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Evaluating a mindfulness randomized controlled trial in Chinese migrant youth: A follow up mixed methods study

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ABSTRACT

Background: Mindfulness-based interventions (MI) have shown efficacy in improving mental health among adults; however, the results for younger populations remain inconsistent Research on this topic in low- and middle-income countries is still limited. This study seeks to address this gap by examining the impact of a mindfulness-based intervention on Chinese migrant youth.

Methods: A randomized controlled trial delivering mindfulness and life skills mentorship to 653 migrant students aged 9 to 17 in China. Quantitative results in depression and anxiety were examined between Mindfulness Training group (MT group, n = 167), the Mindfulness Training plus Life Skill Training group (MT + LS group, n = 118), and Control group (n = 368) using student t-tests and Differences-in-Differences. Qualitative study from 20 interviews was conducted using a semi-structured interview and deductive approach.

Results: Quantitatively, participants in intervention group did not show significantly different anxiety and depression symptoms compared to control groups post intervention. Nevertheless, qualitative data highlighted several key benefits of the mindfulness intervention, including improved emotional regulation and increased social support among participants.

Conclusions: A volunteer-led, two-month mindfulness and life skills intervention with Chinese migrant youth did not yield statistically significant reduction in depression or anxiety symptoms. While no notable quantitative benefits were observed, qualitative findings suggested enhanced application of mindfulness and emotional regulation skills among participants that the quantitative measures failed to capture.

1. Background

Ensuring the mental health and well-being of children and adolescents is a worldwide challenge. Recent reviews estimated that the global prevalence of youth mental disorders was 13.4 % overall (Kokka, et al., 2023), 6.5 % for anxiety and 2.6 % for depression (Polanczyk, et al., 2015). The Global Burden of Diseases, Injuries, and Risk Factors Study (GBD) 2019 shows that depression and anxiety disorders were the two main contributors to the mental disorder burden disability-adjusted life-years (DALYs), both of which are among the top 25 leading causes of years lived with disability (YLDs) in 2019. (GBD 2019 Risk Factors Collaborators, 2022). Adolescents are at high risk for developing mental health problems due to hormonal changes, increasing peer pressure, and lack of fully developed executive function (Solmi, et al., 2022). In China, with rapid social and economic development comes an emerging wave of youth mental health problems (Xiong, 2016). A national survey in 2019 showed that 32.0 % of adolescents reported anxiety symptoms and 4.4 % of them reported depressive symptoms (Luo et al., 2020). If these problems are not detected and intervened in time, they are likely to have severe long-term impacts on youth health and development, with

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chronic complications that are dangerous and costly to treat (Bricker, et al., 2004; Patel, et al., 2007).

Researchers and clinical practitioners have been exploring mindfulness-based intervention (MI) as a promising approach in recent years (Lindsay & Creswell, 2017). Mindfulness, originally derived from Buddhism and introduced to the West through secular clinicians and researchers, involves cultivating moment-to-moment awareness in a nonjudgmental and accepting way (Kabat-Zinn, 1994; 2003). MI use guided mindfulness training and practices to help participants gain moment-to-moment awareness, which can lead to improved emotional regulation and executive function (Perry et al., 2016; Prakash et al., 2021). Neuroscience evidence suggests that mindfulness practice helps individuals better regulate their emotions through improved amygdala regulation by the lateral prefrontal cortex (Hölzel et al., 2011). It is thought to reduce anxiety by redirecting attention from anxiety-provoking thoughts (Semple et al., 2010) and by fostering greater tolerance of unpleasant internal states instead on relying on avoidance strategies that perpetuate anxiety (Heckman et al., 2004). The efficacy of MI, therefore, is intrinsically linked to its capacity to directly impact neural circuitry involved in emotional processing within the context of anxiety management.

Previous studies have proven effective more often in clinical populations or in adults. But in recent years, it has also been studied in children and adolescents in developed countries (Bender et al., 2023), showing some promise to reduce psychological distress (Lin et al., 2019), to improve internalizing symptoms (Dunning et al., 2019; Yu et al., 2021), to improve youth mindfulness, executive function, attention, depression/anxiety symptoms, as well as emotional regulation (Dunning et al., 2019; González-Valero et al., 2019; Simkin et al., 2014). The distinctiveness of these findings lies in their focus on younger populations within a developed-world setting, contrasting with the intervention's traditional application and necessitating further rigorous analysis of its specific impact within this unique context.

However, findings in school-based research on positive thinking interventions for adolescents are not entirely consistent. While some studies have reported positive outcomes of MI on psychological distress in children and adolescents, others have found it to be ineffective in youth, particularly in promoting prosocial behaviors and reducing anxiety and depression symptoms (Lin et al., 2019; Strauss et al., 2014; Viglas et al., 2018). Notably, a large-scale randomized control trial in the UK has shown school-based mindfulness training in the UK did not significantly improve youth mental health symptoms or improve well-being (Kuyken et al., 2022) or reducing stress among college students (Chui, 2020). An 8-week pilot randomized control trial of Mindfulness training using community volunteers also did not significantly impact resilience, mindfulness, depression, or anxiety measurements in migrant Chinese children (She et al., 2023).

These mixed results regarding the efficacy of mindfulness interventions in youth populations have several possible explanations. First, as Garcia (2010) note, adolescents present a heterogeneous group, exhibiting diverse psychological profiles, life circumstances, and preferred coping mechanisms, all of which can significantly modulate their response to mindfulness training. Second, Divergences in research design, specifically the application of varying mindfulness programs and assessment instruments, further contribute to the inconsistent findings (Baer, 2003). Crucially, the fidelity and duration of intervention implementation represent another critical factor; subpar execution or a failure to maintain engagement may attenuate observed benefits (Crane et al., 2010). Moreover, the individual adolescent's pre-existing attitudes toward mindfulness and their active participation in the intervention directly impact its effectiveness (Semple et al., 2014).

Despite the popularity of mindfulness in Western countries for improving youth mental health, its exploration in China remains limited. The concept of mindfulness is relatively new in China, resulting in a lack of knowledge and understanding among this population. This cultural difference may lead to uncertainty in study results, making it challenging to determine the true impact of mindfulness in China. Furthermore, existing literature reveals a disparity in findings regarding mindfulness efficacy. While robust evidence supports its benefits in clinical populations and adult samples (Grossman, et al., 2004), research focusing on school-based adolescent populations yields less consistent results (Dunning, et al., 2019). This highlights the need for further research to elucidate the potential benefits of mindfulness practices, particularly in Chinese school-based youth.

Therefore, it is crucial to explore the potential benefits of mindfulness practices in this population. This study aims to examine the 3-month follow-up measurements of mindfulness, depression anxiety symptoms post intervention. A secondary aim is to explore the perception and acceptability of this intervention through qualitative interviews. The integration of quantitative and qualitative data will provide a nuanced understanding of the intervention's impact and inform culturally sensitive strategies for promoting adolescent mental health in China. Such understanding is crucial, as evidence suggests that direct translation of Western interventions can be ineffective without cultural adaptation (Favazza, 2004). Furthermore, the study's focus on a three-month follow-up addresses the need for longitudinal data in evaluating the sustained effects of mindfulness interventions, a gap often cited in previous research (Grossman, et al., 2004). The findings will contribute to a more refined and culturally appropriate application of mindfulness practices for Chinese adolescents, potentially offering a more effective alternative to traditional mental health interventions.

2. Methods

2.1. Research design

This study utilized a mixed-methods approach (Johnson et al., 2003; 2014). A randomized controlled trial was conducted among 653 migrant Chinese school-age youth 9–16 years-old from two elementary schools and five middle schools in Shanghai. Details of its implementation were described in previous publications (Liu et al., 2023; She, et al., 2023). Briefly, participants were randomly assigned to one of three conditions: a mindfulness training group (MT), a mindfulness training plus life skills training group (MT + LS), or a waitlist control group. The MT intervention, informed by attentional control theory (Anderson et al., 2007) and emphasizing present moment awareness, consisted of eight weekly one-hour sessions dedicated solely to mindfulness practices. The MT + LS intervention combined the mindfulness component with eight one-hour group sessions focusing on life skills development. This combined model draws on social cognitive theory (Bandura, 2013), positing that enhanced self-efficacy and coping mechanisms, in conjunction with mindfulness, would yield superior outcomes.

While both intervention arms hold theoretical merit, a preference leans toward the MT + LS model, anticipating that the synergistic effect of mindfulness and practical life skills would generate more robust and sustainable improvements in mental well-being among this vulnerable population. All participants completed questionnaires at baseline, immediately post-intervention, and three-month post intervention. To complement the quantitative data, semi-structured interviews were conducted with 20 participants (6 control, 7 MT, 7 MT + LS) to explore their experiences with the program and their perceptions of mindfulness and mental health.

2.2. Participants

PASS15.0 was applied to calculate the sample size required for the experiment and learned that 548 students (137 in each intervention group and 274 in the control group) are needed. It allowed a loss of 20 % at 3 months of follow-up. Taking into account the representative of the participants, we recruited different types of schools, including public schools and private schools. The stratified cluster sampling method was used to recruit the participants. Stratified factors include the type of

school, grade, and class. Three to four classes are randomly recruited for each grade, and the whole class is selected if it was recruited. In addition, at the individual level, inclusion criteria are as follows: (a) students have been involved in the study at school for more than six months; (b) the student has no known diagnosed mental illness; (c) The student's parents have consented to their child's participation in the study. Exclusion criteria include: (a) the student's family plans to leave school within six months; (b) the student has been diagnosed with a mental illness; (c) The parents of the student refused to give consent.

The final sample consisted of 653 children (mean age = 11.6 years, age range = 9 to 17 years) who were randomly assigned to the MT group (n = 167, mean age = 11.7 years, SD = 1.4), the MI + LS group (n = 118, mean age = 12.0 years, SD = 1.3), and the control group (n = 368, mean age = 11.4 years old, SD = 1.3). Due to the number of migrant children in each class being variant, and the recruited unit being class, the number of students in the two intervention groups is not equal. Among 653 students, 55.1 % were male and 42.9 % were female. In addition to grade level, the characteristics of students from all groups were similar, such as gender/parental education level/annual family income (see Table 1).

Moreover, a total of 20 students aged 9 to 13 with a gender ratio of 1:1 were recruited to attend the qualitative interview by purposive sampling method. The sampled students included 2 elementary school students and 5 middle school students from the MT group, 2 elementary school students and 5 middle school students from the MT + LS group, and 2 primary school students and 4 middle school students from the control group.

2.3. Curriculum, volunteer training and implementation

The details of curriculum and implementation process were presented elsewhere (She et al., 2023; Liu et al., 2023). Briefly, 26 community volunteers who majored in psychology or sociology were recruited and trained over two months. Half taught the mindfulness-training curriculum only and the other half implemented both mindfulness-training and life skill-based mentorship to participants randomized into the intervention arms (n = 167 for the mindfulness only arm, n = 118 for the mindfulness plus life skills arm) over eight weeks. The intervention was conducted in small groups averaging 15 students per group.

2.4. Quantitative questionnaires

This study used student reports and questionnaires filled out by parents. The basic family information questionnaire was completed by the parents and included sociodemographic characteristics like the grade level of the adolescent, gender, whether the adolescent was an only child, the level of education of the parents, the type of family, and annual household income. The psychological scale measuring mental health outcomes (anxiety and depression symptoms) was completed by the students. The specific psychological assessment scales used in this study are listed below:

2.4.1. Multidimensional anxiety scale for children (MASC)

The Multidimensional Children's Anxiety Scale (March et al., 1997), which is filled in by students, is mainly used to comprehensively assess the anxiety symptoms of children and adolescents within one week from multiple dimensions. The MASC scale has a total of 39 items, using a four-point Likert scale, with a total score of 0–117, to assess the anxiety level of adolescents from four main dimensions: somatic symptoms, social anxiety, separation anxiety, and injury avoidance. According to other studies using this scale, the use of 64 points as the cutoff value for the presence or absence of anxiety symptoms has good sensitivity and specificity (Ivarsson, 2006). Yao et al. translated the MASC scale into Chinese in 2007. After fully considering cultural differences, they ensured that each item can accurately reflect the original meaning. After verification, the Cronbach's alpha coefficient of the MASC-C scale is 0.91, and the retest reliability was 0.84; confirmatory factor analysis showed GFI = 0.96, CFI = 0.95, NNFI = 0.94, RMSEA = 0.06, indicating that the MASC-C scale has good reliability and validity (Yao et al., 2007). In this study, the Cronbach's α coefficient of the total score of this scale was 0.835, the Cronbach's α coefficient of the somatic symptom dimension was 0.892, the Cronbach's α coefficient of social anxiety was 0.888, the Cronbach's α coefficient of separation anxiety was 0.781, and the Cronbach's α coefficient of injury avoidance was 0.694. This proves that this scale has good internal consistency in this study.

2.4.2. The Center for Epidemiological studies depression scale (CES-D)

The Center for Epidemiological Studies Depression Scale was

Table 1
Demographic characteristics of participants in three groups in baseline.

	Totaln (%)	Control group n (%)	MT group n (%)	MT + LS group n (%)	χ^2	p
Gender (NA*=13, 1.99 %)						
Boys	360 (56.25)	204 (57.30)	94 (56.63)	62 (52.54)	0.83	0.661
Girls	280 (43.75)	152 (42.70)	72 (43.37)	56 (47.46)		
Grade						
Four	132 (20.21)	90 (24.46)	28 (16.77)	14 (11.86)	27.44	0.001
Five	102 (15.62)	58 (15.76)	29 (17.37)	15 (12.71)		
Six	172 (26.34)	107 (29.08)	36 (21.56)	29 (24.58)		
Seven	142 (21.75)	68 (18.48)	45 (26.95)	29 (24.58)		
Eight	105 (16.08)	45 (12.23)	29 (17.37)	31 (26.27)		
Annual household income (USD $; NA = 30, 4.59 %)						
≤ 7,900	84 (13.48)	42 (11.97)	20 (12.58)	22 (19.47)	14.62	0.147
7,900—15,700	153 (24.56)	90 (25.64)	38 (23.90)	25 (22.12)		
15,700—23,600	117 (18.78)	68 (19.37)	24 (15.09)	25 (22.12)		
23,600—31,400	106 (17.01)	61 (17.38)	33 (20.75)	12 (10.62)		
31,400—47,100	92 (14.77)	51 (14.53)	29 (18.24)	12 (10.62)		
> 47,100	71 (11.40)	39 (11.11)	15 (9.43)	17 (15.04)		
Father's education (NA = 14, 2.14 %)						
Elementary	35 (5.48)	19 (5.26)	7 (4.35)	9 (7.69)	1.87	0.759
High school	463 (72.46)	265 (73.41)	117 (72.67)	81 (69.23)		
College or higher	141 (22.07)	77 (21.33)	37 (22.98)	27 (23.08)		
Mother's education (NA = 16, 2.45 %)						
Elementary	57 (8.95)	30 (8.36)	15 (9.26)	12 (10.34)	2.20	0.699
High school	456 (71.59)	265 (73.82)	111 (68.52)	80 (68.97)		
College or higher	124 (19.47)	64 (17.83)	36 (22.22)	24 (20.69)		
Siblings (NA = 17, 2.60 %)						
0	130 (20.44)	74 (20.67)	35 (21.6)	21 (18.10)	4.06	0.398
1	356 (55.97)	197 (55.03)	97 (59.88)	62 (53.45)		
>1	150 (23.58)	87 (24.30)	30 (18.52)	33 (28.45)		
Total	653 (100)	368 (56.36)	167 (25.57)	118 (18.07)		

Note: *NA means the number of missing data. The missing value of the data used in this study is no more than 5%.

developed by Radloff in 1977 to screen various populations for short-term depressive symptoms (Radloff, 1977). This scale includes a total of 20 items, and the filling people use 0–3 points to evaluate the frequency of symptoms in the last week, to screen the filling people's depressive symptoms in a week from 4 dimensions: depressive influence, positive influence, physical symptoms, and relationships. The total score of this scale ranges from 0 to 60 points, usually with 16 points as the cut-off point (Radloff, 1991), but other scholars use different cut-off points, such as: using 17 points as the possible presence of depressive symptoms, 23 points as a cut-off point for the likely presence of depressive symptoms (Chen et al., 2009). Although this scale is a universal depression screening scale, many studies have shown that this questionnaire is also suitable for adolescents and children, and has good reliability and validity (Chen et al., 2014; Mian et al., 2019). In this study, Cronbach's alpha coefficient of the total score of this scale was 0.882, and Cronbach's alpha coefficient of its internal dimension was 0.882. In addition to the relatively low internal consistency of the interpersonal dimension between 0.528–0.839, this scale overall still has good internal consistency in this study.

2.5. Qualitative interviews

The interviews were conducted by four trained volunteers, and each interview lasted about 40 min. The interview protocol focused on participants' awareness and understanding of mindfulness and mental health and students' social environment of the student, potential stressors, and support system. For the intervention group, we also asked questions about their experiences with the intervention program and if there any changes in their perceptions and understandings of their mental health status after the intervention. All interviews were audio-recorded anonymously and transcribed.

2.6. Statistical analysis

STATA version 16.0 was applied to carry out the statistical analyses on the quantitative data. The chi-squared test was used to examine the differences in categorical variables of demographic information among the intervention groups and the control group. Comparisons of groups at baseline and follow-up were first conducted using student t-tests, then Differences-in-Differences was applied to clarify the effect of intervention. Confounding factors including students' age, gender, parental education, and annual household income were adjusted. Adjusted t-values and *p*-values are presented in the outcome tables.

All interview audio recordings were transcribed and uploaded into NVivo 11. To complement/support the quantitative component of the study, we took a deductive approach. Four trained coders independently analyzed the data based on the grounded theory. They first developed a general codebook with "categories" based on the interview protocol. Then they engaged with open coding that could characterize and summarize segments of the data (Miles et al., 2014). They frequently revisited and revised open codes. Finally, they completed a second cycle of coding exploring the themes and relationships among the codes to develop "categories" (Miles et al., 2014; Saldana, 2015).

2.7. Ethics

This study was approved by the Medical Research Ethics Committee of the School of Public Health of Fudan University in Shanghai, China (approve number: IRB#2019-11-0788) and by the Institutional Review Board at Stanford University, CA, USA (#53264). It entered the Chinese Clinical Trial Registry in 2022. Before research commencement, all participating students and their parents were required to read and sign an informed consent form.

3. Results

3.1. Demographic homogeneity and mental health Prevalence: A baseline analysis

This study examined a cohort of 653 participants, comprised of 55.1 % boys and 42.9 % girls, ranging in age from 9 to 17 years (Mean = 11.57, SD = 1.35). The majority (79.56 %) had siblings, with a substantial minority (23.58 %) having more than one sibling. Parental education levels were largely consistent, with approximately 72 % of both fathers and mothers having attained a high school diploma as their highest level of education. Annual household incomes predominantly fell within the $7,900-$15,700 range. Crucially, the three intervention groups demonstrated homogeneity across key demographic and socio-economic variables, including gender ($\chi^2 = 0.83$, $p = 0.661$), household income ($\chi^2 = 14.62$, $p = 0.147$), father education level ($\chi^2 = 1.87$, $p = 0.759$), mother education level ($\chi^2 = 2.20$, $p = 0.699$) and sibling level ($\chi^2 = 4.06$, $p = 0.398$), with the exception of grade composition (see Table 1).

3.2. Baseline anxiety prevalence and longitudinal intervention effects

At baseline, the prevalence of anxiety symptoms within the student sample was 11.64 %. Follow-up assessment indicated an overall anxiety prevalence of 18.68 % in follow-up 1, and 19.22 % in follow-up 2. Anxiety rates demonstrated no statistically significant differences across the three study groups. Comparative analysis revealed non-significant difference between the mindfulness training (MT) group ($\chi^2 = 0.29$, $p = 0.588$) and the MT plus life skills (MT + LS) group ($\chi^2 = 2.03$, $p = 0.154$) relative to the control condition at baseline. Longitudinal analysis further indicated no statistically significant differences between the MT and control groups ($F = 9.56$, $p = 0.839$) or between the MT + LS and control groups ($F = 9.02$, $p = 0.775$) in follow-up 1. Similarly, no significant differences were found between the MT and control groups ($F = -0.74$, $p = 0.459$), and the MT + LS and control groups ($F = -0.02$, $p = 0.983$) in follow-up 2 (see Table 2). These results collectively suggest that, within the parameters of this trial, the implemented mindfulness-based interventions did not demonstrate statistically significant effects on anxiety symptomatology among participants at follow-up.

3.3. Baseline depression prevalence and longitudinal intervention effects

At baseline, the prevalence of depression symptoms within the student sample was 15.27 %. The aggregated prevalence of depression symptoms across all three study groups at follow-up 1 and follow-up 2 were 21.77 % and 21.90 % respectively. Similar to anxiety outcomes, no statistically significant differences in depression rates were observed among the three groups during pairwise comparisons, including between the mindfulness training (MT) and MT plus life skills (MT + LS) groups relative to the control group. A statistically significant difference was not observed in baseline depression levels among the three study groups. Comparisons further indicated no significant differences between the MT group ($\chi^2 = 2.14$, $p = 0.143$) or MT + LS group ($\chi^2 = 0.45$, $p = 0.504$) and the control group at baseline. Longitudinal analysis revealed no significant changes in depression levels neither between the MT group and control group ($F = 5.29$, $p = 0.904$), nor between the MT + LS group and control group at follow-up 1 ($F = 4.51$, $p = 0.477$). Similarly, no significant differences were found between the MT and control groups ($F = -1.04$, $p = 0.259$), and the MT + LS and control groups ($F = -0.89$, $p = 0.673$) in follow-up 2 (see Table 2). These findings suggest that neither the standalone MT intervention nor the combined MT + LS program yielded statistically distinguishable effects on depressive symptomology relative to the control condition over time.

Table 2
The effect of MI on anxiety/depression symptoms, and mindful awareness at each time point.

	Total n (%)	Control group n (%)	MT group n (%)	MT + LS group n (%)	Difference among three groups	MT vs Control group	MT + LS vs Control group
					χ^2	χ^2/F	χ^2/F
Anxiety symptoms							
	n = 653	n = 368	n = 167	n = 118			
Baseline	76 (11.64)	41 (11.14)	16 (9.58)	19 (16.10)	3.06	0.29	2.03
Follow-up 1	122 (18.68)	67 (18.21)	33 (19.76)	22 (18.64)	0.18	0.18	0.01
						9.56[a]	9.02[b]
Follow-up 2	113 (19.22)	61 (18.32)	31 (20.67)	21 (20.00)	0.42	0.37	0.15
						−0.74[a]	0.02[b]
Depression symptoms							
	n = 624*	n = 350*	n = 163*	n = 115*			
Baseline	93 (15.27)	55 (16.03)	17 (11.04)	21 (18.75)	3.33	2.14	0.45
Follow-up 1	135 (21.77)	76 (21.71)	32 (20.13)	27 (24.32)	0.68	0.17	0.33
						5.29[a]	4.51[b]
Follow-up 2	129 (21.90)	73 (21.92)	32 (21.19)	24 (22.86)	0.10	0.03	0.04
						−1.04[a]	−0.89[b]

Note: *MT group* = the mindfulness intervention group; *MT + LS group* = the mindfulness plus mentorship intervention group. All p values for $\chi 2/F$ didn't meet the statistic significance ($p < 0.05$).
* Exsiting missing data at follow-up survey.
a: F-value from Differences-in-Differences between baseline and follow-up adjusted age & gender between control group and MT group.
b: F-value from Differences-in-Differences between baseline and follow-up adjusted age & gender between control group and MT + LS group.

3.4. Qualitative insights and theoretical integration

While quantitative measures did not reveal significant statistical differences, qualitative findings provided rich insights into the nuanced ways in which the mindfulness intervention impacted participants' lives. There may be positive signs. For example, did participants mention any positive experiences during the intervention process or willingness to apply mindfulness in the future? Building upon the mixed-methods design, the qualitative component of this study—comprising 20 semi-structured interviews—provided a layered exploration of participant experiences, extending beyond descriptive accounts to reveal contextually grounded patterns. Through systematic thematic analysis, iterative coding processes identified emergent themes and subthemes (see Table 3), which collectively formed a cohesive framework that bridges empirical observations with theoretical discourse. This analytical approach not only uncovered latent meanings within the data but also illuminated connections to existing conceptual models, offering critical linkages between lived experiences and broader psychosocial constructs. By situating these findings within established theoretical paradigms, the study advances opportunities for refining intervention frameworks and contextualizing mechanisms underlying mindfulness-based approaches in migrant youth populations.

Table 3
The framework of the interview guideline (qualitative coding classification).

Themes	Sub-themes
Changes in the perspectives of mindfulness before and after the intervention	1. Memories of the overall impressions and content details of the MI course 2. Changes in the understanding of mindfulness before and after the intervention 3. The impact of MI courses on life and learning
Changes in emotions and coping styles before and after the intervention	1. Cause of changes in mental state 2. How to deal with bad emotions before and after MI 3. Scenarios of using mindfulness
Evaluations of the mindfulness course	1. Advice for improving the MI course 2. Perspectives from non-participants

3.5. From particular experiences to generalized understanding: shifts in mindfulness perspectives

3.5.1. Unveiling the intangible: qualitative insights into mindfulness training

Most students continued to express a favorable impression of the course. Their takeaways from the Mindfulness Intervention (MI) course were a heightened awareness of their emotions in the present moment. They retained information related to mindfulness techniques including mindful breathing and drawing attention to one's five senses. While quantitative data might measure performance changes, the expressed favorability and articulated takeaways, such as heightened emotional awareness and retention of mindfulness techniques, indicate a profound shift in students' internal landscape. These subjective experiences offer invaluable insight into the mechanism by which the Mindfulness Intervention (MI) course impacts learning.

"They let us take a deep breath, and everyone is just relaxed…It's like about five or six ways to breathe." (12-year-old male participant).

"We were told to close our eyes and then sit up straight with both hands in our laps. Then the teacher would give one of us a rock and then ask us to hold it in our hands to feel the rock." (13-year-old male participant).

"We also interacted, and some people said what we heard, smelled, looked over, and everyone said one kind of thing…Eat raisins to feel it." (14-year-old male participant).

3.5.2. Mindfulness misunderstood: bridging the gap between theory and practice in student comprehension

The initial understanding of mindfulness among students, largely shaped by linguistic and conceptual ambiguity, revealed a pre-intervention perspective characterized by limited and often misconstrued interpretations. Equating it simplistically with related practices such as meditation or mindfulness betrayed a lack of nuanced comprehension. Post-intervention, while a shift towards associating mindfulness with relaxation and anxiety reduction was evident, suggesting a surface-level understanding of its potential benefits, it also highlighted the challenges of translating theoretical knowledge into practical application. The persistence of misconceptions, coupled with expressed difficulty in grasping the core concept of present-moment awareness, points to a fundamental limitation in transferring abstract philosophical principles through purely didactic methods. This suggests a pedagogical preference for integrating experiential learning and embodied practices alongside theoretical instruction to foster a more profound and internalized understanding of mindfulness, ultimately

moving beyond superficial associations to a deeper, more authentic engagement with the practice.

"Before taking this class, I was relatively unfamiliar with this word (mindfulness). And now I think mindfulness is something that can change a person from a very nervous state to A very relaxed state, which can make people from nervous to relaxed." (14-year-old male participant).

"The first time I heard it (mindfulness), I was a little confused and I didn't know what it was. Now I know mindfulness is a process of thinking… Mindfulness is where your thoughts are, and then you can feel it…Just feeling like your current mood." (14-year-old female participant).

"Before taking the mindfulness class, I didn't know what mindfulness was. After the class, I don't really know what it is either." (10-year-old male participant).

3.5.3. Unveiling the latent barriers to Mindfulness: A qualitative perspective

The limited and inconsistent comprehension of mindfulness among students, despite targeted interventions, points towards a deeper, more systemic issue than simple exposure. While quantitative analysis might reveal a superficial improvement in knowledge, qualitative findings illuminate the underlying factors hindering genuine understanding and adoption. These factors, often overlooked in purely numerical assessments, speak to the prevailing cultural and psychological landscape within academic settings. The initial paragraph highlights two critical qualitative insights: firstly, mindfulness is perceived as an abstract concept difficult to grasp without contextualization and experiential learning. Secondly, and perhaps more significantly, there exists a prioritization of academic performance that overshadows the perceived value of mental well-being practices like mindfulness. This reveals a fundamental tension between the demands of the academic environment and the internal cultivation of mindfulness, suggesting that students may view it as a secondary, even expendable, pursuit when faced with academic pressures. Further qualitative research, focusing on the lived experiences and perceptions of mindfulness of students, is crucial to identifying the specific barriers preventing genuine integration into their lives. This deeper understanding, going beyond surface-level comprehension, is vital for crafting more effective and culturally relevant interventions.

"I don't usually talk about my emotions with my friends, because I think time will take it away." (13-year-old female participant).

"I was shy, so I didn't have much interactions with my teachers." (13-year-old male participant).

3.5.4. From affective regulation to enhanced existential agency: the impact of mindfulness

The introduction of mindfulness practices within an educational context transcends simple emotional regulation; it cultivates a deeper sense of existential agency in adolescent learners. Instead of advocating for the avoidance of conflict, mindfulness training encourages a non-judgmental acceptance of present experiences, including negative emotions. This acceptance, rather than critical analysis, forms the bedrock for mindful engagement. Qualitative findings reveal that students ascribe significant emotional growth to the intervention, specifically citing an enhanced capacity to manage emotional fluctuations. At a more abstract level, this improved emotional regulation suggests a shift in perspective, enabling students to navigate the inherent psychological challenges of adolescence with increased intentionality and a heightened sense of self-efficacy in confronting life's complexities. Mindfulness, therefore, empowers students to actively shape their experiences, fostering a sense of control and purpose within their learning and personal development.

"After this class, I know that there is a way to go to relieve my anxiety… mindfulness has made me feel a new way to work on my emotions. I've become so much gentler." (13-year-old female participant).

"Deeper understanding of my emotions…… I learned to ease my emotions." (12-year-old female participant).

"I have a better understanding of my own psychology. I was able to manage my emotions and not be impulsive…… I have the feeling of being in the moment and not being too easily disturbed by the outside world." (14-year-old female participant).

3.6. Shifting affect and resilience: a conceptual reconfiguration

3.6.1. From manifestation to mechanism: the interplay of context and emotional regulation

The qualitative findings regarding changes in emotions and coping styles pre- and post-intervention transcend mere descriptive accounts. The reported impact of family environments on student well-being, specifically anxiety and depression, suggests a crucial interplay between contextual stressors and developing emotional regulation skills. Rather than simply identifying family as a causative agent, the data points to the family system as a significant contributor to the internal working models adolescents employ to navigate stress. The immediate impact of academic pressure, peer conflict, and bullying highlights the vulnerability of this developmental stage to external stimuli. These stressors, acting as catalysts, expose the limitations in existing coping mechanisms and underscore the need for interventions designed to foster resilience and adaptive emotional responses. Ultimately, the observed shifts reflect a dynamic process of negotiating internal resources against external demands, a process ripe for targeted theoretical investigation and intervention.

Academic stress.

"I'm usually more depressed when I do poorly on exams." (10-year-old male participant).

"Actually, most of my low moods are due to academic performance not living up to my expectations." (12-year-old female participant).

"Since finals are coming up, I'm not in the best of spirits. At that time, I didn't do well on my English test, so I was worried that I would be removed from my position as class president…… I'm in good spirits now because my grades are back." (13-year-old female participant).

Family Relationships.

"When I fight with my parents, I may feel depressed. There is a generation gap between our parents and us on some ideas. Some of the things I say may not make sense to them." (12-year-old female participant).

"I feel sad because my sister and because my parents don't understand me… I'm a junior high, I 'm not allowed to talk back to them." (12-year-old female participant).

"My mom didn't buy me the children's day gift as promised and that depressed me for three weeks… My parents forgot my birthday once… I have nightmares about my birthday. It's kind of my own psychological shadow." (12-year-old male participant).

Friendship.

"During puberty, I get irritable and annoyed with my friends… I can easily get into fights with them, and I kind of regret it afterward." (12-year-old male participant).

"I get depressed when my friends don't play with me." (10-year-old male participant).

"If my friend doesn't talk to me today and then they go talk to someone else, I will get upset." (12-year-old female participant).

School Bullying.

"I was bullied with words and actions by my classmates… It happened 3 times." (12-year-old female participant).

"Some of the boys just talk about us girls all the time…Once I was pushed down the corridor by a boy… I was bleeding from the fall." (12-year-old female participant).

"There is one student is taller and stronger than you, so you were powerless to resist his behavior towards you…… But the student who bullied me transferred out this semester." (12-year-old male participant).

3.6.2. From coping mechanisms to emotion regulation strategies: navigating affective states in the context of motivational interviewing

The diverse coping mechanisms employed by students, ranging from distraction and self-admonishment to social support, physical activity, and maladaptive behaviors like stress eating and uncontrolled vocalizations, illustrate a fundamental human drive to regulate affective states. Prior to engaging with Motivational Interviewing (MI), these disparate strategies represent individualized attempts to navigate negative emotions. Examining these pre-existing behaviors within a theoretical framework of emotion regulation highlights the inherent variability in individual approaches and the potential for both adaptive and maladaptive coping mechanisms. These pre-MI behaviors provide a crucial baseline for understanding how MI training subsequently influences and refines students' abilities to effectively manage negative emotions encountered both before and after the implementation of MI techniques.

"Before the mindfulness class, I can listen to some happy songs or think about something else, just like taking a deep breath." (12-year-old female participant).

"Before the mindfulness class, if I get angry, or have some unhappy emotions, I will talk to somebody." (10-year-old male participant).

"Before the mindfulness class, if I have some emotional problems, I will eat candy. Or do whatever I want." (12-year-old male participant).

The observed shift in students' emotional coping mechanisms following mindfulness training suggests a potential re-evaluation of the relationship between self-awareness and emotional regulation. The adoption of mindfulness techniques reflects a transition from potentially reactive or avoidant coping strategies to a proactive and internally-oriented approach. This movement signifies a theoretical shift towards the conscious cultivation of emotional equilibrium, suggesting that targeted interventions can empower individuals to develop greater agency in navigating their emotional landscape, potentially leading to a more resilient and integrated sense of self. This finding contributes to the broader understanding of how learned practices can shape neuro-cognitive processes and ultimately influence emotional well-being.

"After these classes, I learned a lot of ways to regulate my mentality. I will talk or chat with my parents, understand each other's views and ideas, to see if there is a better way to solve a problem." (12-year-old female participant).

"After taking this course, when someone makes me angry, I won't answer him, I will slowly relax down… I think this approach is much better." (10-year-old male participant).

"After taking this course, I will solve it (conflict) directly and express my thoughts." (12-year-old male participant).

3.6.3. From coping mechanisms to embodied Self-Regulation: A qualitative Interpretation

The qualitative data reveals that students, following the mindfulness intervention, adopted these practices not merely as reactive coping mechanisms, but as proactive tools for embodied self-regulation. The application of mindfulness techniques across contexts—from managing emotional distress and academic stress to navigating interpersonal conflicts—suggests an emergent capacity for individuals to modulate their internal states and cultivate a more present, adaptive response to challenging life circumstances. These findings indicate a shift towards intentionality and self-awareness, reflecting a deeper engagement with their own emotional and cognitive processes, and illustrating mindfulness as a pathway towards enhanced well-being and resilience.

"If someone makes me angry, I can relax with mindfulness… I have used it about 10 times." (10-year-old male participant).

"To reduce anxiety, I wanted to calm down with mindfulness. Then I put soothing music on my phone, and then gradually calmed me down." (13-year-old female participant).

"When my grades are not ideal, or when I do not understand the class, although I did not think about the content of the class, I will calm down subconsciously." (14-year-old female participant).

3.6.4. Implicit embodiment of theoretical Constructs: A Case for qualitative insights

The observation that certain students, seemingly without conscious awareness, employed techniques resembling mindfulness to mitigate anxiety highlights a crucial value of qualitative research: its capacity to reveal the implicit embodiment of theoretical constructs. While quantitative studies excel at measuring the prevalence and impact of explicitly defined variables, qualitative inquiry allows researchers to uncover the tacit, lived realities that underpin and inform those variables. In this instance, the spontaneous adoption of mindfulness-like strategies suggests that the underlying principles of emotional regulation, often formalized in theoretical models, may be intuitively accessible and adaptable even without formal training or explicit understanding. This potential for unconscious application offers valuable insights into the innate human capacity for resilience and suggests avenues for further exploration of the interplay between theory and lived experience.

"I didn't know what mindfulness was before the class, and I didn't know what mindfulness was after class… But I have tried (to use mindfulness). It is useful. I have used it for 10 times… It was helpful to my study and life." (10-year-old male participant).

3.7. Evaluations of the mindfulness course: a grounded perspective

3.7.1. Enhancing mindfulness Interventions: A framework for culturally relevant pedagogy

The qualitative feedback garnered from student experiences with the mindfulness intervention (MI) course offers valuable insights applicable to broader theoretical considerations of pedagogical design and cultural sensitivity. Beyond specific recommendations, these findings highlight the importance of optimizing learning environments for active engagement and fostering inclusivity. The proposed extension and enhancement of the curriculum reflect a need for sustained cognitive absorption, aligning with theories of flow state and experiential learning. Suggestions for reduced group size and the incorporation of interactive activities underscore the significance of social constructivism, emphasizing the collaborative nature of knowledge acquisition. The call for improved classroom organization speaks to the impact of structured learning environments on cognitive processing and attentional focus. Most significantly, the demand for culturally sensitive adaptation points towards the limitations of universally applied interventions. This necessitates the application of culturally relevant pedagogy, acknowledging the diverse needs and values inherent within specific populations to maximize the efficacy and impact of mindfulness training. These collective observations offer a theoretical foundation for refining future interventions, promoting both cognitive and cultural congruity within the learning process.

I want a playful atmosphere. I prefer classes with fewer acquaintances. (12-year-old female participant).

I hope the course can be a little bit more content suitable for Chinese students and a little longer. (12-year-old female participant).

It is just too gentle, kind of indulge those disobedient students… Too many undisciplined (students). (13-year-old female participant).

3.7.2. Vicarious engagement and latent Interest: Perspectives from Non-Participants

While participant perspectives provide direct insight into intervention efficacy, the attitudes of non-participants offer a complementary, albeit indirect, evaluation. The observed favorable views and support from participating parents align with expected positive outcomes. However, the discernible disinterest among a subset highlights the importance of addressing barriers to parental involvement and exploring potentially unmet needs. More significantly, the expressed envy and curiosity displayed by non-participating students suggest a latent demand for mindfulness interventions within the broader student population. This vicarious engagement, manifested through inquiries

and surreptitious observation, indicates a perceived value in the intervention, even in the absence of direct participation, thereby underscoring the potential for wider adoption and impact.

"My parents said that I used to have a bad personality, and my personality would change for the better after taking this course… My friends who didn't take this course were a little envious." (12-year-old male participant).

"My parents just said they knew…Those who didn't take the course would go and sneak a peek at it after class." (10-year-old male participant).

"Those who didn't take the class were curious about what we were doing and would ask what you were doing. and they would get curious and ask what mindfulness class was. Then I tell them about the class. They say: that's not bad." (13-year-old female participant).

"My mom thinks this kind of thing is good and is still quite supportive…After this class, my good friends will ask me what we did in this class. For example, we learn to breathe, and then I will show him." (12-year-old male participant).

4. Discussions

4.1. Null findings and potential Explanations: An exploration of effect Sizes

This study is one of few randomly controlled trials to applied mindfulness training in Chinese youth. At follow-up, the aggregate anxiety prevalence was 18.68 %. The aggregated prevalence of depression symptoms was 21.77 %. It also found that a volunteer-led 8 weeks' mindfulness training in Chinese youth had no measurable impact on depression/anxiety symptoms at the three months follow-up assessment. Noting potential ceiling effects due to high baseline adversity, a few explanations exist for these findings.

4.2. Discussion of quantitative research

The age of participants may have influenced the efficacy of Mindfulness Interventions (MI) (Roeser et al., 2014). These interventions may have the most significant impact on mental health during late adolescence (15–18 years of age) (Carsley et al., 2018). Older adolescents may derive greater benefits from MI compared to younger children due to increased ability to grasp abstract ideas and to maintain a regular practice (Roeser et al., 2014). Notably, the period between 14 and 18 years is considered a critical phase for the effectiveness of mindfulness interventions due to increased brain plasticity (Giedd, 2008). This age range is characterized by heightened self-reflection, social perspective taking, and an increased interest in understanding oneself and others (Blakemore & Mills, 2014; Leahy, 2001; Keri, 2004). Our study encompassed students in primary and middle schools, who may be too young to understand and apply mindfulness teaching after a short course.

The effectiveness of MI is possibly influenced by environmental factors, e.g. school vs. clinical settings. In other words, the effect may be influenced by the objects, which are normal developed school students or patients who were diagnosed with mental disorders. A distinct effect of MI were found between non-clinical populations in schools, largely as preventative intervention, and MI targeting medical or psychiatric populations seeking treatment in clinical settings (Biegel et al., 2009; Chadi et al., 2016). Meta-analytic findings suggest that MI has relatively large effects on populations with a clinical diagnosis, both in adolescents (Borquist-Conlon et al., 2019) and adults (Goldberg et al., 2018). Universal school-based MI (Johnson et al., 2016; 2017) have even been associated with increased anxiety symptoms in the participants after intervention. Even the passive or active controls would influent the effectiveness of MI. A study found negligible effect of MI differences between studies using passive (no intervention, usual practice, or wait list) compared with active controls (often reflective of current best practice) (Dunning et al., 2019; Furukawa et al., 2014). Our study was conducted in regular students without significant clinical diagnoses, and concurs with literature suggesting that the universal school-based MI may not be as effective as MI targeting high risk populations.

Our pilot study may not have identified the most effective implementation process. The timing of the surveys unfortunately coincided with the school final exam period. The stress associated with these exams could have exacerbated symptoms of anxiety and depression (Zhu et al., 2021), potentially interfering with the intended effects of the intervention. The pressure of examinations is particularly significant for Chinese students, who typically experience considerable academic stress, including the pressure to perform well at the end of the semester and to gain admission to higher education institutions (Helminen et al., 2022). Additionally, while Chinese educational institutions emphasize academic achievement, they often neglect psychological well-being (Li et al., 2023).

Although some mindfulness-based interventions can improve youth mental health outcomes, curriculum used was from the US and translated and adapted to China, no agreed-upon best curriculum or practices on implementation exists and culturally and linguistically adapted curriculums are lacking. The curriculum we used for this study was adapted from a US-based 2-month program for American youth that was translated and published in Chinese, but that does not guarantee cultural and age-appropriate adaptation of its content and language, even under the guidance of the two certified mindfulness instructors. There have been several *meta*-analyses examining the effects of MI on the mental health of children and adolescents. Most studies that found a significant benefit were conducted in developed countries and resource-rich settings (Zoogman et al., 2015; Klingbeil et al, 2017; Dunning, 2019) where mindfulness is better known and accepted, and professional mindfulness trainers are mostly available for training participants directly. In China, there are very few mental health providers or certified professional mindfulness teachers and millions of potential youth participants. Volunteers have variable experience teaching in groups–may have had difficulties. We only intervened in students, not in teachers, school principals, educational systems or parents and all of them may have influenced the mental health symptoms to a larger extent. It may not be realistic to implement programs with a small student-to-teacher ratio as described in most of the published studies, let alone to scale them up for impact in the future. What's more we are not sure that the students actually practiced at home.

Social and cultural norms may affect the efficacy of MI because they can influence anxiety expression (Hinton 2012; Hofmann & Hinton, 2014). Cultural differences impact the conceptualization of mindfulness (Christopher et al., 2009; Haas and Akamatsu, 2019). Previous mindfulness studies for both adults and youth were predominantly conducted in Western countries, showing reduced psychological symptoms and enhanced coping strategies (Sibinga et al., 2013, Ngô, 2013). One study in Chinese adolescents found no significant association between mindfulness and post-traumatic growth (An Y et al., 2018). Chinese students may have an avoidant attitude toward discussing mental health while parents and teachers also seldom discuss such topics. Students may not possess high psychological sensitivity and subjectively reject concepts that remind them of psychotherapy due to existing stigma. The stigma is exacerbated by that many people in China consider those with mental illness to be dangerous or shameful (Jiang et al., 2021). Without accurate recognition of mental disorders and symptoms, and with negative cultural perceptions of mental illness, people tend not to seek out help (Morgan et al., 2004). Negative beliefs about mental health services and professionals are also common barriers to help-seeking behavior among youth (Aguirre et al., 2020). One study in China revealed that the participants who strongly adhered to traditional Chinese beliefs about the causes of mental illness and traditional treatment methods (such as herbal medicine and acupuncture) are less inclined to seek professional help (Daniel et al., 2014). Despite the robust need for youth mental health services in the world, relatively small numbers seek help due to

the fear of stigma (Fazel M et al., 2014). Approximately one in ten children and adolescents suffer from mental health difficulties at any given time, yet less than one-third seek treatment (Kaushik et al., 2016).

4.3. Discussion of qualitative research

The negative quantitative results do not negate the potential benefits of mindfulness; rather, they suggest the need for a more nuanced understanding of its application within this specific context. The qualitative data, however, aligns with the theoretical premise that mindfulness can enhance self-regulatory capacity, providing a foundation for developing more intensive and tailored interventions that address the specific stressors faced by this population. Furthermore, this study expands the existing theoretical framework by highlighting the importance of social support networks in moderating the effectiveness of mindfulness interventions. The qualitative data revealed that participants with stronger social connections reported a greater ability to integrate mindfulness practices into their daily lives, suggesting that social support acts as a crucial contextual factor influencing intervention outcomes.

The qualitative data revealed nuanced insights into its perceived benefits for Shanghai migrant youth. Specifically, participants reported improved emotional regulation and enhanced social connectedness, despite the lack of significant change in quantitative measures. These qualitative findings highlight the potential of mindfulness to address the unique challenges faced by this population, even when not reflected in standardized scales. Through qualitative feedback, we learned that some were able to utilize the acquired mindfulness skills for emotional regulation. Participant interviews have revealed a fascinating disparity: students are effectively employing mindfulness techniques for emotional regulation without possessing a deep theoretical understanding of mindfulness itself. This observation highlights a disjunction between the practical application of mindfulness and its abstract conceptualization, suggesting that embodied experience may play a crucial role in the efficacy of these practices, even in the absence of comprehensive cognitive knowledge. This phenomenon warrants further investigation into the complex relationship between practical application and theoretical grounding.

According to the qualitative interview findings, Shanghai migrant youth may initially approach mindfulness courses with a lack of seriousness, listening with a relaxed attitude and limited enthusiasm for learning. The perceived monotony of the class and other reasons contribute to a lack of interest, resulting in suboptimal learning. Additionally, some students may resist the need to understand and apply mindfulness techniques as opposed to maintaining their current habits on managing emotions, making a short-term intervention difficult to manifest its effectiveness. Furthermore, shyness and reluctance to interact with teachers may have hindered the impact of the intervention. Most students describe vague understanding of mindfulness, associating it with words such as “good,” “relaxed,” and “calm thinking,” yet they struggle to demonstrate understanding the true essence of mindfulness, which involves being fully aware in each present moment with an attitude of curiosity and acceptance. Furthermore, there is a tendency for confusion between mindfulness and meditation, with the former being perceived as a more abstract concept compared to the latter. It is not surprising that teenagers’ grasp of new concepts may be difficult, and while they may not fully comprehend mindfulness, it does not necessarily impede their ability to utilize mindfulness skills in managing emotions. Their capacity to articulate or conceptualize mindfulness has remained largely unchanged; however, their proficiency in employing mindful techniques, such as controlled breathing, in real-life stress scenarios has notably improved.

Future interventions of similar type should consider intensifying the training process for volunteers, involving parents and schoolteachers, diversifying measurements of impact, planning for longer intervention and follow up periods (Coatsworth et al., 2015; Emerson et al., 2020). Some research suggesting the presence of a potential dose–response relationship in mindfulness interventions (Creswell, 2017). Others, including *meta*-analyses of youth interventions, suggested that intervention intensity (total intervention hours) was not related to overall outcomes (Klingbeil et al., 2017; Dunning et al., 2019), and improved mental health outcomes may appear as distal effects of intervention (Stewart & Sun 2004). There is currently no scientific certainty regarding longitudinal effects on mental health outcomes both by self-report (Farias et al., 2016) and by brain imaging (Fox et al., 2014). Studies have shown that programs of medium duration (from 5 to 8 weeks) have the best effect on improving mental health in students (González-Valero G et al., 2019). The effects of mindfulness-based interventions varied by intervention type, and by length of the intervention (Kral et al., 2018). From adult literature a standard mindfulness course is offered in structured 8-week groups, consisting of 2.5-h of weekly group meetings and a 6-h day-long retreat, resulting in a total of 26 h of contact time (Carmody & Baer, 2009). However, this schedule may not be realistic for children with shorter attention span. Future intervention may consider to adding mandatory practice at home and monitoring of its completion and effect on outcomes.

In addition to this, the external environment plays a critical role in shaping an individual’s mental state, particularly in relation to anxiety and depression. This is especially true for students who face pressures related to family, friendships, academic performance, and bullying in school. The constant pressure to excel academically, maintain social relationships, and deal with familial issues can lead to feelings of anxiety and depression. Family dynamics, unresolved conflicts, and lack of communication can contribute to feelings of isolation and anxiety, especially for students who may lack coping mechanisms to handle familial stressors (Briggs-Gowan et al., 2015; Yang et al., 2023). Friendships, peer pressure, bullying, and social isolation can also contribute to these feelings, particularly for students without a strong support system. The pressure to excel academically and the fear of failure can also lead to anxiety and depression (Steare et al., 2023). Additionally, the impact of bullying in school can have long-lasting effects on an individual’s mental health (Anderson et al., 2022; Turner et al., 2014). Building upon stress and coping theory, our findings suggest that while mindfulness practices may offer a buffer against the chronic stressors experienced by Chinese migrant youth, the intensity and persistence of these stressors may exceed the intervention’s capacity to produce statistically significant quantitative changes within the timeframe of the study. The qualitative data, however, aligns with the theoretical premise that mindfulness can enhance self-regulatory capacity, providing a foundation for developing more intensive and tailored interventions that address the specific stressors faced by this population. Building upon existing theoretical foundations, this research further elucidates the nuanced impact of mindfulness interventions. Specifically, the qualitative analysis reveals the significant moderating roles of both social support networks and deeply ingrained cultural values in determining the overall effectiveness of such interventions.

Furthermore, the selected metrics to gauge outcomes may not have been the most effective for assessing the intervention process as opposed to mental health outcomes. Our qualitative findings suggest that participants’ knowledge and attitudes may have been altered as a result of completing the mindfulness program, yet we did not gather quantitative data on these aspects.

4.4. Limitations and strengths

The study has several notable limitations that warrant consideration. Firstly, the post-intervention survey was conducted at the end of the semester, coinciding with a period of heightened stress for students due to academic pressures, potentially impacting the effectiveness of the Mindfulness Intervention (MI). Secondly, the intervention curriculum was relatively brief and had not been extensively validated in the Chinese cultural context. Thirdly, the findings were derived from a sample

of Chinese youth and may not be readily generalizable to other populations. Lastly, due to funding constraints, only a short-term follow-up of three months was feasible, leaving uncertainty regarding the emergence of potential longer-term benefits from the intervention.

Nonetheless, the study contributes significantly to the existing literature in several key respects. This study contributes to the growing body of evidence supporting the potential benefits of mindfulness interventions for migrant youth, particularly in enhancing their emotional well-being and social connectedness. Firstly, it possesses robust statistical power and employs a rigorous randomized controlled design, allowing for the adjustment of confounding factors and mitigating many biases commonly associated with observational studies. Secondly, it investigates the implementation of a cost-effective mindfulness intervention utilizing trained community volunteers in a middle-income country characterized by a high burden of mental health issues among youth and limited resources. Lastly, the study incorporates qualitative analysis to elucidate participant perceptions, feedback, and the acceptability of the intervention among other community members, offering valuable insights for the global implementation of mindfulness interventions targeting youth.

5. Conclusions

Despite the lack of statistically significant findings in the quantitative analysis, the qualitative data revealed compelling narratives of participants experiencing increased self-awareness, improved emotional regulation, and a greater sense of belonging. The qualitative results suggest that the mindfulness intervention may have facilitated positive changes in participants' subjective well-being, even if these changes were not captured by the quantitative measures. Future studies should consider adding school and family level interventions, longer intervention period, requiring and monitoring home practice, more in-depth cultural adaptation, and more process measurements to further explore its effectiveness and applicability.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The data that has been used is confidential.

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