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The associations between three mattering measures and exhaustion, loneliness, self-esteem, and hope across different educational levels: insights from primary, middle, high school, and university students

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General mattering (GM), anti-mattering (AM), and fear of not mattering (FNM) are three critical mattering constructs that significantly impact students' mental health. Previous studies have explored the associations between these constructs and variables such as exhaustion, loneliness, self-esteem, and hope among primary, middle school, high school, or university student samples. However, no single study has compared the three mattering constructs across different educational levels or investigated their varying associations with the aforementioned variables. To address these research gaps, the current study employed a convenience sampling to recruit 2034 primary school students, 1680 middle school students, 1862 high school students, and 3594 university students. The data were analyzed using multiple regression analyses and network analysis. The findings revealed that the disparities in the three mattering constructs were more pronounced between different educational stages than within specific grade levels of the same stage. GM was found to be positively associated with self-esteem and hope, and negatively associated with exhaustion and loneliness. Conversely, AM and FNM exhibited the opposite relationships with these variables. Furthermore, the strength of these associations varied across the different educational levels. This study examines mattering constructs and their associations across four educational levels, emphasizing the need for tailored interventions to enhance student well-being at different stages.

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Introduction

Mattering, a psychological construct through which most people, particularly students, define themselves, is crucial for one's psychological well-being (Flett et al., 2019). The mattering construct was first introduced by Rosenberg and McCullough (1981), who, focusing on adolescents, identified three subcomponents: the sensation of being relied upon, the perception of being viewed as significant, and the awareness of being noticed. Targeting adolescents, Rosenberg (1985) later broadened this construct by adding the concept that one's absence would be felt by others. Flett (2018a) enriched the construct, stating that people need to feel important and be recognized as individuals to maintain their unique identity. Several years later, Flett and Nepon (2024) expanded the concept by adding "the feeling of being cared about."

In addition to positively oriented general mattering (GM), two other negatively oriented mattering constructs exist: the feeling of not mattering (anti-mattering, AM) (Flett et al., 2022) and the fear of not mattering (FNM) (Casale and Flett, 2020). AM refers to the feeling of not being significant—that is, the feeling of invisibility—while FNM is a construct pertaining to the worry of becoming irrelevant to others (Besser et al., 2020). It should be noted that GM and AM are not two ends of a uniform continuum (Flett, 2022), and the distinction between AM and FNM lies in the latter involving anxiety about the possibility of being insignificant to others (Chen et al., 2022).

The mattering constructs have attracted considerable attention (Etherson et al., 2022; Flett, 2018b; Flett et al., 2012; Shannon et al., 2020). They have been studied among different groups of students, including primary school (Flett et al., 2016b), middle school (Dixon et al., 2009), high school (Flett et al., 2023b), and university students (Flett et al., 2019). However, to our knowledge, no research has focused on children or adolescents while considering possible age differences across three or more groups. Furthermore, no research has simultaneously studied the correlations of GM, AM, and FNM with other variables, such as exhaustion, loneliness, self-esteem, and hope, or compared these varying associations across different age groups.

To address these gaps, the current study aimed to compare and contrast three mattering constructs and their correlates among early and late adolescents from China. The cultural specificities of China profoundly shape the construct of mattering within educational contexts, primarily through collectivist norms and Confucian values. Rooted in Confucianism, education in China is framed as a moral endeavor tied to familial and societal obligations, where students' self-worth is often derived from fulfilling role-based expectations (e.g., academic achievement as filial piety) rather than individual aspirations (Li, 2003). This collectivist orientation intertwines with the concept of miànzi (face), where maintaining social harmony and public recognition becomes central to students' sense of mattering, incentivizing conformity over self-expression in classrooms (Hwang and Hwang, 2012). These dynamics highlight how China's unique socio-cultural fabric—balancing hierarchical traditions, collectivist identity, and evolving individualism—necessitates culturally grounded frameworks to understand mattering, diverging from Western individual-centric models.

Building on this foundation, the first goal was to investigate possible age-related differences in levels of GM, AM, and FNM among Chinese primary school, middle school, high school, and university student samples. The second goal was to evaluate the correlations of the mattering facets with four variables, i.e., exhaustion, loneliness, self-esteem, and hope.

To achieve these goals, a critical examination of extant literature was conducted, focusing on mattering constructs across diverse educational settings and their relationships with key psychosocial variables.

Research on age differences of three mattering constructs at different educational levels. Research on mattering has primarily focused on university, high school, and middle school students, with limited attention given to primary school students. Furthermore, no studies to date have examined age differences across three or more groups of children or adolescents while considering all three aspects of mattering. Only two relevant studies have explored age-related differences in perceived mattering.

Marshall (2001) found higher levels of mattering across all subscales (e.g., mattering to mother, father, and friends) for university students compared to high school students, suggesting a trend toward increased mattering with age. Conversely, Vaillancourt et al. (2022) reported higher mattering levels among primary school students versus high schoolers during the COVID-19 pandemic, particularly for those learning in person.

These findings present a complex picture. Vaillancourt et al.'s (2022) results reveal two key insights: first, primary school students reported higher mattering levels than high school students, which initially appears to support Rosenberg's (1985) theory that mattering diminishes during adolescence. However, their second finding—that students learning online reported lower mattering levels compared to those learning in person—highlights the significant impact of situational factors (Vaillancourt et al., 2022). This underscores the importance of considering both developmental and contextual influences. The apparent decline in mattering from primary to high schoolers likely reflects a complex interplay between environmental factors, age, and developmental stage. Factors such as adolescent developmental challenges, changing academic pressures, and educational transitions interact with situational changes in learning environments (Sun et al., 2025). The stark difference between online and in-person learning emphasizes how environmental factors can substantially affect students' sense of mattering, working in conjunction with age and developmental stage.

In the context of our study in China, middle school students face intense academic pressure due to policies directing 50% of them toward vocational education based on academic rankings (MOE of China, 2017). This pressure is compounded by the public nature of school assignments, where academic performance is openly displayed, affecting family pride or shame. In this educational environment, students' sense of worth often becomes strongly tied to their academic performance, despite the ideal that they should feel unconditionally valued by family, school officials, and friends. Flett (2022) argues that such conditional mattering can have significantly negative impacts on young people. In Chinese context, where academic performance is highly emphasized, these effects may be particularly pronounced. Middle school students at risk of being directed towards vocational education may feel unaccepted and less important to others. While vocational students can return to higher education (MOE of China, 2022), they often struggle due to weaker learning abilities and environments. This unique educational landscape provides a compelling context for studying the impact of this system on middle school students' perceived mattering.

Given these considerations, there is likely a variation in mattering levels among primary, middle, high school, and university school students in China. This study aims to examine these age-related differences in levels of GM, AM, and FNM across these different student groups.

Research question 1: How do the three types of mattering differ among students across primary, middle, high school, and university levels?

Hypothesis 1: Middle school students have the lowest mean scores in terms of the construct of GM, and elevated mean scores in AM and FNM.

Research on correlations of mattering constructs with other variables. Mattering has been associated with various psychological constructs and outcomes across different domains. In educational contexts, researchers have explored its relationships with several key variables that impact students' well-being and academic experiences. In this study, four such variables are the focus: exhaustion, loneliness, self-esteem, and hope.

Current research on the relationship between mattering and exhaustion (a key component of burnout) in educational contexts has primarily focused on teachers (Wilson et al., 2020), with limited studies examining students. Flett et al. (2023b) and Chen et al. (2022) have demonstrated GM's protective role against academic exhaustion and FNM's positive association with exhaustion among high school and university students, respectively. However, research exploring AM's relationship with exhaustion among students, particularly studies encompassing all three types of mattering, remains scarce.

Regarding the association between mattering and loneliness, several studies have consistently shown that lower GM correlates with increased loneliness (Flett et al., 2016a; Somers et al., 2022). AM has also been found to have a strong positive association with loneliness in both university and high school students (Flett et al., 2022). McComb et al. (2020) extended this research by examining the relationship between loneliness and all three types of mattering among female undergraduate students. However, there is a notable gap in research examining these relationships among primary school students.

The relationship between mattering and self-esteem has been a subject of interest since Rosenberg and McCullough's (1981) seminal work. While several studies have supported the distinction between GM and self-esteem (e.g., Flett and Nepon, 2019), recent research with Chinese middle school students by Flett et al. (2023b) suggests the need for further investigation. Their study found that GM did not predict significant unique variance in depression beyond self-esteem, prompting a re-examination of the relative predictive utility of GM versus self-esteem.

Hope has also been identified as strongly linked to mattering. Somers et al. (2022) found a positive association between GM and hope among high school students, while Liu et al. (2023) examined the relationship between all three types of mattering and hope among university students, confirming the positive association between GM and hope. Little literature examining these correlations among primary and middle school students has been found.

Another point worth highlighting is that from a developmental perspective, these associations likely vary across educational stages due to distinct psychological and contextual factors at each developmental period. Previous research supports this variation: the correlation between GM and exhaustion was weaker in high school samples ($r = 0.23$, $p < 0.001$) (Flett et al., 2023b) compared to university students ($r = 0.32$, $p < 0.001$) (Chen et al., 2025). Regarding loneliness, university students exhibited strong positive correlations between AM and loneliness and moderate correlations between FNM and loneliness (Su and Flett, 2025), as well as robust negative associations between GM and loneliness (Flett et al., 2016a). In contrast, high school students demonstrated weak GM-loneliness associations but moderate-strength

correlations for both AM and FNM with loneliness (Ding et al., 2024). Furthermore, GM showed a stronger association with self-esteem in middle school students ($r = 0.51$) (Flett et al., 2023a) than in university students ($r = 0.37$) (Flett and Nepon, 2019). Similarly, the correlation between GM and hope was stronger among high school students (Liu et al., 2023) than university students (Somers et al., 2022).

From a cognitive developmental perspective, these varying associations between mattering constructs and psychological outcomes reflect students' evolving cognitive capabilities across educational stages. Primary school students, with developing executive functions and emergent emotion regulation abilities (Zelazo and Carlson, 2012), process mattering predominantly through concrete experiences with immediate caregivers and teachers. Their limited abstract reasoning capacity constrains their ability to integrate mattering perceptions into a coherent self-concept, resulting in more fragmented connections between mattering and psychological outcomes. These developmental constraints help explain why mattering may exhibit weaker associations with psychological variables at this early educational stage, as children cannot yet fully utilize mattering perceptions as psychological resources. As students progress through middle and high schools, enhanced social-cognitive development (Crone and Dahl, 2012) and neurobiological maturation in regions supporting social cognition (Blakemore and Mills, 2014) transform how mattering influences well-being. Adolescents can now internalize mattering as a core component of their identity rather than merely concrete interactions, while simultaneously developing heightened sensitivity to social evaluation. This developmental shift directly explains the stronger GM-self-esteem correlation in middle school ($r = 0.51$) (Flett et al., 2023b) and the more pronounced association between GM and hope in high school (Liu et al., 2023), as mattering becomes increasingly integrated into adolescents' self-narratives and future orientation. By university, students develop more sophisticated emotion regulation strategies (Zimmermann and Iwanski, 2014) and face the significant transition to greater autonomy, fundamentally altering how mattering functions psychologically. Their advanced cognitive frameworks enable more complex processing of mattering perceptions across multiple life domains simultaneously, while decreased structured support systems make mattering a more critical psychological resource for managing stress and maintaining well-being. This developmental context explains the stronger association between GM and exhaustion in university students ($r = 0.32$) (Chen et al., 2025), as mattering becomes increasingly central to coping with academic demands and identity challenges in an environment with less external scaffolding. These developmental shifts in cognitive processing and emotional integration directly determine how strongly mattering constructs relate to psychological outcomes at different educational stages.

In summary, existing research has primarily focused on the relationship between one type of mattering, typically GM, and one or two psychological factors. Despite this developmental perspective suggesting that these associations evolve meaningfully across educational stages due to cognitive maturation and changing social contexts, there is a lack of comprehensive studies examining all three types of mattering in relation to exhaustion, loneliness, self-esteem, and hope simultaneously, particularly across different educational levels. Consequently, our second research question and hypothesis are:

Research question 2: What are the associations between the three types of mattering and exhaustion, loneliness, self-esteem, and hope across four educational levels (primary, middle, high school, and university)?

Hypothesis 2: GM will demonstrate protective effects, while AM and FNM will be associated with problematic outcomes

Table 1 Demographic characteristics of the participants.

	Primary school students: Grade 4–6 ($n = 2034$)	Middle school students: Grade 7–9 ($n = 1680$)	High school students: Grade 10–12 ($n = 1862$)	University students ($n = 3594$)
Age in years (SD)	11.23 (1.47)	14.06 (1.05)	16.71 (0.63)	19.52 (1.45)
Gender (Female)	1011 (49.7%)	788 (46.9%)	927 (49.8%)	1696 (47.2%)
Sibling (Yes)	1321 (64.9%)	1401 (83.4%)	1727 (92.7%)	3102 (86.3%)
Grade				
4	601 (33.6%)			
5	738 (32.9%)			
6	695 (33.6%)			
7		550 (36.0%)		
8		565 (33.4%)		
9		565 (30.6%)		
10			1577 (84.7%)	
11			158 (8.5%)	
12			127 (6.8%)	
Freshman				1947 (54.2%)
Sophomore				721 (20.1%)
Junior				653 (18.1%)
Senior				273 (7.6%)

regarding exhaustion, loneliness, self-esteem, and hope across all educational levels, with potential variations in the strength of these associations at different stages.

Materials and methods

Participants. This study used convenience sampling to survey students from primary school to university level. To minimize potential timing effects on our results and reduce the influence of academic pressure on participants' responses, we carefully scheduled data collection periods. All surveys were administered during the first academic semester, intentionally avoiding examination periods and the end of semester when stress levels typically peak. University student data were collected from August to October 2022, while primary and middle school student data were gathered between December 2022 and December 2023. High school student data were obtained from August to September 2023. The university-level participants came from 19 universities across 13 Chinese provinces. Primary, middle, and high school student data were sourced from three schools in a southwestern province, three schools in a central province, and ten schools in a northern province of China, respectively.

For minors, we contacted school principals, held online meetings with guardians to explain the survey, emphasizing voluntary participation, then distributed online consent forms via teachers. Consenting students completed surveys in computer labs. For university students, we partnered with instructors to distribute a QR code linking to a consent form and survey, allowing students to proceed upon agreement.

The inclusion criteria for this study were participants who provided consent. The online survey platform's functionality ensured complete responses to all questions before submission, resulting in no missing data. The exclusion criteria consisted of: (1) unreasonable response times (e.g., responses completed in under 10 min); (2) participants with documented mental illness records; and (3) failure on an attention check question, which asked respondents to select their favorite color. Participants who selected non-color responses to this attention check were excluded from the analysis. The final sample consisted of 2034 primary school students, 1680 middle school students, 1862 high school students, and 3594 university students.

Table 1 presents the demographic information of participants across the four groups. The gender ratio in each group was ~1:1, with a slight male predominance. Over 60% of the students came

from families with siblings. The primary school participants were roughly equally distributed among grades 4, 5, and 6, while middle school students were evenly distributed among grades 7, 8, and 9. The majority of high school and university students were first-year students.

Measures. In the following sections, we describe the instruments used to assess three dimensions of mattering, as well as measures of exhaustion, loneliness, self-esteem, and hope. The psychometric properties, including validity and reliability indices for these instruments, are presented in the results section.

Three types of mattering scales. In this investigation, three specialized scales were applied to probe into the nuanced dimensions of students' perceived significance: General Mattering Scale (GMS), Anti-Mattering Scale (AMS), and Fear of Not Mattering Inventory (FNMI). Originating from the seminal work of Marcus and Rosenberg in 1987, the GMS serves to quantify an individual's perceived value in a general interpersonal context (Marcus and Rosenberg, 1987). The AMS and FNMI, both contemporary constructs developed by Flett and associates [AMS delineated in Flett et al. (2022); FNMI articulated in Flett (2025)], delve into the realms of perceived insignificance and the anxiety associated with potential inconsequentiality, respectively.

These scales are designed as unidimensional constructs, each consisting of five items measured on a four-point Likert scale. The GMS and AMS use a range from 1 ("not at all") to 4 ("a lot"), while the FNMI uses a range from 0 ("never") to 3 ("almost always"). Higher scores on these scales indicate a stronger presence of the respective psychological constructs they measure. Sample questions include: "How much do you think you would be missed if you went away?" (GMS), "How often are you treated in a way that makes you feel unimportant?" (AMS), and "Do you worry about being seen as insignificant?" (FNMI).

The three mattering scales have demonstrated high internal reliability across diverse student populations. Empirical studies have confirmed their effectiveness across different age groups: the GMS has been used successfully with primary school students (Flett et al., 2016b; Vaillancourt et al., 2022) and university students (Flett et al., 2023b; Liu et al., 2023; Wang et al., 2025); the AMS has shown strong psychometric properties with early adolescents (Maftei and Diaconu-Gherasim, 2023) and university students (Flett et al., 2023b; Liu et al., 2023; Wang et al., 2025);

and the FNMI has demonstrated reliability with early adolescents (Flett et al., 2023a) and high school students (Ding et al., 2024).

Maslach Burnout Inventory—Student Survey (MBISS). In the present study, Exhaustion subscale of the MBISS, a specialized instrument developed to assess burnout in students resulting from academic pressures, was used to measure academic exhaustion. The MBISS was developed by Schaufeli and colleagues in 2002; it is an offshoot of the MBI–General Survey (Schaufeli et al., 2002). The MBISS breaks down student burnout into three key areas: Exhaustion, Cynicism, and Reduced Efficacy. It uses a five-point scale ranging from "never" (0) to "always" (4) and has been verified as possessing acceptable internal reliability among adolescents (Hu and Schaufeli, 2009) and primary school students (Aypay, 2011). Chen et al. (2022) thoroughly tested the Chinese version of the MBISS, which showed strong psychometric properties. The Exhaustion subscale includes five statements, such as "I feel emotionally drained by my studies" and "I feel used up at the end of a day at university."

Rosenberg Self-Esteem Scale (RSES). The RSES, created by Rosenberg (1965), is a widely used tool for measuring overall self-esteem, which has been validated among primary school students (Syropoulou et al., 2021) and adolescents (Jiang et al., 2023). It has 10 items rated from 1 (strongly disagree) to 4 (strongly agree), with higher scores indicating greater self-esteem. Half items are negatively worded and need reverse scoring. However, people often respond inconsistently to negative items (Ponce et al., 2022), especially younger participants such as primary school students. Also, some reverse-worded items may not translate well culturally; for instance, the appropriateness of reversing item 8 in the Chinese version of the RSES has been debated (Wu et al., 2017). To avoid these issues, the five positively worded items from the Chinese version of the RSES were used (Li et al., 2012).

University of California, Los Angeles Loneliness Scale (UCLA Loneliness Scale—Version 3). The UCLA Loneliness Scale—Version 3 was used to measure participants' feelings of loneliness. It is an improved version of Russell's original scale, designed to assess subjective loneliness and social isolation (Russell, 1996). The scale has 20 items rated from "Never (1)" to "Often (4)." These items cover various aspects of loneliness, including relational connectedness, social belonging, and perceived social support. Of the 20 items, 11 are negatively worded (lonely) and 9 are positively worded (non-lonely). The scale has been validated and applied to Chinese adolescents (Wang and Sun, 2009) and Chinese young children (Wang et al., 2024). To maintain consistency with RSES, we used only the 11 negatively worded items.

Dispositional Hope Scale. The Chinese version of the Dispositional Hope Scale (DHS), validated among university students (Sun et al., 2012) and primary school students (Li, 2023), was used to assess participants' hopeful tendencies. The original DHS, developed by Snyder et al. (1991), has 12 items rated from 1 (definitely false) to 4 (definitely true). It is divided into two parts: Agency (4 items) and Pathways (4 items), plus 4 additional "filler" items. The Chinese DHS keeps the same two-part structure and shows strong associations with overall health and well-being (Sun et al., 2012).

Data analysis strategy. To assess the measurement properties of our constructs, which is especially critical as it influences the accuracy of subsequent analyses (e.g., regression or network analysis), we implemented a rigorous analytical approach. To do so, we tested a comprehensive measurement model across

primary to university students using confirmatory factor analysis (CFA). This model included seven latent variables: GM, AM, FNM, exhaustion, loneliness, self-esteem, and hope. It should be noted that the model for university students excluded the self-esteem construct. We first examined model fit indices to evaluate overall adequacy of the measurement model for checking factorial validity. To further assess internal convergent validity, we examined the pattern of item loadings on their respective factors and computed the average variance extracted (AVE) for each construct. Cronbach's alpha and McDonald's omega coefficients were calculated to evaluate internal consistency. Additionally, we assessed discriminant validity between factors using Henseler's heterotrait-monotrait ratio of correlations (HTMT).

Descriptive statistics and analysis of variance (ANOVA) were employed to compare the levels of the three types of mattering across different educational stages. To further investigate the differences between groups, a post hoc analysis using the Games-Howell test was conducted, as this test does not assume equal variances among the groups. Additionally, Pearson correlations were calculated to examine the relationships between the variables of interest, with a specific focus on the associations of the three types of mattering with other psychological constructs, such as exhaustion, loneliness, self-esteem, and hope.

To investigate the relationship between mattering and psychological well-being variables across age groups, multiple regression analyses were performed. The models included GM, AM, and FNM as explanatory variables, while controlling for gender (dummy coded, with male as the reference group), siblings (dummy coded, with no siblings as the reference group), and age in years (grade was excluded due to its high correlation with age). The dependent variables were exhaustion, loneliness, self-esteem, and hope. The relative influence of each mattering type on the dependent variables was assessed by examining the standardized coefficients and their statistical significance using bootstrapping procedures (1000 iterations) to determine whether the 95% confidence intervals included zero. This approach provided insights into the unique contributions of each form of mattering to psychological well-being across different developmental stages.

Furthermore, network analysis was employed to visualize the complex associations among mattering and the other psychological variables across the four age groups. Defined as the study of network structure and association, this method enables the modeling of intricate relational dynamics, and through systematic examination of network topology, it facilitates the identification of key structural characteristics inherent to the system (Hevey, 2018). In the current study, the analysis aimed to identify consistent patterns of positive and negative relationships between the constructs, as well as to detect any age-related deviations or trends in the strength of these associations. By utilizing network analysis, the study sought to provide a more comprehensive understanding of the intricate dynamics between mattering and psychological well-being across different developmental stages, highlighting the potential differences in the interplay of these constructs as individuals progress through various educational levels.

Results
Preliminary examination of the measurement model. The fit indices of the measurement models for primary, middle, high school, and university students are shown in Figs. S1–S4, respectively. All indices fall within satisfactory thresholds. According to factor loadings (see Figs. S1–S4), the AVE for GM, AM, FNM, exhaustion, loneliness, self-esteem, and hope was 0.55, 0.62, 0.64, 0.72, 0.49, 0.63, and 0.59 among primary school students; 0.53, 0.60, 0.61, 0.70, 0.53, 0.58, and 0.50 among middle

Table 2 Means and the correlations among the observed variables.

Primary school students: Grade 4–6 (n = 2034)

	Mean (SD)	α/ω	1	2	3	4	5	6	7	8
1. General mattering (range: 5–20)	13.83 (3.89)	0.84/0.85	1.00							
2. Anti-mattering (range: 5–20)	8.09 (3.45)	0.88/0.88	−0.03	1.00						
3. Fear of not mattering (range: 0–15)	2.34 (3.00)	0.89/0.89	0.00	0.60***	1.00					
4. Exhaustion (range: 0–20)	2.23 (3.58)	0.92/0.92	−0.06**	0.52***	0.54***	1.00				
5. Loneliness (range: 11–44)	17.27 (6.75)	0.92/0.92	−0.04	0.67***	0.53***	0.50***	1.00			
6. Self-esteem (range: 5–20)	15.05 (3.71)	0.87/0.87	0.37***	−0.20***	−0.17***	−0.22***	−0.15***	1.00		
7. Hope_Overall (range: 8–32)	25.09 (5.66)	0.88/0.88	0.48***	−0.19***	−0.15***	−0.20***	−0.19***	0.51***	1.00	
8. Hope_ Pathways (range: 4–16)	12.63 (3.03)	0.85/0.86	0.46***	−0.18***	−0.15***	−0.19***	−0.17***	0.48***	0.96***	1.00
9. Hope_ Agency (range: 4–16)	12.46 (2.87)	0.85/0.85	0.46***	−0.19***	−0.14***	−0.19***	−0.19***	0.49***	0.96***	0.84***

Middle school students: Grade 7–9 Students (n = 1680)

	Mean (SD)	α/ω	1	2	3	4	5	6	7	8
1. General mattering (range: 5–20)	12.36 (3.47)	0.84/0.85	1.00							
2. Anti-mattering (range: 5–20)	10.48 (3.92)	0.88/0.88	−0.21***	1.00						
3. Fear of not mattering (range: 0–15)	3.59 (3.36)	0.89/0.89	−0.06*	0.55***	1.00					
4. Exhaustion (range: 0–20)	5.61 (4.74)	0.92/0.92	−0.18***	0.47***	0.38***	1.00				
5. Loneliness (range: 11–44)	22.78 (7.95)	0.92/0.92	−0.22***	0.78***	0.52***	0.48***	1.00			
6. Self-esteem (range: 5–20)	13.40 (3.46)	0.87/0.87	0.44***	−0.28***	−0.14***	−0.19***	−0.26***	1.00		
7. Hope_Overall (range: 8–32)	21.49 (5.16)	0.89/0.89	0.49***	−0.29***	−0.18***	−0.28***	−0.31***	0.61***	1.00	
8. Hope_ Pathways (range: 4–16)	10.94 (2.80)	0.81/0.81	0.46***	−0.26***	−0.17***	−0.26***	−0.28***	0.57***	0.95***	1.00
9. Hope_ Agency (range: 4–16)	10.55 (2.63)	0.79/0.79	0.48***	−0.29***	−0.18***	−0.28***	−0.31***	0.59***	0.95***	0.80***

High school students: Grade 10–12 Students (n = 1862)

	Mean (SD)	α/ω	1	2	3	4	5	6	7	8
1. General mattering (range: 5–20)	14.66 (3.77)	0.88/0.88	1.00							
2. Anti-mattering (range: 5–20)	9.67 (3.85)	0.90/0.89	−0.20***	1.00						
3. Fear of not mattering (range: 0–15)	2.88 (3.26)	0.92/0.92	−0.10***	0.56***	1.00					
4. Exhaustion (range: 0–20)	4.24 (4.54)	0.93/0.93	−0.18***	0.48***	0.48***	1.00				
5. Loneliness (range: 11–44)	20.62 (8.02)	0.93/0.93	−0.21***	0.68***	0.49***	0.48***	1.00			
6. Self-esteem (range: 5–20)	14.85 (3.34)	0.91/0.91	0.39***	−0.21***	−0.23***	−0.21***	−0.18***	1.00		
7. Hope_Overall (range: 8–32)	24.03 (5.39)	0.92/0.92	0.54***	−0.23***	−0.18***	−0.20***	−0.28***	0.50***	1.00	
8. Hope_ Pathways (range: 4–16)	12.07 (2.88)	0.86/0.86	0.51***	−0.21***	−0.18***	−0.19***	−0.27***	0.49***	0.96***	1.00
9. Hope_ Agency (range: 4–16)	11.95 (2.73)	0.85/0.85	0.53***	−0.22***	−0.15***	−0.19***	−0.27***	0.48***	0.96***	0.85***

University students (n = 3594)

	Mean (SD)	α/ω	1	2	3	4	5	6	7	8
1. General mattering (range: 5–20)	13.11 (3.03)	0.87/0.87	1.00							
2. Anti-mattering (range: 5–20)	10.93 (3.56)	0.91/0.91	−0.30***	1.00						
3. Fear of not mattering (range: 0–15)	4.14 (3.24)	0.92/0.92	−0.04*	0.53***	1.00					
4. Exhaustion (range: 0–20)	6.11 (4.53)	0.93/0.93	−0.20***	0.47***	0.39***	1.00				
5. Loneliness (range: 11–44)	23.90 (7.24)	0.93/0.93	−0.32***	0.73***	0.46***	0.48***	1.00			
6. Hope_Overall (range: 8–32)	22.85 (4.66)	0.90/0.90	0.38***	−0.32***	−0.22***	−0.26***	−0.33***	1.00		
7. Hope_ Pathways (range: 4–16)	11.69 (2.54)	0.85/0.85	0.34***	−0.27***	−0.22***	−0.22***	−0.28***	0.95***	1.00	
8. Hope_ Agency (range: 4–16)	11.16 (2.37)	0.80/0.80	0.39***	−0.33***	−0.21***	−0.27***	−0.35***	0.94***	0.80***	1

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$.

school students; and 0.60, 0.63, 0.70, 0.74, 0.54, 0.67, and 0.59 among high school students. For university students, the AVE values were 0.58, 0.67, 0.71, 0.72, 0.56, and 0.54 for GM, AM, FNM, exhaustion, loneliness, and hope, respectively. These values indicate good internal convergent validity across all groups. Moreover, Cronbach's alpha and McDonald's omega coefficients for all constructs are presented in Table 2. The results demonstrate satisfactory internal consistency reliability, with nearly all coefficients exceeding 0.80.

We also calculated the HTMT, presented in Tables S1–S4, which revealed values predominantly below 0.85 across all constructs, with the sole exception being the relationship between AM and loneliness among middle school students (0.87, slightly exceeding the 0.85 threshold; see Table S2 in the Supplementary Materials). These findings demonstrate sufficient discriminant validity among the constructs.

ANOVA and Pearson correlations among the observed variables. Table 2 presents the mean observed scores and standard deviations for primary, middle, high school, and university students across the variables studied. The results of the ANOVA indicated distinct levels of the three types of mattering across the different educational stages. For GM, the ranking was: high school students > primary school students > university students > middle school students (Welch's F statistic = 137.28, $p > 0.001$, $\eta^2 = 0.05$). For AM, the order was: university students > middle school students > high school students > primary school students (Welch's F statistic = 298.55, $p < 0.001$, $\eta^2 = 0.08$). The ranking for FNM was: university students > middle school students > high school students > primary school students (Welch's F statistic = 162.55, $p < 0.001$, $\eta^2 = 0.05$).

Figures S5–S11 and Table S5 in the Supplementary Materials provide a more detailed examination of the three facets of

mattering and present differences in related constructs such as exhaustion, loneliness, self-esteem, and hope across different educational grades (grades 4, 5, 6, 7, 8, 9, 10, 11, 12, and university). An analysis of GM revealed no discernible differences across grade levels within the primary school and middle school educational phases. Conversely, a significant elevation in GM was observed in high school freshmen compared to their sophomore and junior counterparts ($F = 24.54$, $p < 0.001$), with a similar trend noted between university freshmen and sophomores ($F = 3.76$, $p = 0.011$).

Pertaining to AM, a marked elevation was found in fourth-grade students within the primary school sector compared to those in fifth and sixth grades ($F = 7.27$, $p < 0.001$). However, this trend did not extend into the middle school years, where no significant differences were observed across grades. In the context of high school, freshmen reported significantly lower levels of AM relative to sophomores and juniors ($F = 9.95$, $p < 0.001$). As for FNM, the study found uniformity across the grades within primary school, middle school, and university levels, with an exception noted in high school where freshmen exhibited significantly lower levels compared to sophomores ($F = 9.68$, $p < 0.001$).

The data underscore that disparities in the dimensions of mattering are predominantly evident between different educational stages rather than within individual grades of the same stage. Specifically, the level of GM was consistent from fourth to sixth grade in primary school. A noticeable decline was observed during the middle school years, followed by a significant resurgence in the freshman year of high school. A minor decline was noted in the subsequent year, after which the levels plateaued.

The patterns for AM and FNM paralleled those of GM in the primary school years, with stability noted from fourth to sixth grade. The inception of middle school (seventh grade) marked a significant increase, which then leveled off. The freshman year of high school was characterized by a significant reduction, followed by a modest rise from the sophomore year onwards, stabilizing through to the senior year of university. These findings highlight the transitional periods of seventh grade (middle school) and the freshman year of high school as pivotal in the fluctuation of the three dimensions of mattering.

In the zero-correlation analysis (refer to Table 2), a significant negative correlation was observed between GM and AM across all groups, with the primary school group exhibiting a notably lower and non-significant correlation coefficient (i.e., −0.03). Furthermore, a significant negative correlation between GM and FNM was found in high school and university students ($r = -0.10$, $p < 0.001$ and $r = -0.04$, $p = 0.03$, respectively), but not in primary and middle school students.

Regarding the association of mattering facets with other variables, a significant negative correlation was predominantly found between GM and both loneliness and exhaustion across nearly all groups, with the exception of the association between GM and loneliness not reaching significance in primary school students. In fact, the strength of these correlations in primary school students was weaker ($r = -0.06$ with exhaustion) compared to the other groups, where r values ranged between −0.18 and −0.32. A similar pattern was observed with GM and self-esteem, where the correlation strength in primary school students ($r = 0.37$, $p < 0.001$) was lower than in middle ($r = 0.44$, $p < 0.001$) and high school students ($r = 0.39$, $p < 0.001$). In terms of the relationship between GM and sense of hope, high school students exhibited the highest positive correlation ($r = 0.54$, $p < 0.001$), in contrast to other groups where the correlation coefficients ranged from ∼0.38–0.49 (all $p < 0.001$).

Regarding the association of AM with other variables, the analysis reveals a moderate, statistically significant positive correlation with exhaustion across all groups, with correlation coefficients exceeding 0.45. Furthermore, a highly significant positive correlation is observed between AM and loneliness in all groups, with coefficients surpassing 0.60. This correlation is particularly pronounced among middle school and university students, with both groups exhibiting r values exceeding 0.70. Moreover, significant negative correlations are found between AM and both self-esteem and hope, with r values ranging between −0.19 and −0.32. Among these correlations, the relationship between AM and hope in university students is notably more pronounced, with an r value of −0.32.

Regarding the relationship of FNM with other variables, a significant moderate positive correlation with both exhaustion and loneliness was observed among all groups, with r values ranging from 0.38 to 0.54. Furthermore, FNM was negatively associated with self-esteem and hope among all groups, with r values ranging from −0.14 to −0.23.

Regression analysis on the relationship of mattering with exhaustion, loneliness, self-esteem, and hope. Prior to presenting the results of the regression, the assumptions inherent to the analysis were assessed to ensure the validity of the findings. These included the absence of heteroscedasticity, the lack of substantial outlier influence, the absence of autocorrelation, the absence of multicollinearity, and the normal distribution of residuals. The Goldfeld-Quandt test and Durbin-Watson statistic confirmed the absence of heteroskedasticity and autoregression, respectively, for all dependent variables across the educational levels. Cook's Distance values were approximately zero in all cases, indicating that there were likely no highly influential observations in the dataset. Furthermore, all Variance Inflation Factor (VIF) values were below 1.57, signifying the absence of multicollinearity issues. The standardized residuals histograms (Figs. S12–S15 in the Supplementary File) revealed that the residuals of all variables among the four educational levels approximately followed a normal distribution. However, some deviations were observed, particularly in the form of higher peaks (leptokurtosis) and heavier tails than expected for a perfect normal distribution. Although these deviations do not appear to be severe, it is important to consider them when interpreting the results, and caution should be exercised in drawing conclusions.

The regression analysis reveals the significant impact of GM, AM, and FNM on exhaustion, loneliness, self-esteem, and hope across age groups, controlling for gender, siblings, and age years. The models significantly explained the variance in the dependent variables, with F values ranging from 72.06 to 778.29 ($p < 0.001$) and R^2 values ranging from 0.18 to 0.63 (specific values are presented in Tables 3–6). The explanatory power was highest for the loneliness models (R^2: 0.48–0.63, F: 291.08–778.29), followed by the exhaustion models (R^2: 0.26–0.36, F: 97.07–208.32), the hope models (R^2: 0.20–0.31, F: 115.16–151.25), and the self-esteem models (R^2: 0.18–0.23, F: 72.06–85.21). Tables 3–6 present both unstandardized and standardized regression coefficients, along with their corresponding bootstrapped confidence intervals for each model, revealing the differential effects of the three mattering dimensions on psychological well-being variables across developmental stages.

Regarding exhaustion, all three forms of mattering significantly influence the outcome across all age groups, with AM ($b = 0.32$–0.41) and FNM ($b = 0.28$–0.43) exhibiting stronger effects compared to GM. For loneliness, significant associations were observed between all three mattering types and the dependent variable across all groups, with the exception of GM in primary school students. AM demonstrated the strongest impact ($b = 1.07$–1.38). In terms of self-esteem, significant

Table 3 Regression analysis of mattering variables on exhaustion.

R^2/F	Primary school students			Middle school students			High school students			University students		
	0.36/186.02			0.26/97.07			0.31/142.98			0.26/208.32		
	Estimate(se)	BC CI	β	Estimate(se)	BC CI	β	Estimate(se)	BC CI	β	Estimate (se)	BC CI	β
Gender (Ref: Male)	−0.31 (0.13)	**−0.16; −0.01**	−0.09*	−0.19 (0.20)	−0.13; 0.04	−0.04	0.61 (0.18)	**0.06; 0.21**	0.14	−0.04 (0.13)	−0.07; 0.05	−0.01
Sibling (Ref: No)	−0.14 (0.13)	−0.11; 0.04	−0.04	0.58 (0.27)	**0.01; 0.22**	0.12	−0.73 (0.34)	**−0.33; −0.02**	−0.16	−0.52 (0.19)	**−0.20; −0.03**	−0.12
Age in years	0.03 (0.07)	−0.03; 004	0.01	0.29 (0.10)	**0.02; 0.11**	0.06	0.27 (0.11)	**0.01; 0.09**	0.05	0.02 (0.06)	−0.02; 0.04	0.01
General mattering	−0.04 (0.02)	**−0.09; −0.01**	−0.05	−0.13 (0.03)	**−0.14; −0.05**	−0.09	−0.10 (0.02)	**−0.13; −0.03**	−0.08	−0.15 (0.02)	**−0.13; −0.07**	−0.10
Anti–mattering	0.32 (0.02)	**0.26; 0.37**	0.31	0.41 (0.03)	**0.28; 0.39**	0.34	0.34 (0.03)	**0.24; 0.35**	0.29	0.41 (0.02)	**0.28; 0.36**	0.32
Fear of not mattering	0.42 (0.03)	**0.29; 0.42**	0.35	0.28 (0.04)	**0.14; 0.26**	0.19	0.43 (0.03)	**0.25; 0.37**	0.31	0.31 (0.02)	**0.19; 0.26**	0.22

BC CI = bootstrap 1000 high-low, indicating confidence intervals calculated using 1000 bootstrap replications.
Bold denotes BC CIs excluding zero.

Table 4 Regression analysis of mattering variables on loneliness.

R^2/F	Primary school students			Middle school students			High school students			University students		
	0.48/307.09			0.63/474.04			0.48/291.08			0.57/778.29		
	Estimate(se)	BC CI	β	Estimate(se)	BC CI	β	Estimate(se)	BC CI	β	Estimate (se)	BC CI	β
Gender (Ref: Male)	0.38 (0.22)	−0.01; 0.12	0.05	0.71 (0.24)	**0.03; 0.15**	0.09	1.12 (0.27)	**0.07; 0.20**	0.14	1.73 (0.16)	**0.20; 0.29**	0.24
Sibling (Ref: No)	−0.74 (0.23)	**−0.18; −0.04**	−0.11	0.68 (0.32)	**0.01; 0.16**	0.09	−0.65 (0.52)	−0.21; 0.05	−0.08	−0.20 (0.23)	−0.09; 0.03	−0.03
Age in years	0.16 (0.11)	−0.01; 0.06	0.02	0.04 (0.12)	−0.02; 0.04	0.01	0.14 (0.17)	−0.02; 0.05	0.01	−0.09 (0.07)	−0.04; 0.01	−0.01
General mattering	−0.04 (0.03)	−0.05; 0.01	−0.02	−0.16 (0.04)	**−0.11; −0.04**	−0.07	−0.15 (0.04)	**−0.11; −0.03**	−0.08	−0.33 (0.03)	**−0.16; −0.11**	−0.14
Anti-mattering	1.07 (0.04)	**0.50; 0.61**	0.55	1.38 (0.04)	**0.64; 0.72**	0.68	1.18 (0.04)	**0.52; 0.61**	0.57	1.24 (0.03)	**0.58; 0.64**	0.61
Fear of not mattering	0.45 (0.05)	**0.15; 0.25**	0.20	0.32 (0.04)	**0.09; 0.18**	0.13	0.40 (0.05)	**0.12; 0.21**	0.16	0.28 (0.03)	**0.10; 0.15**	0.13

BC CI = bootstrap 1000 high-low, indicating confidence intervals calculated using 1000 bootstrap replications.
Bold denotes BC CIs excluding zero.

Table 5 Regression analysis of mattering variables on self-esteem.

R^2/F	Primary school students			Middle school students			High school students			University students
	0.18/74.64			0.23/85.21			0.19/72.06			Not applicable
	Estimate(se)	BC CI	β	Estimate(se)	BC CI	β	Estimate(se)	BC CI	β	β
Gender (Ref: Male)	−0.14 (0.15)	−0.12; 0.05	−0.03	−0.10 (0.15)	−0.12; 0.05	−0.03	0.01 (0.14)	−0.08; 0.09	0.01	
Sibling (Ref: No)	0.20 (0.16)	−0.03; 0.14	0.05	−0.50 (0.20)	**−0.26; −0.03**	−0.14	0.33 (0.27)	−0.06; 0.29	0.10	
Age in years	0.23 (0.08)	**0.02; 0.10**	0.06	0.21 (0.07)	**0.02; 0.11**	0.06	−0.23 (0.09)	**−0.10; −0.01**	−0.06	
General mattering	0.35 (0.02)	**0.32; 0.41**	0.37	0.40 (0.02)	**0.34; 0.45**	0.40	0.31 (0.02)	**0.30; 0.41**	0.36	
Anti-mattering	−0.13 (0.03)	**−0.17; −0.07**	−0.13	−0.16 (0.02)	**−0.24; −0.13**	−0.18	−0.04 (0.02)	−0.09; 0.01	−0.04	
Fear of not mattering	−0.12 (0.03)	**−0.15; −0.04**	−0.10	−0.01 (0.03)	−0.07; 0.04	−0.01	−0.17 (0.03)	**−0.21; −0.11**	−0.16	

BC CI = bootstrap 1000 high-low, indicating confidence intervals calculated using 1000 bootstrap replications.
Bold denotes BC CIs excluding zero.

Table 6 Regression analysis of mattering variables on hope.

R^2/F	Primary school students			Middle school students			High school students			University students		
	0.26/121.89			0.29/115.16			0.31/140.00			0.20/151.25		
	Estimate(se)	BC CI	β	Estimate(se)	BC CI	β	Estimate(se)	BC CI	β	Estimate(se)	BC CI	β
Gender (Ref: Male)	−0.10 (0.22)	−0.09; 0.06	−0.02	−0.75 (0.22)	**−0.23; −0.06**	−0.15	−0.46 (0.21)	−0.16; 0	−0.08	−0.12 (0.14)	−0.09; 0.03	−0.03
Sibling (Ref: No)	0.36 (0.23)	−0.02; 0.14	0.06	−1.13 (0.29)	**−0.34; −0.11**	−0.22	−0.09 (0.40)	−0.15; 0.13	−0.02	−0.28 (0.20)	−0.15; 0.02	−0.06
Age in years	0.20 (0.11)	−0.01; 0.07	0.04	0.05 (0.11)	−0.04; 0.05	0.01	−0.26 (0.13)	−0.52; 0.01	−0.04	−0.06 (0.06)	−0.04; 0.02	−0.02
General mattering	0.69 (0.03)	**0.43; 0.53**	0.48	0.68 (0.03)	**0.40; 0.52**	0.46	0.73 (0.03)	**0.45; 0.56**	0.51	0.51 (0.02)	**0.29; 0.37**	0.33
Anti-mattering	−0.22 (0.04)	**−0.18; −0.08**	−0.13	−0.18 (0.03)	**−0.19; −0.08**	−0.14	−0.10 (0.03)	**−0.13; −0.02**	−0.07	−0.19 (0.02)	**−0.19; −0.11**	−0.15
Fear of not mattering	−0.14 (0.05)	**−0.12; −0.03**	−0.07	−0.11 (0.04)	**−0.11; −0.02**	−0.07	−0.13 (0.04)	**−0.13; −0.04**	−0.08	−0.19 (0.03)	**−0.17; −0.10**	−0.13

BC CI = bootstrap 1000 high-low, indicating confidence intervals calculated using 1000 bootstrap replications.
Bold denotes BC CIs excluding zero.
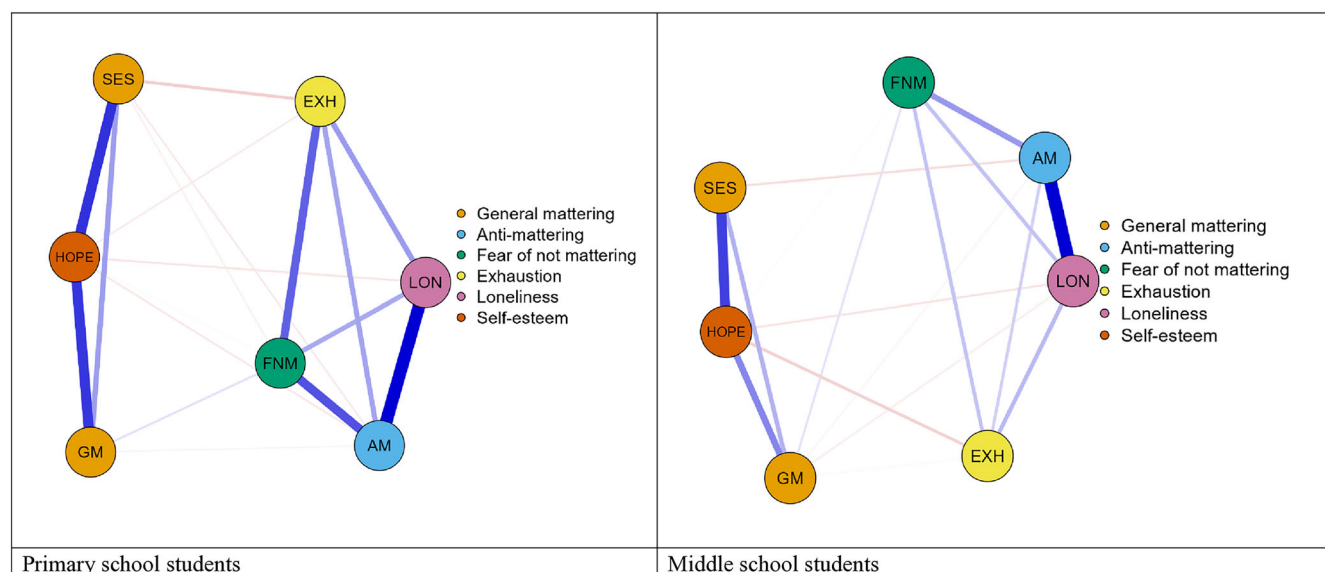
Fig. 1 Visualization of the relationships between the three mattering and other variables among primary and middle school students. GM general mattering, AM anti-mattering, FNM fear of not mattering, EXH exhaustion, LON loneliness, SES self-esteem.

relationships were found for all three types of mattering across various age groups, with the exception of FNM in middle school students and AM in high school students ($b = -0.04$, $p = 0.07$, closely approaching significance). GM showed the most substantial impact on self-esteem ($b = 0.31-0.40$). Finally, for hope, all mattering types, except for FNM in middle school students, demonstrated significant coefficients in various age groups, with GM having the highest impact ($b = 0.51-0.73$). These findings underscore the varying influence of mattering types on psychological well-being across different age groups, highlighting the importance of considering the multidimensional nature of mattering in understanding its effects on mental health outcomes.

Network analysis: depicting the associations among mattering and other psychological variables. Before presenting the results for network analysis, we assessed the stability and accuracy of the network's centrality by employing case-dropping subset bootstrapping, a technique that evaluates the consistency of centrality indices across different subsets of the data. The correlation stability coefficient (CS-coefficient) was utilized to determine the stability of centrality measures, with values above 0.50 considered preferable and those below 0.25 deemed unstable and uninterpretable (Epskamp et al., 2012). Furthermore, we calculated 95% confidence intervals (CIs) using parametric bootstrapped samples to gauge the accuracy of the edge estimates, with narrower CIs indicating greater precision (Epskamp and Fried, 2018).

The results showed that CS-coefficients for the centrality measures in various subsets consistently surpassed the 0.25 threshold and approached 0.50, suggesting an acceptable level of stability (Fig. S16). Furthermore, the majority of the CIs did not include zero, indicating sufficiently narrow intervals and confirming the accuracy of the centrality estimates in the network analysis (Fig. S17).

The network analysis, as depicted in Figs. 1 and 2, illustrates a consistent pattern across four age groups, characterized by substantial positive relationships, indicated in blue, between several key constructs. Specifically, GM shows a positive association with self-esteem and hope. Similarly, AM is positively correlated with loneliness, and FNM is positively linked with

exhaustion. This pattern of positive relationships is uniformly observed across the age groups.

For primary school students, an interesting deviation is noted: GM does not exhibit a significant negative relationship (represented in red) with loneliness and exhaustion. However, in the other three age groups, there is a significant negative correlation between GM and both loneliness and exhaustion. Furthermore, the analysis reveals that the negative correlation between GM and FNM becomes increasingly pronounced with age, with a particularly strong representation among university students.

Discussion

The current study sought to explore the variations in three distinct dimensions of mattering—GM, AM, and FNM—across a diverse educational spectrum encompassing primary, middle, high school, and university students. Additionally, the research aimed to investigate the relationships between these mattering dimensions and key psychological variables, namely exhaustion, loneliness, self-esteem, and hope, within each educational level. The findings illuminated that the disparities in mattering dimensions were more pronounced among different educational stages than within specific grade levels of the same stage. Moreover, the study uncovered positive associations between GM and both self-esteem and hope, as well as between AM/FNM and both exhaustion and loneliness. Conversely, negative associations were observed between GM and both exhaustion and loneliness, as well as between AM/FNM and both self-esteem and hope. Notably, the strength of these associations exhibited variability across the different educational levels examined.

Differences in the extent of three types of mattering across the four age groups. First and foremost, our focus was on levels of mattering across the four age groups. Hypothesis 1 was fully supported, as the middle school students had the lowest level of GM and higher levels of AM and FNM than the high school or primary school students. This is likely associated with the pressures they face, especially the increased academic pressures and social comparisons resulting from the policy that only half of them have the opportunity to enter high schools (MOE of China, 2017). This environment probably cultivates conditional
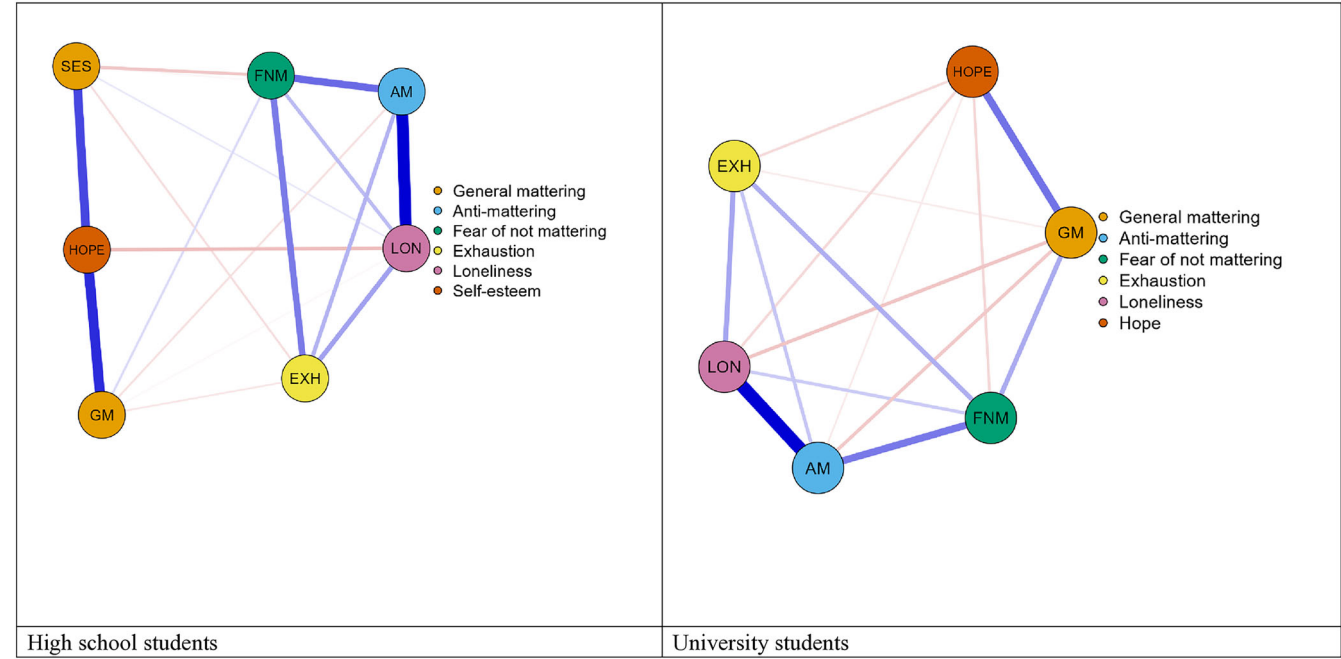
Fig. 2 Visualization of the relationships between the three mattering and other variables among high school and university students. GM general mattering, AM anti-mattering, FNM fear of not mattering, EXH exhaustion, LON loneliness, SES self-esteem.

mattering, where students feel they "only matter if they achieve academic success, for instance, earning a place in a high school or even a prestigious high school." Unfortunately, half of the students cannot achieve this condition since they are forced to enter the vocational education system and cannot enter high school, which indicates a very high chance of not obtaining an opportunity to attend university. Consequently, as middle school students begin their educational journey, this idea of conditional mattering becomes deeply rooted in their minds, likely continuing to arouse and intensify throughout their academic experiences. This kind of conditional mattering can easily lead to diminished mattering or even AM or FNM (Flett, 2022).

In addition, high school students reported the highest levels of GM, followed by primary school, university, and middle school students. Within both high school and university, freshmen reported higher levels of GM compared to their older counterparts. This pattern likely stems from several factors. For high school freshmen, their recent success in the highly competitive entrance examination, the exclusivity of their achievement (as only half of their peers have this opportunity), and the excitement of a new academic chapter contribute to their elevated sense of mattering. Similarly, university freshmen experience heightened GM due to the initial increased support from counselors (called "fǔdǎo yuán" in China, assigned to each freshman) and peers during their transition (Cole et al., 2020), the pride of passing the college entrance exam, confidence in their future prospects, and the anticipation of new experiences in college life. These freshmen-specific factors, such as recent significant achievements, transition support, and optimism about the future, appear to temporarily boost GM levels. This suggests that the development of GM is more complex than a simple linear progression, with fluctuations occurring within educational stages, highlighting the importance of transition periods and recent achievements in shaping students' perceptions of mattering.

Interestingly, despite their initially high GM levels, university students were found to have the highest mean levels of AM and FNM, indicating that many university students are grappling with various concerns about their sense of being valued and mattering

to others. This seemingly paradoxical finding can be attributed primarily to the evolution of conditional mattering. As students progress through university, the focus of conditional mattering shifts from academic success to job success. Nowadays, university students in China are faced with severe employment difficulties (Yin, 2022). The pressure to find a high-paying job and bring honor to their family becomes increasingly salient, yet more challenging to achieve. Their original expectation to provide greater support to their family cannot be easily satisfied if they are unable to secure a desirable job. Consequently, the conditional mattering that initially boosted their sense of importance in academic achievements may transform into AM and FNM as they confront the harsh realities of the job market. This transition highlights how the basis for feeling valued can change throughout one's educational journey, potentially leading to increased uncertainty and fear about one's worth in society.

What needs to be noticed is that the order of GM and AM from high to low among the four age groups is not directly opposite. For example, middle school students, who ranked lowest in GM, didn't rank highest in AM. They only had higher levels of AM than high and primary school students, but lower than that of university students. This suggests that the development of AM may not be directly inverse to that of GM, which further confirms that these dimensions of mattering are not on the same spectrum (Liu et al., 2023).

Different associations of mattering types with positive and negative outcomes. The second broad theme involved the correlates of individual differences in feelings of mattering versus feelings and fears of not mattering to others. The results attested to the benefits of feelings of mattering and the difficulties inherent in the sense of not mattering to other people. These findings suggested that different types of mattering may play distinct roles in shaping psychological well-being. GM, which reflects a sense of being important and significant to others, may serve as a protective factor, promoting positive self-evaluations and future-oriented thinking (Dixon and Kurpius, 2008; Liu et al., 2023). In contrast, AM and FNM, which involve feelings of insignificance

and anxiety about potential irrelevance, may act as risky factors, contributing to emotional exhaustion and social disconnection (Chen et al., 2022; Flett et al., 2022).

Most importantly, our study further revealed that the strength of the associations between GM and negative variables, specifically exhaustion and loneliness, exhibited a tendency to intensify with increasing age across educational levels. This pattern was exemplified by the weaker negative association between GM and exhaustion among primary school students in comparison to the other age groups in the regression analysis. Furthermore, the negative relationship between GM and loneliness was found to be non-significant among primary school students, while it reached statistical significance in other three age groups. The network analysis provided additional evidence supporting this trend, demonstrating that the absence of negative associations between GM and negative variables (i.e., loneliness and exhaustion) was unique to primary school students when compared to the other age groups.

The weaker or absent associations between GM and negative variables among primary school students may be attributed to the lower academic demands and pressures experienced at this educational level (Jiang et al., 2022), as well as the greater reliance on family relationships for social support (Vélez et al., 2020). According to Sun et al.'s (2025) study, as individuals progress through their educational journey, the need to consider mental health issues becomes stronger. Under such circumstances, the protective role of mattering against negative outcomes may become increasingly important. This is consistent with previous research (Flett et al., 2022) highlighting the growing significance of mattering in buffering against psychological distress and promoting well-being as individuals navigate the challenges of adolescence and emerging adulthood.

By and large, our results showed that after controlling for demographic factors, all three mattering measures were significant predictors of key outcomes. Therefore, Hypothesis 2 was also generally supported.

Lastly, it should be pointed out that the primary school student group, which had received little attention before, these students were clearly distinguished by much lower mean scores on both AM and the FNM. If viewed developmentally, our results indicate that one looming challenge for many primary school students who will be moving eventually to middle school is that they are going to have more challenges ahead that will arouse feelings of not mattering and losing some of their sense of being valued. Students should benefit to the extent that they become aware of the feelings that might be experienced as they advance in school and learning some ways to regulate negative emotions and sense of isolation that are elicited by an increasing sense of not mattering to others. Clearly longitudinal study of the same students at multiple time periods would be quite illuminating if examined in future research.

Furthermore, in view that the SD of primary school students on mattering is 3.89, higher than middle school students (3.47), high school students (3.77) and university students (3.03), our results also illustrated that individual differences in mattering were useful and meaningful to consider among primary school students in China, and this is likely the case elsewhere in other parts of the world.

This research offers two significant practical implications. First, our findings of developmental differences in mattering facets across educational stages suggest that interventions should be tailored to address the specific challenges facing each age group, particularly the diminished sense of mattering and heightened FNM observed among middle school students in China. Second, our results affirm the value of conceptualizing mattering as a multi-faceted construct with distinct dimensions that contribute differently to adjustment outcomes. Schools should implement comprehensive approaches that both enhance GM through practices that emphasize student contributions and significance (e.g., collaborative projects highlighting individual roles, recognition systems acknowledging diverse strengths), while simultaneously addressing AM and FNM by reducing competitive pressures and social comparison that create environments where only high-achieving students feel valued, while others feel insignificant. By addressing these distinct facets of mattering, educational environments can better support positive psychosocial development during critical transition periods, particularly for vulnerable middle school students who demonstrated concerning patterns in our large-scale sample.

Conclusions

Based on extensive data from a large sample, several conclusions can be drawn from the current results. First, evidence indicated that there are developmental differences in levels of the various mattering facets. Clearly, more research is needed, and future research needs to take a nuanced approach that takes key contextual factors into account. The merits of comparing early and late adolescents within the same investigation were established by the results of the current study, which painted a portrait of the challenges and pressures facing middle school students in China. Our results indicate that a significant consideration is the diminished sense of mattering and heightened FNM that is evident among these middle school students.

A second major conclusion that emerges from our results is that there is clear merit in continuing to examine mattering as a multi-faceted construct. Feelings of mattering and not mattering seem to be distinct and contribute to the adjustment and maladjustment of young people. Parenthetically, the mattering measures in the current study have sound psychometric attributes and characteristics and can be used across age groups ranging from children to emerging adults.

Limitations and future directions

While this study provides valuable insights into the development and associations of mattering across different educational levels, it is not without limitations. Firstly, the cross-sectional design limits the ability to draw causal inferences; longitudinal research that takes place over multiple time periods is needed so that possible developmental trajectories may be considered in the future. Secondly, though we carefully scheduled data collection periods in order to reduce the influence of time on the responses as described in the "participants" part, and implemented this timing strategy consistently across all age groups, we acknowledge that other school-based activities and events specific to individual institutions may have introduced some uncontrolled variability in our data. These timing-related factors represent a limitation that should be considered when interpreting the results across different developmental stages. Thirdly, the current study did not investigate the self-esteem in the university student sample. Besides, the analysis of standardized residuals revealed slight deviations from normality, characterized by leptokurtosis and heavier tails than expected in a perfect normal distribution. Furthermore, while our regression analyses controlled for variables such as gender, age, presence of siblings, and school level, this study has limitations due to the exclusion of potentially influential factors. Variables such as socioeconomic status, family support, and academic achievement were not incorporated in the current research design, which may have affected our findings and should be considered in future investigations.

Data availability

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

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Author contributions

C-HC has contributed to conceptualization, formal analysis, and writing—original draft preparation. W-MZ and X-LW have contributed to methodology, resources, investigation, and data curation. X-YJ and LZ have contributed to software, resources, and data curation. I-HC has contributed to conceptualization, methodology, validation, investigation, writing—review and editing, supervision, project administration, and funding acquisition. GLF has contributed to validation, writing—review and editing, visualization, and project administration. Y-XS has contributed to writing—original draft preparation and investigation. All authors reviewed the manuscript.

Competing interests

The authors declare no competing interests.

Ethical approval

Ethical approval was obtained in advance from the Institutional Review Board (IRB) of the Jiangxi Psychological Consultant Association (IRB references blinded for peer review: JXSXL-2022-CL15 for primary, middle, and high school participants; and JXSXL-2022-Jul13 for university participants). Notably, the research involving university students and minor participants was funded by two distinct projects. This resulted in the variable of self-esteem not being collected among university students.

Informed consent

Electronic informed consent was obtained through online consent forms by the author team according to the following timeline: For university students: consent was obtained from participants (aged 18 years and above) between August and October 2022, prior to data collection. For primary and middle school students: consent was obtained from guardians of minors between December 2022 and December 2023, prior to each phase of data collection. For high school students: consent was obtained from guardians of minors between August and September 2023, prior to data collection. The electronic consent forms clearly explained: (1) the purpose of the survey, (2) researchers' affiliations, (3) privacy guarantees, and (4) data confidentiality measures. The scope of consent covered: (a) voluntary participation in the survey, (b) use of collected data for research purposes, (c) anonymous publication of aggregated results in academic journals, and (d) the right to withdraw from the study at any time without consequences.

Additional information