and self-compassion training may be key protective components within mental health-promoting interventions for preadolescents.

## 1. Introduction

Adolescence is a pivotal stage in the development of social and emotional behaviors and patterns that profoundly influence psychological well-being and health across the lifespan. It is alarming that one in seven adolescents globally has a mental disorder, with half of all mental illnesses beginning before age 14 (WHO, 2021), and suicide consistently ranking as the second leading cause of death among U.S. adolescents from 2011 to 2019 (WISQARS/CDC, 2023).

Numerous factors seem to contribute to and exacerbate the global mental health crisis in children and adolescents. Among these factors, Adverse Childhood Experiences (ACEs), which are potentially traumatic

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events that can occur in childhood and adolescence, are some of the most significant and common sources of early life stress for children. These experiences encompass various forms of abuse, neglect, domestic violence between parents or caregivers, severe household issues like substance abuse, and exposure to social violence (Felitti et al., 1998; Hillis et al., 2016). ACEs represent one of the main threats to individual well-being and health and are, therefore, a significant global social concern, contributing to an increased risk of disease and premature death, while also adversely affecting social interactions and limiting opportunities throughout a person's life (Madigan et al., 2021). Experiencing four or more ACEs significantly increases the risk of various health problems, such as mental health disorders, substance abuse, risky sexual behaviour, smoking, obesity, diabetes, cancer, respiratory and cardiovascular diseases, as well as self-directed and interpersonal violence (Hughes et al., 2017). Notably, some of the most pronounced effects of multiple ACEs, such as violent behavior and addiction, contribute to the intergenerational cycle of maltreatment and neglect, increasing the likelihood of ACEs in subsequent generations (Barnert et al., 2023; Blackwell et al., 2024; Widom, C. S., Czaja, S. J., & DuMont, 2015). In addition to ACEs, two additional global factors seem to contribute to the mental health crisis in children and adolescents: the toxic use of technology and eco-anxiety (Chatfield et al., 2024; Crandon et al., 2022; Thibault, 2024). Moreover, the COVID-19 pandemic had an impact on the mental health of children and adolescents, whether due to the death of loved ones, the deterioration of family finances, forced isolation, the loss of age-appropriate experiences, alterations in the rhythm of sleep, among other situations (Madigan et al., 2023; Racine et al., 2021; Weissman et al., 2024).

Despite these facts, today, mental health in children and adolescents is one of the most underserved areas of public health (Eisenberg & Raghavan, 2024). The Childhood and Adolescence Opinion Barometer 2023–2024 published by UNICEF Spain which involved 4740 adolescents aged 13–18 from 168 educational centers in Spain, reports that 41.1 % affirm or think they had had a mental health problem in the past year. Over one in three of them had never spoken to anyone about these problems and over half had never sought help (Ramos et al., 2024).

In Latin America, one of the most violent regions globally, schools can play a pivotal role in mitigating cycles of violence. In Argentina, where our study took place, a UNICEF report reveals alarming statistics on mortality among minors aged 10 to 19: six out of ten deaths are preventable and linked to violence, while one in four is the result of suicide (Sulleiro et al., 2021). Evidence shows that school connectedness is a protective factor for common mental health problems (Raniti et al., 2022). However, high levels of stress and poor mental health in children, often linked to ACEs, can undermine the protective effects of school connectedness, weakening resilience, socialization, and the overall school climate. When school environments are unsafe or emotionally unsupportive, they can shift from being protective spaces to becoming risk factors for violence, with direct consequences for students' learning, well-being, academic performance and safety (Glew et al., 2008). Therefore, efforts to define mental health risk indicators, the early detection of mental health problems, the improvement of coordination between the education centers and health and social services and the development of effective age-specific targeted programs to promote psychological well-being, are a priority. In this context, here we report the psychometric evaluation of 11-year-old children from a primary school in a disadvantaged neighborhood of Buenos Aires, Argentina.

## 2. Methods

### 2.1. Participants

All participants were students of sixth grade from a primary school in Buenos Aires Argentina, aged 11 years (n = 35). No exclusion criteria were applied for participation in this study. To adhere to local ethical guidelines of confidentiality, the identity of the school where the study was conducted will not be disclosed. We had no access to comprehensive information about family, health or life history of the participants. Table 1 provides the limited participants' demographic information that we were allowed to collect. Due to the absence of data on participants' gender identities, our study employs the terms "sex," "boys," and "girls" to denote sex assigned at birth. To participate in this research, participants and their legal representatives provided a written informed consent. All the assessments and the intervention carried out in this study were performed at the school during regular school time. This research was reviewed and approved by the Institutional Review Board of the Catholic University of Argentina (UCA) (code #10835, April 12, 2023). This study was carried out between March and June 2024.

### 2.2. Measures

Psychometric questionnaires were administered by two trained psychologists in a supportive and distraction-free environment, helping to ensure that children understood the questions and felt comfortable responding. Age-appropriate, validated instruments with clear and culturally adapted simple language were used. Anonymity and confidentiality were emphasized to encourage honest answers.

#### 2.2.1. Perceived Stress Scale (PSS-14)

Perceived stress was assessed using the 14-item Perceived Stress Scale (PSS-14), a widely validated instrument (Cohen et al., 1983). This scale employs a five-point Likert format, yielding scores from 0 to 56, with higher values indicating greater perceived stress. The PSS-14 captures an individual's subjective experience of stress, focusing on perceptions rather than the objective magnitude of stressors. The PSS-14 has been adapted and validated in Spanish populations, confirming its reliability and validity within this demographic with an alpha coefficient of 0.82 (Remor, 2006). Notably, the PSS has been effectively utilized in adolescent populations to measure perceived stress levels, demonstrating its applicability and reliability in this age group (Thorsén et al., 2022).

#### 2.2.2. Child PTSD symptom scale (CPSS)

We used the validated Spanish version of the CPSS (Serrano-Ibáñez et al., 2018), one of the most frequently used scales to assess PTSD in children and adolescents (Foa et al., 2001). The CPSS is composed by 17 items designed for children aged 8–18 years. Participants rate how often each symptom has occurred in the past month and each item is rated on a 4-point scale that ranges from 0 (not at all) to 3 (5 or more times a week). The total score is the sum of all items. It has been described that dysphoria four-factor model fit well in children and adolescents using the CPSS in Spanish (items 1–5: intrusion, $\alpha = 0.80$; items 6–8: avoidance, $\alpha = 0.70$; items 9–15: dysphoria, $\alpha = 0.83$; items 16–17: arousal, $\alpha = 0.74$) (Serrano-Ibáñez et al., 2018).

#### 2.2.3. Spanish Multidimensional Empathy Questionnaire for children and early adolescents

We used the Spanish Multidimensional Empathy Questionnaire for children, which comprises 15 items with four response options: always, often, sometimes, and never. Validity and reliability of this questionnaire was analyzed in Argentinian children aged 9–12 years (Richaud et al., 2017). This self-report multidimensional instrument integrates five psychological aspects with major influence in social relationships, individual quality of life, and overall mental well-being (i.e., emotional contagion, self-other awareness, perspective-taking, emotional regulation, and empathic action; McDonald's omega of the dimensions were 0.75, 0.76, 0.72, 0.72, and 0.70, respectively) (Richaud et al., 2017).

#### 2.2.4. Mindful Attention Awareness Scale-Adolescents (MAAS-A)

The MAAS for adolescents (MAAS-A) (Brown & Ryan, 2003) consists of 14 items with responses on a 6-point scale (1 = almost always, 2 = very frequently, 3 = somewhat frequently, 4 = somewhat infrequently,

**Table 1**
Participant's age and body mass index (BMI).
Descriptive statistics for age and body mass index (BMI, kg/m$^2$) including the corresponding age-based BMI z-scores and percentiles, for the total sample and separately by gender. Data with a normal distribution are presented as mean and standard deviation (SD) and group comparisons were performed using Student's t-test. Non-normally distributed data are presented as median and interquartile range (IQR) and group comparisons were performed using the Mann–Whitney *U* test. BMI z-scores and percentiles were calculated using the age-based pediatric growth reference charts from the Children's Nutrition Research Center, Baylor College of Medicine (https://www.bcm.edu/bodycomplab/BMIapp/BMI-calculator-kids.html).

| | All | | Girls | | Boys | | Statistic test | |
|---|---|---|---|---|---|---|---|---|
| | **n** | **Median (IQR)** | **n** | **Median (IQR)** | **n** | **Median (IQR)** | **Statistic (U)** | ***p-value*** |
| **Age** | 35 | 11 (0) | 21 | 11 (0) | 14 | 11 (0) | 132 | 0.691 |
| **BMI z-score** | 35 | 1.32 (1.42) | 21 | 1.17 (1.22) | 14 | 1.55 (1.43) | 137 | 0.749 |
| **BMI percentile** | 35 | 90.60 (33) | 21 | 88 (29.30) | 14 | 93.90 (33.55) | 136 | 0.724 |
| | **n** | **Mean (SD)** | **n** | **Mean (SD)** | **n** | **Mean (SD)** | **Statistic (t)** | ***p-value*** |
| **BMI** | 35 | 21.76 (4.10) | 21 | 21.92 (4.45) | 14 | 21.53 (3.67) | 0.281 | 0.781 |

5 = very infrequently, 6 = almost never), assessing attention/awareness-related experiences (being aware or not of feelings, sensations, thoughts or behaviours). Higher scores reflect higher mindful attention and awareness trait. We used the validated Spanish version of the MAAS-A scale, with an α = 0.85 indicating good internal consistency (Calvete et al., 2014).

#### 2.2.5. Self-Compassion Scale-Short Form (SCS-SF)

The Self-Compassion Scale-Short Form (SCS-SF) was created by (Raes et al., 2011) and adapted to Spanish (Garcia-Campayo et al., 2014, pp. 1–9) and consists of 12 items divided into 6 dimensions (kindness to oneself, common humanity, mindfulness, self-criticism, isolation, over-identification). The items are scored on a Likert scale from 1 to 5 (almost never to almost always). Reliability was calculated using Cronbach's alpha for the global scale (α = 0.75), an acceptable level of reliability and for the dimensions, which ranged from 0.71 to 0.77 (Garcia-Campayo et al., 2014, pp. 1–9). The internal structure and degree of reliability of the Spanish version of the SCS-SF was validated in adolescents (Travezaño-Cabrera & Elguera-Cuba, 2022).

### 2.3. Data analysis

All the analyses were conducted in the statistical software R (R Core Team, 2020). Age, BMI z-score, BMI percentil, and empathy dimensions of the Multidimensional Empathy Questionnaire for children and early adolescents exhibited a non-normal distribution. The rest of the data presented a normal distribution. Data with a normal distribution are presented as mean and standard deviation (SD) and group comparisons were performed using Student's t-test. Non-normally distributed data are presented as median and interquartile range (IQR) and group comparisons were performed using the Mann–Whitney *U* test. To investigate inter-scale correlations, Spearman correlation coefficients (r) were used. Partial correlation analyses were performed using data from all participants, and in boys' and girls' subgroups. Cronbach alpha values were determined to measure the internal consistency of the scales.

## 3. Results and Discussion

### 3.1. Participants' age, sex, and BMI distribution

The sample consisted of 35 children with a mean age of 10.82 years (SD = 0.38). Among them, 21 were girls and 14 were boys. Statistical analyses indicated no significant differences between boys and girls in terms of age or BMI (Table 1). We observed that 25 % of children had a BMI-percentile-for-age classified as overweight, while another 25 % fell within the range associated with obesity. In contrast, only 50 % of the children were found to have a BMI percentile corresponding to a healthy weight. Although BMI-percentile-for-age do not directly measure body fat and can be related to extra muscle, these findings highlight a concerning trend in pediatric weight status and increased risk for weight-related health issues, including mental health (Förster et al., 2023).

### 3.2. Perceived stress

Using the validated Spanish version of the Perceived Stress Scale PSS-14 (Remor, 2006), we found a mean total score for all participants of 25.63 (SD = 9.32) over a maximum score of 56. We found significant sex disparities in perceived stress levels, with girls reporting significantly higher scores than boys (Table 2). Girls scored higher in items related to unexpected events, nervousness, control of life important things, and control of life difficulties (Supplementary Table 1). In contrast, compared to boys, girls perceived greater control over time management. The internal consistency of the scale in this study was α = 0.81, confirming its reliability.

Our findings on perceived stress are consistent with prior studies conducted in diverse countries, including Canada, Australia, Sweden, Bulgaria, China, and Poland, which indicate that girls tend to experience higher levels of perceived stress and exhibit poorer psychological outcomes than boys (Długosz, 2022, pp. 271–278; Marie et al., 2022; Thorsén et al., 2022; Zhang et al., 2024). These gender differences may result, at least in part, from societal roles and gender-based expectations, which tend to place greater demands on girls, especially during the transition to adolescence (Campbell et al., 2021).

### 3.3. PTSD symptoms

Children living in disadvantaged neighbourhoods face an increased risk of trauma exposure, which can intensify PTSD symptoms due to limited access to mental health services and heightened environmental stressors. A recent study examining a cohort of 2924 individuals from the US-based AURORA study consortium (Advancing Understanding of RecOvery afteR traumA), identified several trauma-related risk factors (i.e., stress disorder, neuroticism, lifetime sexual assault exposure, anxiety sensitivity, pre-trauma anxiety symptoms), more prevalent or severe in women than in men (Haering et al., 2024). Using the validated Spanish version of the Child Post-traumatic Stress Scale (CPSS) (Serrano-Ibáñez et al., 2018), we found a mean total score for all participants of 23.43 (SD = 11.84) over a maximum score of 51. Girls presented a significantly higher mean total score than boys (Table 2; Supplementary Table 2). The internal consistency of the CPSS scale in this study was α = 0.91, confirming its reliability. Prevalence and incidence rates from studies of at-risk groups of children have shown significant PTSD prevalence variability, ranging from 0 % to 100 % (Yule & Ph, 2001, pp. 23–28). Our data showed that 74 % of all participants met or exceeded a total CPSS score of 16 which is the higher PTSD cut-off proposed for this scale (Nixon et al., 2013; Serrano-Ibáñez et al., 2018). In our study population, 95 % of the girls and 43 % of the boys scored above this threshold (Fig. 1). The analysis of specific PTSD symptom clusters (Table 3) showed no significant sex difference for intrusion and avoidance symptoms. However, girls scored significantly higher in dysphoria. These findings suggest that girls may feel more emotional distress and difficult emotions after traumatic experiences. Regarding the arousal symptoms, girls scored higher than boys,

**Table 2**
Psychological well-being and mental health-related self-report measures.
We used the validated Spanish versions of the Perceived Stress Scale (PSS-14), the Child PTSD Symptom Scale (CPSS), the Spanish Multidimensional Empathy Questionnaire for children and early adolescents (empathy), the Mindful Attention Awareness Scale-Adolescents (MAAS-A), and the Self-Compassion Scale-Short Form (SCS-SF). Mean total score values in the whole sample and analysis by sex are indicated.

| | All participants (n = 35) | Girls (n = 21) | Boys (n = 14) | Statistic test | |
|---|---|---|---|---|---|
| SCALE | Mean (SD) | Mean (SD) | Mean (SD) | *t*-statistic | *p-value* |
| **PSS-14** | 25.63 (9.32) | 30 (5.93) | 19.07 (9.79) | 4.12 | <0.001 |
| **CPSS** | 23.43 (11.84) | 27.48 (9.45) | 17.36 (12.76) | 2.70 | 0.011 |
| **Empathy** | 39.43 (5.8) | 38.29 (5.04) | 41.14 (6.61) | −1.45 | 0.156 |
| **MAAS-A** | 52.14 (13.63) | 49.86 (12.66) | 55.57 (14.77) | −1.22 | 0.23 |
| **SCS-SF** | 35.17 (8.79) | 31.52 (7.74) | 40.64 (7.51) | −3.46 | 0.002 |

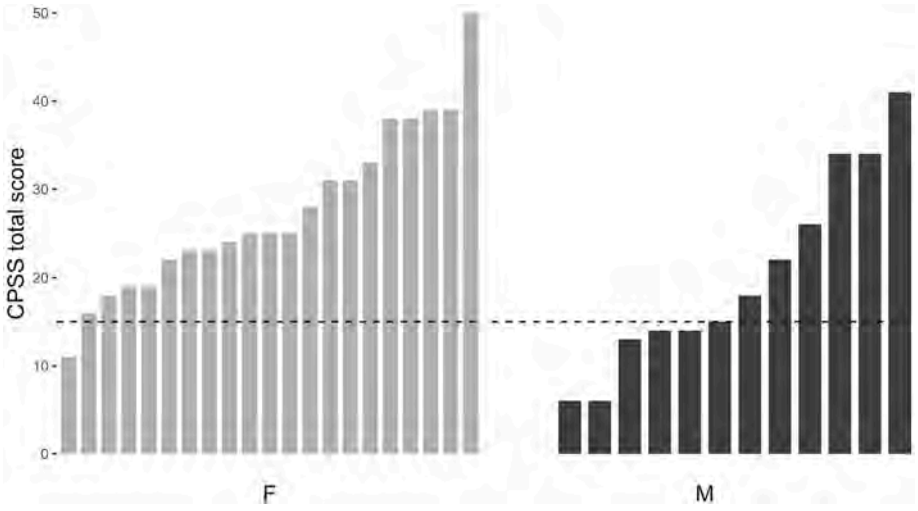


**Fig. 1.** Child Post-traumatic Stress Disorder Symptom Scale (CPSS) scores by sex. The PTSD clinical cutoff proposed for this scale (score 16 or higher) (Nixon el al., 2013) is indicated by a dotted line. F (females); M (males).

indicating increased alertness and physical reactions to stress triggers in girls. These findings underscore the need for sex/gender-specific approaches in trauma-focused interventions.

### 3.4. Empathy

Empathy is a multifaceted construct that encompasses both cognitive and emotional components, which may develop along distinct trajectories. Cognitive empathy, also known as perspective-taking, refers to the ability to recognize and comprehend another person's emotional state, while affective empathy involves experiencing emotions that align with those of another individual, often leading to feelings of compassion or sorrow (Davis, 1983). Using the Spanish Multidimensional Empathy Questionnaire for children and early adolescents (Richaud et al., 2017), the mean total empathy score for all participants was 39.43 (SD = 5.8) over a maximum score of 60. No significant sex differences were found in empathy total scores or in the analysis of the dimensions integrated in this questionnaire (i.e., emotional contagion, self-other awareness, perspective-taking, emotional regulation, and empathic action) (Table 2, Table 4 and Supplementary Table 3). Our findings are consistent with previous studies showing that sex differences in empathy during early adolescence are often minimal or context-dependent (Graaff et al., 2014; Hoffman, 1977). However, the interpretation of our empathy-related findings should be approached with caution, as internal consistency for this scale in our study was questionable (Cronbach's α = 0.602).

### 3.5. Mindful attention awareness

Dispositional mindfulness refers to an individual's habitual inclination to remain attentive and aware of present-moment experiences in everyday life (Brown & Ryan, 2003). Using the validated Spanish version of the Mindful Attention Awareness Scale-Adolescents (MAAS-A) (Calvete et al., 2014), we found a mean total MAAS-A score for all participants of 52.14 (SD = 13.63) over a maximum score of 84 (Table 2). No significant sex difference was observed on individual items (Supplementary Table 4). The internal consistency of the scale in this study was α = 0.86, indicating a good reliability. Previous research and results presented here suggest that dispositional mindfulness, as measured by the MAAS-A scale, is often similar across sex in children and adolescents, although the mean MAAS-A score in our sample was lower than in Dutch, Spanish and Turkish adolescents (Calvete et al., 2014; de Bruin et al., 2011; Doğan & Metin, 2023).

### 3.6. Self-compassion

The concept of self-compassion, involves maintaining a kind, supportive, and soothing attitude toward oneself during challenging moments (Neff, 2023). The mean self-compassion score for all participants using the validated Spanish version of the Self-Compassion Scale-Short Form (SCS-SF) (Garcia-Campayo et al., 2014, pp. 1–9) was 35.17 (SD = 8.79) out of a maximum possible score of 60. When examined by sex, boys had a significantly higher mean score compared to girls (Table 2 and Supplementary Table 5). A Cronbach's alpha (α = 0.75) indicates an acceptable reliability. Our findings are consistent with previous reports suggesting that sex differences in self-compassion often emerge in adolescence, with males typically scoring higher than females (Bluth & Blanton, 2015; Cruz et al., 2024; Yarnell et al., 2015). Boys may exhibit higher self-compassion than girls due to differences in gender socialization, coping mechanisms, and biological factors. Cultural factors and

social expectations that encourage boys to prioritize self-confidence and emotional self-sufficiency are prevalent in Latin American populations, while girls are more prone to self-criticism and perfectionism influenced by societal pressures and social comparisons (Raffaelli & Ontai, 2004).

### 3.7. Correlation analyses

We conducted partial cross-correlation analysis between the psychometric scales used in this study (PSS-14, CPSS, Spanish Multidimensional Empathy Questionnaire, MAAS-A, and SCS-SF). The analysis revealed significant relationships between scales in the whole sample as well as several sex differences (Table 5).

In the whole sample, we found positive correlations between stress and PTSD symptoms and between mindfulness and self-compassion. On the other hand, both dispositional mindfulness and self-compassion negatively correlated with perceived stress and PTSD symptoms. No statistically significant correlation was found between empathy and the rest of the scales.

Our findings align with prior studies, where MAAS-A scores were negatively correlated with symptoms of stress and anxiety (Royuela-Colomer et al., 2023). Moreover, higher dispositional mindfulness in adolescents has been correlated with lower levels of anger, antisocial behavior, substance dependence, and higher self-regulation (Calvete et al., 2014). Mindfulness training, therefore, shows promise as a protective strategy to help children cope with stressful experiences with a beneficial impact on emotional regulation and behavior.

Significant sex differences were evident in the correlations between scales. The positive correlation between mindfulness and self-compassion was significant in girls but showed only a statistical trend in boys which may reach significance with a larger sample size.

We observed negative correlations between self-compassion and both perceived stress and PTSD symptoms in boys. In contrast, these correlations were not significant in girls, potentially reflecting the significantly lower mean self-compassion scores that we detected in girls. This disparity may indicate that girls benefit less from the protective effects of self-compassion due to their lower baseline levels, underscoring the importance of interventions that aim to enhance gender-sensitive self-compassion training.

### 3.8. Policy and practice-based implications

Implementing evidence-based prevention programs tailored to improve children's mental health is a global public health priority, not only to address immediate psychological concerns but also to support healthier developmental trajectories (Blaisdell et al., 2023). Our findings in school children in Argentina support the notion that fostering resilience and emotional well-being in children is essential, even in contexts where comprehensive screening for adverse childhood experiences is not feasible. This is especially true for Generation Alpha children (born between 2010 and 2024), a cohort growing up amid unprecedented challenges, including the digitalization of most aspects of life, reduced real-world interaction, widespread addictive exposure to social media, artificial intelligence-driven data misuse and bias, and climate-related anxiety (McGorry, 2024; McGorry et al., 2024).

As daily environments that provide education, protection, and social-emotional support during critical developmental windows, schools are uniquely positioned to implement structured, evidence-informed mental-health promoting curricula. We propose that teaching psychological well-being strategies through systematic, protocolized curricula should be considered as essential as teaching traditional academic contents, requiring coordinated efforts toward the development of new educational policies. However, previous research has identified implementation challenges for school-based mental health programs, particularly stemming from stakeholders' limited understanding of program rationale and low perceived benefits (Dowling & Barry, 2020; Jenniskens et al., 2024). It is therefore crucial to adopt collaborative approaches that foster shared goals, transparent communication, and active participation from educators, families, and mental health professionals. These strategies may not only enhance community engagement but also reduce the vulnerability of such initiatives to institutional or political shifts. Moreover, as schools face increasing accountability pressures tied to academic performance, mental health interventions risk being deprioritized unless explicitly aligned with educational goals. Framing these programs as contributing to positive school climate, violence prevention, and a supportive learning environment may facilitate their integration into mainstream education. This framing recognizes children's mental health as foundational to academic success, emotional resilience, and social development. For school-based initiatives to be impactful and sustainable, they must be positioned not as add-ons, but as integral to the core mission of education.

Our previous studies, alongside the work of other researchers suggest that multimodal mental-health promoting interventions may be ideal for school settings, yielding promising outcomes in improving children's mental health, including in trauma-exposed populations (Kaliman et al., 2022; Roque-Lopez et al., 2021; Silverstone & YM Suen, 2016). Indeed, the diversity of practices included in multimodal interventions (e.g. movement-based practices, games, expressive arts, nature-based activities) increases the likelihood that each child will connect with one or more components that resonate with their personal experiences, preferences and emotional needs. Our findings suggest that mindfulness and self-compassion training may be key protective components within mental health-promoting school interventions. However, drawing clear

**Table 4**
Dimensions of the Multidimensional Empathy Questionnaire for children and early adolescents. Mean total score values in the whole sample and analysis by sex are indicated.

| | All partcipants (n = 35) | Girls (n = 21) | Boys (n = 14) | Statistic test (U Mann Withney) | |
|---|---|---|---|---|---|
| | Median (IQR) | Median (IQR) | Median (IQR) | U | *p-value* |
| **1. Emotional Contagion** | 6 (3.5) | 6 (3) | 4.5 (3.5) | 193 | 0.12 |
| **2. Self-others Awareness** | 9 (3) | 9 (2) | 9 (3.5) | 140.5 | 0.838 |
| **3. Perspective-Taking** | 8(2) | 7(3) | 9 (3) | 88 | 0.046 |
| **4. Emotional Regulation** | 7 (3) | 7 (2) | 8.5 (2.75) | 102.5 | 0.135 |
| **5. Empathic Action** | 9 (3) | 9 (3) | 9 (2.75) | 127 | 0.499 |

**Table 3**
Child Post-traumatic Stress Disorder Symptom Scale (CPSS) Dysphoria 4-factor model (Meyer et al., 2015). Mean total score values in the whole sample and analysis by sex are indicated.

| | All partcipants (n = 35) | Girls (n = 21) | Boys (n = 14) | Statistic test | |
|---|---|---|---|---|---|
| Dysphoria 4-factor model | Mean (SD) | Mean (SD) | Mean (SD) | t-statistic | *p-value* |
| **1. CPSS - intrusion** | 6.31 (4.29) | 7.33 (3.69) | 4.79 (4.79) | 1.78 | 0.085 |
| **2. CPSS - avoidance** | 3.86 (2.63) | 4.19 (2.23) | 3.36 (3.15) | 0.92 | 0.365 |
| **3. CPSS - dysphoria** | 9.69 (5.11) | 11.52 (4.48) | 6.93 (4.87) | 2.87 | 0.007 |
| **4. CPSS - arousal** | 3.57 (1.74) | 4.43 (1.4) | 2.29 (1.38) | 4.46 | <0.001 |

**Table 5**
Cross correlation among scores of all self-report measures.
Partial correlation analyses to evaluate the relationships between scales were performed for all participants and by sex.
Perceived Stress Scale (PSS-14), the Child PTSD Symptom Scale (CPSS), the Spanish Multidimensional Empathy Questionnaire for children and early adolescents (empathy), the Mindful Attention Awareness Scale-Adolescents (MAAS-A), and the Self-Compassion Scale-Short Form (SCS-SF).

| All participants | MAAS-A | | PSS-14 | | CPSS | | SCS-SF | | Empathy | |
|---|---|---|---|---|---|---|---|---|---|---|
| | r | p-value | r | p-value | r | p-value | r | p-value | r | p-value |
| **MAAS-A** | – | – | −0.526 | 0.001 | −0.616 | <0.001 | 0.439 | 0.008 | 0.173 | 0.32 |
| **PSS-14** | −0.526 | 0.001 | – | – | 0.597 | <0.001 | −0.595 | <0.001 | −0.145 | 0.405 |
| **CPSS** | −0.616 | <0.001 | 0.597 | <0.001 | – | – | −0.561 | <0.001 | −0.025 | 0.889 |
| **SCS-SF** | 0.439 | 0.008 | −0.595 | <0.001 | −0.561 | <0.001 | – | – | 0.229 | 0.185 |
| **Empathy** | 0.173 | 0.32 | −0.145 | 0.405 | −0.025 | 0.889 | 0.229 | 0.185 | – | – |
| **Girls** | *r* | *p-value* | r | p-value | r | p-value | r | p-value | r | p-value |
| **MAAS-A** | – | – | −0.59 | 0.005 | −0.657 | 0.001 | 0.436 | 0.048 | −0.034 | 0.883 |
| **PSS-14** | −0.59 | 0.005 | – | – | 0.53 | 0.013 | −0.325 | 0.15 | 0.086 | 0.711 |
| **CPSS** | −0.657 | 0.001 | 0.53 | 0.013 | – | – | −0.209 | 0.364 | 0.233 | 0.31 |
| **SCS-SF** | 0.436 | 0.048 | −0.325 | 0.15 | −0.209 | 0.364 | – | – | 0.13 | 0.576 |
| **Empathy** | −0.034 | 0.883 | 0.086 | 0.711 | 0.233 | 0.31 | 0.13 | 0.576 | – | – |
| **Boys** | *r* | *p-value* | *r* | *p-value* | *r* | *p-value* | *r* | *p-value* | *r* | *p-value* |
| **MAAS-A** | – | – | −0.593 | 0.026 | −0.631 | 0.016 | 0.487 | 0.077 | 0.372 | 0.191 |
| **PSS-14** | −0.593 | 0.026 | – | – | 0.591 | 0.026 | −0.657 | 0.011 | −0.231 | 0.426 |
| **CPSS** | −0.631 | 0.016 | 0.591 | 0.026 | – | – | −0.799 | 0.001 | −0.162 | 0.58 |
| **SCS-SF** | 0.487 | 0.077 | −0.657 | 0.011 | −0.799 | 0.001 | – | – | 0.116 | 0.694 |
| **Empathy** | 0.372 | 0.191 | −0.231 | 0.426 | −0.162 | 0.58 | 0.116 | 0.694 | – | – |

conclusions from the current evidence on mindfulness- and compassion-based interventions in school settings remains challenging due to significant discrepancies in methodological rigor, implementation strategies, intervention types, instructor training, assessment tools, and the specific practices employed, factors that collectively limit comparability across studies (Monsillon et al., 2023; Palacios et al., 2023). To address these challenges, future research should prioritize methodological standardization and transparent reporting of intervention components. Importantly, to ensure that these programs have a positive impact, trained instructors are essential. Any initiative of this nature needs to sensitize and train key professionals (e.g., teachers, educational psychologists, social workers) to embody the very principles the programs aim to cultivate in children. Equally important are considerations of program replicability, long-term sustainability, and communication strategies to foster positive school-wide reception and help prevent potential stigma around mental health initiatives.

Finally, empirical research is needed to identify the most effective formats for school-based programs. While early adolescence appears to be a particularly sensitive window for these interventions, further investigation is required to determine the most receptive age ranges, the optimal frequency and duration of the sessions, and the delivery formats that best align with school schedules while minimizing classroom disruption. Moreover, rigorous program evaluation is critical. Multicentered, controlled, and longitudinal studies that use comprehensive methodologies, including first-person accounts (children's narratives), second-person assessments (perspectives from teachers and families), and third-person evaluations (clinical and physiological measures) are required. The identification of sensitive, developmentally appropriate assessment tools is critical to more accurately capture the psychological and behavioral impact of the interventions. In parallel, monitoring biological markers of stress (e.g., stress hormones, inflammatory cytokines) in non-invasive samples such as saliva or hair may offer valuable insights into potential physiological effects.

In conclusion, we believe that school-based mental health promotion must be reconceptualized as a structural priority of educational systems, embedded within school culture, supported by policy, and grounded in scientific evidence.

## 4. Conclusions

This study contributes to our understanding of well-being and mental health among pre-adolescents in vulnerable communities, where socioeconomic and environmental stressors seem to impact affective and cognitive dimensions in sex-sensitive ways. Randomized controlled trials are necessary to evaluate the impact of trauma-sensitive school programs. The quality of implementation is a crucial factor in the success of school-based programmes and should therefore be a priority. Integrating components such as mindful awareness and self-compassion training holds promise as effective strategies to mitigate stress and PTSD symptoms in mental health-promoting programs for preadolescents. In particular, the observed sex disparities in perceived stress and PTSD symptoms highlight the importance of developing sex/gender-sensitive interventions.

## 5. Strengths and Limitations

One of the key strengths of this work lies in its focus on a highly vulnerable and under-characterized population whose mental health needs are critically underrepresented in the literature. By employing a comprehensive set of validated psychometric measures, the study offers a nuanced understanding of gender differences in mental health indicators among preadolescents, shedding light on disparities in stress, PTSD symptoms, and protective factors like mindfulness and self-compassion. The integration of both risk and resilience factors provides important insights into the complex emotional landscape of these children, offering evidence that can inform targeted interventions. The recommendations derived from our experience reinforce the study's translational value and its potential to guide the development of trauma-informed and gender-sensitive mental health-promoting strategies in school settings.

This study presents several limitations. The sample size was small, and we had no access to formal demographic information such as race, religion, family structure, education and socioeconomic status, participant's gender identity and ACE screening, which prevented further analyses. Although participants were not all from the same class, they were all from the same grade and school, which limits the generalizability of the findings to other school populations with different educational and sociocultural contexts. Furthermore, due to ethical considerations of non-intrusiveness, we did not conduct individual interviews with the children, which limited our ability to understand the specific factors that may have contributed to the alarming high PTSD scores that we detected (e.g., their traumatic experiences, personal perspectives on the impact of

these events, and their emotional responses during and after the incidents). Another limitation of this study is the reliance on self-report measures, which may be influenced by children's cognitive and emotional abilities and social desirability bias, highlighting the need for complementary methods such as physiological assessments of stress-related pathways. Additionally, the absence of follow-up assessments limits our ability to evaluate the persistence or evolution of symptoms over time.

## CRediT authorship contribution statement

**Perla Kaliman:** Writing – review & editing, Writing – original draft, Validation, Supervision, Project administration, Methodology, Investigation, Funding acquisition, Data curation, Conceptualization. **María Jesús Álvarez-López:** Formal analysis. **Marina Lisenberg:** Supervision, Methodology. **María Agustina Acosta:** Writing – review & editing, Methodology. **Denise Agostina Simkin:** Writing – review & editing, Methodology. **Rocío Martínez-Vivot:** Writing – review & editing, Project administration, Methodology, Funding acquisition.

## Declaration of generative AI and AI-assisted technologies in the writing process

During the preparation of this work the authors used ChatGPT4o for checking grammar, and spelling. After using this tool/service, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

## Declaration of competing interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: Perla Kaliman reports financial support was provided by Anonymous donor. Perla Kaliman reports financial support was provided by Moksha Holdings. Rocio Martinez Vivot reports financial support was provided by Mind and Life Europe. PK is the founder and director of Generation Alpha Minds (GAM), a non-profit organization committed to supporting the creation and scientific validation of free psychological well-being programs for children in underserved, vulnerable communities (www.generationalphaminds.org). ML is a board member of GAM. The rest of authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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## Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.chipro.2025.100227.

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