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Research paper

The interplay among nonsuicidal self-injury, depression, loneliness, resilience, and family relationships in youth: A path analysis

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ABSTRACT

Background: Recent research has increasingly highlighted the complex interplay among depression, loneliness, and non-suicidal self-injury (NSSI). Resilience and family relationships have emerged as potential protective factors in mitigating these mental health challenges.

Methods: This study investigated the associations among depression, loneliness, NSSI, resilience, and family relationships in a sample of 7146 Italian high school and university students. Participants completed a multidimensional online survey featuring standardized instruments to assess depressive symptoms, loneliness and resilience. Spearman correlations and path analysis were employed to examine the interrelationships among these variables.

Results: A substantial proportion of participants reported clinically significant depressive symptoms (42.8 %) and NSSI behaviours (28.4 %). Path analysis revealed a strong positive effect of depressive symptoms on both loneliness and NSSI, alongside a pronounced negative effect on satisfaction with family relationships and resilience. Loneliness significantly reduced satisfaction with family relationships and resilience, while the impact on NSSI was significant, but minimal. Family relationships exhibited a significant but modest negative effect on NSSI behaviours.

Limitations: The generalizability of the sample and the potential biases inherent in self-report measures are addressed.

Conclusions: This study highlights the intricate interplay between depressive symptoms, loneliness, NSSI, resilience, and family relationships in a large sample of Italian adolescents and young adults. The findings emphasize the need for comprehensive interventions targeting these factors to enhance mental health and well-being.

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1. Introduction

Youth depression is a widespread mental health concern, with one in three adolescents aged 10–19 experiencing elevated depressive symptoms globally (Shorey et al., 2022). It ranks among the leading causes of illness and disability in this age group, significantly impacting individuals and society (World Health Organization, 2023). Research consistently highlights a strong association between depression and loneliness (Spithoven et al., 2017; Wang et al., 2018). Unlike social isolation, loneliness, is a negative subjective experience arising from unmet needs regarding the quality of social connections (Surkalim et al., 2022). It plays a significant role in both the development and persistence of depressive symptoms (Erzen and Çikrikci, 2018; Xiao et al., 2023). Evidence further suggests a bidirectional relationship between depression and loneliness (Giacco, 2023) with each amplifying the other in a cycle of reciprocal effects (Qirtas et al., 2023).

While the relationship between depression and loneliness is well-established, recent research has delved deeper into the complex interplay between these mental health challenges and Non-Suicidal Self-Injury (NSSI) (Madjar et al., 2021; Wang and Liu, 2019; Zhang et al., 2023). NSSI refers to self-inflicted harm without suicidal intent, often manifested through behaviours such as cutting, scratching, burning, or hitting and banging oneself. This behaviour is most prevalent among adolescents and young adults (Nock, 2010). Research highlights an increased risk of NSSI among individuals experiencing depression and loneliness. Those with depressive symptoms are more likely to engage in NSSI as a coping mechanism to regulate their emotions, compared to individuals' depression (Yan and Yue, 2023). Depression has been identified depression as a significant risk factor for NSSI, with a positive correlation observed between loneliness and NSSI (Zhang et al., 2023). Additionally, loneliness is notably higher among individuals with a history of self-injurious thoughts or behaviours compared to those without (McClelland et al., 2021). Supporting this connection, Madjar et al. (2021) found that feelings of loneliness were linked to depressive symptoms, which, in turn, were associated with NSSI.

Given the complexity of these mental health challenges, the associations between depression, loneliness, and NSSI are likely influenced by numerous additional factors. Youth mental health is shaped by a variety of psychological, environmental, or relational variables. Among these, resilience and the quality of family relationships have been identified as critical factors affecting mental health outcomes, including depression and NSSI (Mason et al., 2009; Mesman et al., 2021). Resilience is understood as a dynamic process involving biological, psychological, social, and ecological systems working together to help individuals adapt and recover from adversities (Ungar and Theron, 2020). Those with higher resilience typically employ a diverse range of coping strategies and emotional regulation skills, enabling them to navigate challenges effectively and maintain a sense of stability. Higher resilience levels are associated with fewer mental health issues, including lower rates of depression (Mesman et al., 2021). Moreover, higher resilience levels have been found to be negatively associated with both the occurrence of NSSI (Buelens et al., 2023) and the experience of loneliness (Zhang et al., 2023). Family relationships also play a pivotal role in youth mental health. Positive family dynamics - characterized by warmth, support, and open communication - can serve as a protective buffer against the adverse effects of social isolation. For instance, a recent study found that a stronger subjective sense of belonging within one's family was associated with reduced feelings of loneliness (Wakefield et al., 2020). Conversely, negative family dynamics - characterized by conflict, lack of support, or poor communication - can increase the risk of adverse mental health outcomes, including depression and NSSI. Mason et al. (2009) found that adolescents with higher quality family relationships exhibited significantly lower levels of depressive symptoms. Moreover, family cohesion and adaptability were shown to be significant protective factors, negatively predicting NSSI behaviours among ethnic minority adolescents (Lai and Chen, 2023).

While research on these individual relationships has grown, the number of studies examining the complex interconnections among depression, loneliness, and NSSI, in relation to resilience and quality of family relationships, remains limited. Understanding these multifaceted interactions is essential for designing effective prevention and intervention strategies to reduce youth depression and NSSI behaviours. This study seeks to address this research gap by exploring the interplay among these variables in a sample of adolescents and young adults using path analysis. Drawing from the existing literature, we hypothesize that:

1. Depressive symptoms, loneliness, and NSSI will be positively associated with one another and negatively associated with resilience.
2. Resilience and quality of family relationships will be negatively associated with depressive symptoms, loneliness, and NSSI.
3. Resilience and quality of family relationships will exert a significant effect on loneliness, depressive symptoms, and NSSI.

By examining these relationships, this study aims to provide a more comprehensive understanding of the factors contributing to youth depressive symptoms, loneliness and NSSI.

2. Methods

2.1. Study design and participants

Nine high schools and one university located in Brescia, a medium-sized town in Northern Italy, participated in this cross-sectional observational study. Recruitment and data collection were conducted over two weeks in November 2021. Among the 11,839 high school students and 15,000 university students in the target population, 7,146 (26.6 %) agreed to participate. The response rate was 43.9 % for high school students and 13 % for university students. A multidimensional online survey was created using Google Forms and distributed to representatives of each participating institution. Subsequently, all enrolled students aged 14–25 received an email from their respective student administration offices containing the survey link, a detailed study description, and information about voluntary participation and data anonymity. Informed consent was obtained electronically via the survey link. The study complied with the World Medical Association's Declaration of Helsinki and received ethical approval from the coordinating center's Review Board (protocol number: 160/2021, May 28th, 2021).

2.2. Instruments

The online survey assessed several aspects of students' lives, including socio-demographic characteristics, physical and mental health. It incorporated standardized instruments for a comprehensive multidimensional evaluation, including the following measures:

- Severity Measure for Depression – Adult (adapted from Patient Health Questionnaire – 9 [PHQ-9]) and Severity Measure for Depression – Child Age 11–17 (APA, 2015a, 2015b), adapted from the modified version for adolescents of PHQ-9 (Johnson et al., 2002). These 9-item scales assess depressive symptoms and each item is scored on a four-point scale, from 0 to 3. Higher scores indicate higher depressive symptoms. In this study, we adopted a cut-off score of 10, as suggested by a recent meta-analysis (Levis et al., 2019). In our sample, the Cronbach's alpha value was confirmed at 0.89 for both the Child Age and the Adult versions of the scale.
- UCLA Loneliness Scale (UCLA, Russell, 1996), a 20-item scale measuring subjective feelings of loneliness and social isolation. Participants rate each item as either O ("*I often feel this way*", corresponding to a score of 3), S ("*I sometimes feel this way*", corresponding to a score of 2), R ("*I rarely feel this way*", corresponding to a score of 1), and N ("*I never feel this way*", corresponding to a score of 0). The total score is the sum of all the items, with higher scores

indicating greater feelings of loneliness. In our sample, the UCLA demonstrated high reliability, with Cronbach's alpha at 0.94.

- Connor-Davidson Resilience Scale - 10 items (CD-RISC-10, Campbell-Sills and Stein, 2007), a 10-item scale assessing resilience. Each item is scored on a five-point scale ranging from 0 to 4. The total score ranges from 0 to 40, with higher scores suggesting greater resilience. In our sample, the overall Cronbach's alpha value was confirmed at 0.88.
- An adapted version of a selection of items included in the Risky Behaviour Questionnaire for Adolescents (RBQ-A, Auerbach and Gardiner, 2012), a 20-item self-report instrument which assesses broad-based engagement in risky behaviours in the past month, including NSSI. Each item is scored on a five-point scale ranging from 0 to 4 (0 = *Never*; 1 = *Almost never*, *1 time per month*; 2 = *Sometimes*, *2/4 times per month*; 3 = *Almost always*, *2/3 times per week*; 4 = *Always*, *4 or more times per week*). NSSI was assessed using a single item from the adapted version of the RBQ-A, which asked: 'Have you hurt yourself or caused yourself pain on purpose?' Responses were categorized as 'Yes' for any response other than 'Never', and 'No' for 'Never'.

The survey also included questions about students' daily activities, habits, and family relationships. Specifically, participants *were asked* to rate their satisfaction with the quality of their family relationships on a scale from 0 = *not at all satisfied* to 10 = *extremely satisfied*.

2.3. Data analysis

Descriptive statistics were calculated for socio-demographic and academic characteristics, as well as for the questionnaire scores. Frequencies and percentages were used for categorical variables, while means and Standard Deviations (*SD*) were reported for quantitative variables. The normality assumptions for the instrument scores were assessed using the Kolmogorov-Smirnov and Shapiro-Wilk tests. The Variance Inflation Factor (VIF) was examined for all predictors to assess multicollinearity. All VIF values fell below the recommended threshold (<5), suggesting that multicollinearity was not problematic. Gender-based comparisons of instrument outcomes were conducted using the Student's *t*-test or a corresponding non-parametric test such as Mann-Whitney (for non-Gaussian-distributed data). Relationships among the instruments were analyzed using Spearman's correlations. Drawing on these correlations and insights from previous studies (Buelens et al., 2023; Giacco, 2023; Mason et al., 2009; Mesman et al., 2021; Zhang et al., 2023), a theoretical model was developed to represent the interrelations between depressive symptoms, loneliness, NSSI, resilience and satisfaction with family relationships. This model was then tested using path analysis. Path model coefficients were estimated and standardized (ranging from −1 to 1) to facilitate interpretation and comparison between variables. Model fit was assessed using several indices: the Root Mean Square Error of Approximation (RMSEA), the Comparative Fit Index (CFI), the Standardized Root Mean Square Residual (SRMR), and the Tucker- Lewis Index (TLI), as well as Chi-square statistic (χ^2). According to conventional criteria, a good model fit is indicated by an RMSEA below 0.06, a CFI above 0.95, a SRMR below 0.08, and a TLI above 0.96 (Iacobucci, 2010; Schreiber et al., 2006; Sivo et al., 2006).

Path analysis was performed using the *lavaan* package in R (version 4.4.1). All other analyses were conducted using the same version of R software. A *p*-value of <0.05 was considered statistically significant.

3. Results

The majority of students (63.1 %) were female, with a significant proportion aged 18–25 (44.1 %), followed by those aged 16–17 (26.6 %) and 14–15 (29.3 %). Almost all students (96 %) lived with their parents and reported relatively high satisfaction with their family relationships (mean score = 7.32, SD = 2.04). Most participants (89.7 %) had no history of diagnosed mental disorders. Table 1 presents the total mean scores for standardized instruments and the prevalence of risky behaviours by gender, while Table 2 compares these scores and behaviours between minor and adult students. Notably, 42.8 % of students scored above the cut-off on the PHQ-9. Cut-off scores were not available for the UCLA and CD-RISC-10. In the past month, 70.9 % of the sample did not engage in NSSI, 14.3 % reported engaging once, 8.1 % reported 2 to 4 times per month, and 6.7 % reported more than once a week.

Regarding gender differences, female students scored significantly higher than males on the PHQ-9 and the UCLA scales, indicating greater levels of depressive symptoms and loneliness. Females also reported engaging more frequently in NSSI and binge eating behaviours compared to males. Conversely, male students were more likely to engage in binge drinking, reckless driving, and cannabis use, and exhibited higher levels of resilience. In terms of age differences, minor students presented higher levels of depressive symptoms and loneliness, along with lower levels of resilience compared to their adult counterparts. They were also more likely to engage in NSSI and binge eating behaviours. Conversely, adult students showed a greater propensity for alcohol and cannabis use.

Table 3 presents the correlations among the primary study variables. The highest correlation coefficient was observed between the PHQ-9 and UCLA. Medium-to-large positive correlations were found between the PHQ-9 and NSSI, and between the UCLA and NSSI. The CD-RISC-10 showed moderate negative correlations with NSSI, UCLA, and PHQ-9. Similarly, satisfaction with family relationships was moderately negatively correlated with NSSI, UCLA, and PHQ-9.

Drawing on the correlations observed in our sample and existing literature (Buelens et al., 2023; Giacco, 2023; Mason et al., 2009; Mesman et al., 2021; Zhang et al., 2023), a theoretical model was hypothesized to represent the structural relationships among the measures (Fig. 1).

Two path models were developed to explore specific relationships between variables, aiming to identify the most relevant and plausible associations within our large student sample. The primary differences between the two models involved the directional associations among depressive symptoms and loneliness, depressive symptoms and both resilience/family relationships, and loneliness and resilience/family relationships. Both path models were controlled for gender and age (minors vs. adults). The fit indices were nearly identical between the original and controlled models (see Table S1 for detailed fit indices, and Table S2 for the estimation of direct, indirect, and total effects for path models 1 and 2, Supplementary materials), indicating that adjusting for age and gender did not significantly affect the overall model fit. Both models corrected for age and gender demonstrated excellent fit. Model 2 ($\chi^2 = 20.65$, df = 2, $p < .001$) exhibited slightly better fit than Model 1 ($\chi^2 = 50.87$, df = 2, $p < .001$), as evidenced by higher CFI (0.998 vs 0.994) and TLI (0.979 vs 0.947). Additionally, Model 2 exhibited a marginally lower RMSEA (0.036) compared to Model 1 (RMSEA = 0.059), further supporting its superior fit. Similarly, the SRMR was lower in Model 2 (0.009) than in Model 1 (0.015), suggesting that Model 2 more accurately reflected the structure of the relationships within the data after controlling for age and gender. In both models corrected for age and gender, the relationship between resilience and NSSI was non-significant, leading to the exclusion of this path from the final models. The two path models, along with the standardized path coefficients, are presented in Figs. 2 and 3.

The path analysis for Model 2 (Fig. 2) showed a strong positive effect of depressive symptoms on loneliness (β std. = 0.524, $SE = 0.026$, $z = 43.55$, $p < .001$) and NSSI (β std. = 0.388, $SE = 0.003$, $z = 23.21$, $p < .001$). Depressive symptoms also had a medium/strong negative effect on satisfaction with family relationships (β std. = −0.431, $SE = 0.004$, $z = -33.10$, $p < .001$) and resilience (β std. = −0.295, $SE = 0.016$, $z = -23.70$, $p < .001$). Moreover, loneliness was significantly negatively associated with resilience (β std. = −0.106, $SE = 0.018$, $z = -10.12$, $p <$

Table 1
Standardized tools' scores and risky behaviours, by gender.

Standardized tools	Total		Males		Females		Test statistics	*p*
	Mean (SD)	Above cut-off	Mean (SD)	Above cut-off	Mean (SD)	Above cut-off		
PHQ9	9.43 (6.51)	42.8 %	6.93 (5.62)	27.3 %	10.72 (6.49)	51.0 %	*U*st = −24.70	<.001[a]
UCLA	20.69 (13.93)		17.42 (13.26)	–	22.32 (13.89)	–	*U*st = −14.92	<.001[a]
CD-RISC-10	17.79 (8.28)		20.12 (8.15)	–	16.57 (8.00)	–	*t* = −17.78	<.001[b]

Risky behaviours[d]	Total		Males		Females		*p*[c]
	Yes (%)	No (%)	Yes (%)	No (%)	Yes (%)	No (%)	
NSSI	28.4	71.4	22.8	77.2	31.9	68.1	<.001
Binge eating	37.3	62.7	30.4	69.6	41.3	58.7	<.001
Reckless driving	20.9	79.1	32.5	67.5	14.4	85.6	<.001
Binge drinking	42.2	57.8	44.0	56.0	41.2	58.8	.021
Cannabis use	7.5	92.5	10.1	89.9	6.1	93.9	<.001

Note: *t*: statistic *t* of the *t*-test; *U*st: standardized Mann-Whitney *U* statistic.
[a] Non-parametric Mann-Whitney test applied for non-normally distributed data.
[b] Student's *t*-test applied for normally distributed data.
[c] Chi squared test.
[d] *Yes* corresponds to 1 = Almost never, 2 = Sometimes, 3 = Almost always and 4 = Always (RBQA score) for Self-harm, Binge eating, Reckless driving and binge drinking; *Yes* corresponds to 1 = Almost never, 2 = Sometimes, 3 = Almost always and 4 = Always (RBQ-A score) for cannabis use.

Table 2
Standardized tools' scores and risky behaviours, by age (Minors vs Adults).

Standardized tools	Total		Minors		Adults		Test statistics	*p*
	Mean (SD)	Above cut-off	Mean (SD)	Above cut-off	Mean (SD)	Above cut-off		
PHQ9	9.43 (6.51)	42.8 %	9.86 (6.77)	46.1 %	8.87 (6.13)	38.7 %	*U*st = −5.74	<.001[a]
UCLA	20.69 (13.93)		21.41 (14.14)		19.77 (13.61)		*U*st = 1.16	<.001[a]
CD-RISC-10	17.79 (8.28)		17.20 (8.14)		18.53 (8.40)		*t* = 6.74	<.001[b]

Risky behaviours[d]	Total		Minors		Adults		*p*[c]
	Yes (%)	No (%)	Yes (%)	No (%)	Yes (%)	No (%)	
NSSI	28.4	71.4	36.4	63.6	19.8	80.2	<.001
Binge eating	37.3	62.7	41.1	58.6	32.7	67.3	<.001
Reckless driving	20.9	79.1	20.7	79.3	21.2	78.8	.606
Binge drinking	42.2	57.8	35.7	64.3	50.5	49.5	<.001
Cannabis use	7.5	92.5	6.4	93.6	9.2	90.8	<.001

Note: *t*: statistic *t* of the *t*-test; *U*st: standardized Mann-Whitney *U* statistic.
[a] Non-parametric Mann-Whitney test applied for non-Gaussian distributed data.
[b] Student's *t*-test applied for Gaussian distributed data.
[c] Chi squared test.
[d] *Yes* corresponds to 1 = Almost never, 2 = Sometimes, 3 = Almost always and 4 = Always (RBQA score) for Self-harm, Binge eating, Reckless driving and binge drinking; *Yes* corresponds to 1 = Almost never, 2 = Sometimes, 3 = Almost always and 4 = Always (RBQ-A score) for cannabis use.

Table 3
Spearman's correlations between the study variables.

Variable	1	2	3	4	5
1. Satisfaction with family relationships	–				
2. NSSI	−0.28**	–			
3. CD-RISC-10	0.21**	−0.18**	–		
4. UCLA	−0.36**	0.33**	−0.30**	–	
5. PHQ-9	−0.41**	0.44**	−0.34**	0.60**	–

Note: **$p < .01$.

.001), and satisfaction with family relationships (β std. = −0.103, SE = 0.081, $z = -8.76$, $p < .001$). Family relationships were found to have a small but significant negative effect on NSSI behaviours (β std. = −0.120, $SE = 0.007$, $z = -8.71$, $p < .001$). Conversely, loneliness was positively associated with NSSI, although the effect was minimal (β std. = 0.044, $SE = 0.001$, $z = 3.01$, $p < .01$).

While Model 1 (Fig. 3) was not the optimal model, its fit indices indicated a good alignment with the data. Therefore, we included these results to explore their potential implications. This model highlighted the significant role of loneliness. The path analysis revealed a strong positive association between loneliness and depressive symptoms (β std. = 0.459, $SE = 0.005$, $z = 44.12$, $p < .001$) and a significant negative relationship with resilience (β std. = −0.268, $SE = 0.007$, $z = -22.20$, $p < .001$). Additionally, loneliness was negatively associated with satisfaction with family relationships (β std. = −0.336, $SE = 0.002$, $z = -27.16$, $p < .001$), indicating that higher levels of loneliness tended to co-occur with lower satisfaction in family relationships. The association between loneliness and NSSI was also statistically significant, though very small in magnitude (β std. = 0.044, SE = 0.001, z = 3.01, p < .01). Regarding depressive symptoms, a significant negative relationship was observed with resilience (β std. = −0.121, $SE = 0.008$, $z = -12.00$, $p < .001$) and satisfaction with family relationships (β std. = −0.230, $SE = 0.034$, $z = -21.78$, $p < .001$). These findings indicate that higher resilience and more satisfactory family relationships tend to co-occur with lower levels of depression, suggesting a possible protective role. Regarding NSSI, consistent with Model 2, a strong positive relationship

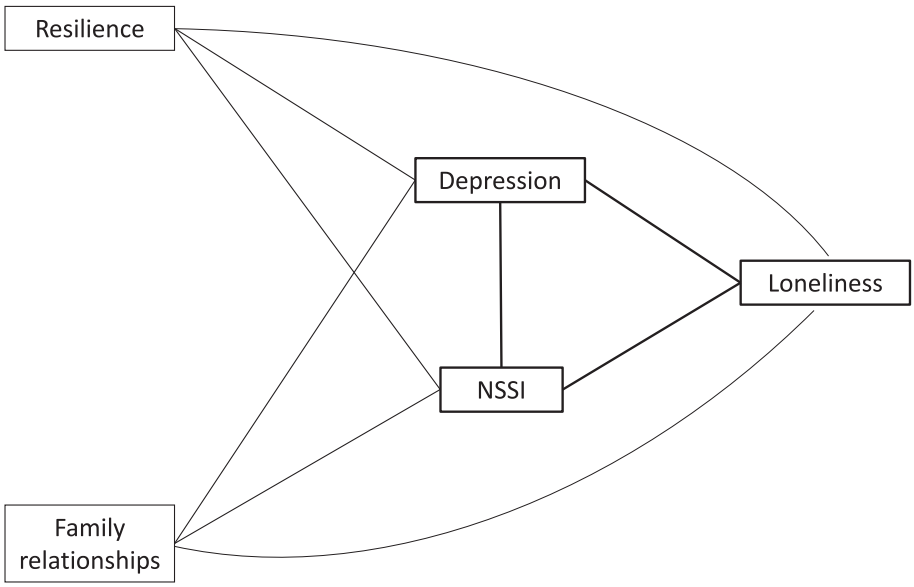

Fig. 1. Theoretical model.

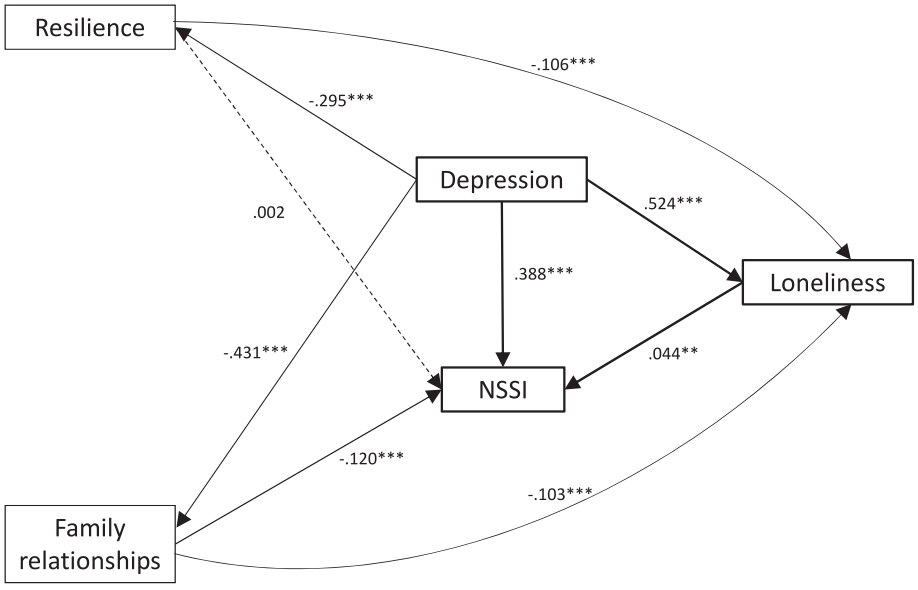

Fig. 2. Path model 2.

was confirmed between NSSI and depressive symptoms (β std. = 0.387, $SE = 0.003$, $z = 23.21$, $p < .001$). Additionally, a small negative association was found between NSSI and satisfaction with the quality of family relationships (β std. = −0.120, $SE = 0.007$, $z = -8.71$, $p < .001$).

4. Discussion

This study aimed to explore the interrelationships among depressive symptoms, loneliness, NSSI, resilience, and family relationships in a large sample of Italian students. The findings provide valuable insights into the complex dynamics shaping youth mental health. A notable proportion of students scored above the PHQ-9 cut-off, indicating clinically significant levels of depressive symptoms. While this self-report questionnaire alone cannot diagnose depression, the results underscore a critical concern for student mental health, suggesting that a substantial segment of this population may require timely support and intervention. In line with previous research (Basta et al., 2022; Lee-Winn et al., 2016; Platt et al., 2021; Sornberger et al., 2012, Surkalim et al., 2022), this study also reveals significant gender and age-related differences in depressive symptoms, loneliness, resilience, and risky behaviours among Italian students. However, the fit indices of the path models remained virtually unchanged after controlling for gender and age. This suggests that these demographic variables did not significantly affect the overall model fit, indicating that the relationships among the variables were consistent across both genders and age groups.

Consistent with our hypotheses, we found significant positive associations between depressive symptoms and loneliness, supporting prior research on their bidirectional relationship (Giacco, 2023). Notably, the path analysis for the best-fitting model (Model 2) demonstrated a strong positive effect of depressive symptoms on loneliness. Conversely, although Model 1 was not identified as the optimal model, it still exhibited a good fit and suggested a potential protective role of reduced loneliness in relation to depressive symptoms severity. These findings align with previous studies emphasizing the interconnectedness of these

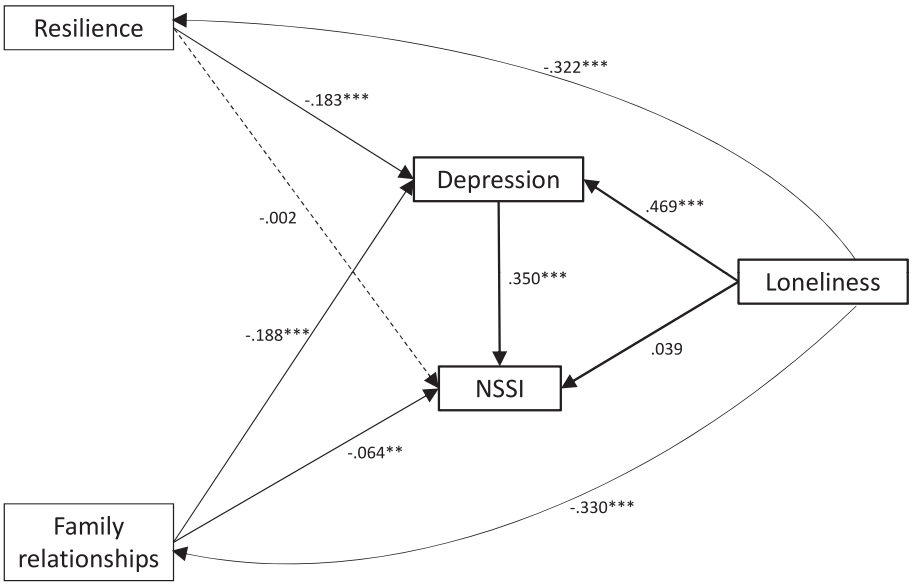

Fig. 3. Path model 1.

mental health variables (Erzen and Çikrikci, 2018; Xiao et al., 2023). Our findings also support the notion that individuals experiencing depression are at increased risk of engaging in NSSI as a coping mechanism (Yan and Yue, 2023). On the other hand, loneliness showed a small positive effect on NSSI occurrence, which was somewhat unexpected given that previous literature reported a strong association between loneliness and NSSI (Huang et al., 2023). One possible explanation for this discrepancy might be that the instrument we used to assess NSSI was not sufficiently detailed, potentially limiting its ability to capture more nuanced associations. Another possibility is that our sample may possess unique characteristics related to the experience of loneliness that differ significantly from those in other studies (e.g., our sample exhibited lower levels of loneliness compared to the sample in the study by Zhang et al., 2023). Further research is needed to explore this issue among Italian youth. While our findings suggest that the direct effect of loneliness on NSSI is smaller compared to the effect of depressive symptoms, addressing loneliness could still play a valuable role in preventing NSSI. Given the strong association between loneliness and depressive symptoms, reducing loneliness may indirectly reduce the risk of NSSI by mitigating depressive symptoms. As hypothesized, the findings of this study revealed negative associations between resilience and family relationships with the core variables of depressive symptoms and loneliness. These results suggest a bidirectional dynamic, whereby depression and loneliness not only diminish resilience and quality of family relationships, but are also intensified by lower levels of resilience and less supportive family environment. These findings suggest that resilience and family relationships may be associated with a reduced risk of the onset and maintenance of depressive symptoms and loneliness, indicating their potential protective role. Conversely, higher levels of depressive symptoms and loneliness may contribute to a reduction in resilience and perceived family relationship quality, potentially creating a self-perpetuating cycle where these factors reinforce each another. While we anticipated resilience would play a role in NSSI, our findings indicated otherwise. Although existing literature highlights resilience as a potential buffer against the occurrence of NSSI (Nearchou, 2024; Zhang et al., 2023), some studies have similarly failed to confirm this effect (Valencia-Agudo et al., 2018). Additionally, the effect of family relationship quality on this maladaptive behaviour was negative (as hypothesized), but minimal.

Our results suggest that individuals with greater resilience and stronger family relationships may be generally better equipped to cope with loneliness and depression. However, the potential protective role of these variables appears to be limited among individuals who engage in NSSI behaviours. One possible explanation for why resilience and positive family relationships did not mitigate NSSI in our study, unlike findings in previous research, could be that these protective factors are overshadowed by more immediate or intense stressors. For instance, participants who have experienced significant past trauma or are currently facing high levels of distress, may find these challenges overwhelming, diminishing the protective effects of resilience and family support. As a result, NSSI might emerge as a coping mechanism to manage such intense emotional experiences. Additionally, the measure of family relationships used in this study may not have adequately captured the full complexity of the construct. Future research should consider employing more comprehensive tools to assess family dynamics. A recent scoping review (Qu et al., 2023) identified several facets of family relationships as risk factors for NSSI, including problematic parenting styles, a poor family environment, and low parental availability. Examining these nuances in future studies could provide deeper insights into the role of parental relationships in NSSI. These findings carry significant implications for clinical practice. Beyond the typical assessment of depressive symptoms and risky behaviours such as NSSI, school counsellors and youth mental health professionals should conduct a comprehensive evaluation that includes loneliness, relationship satisfaction, and resilience. This multi-faceted approach will provide a more nuanced understanding of their mental health and enable the identification of targeted areas for intervention. Such interventions should address multiple factors, including depressive symptoms and loneliness especially when targeting NSSI behaviours. Promoting resilience-building skills represents a valuable strategy for supporting young people at risk of depression or loneliness (Dray et al., 2017). Additionally, interventions that focus on enhancing family dynamics and improving the quality of family relationships can play a crucial role in fostering the overall mental health of young individuals (Cheng et al., 2024; Wynne et al., 2016).

While this study benefits from a large sample size, it has several limitations that warrant consideration. The voluntary nature of participation may have introduced a selection bias, as students who agreed to participate might differ from those who declined. The study's focus on a single Italian city restricts the generalizability of the findings, underscoring the need for multicenter studies to provide a more representative overview. Furthermore, certain sociocultural factors specific to the local context may have influenced participants' experiences and reporting of psychological distress and NSSI. For example, regional norms regarding

emotional expression, stigma surrounding mental health, and family roles—particularly the centrality of the family unit in Italian culture—might have shaped both the prevalence and perceived acceptability of certain behaviours. These factors may limit the applicability of our results to adolescents from different cultural or geographic contexts, and future research should account for such variability. Although self-reported data allowed for the efficient collection of information across multiple domains, it may also have impacted the validity of the findings. A limitation of the present study concerns the use of single-item indicators to assess some key constructs, such as family relationships and NSSI. While these measures were chosen to minimize participant burden in a larger survey context, they may not fully capture the complexity and multidimensionality of the constructs. This could potentially reduce the precision and validity of the findings. Future research should consider using more comprehensive and psychometrically robust instruments to strengthen construct validity. Given the cross-sectional nature of the study, the directionality of the observed associations cannot be determined. While the analyses aimed to explore potential pathways between psychological distress and NSSI, longitudinal research is needed to further clarify their temporal dynamics and potential causal links. In addition, the selection of constructs included in the study was constrained by the need to limit the overall length of the survey and encourage participation. As a result, certain relevant domains—most notably peer relationships—could not be assessed. Given the centrality of peer dynamics in adolescent development and mental health, this represents an important omission. Future studies should include validated measures of peer relationships to better understand their role in psychological distress and NSSI.

In conclusion, our study contributes valuable evidence to the understanding of the interconnectedness of depressive symptoms, loneliness, NSSI, resilience, and family relationships among a large sample of Italian adolescents and young adults. The findings highlight the need for a comprehensive approach in prevention and intervention programs. Future research could further explore the long-term implications of these relationships, and investigate the effectiveness of interventions that target multiple factors simultaneously.

Ethic approval

Organizational ethic approvals were obtained by the Ethical Review Board of the coordinating centre (protocol number: 160/2021, May 28th).

CRediT authorship contribution statement

Jessica Dagani: Writing – original draft, Methodology, Investigation, Formal analysis. **Mariangela Lanfredi:** Writing – review & editing, Supervision, Methodology, Investigation, Conceptualization. **Natale Salvatore Bonfiglio:** Writing – review & editing, Validation, Formal analysis. **Andrea Geviti:** Writing – review & editing, Validation, Formal analysis. **Donatella Albini:** Writing – review & editing. **Maria Bussolati:** Writing – review & editing. **Federica Di Cosimo:** Writing – review & editing. **Thomas Anfosso:** Writing – review & editing. **Erika Loi:** Writing – review & editing. **Elisa Fazzi:** Writing – review & editing, Conceptualization. **Roberta Ghidoni:** Writing – review & editing, Supervision, Project administration, Methodology, Conceptualization. **Alberto Ghilardi:** Writing – review & editing. **Marina Pizzi:** Writing – review & editing. **Luciana Rillosi:** Writing – review & editing, Conceptualization. **Antonio Vita:** Writing – review & editing, Conceptualization.

Consent

All enrolled students were asked to confirm their consent to participate through an online form, and provided their informed consent prior to study inclusion.

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These sources had no further role in this study design, in the data collection and analysis, in the writing of the report, and in the decision to submit the paper for publication.

Declaration of competing interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests:

Mariangela Lanfredi reports financial support was provided by Italian Ministry of Health. Roberta Rossi reports financial support was provided by Italian Ministry of Health. If there are other authors, they declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The datasets generated during and/or analyzed during the current study are available in the Zenodo repository, https://doi.org/10.5281/zenodo.15534291.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jad.2025.119541.

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