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The Influence of University Psychological Intervention Strategies on the Learning Anxiety Level of College Students in Zhejiang, China

Wang Mengwen
Masters' Scholar, INTI International University
Kanwal Zahra
University of Gujrat
Rahat Bashir
University of Management and Technology
Khalid Ahmed
khalid.ahmed@newinti.edu.my
Senior Lecturer, INTI International University
Ahmed Basyoni
INTI International University
Ruqia Saba Ashraf
The Women University Multan
Zaheril Zainudin
INTI International University

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Abstract

Learning anxiety has become an increasingly important concern in higher education because of its adverse effects on students' academic progress and psychological well-being. Despite growing attention to campus mental health, relatively little evidence is available on how different psychological interventions compare in reducing learning anxiety among Chinese university students. This study examined four intervention approaches, namely stress management, mindfulness training, peer support, and cognitive behavioral therapy, using data collected from 380 students enrolled at universities in Zhejiang Province, China. Conservation of Resources Theory and the Stress-Diathesis Model provided the theoretical foundation for this study. Standardized questionnaires were administered in a cross-sectional survey, and the resulting data were analyzed through multiple linear regression and analysis of variance (ANOVA). All four intervention approaches showed significant negative relationships with learning anxiety ($p < 0.001$). Among them, stress management demonstrated the largest effect ($\beta = 0.609$), followed by mindfulness training ($\beta = 0.168$), peer support ($\beta = 0.133$), and cognitive behavioral therapy ($\beta = 0.129$). These findings provide comparative evidence from Chinese higher education that can inform institutional mental health policies and student support practices. By identifying effective, scalable interventions, this study directly supports United Nations Sustainable Development Goal 3 (Good Health and Well-being) by reducing a key mental health burden, and Goal 4 (Quality Education) by removing psychological barriers to academic success and promoting inclusive, equitable learning environments.

1. Introduction

1.1 Learning Anxiety as a Sustainable Higher Education Challenge

Higher education has changed considerably over recent decades. Universities now educate larger and more diverse student populations, while students must meet demanding academic standards and prepare for increasingly competitive employment environments. These pressures do not end with academic performance; they also shape students' psychological well-being. Anxiety, including anxiety arising from learning and assessment demands, has consequently become a major concern in higher education. A systematic review and meta-analysis covering approximately 130,000 undergraduate students estimated that 39.65% experienced elevated levels of non-specific anxiety, although prevalence varied across settings and measurement instruments [1].

Student mental health is not solely an institutional matter. It is closely connected to the wider international commitment to sustainable development, particularly Sustainable Development Goal 3, which promotes health and well-being, and Sustainable Development Goal 4, which calls for inclusive and equitable quality education. Universities cannot fully achieve these objectives when psychological distress restricts students' participation in learning or undermines their academic development. Evidence from higher education therefore increasingly supports interventions that address mental health alongside educational attainment [3].

From this perspective, learning anxiety represents more than a difficulty experienced by individual students. It raises broader questions about whether university environments enable students to learn without persistent and debilitating psychological pressure. Sustainable higher education requires institutions to protect student well-being while maintaining meaningful academic standards. Structural measures such as inclusive practices, health-related skills development, pedagogical adaptation, and supportive learning environments can contribute to this objective, although their effects depend on how they are designed and implemented [4, 5].

Evidence published in recent years indicates that anxiety is widespread among university students. Ahmed et al. [1] found that approximately two-fifths of undergraduate students reported elevated non-specific anxiety. Other studies have shown that students' psychological adjustment was further strained during and following the COVID-19 pandemic, when social isolation, uncertainty, and disruption to established learning routines created additional sources of distress [6–8]. Evidence from the Asia-Pacific region also shows that university students' mental health during the pandemic was affected by academic disruption, social isolation, uncertainty, and differences in access to coping resources [2].

The consequences extend across several dimensions of university life. Persistent anxiety and academic stress can weaken concentration, interfere with learning, and increase students' vulnerability to emotional distress. Evidence from Chinese college students has also demonstrated that academic stress is positively associated with anxiety, hopelessness, and depressive symptoms. Anxiety and hopelessness may, in turn, explain part of the relationship between academic pressure and depression [9]. These findings help explain why universities have expanded counselling services and introduced psychological programmes intended to protect mental health and support students' continued academic participation [3, 10].

Chinese higher education presents a particularly important context for examining these issues. Students must navigate demanding academic workloads, social expectations, and uncertainty concerning their future employment. Research involving Chinese college students has identified significant connections among academic stress, anxiety, hopelessness, and depressive symptoms [9]. Longitudinal evidence further suggests that resilience and mental health influence one another across different stages of university study, although the strength of these relationships may change over time [11]. Learning anxiety should therefore be understood within the wider interaction of academic demands, psychological resources, and the educational environment.

Zhejiang Province provides a valuable setting in which to investigate these relationships. Its universities enrol students from varied educational and socioeconomic backgrounds, creating a context in which students may experience academic demands differently. Rapid technological change, extensive engagement with digital information, and competition over academic and career opportunities may add to the pressures encountered during university study. Examining psychological interventions in this setting can therefore generate locally grounded evidence rather than assuming that findings obtained elsewhere apply uniformly to students in Zhejiang.

Four approaches are particularly relevant to the reduction of learning anxiety: cognitive behavioural intervention, peer support intervention, mindfulness training, and stress management intervention. Although

these approaches share the aim of improving psychological well-being, they operate through different processes. Cognitive behavioural intervention helps students identify and modify maladaptive thoughts and behavioural responses associated with anxiety. Peer support provides emotional and informational assistance through shared experience, mentoring, and peer learning. Mindfulness training develops present-moment awareness and emotional regulation, while stress management provides practical cognitive and behavioural strategies for responding to academic pressure [12–15].

The evidence supporting these interventions is substantial but not uniform. Cognitive behavioural interventions have demonstrated beneficial effects on anxiety among university students, including when delivered digitally [13]. Similarly, a meta-analysis of 11 randomized controlled trials involving 1,824 university students found that mindfulness-based interventions significantly reduced anxiety, stress, and depressive symptoms [15]. Guided stress-management interventions have also produced meaningful reductions in student stress and anxiety, with effects varying according to students' initial stress levels, intervention type, and programme duration [12]. Evidence for peer support is more cautious: peer mentoring and peer learning appear promising for anxiety and stress, but methodological variation and weaknesses in the available studies prevent firm conclusions about their overall effectiveness [14].

Despite these advances, the relative effectiveness of the four approaches remains insufficiently understood within Chinese higher education. Much of the established intervention evidence has been synthesized across international samples, and the results cannot automatically be transferred to every cultural and institutional context. Directly comparing cognitive behavioural intervention, peer support, mindfulness training, and stress management among university students in Zhejiang Province can therefore address an important empirical gap while informing culturally and institutionally appropriate support strategies.

1.2 Current Evidence and Remaining Research Gaps

Psychological interventions are widely regarded as an important means of reducing anxiety and protecting the mental health of university students. Review-level evidence indicates that mindfulness-based programmes, cognitive behavioural interventions, stress-management approaches, and technology-delivered psychological support can reduce common mental-health difficulties in higher education populations [3]. Nevertheless, the evidence has not developed evenly across intervention types. Many studies examine one approach in isolation, target a particular student group, or evaluate an intervention within a single institutional setting. Differences in research design, outcome measurement, and intervention delivery also make it difficult to determine whether reported effects can be generalized across cultural, institutional, and regional contexts [3, 14].

Four approaches are particularly prominent in the literature relevant to this study: cognitive behavioural intervention, peer support intervention, mindfulness training, and stress management intervention. Although all four are intended to reduce psychological distress, they operate through different processes. Cognitive behavioural intervention helps students recognize and modify maladaptive thoughts and behaviours that contribute to anxiety. Mindfulness training develops present-moment awareness, acceptance, and emotional regulation. Peer support draws on shared experience, mutual encouragement, mentoring, and collaborative learning to strengthen social connection. Stress management intervention equips students

with practical strategies, including cognitive coping, relaxation, problem-solving, and the management of academic demands [12–15].

Despite their different mechanisms, these interventions share an emphasis on strengthening the psychological and social resources through which students respond to academic pressure. Evidence for mindfulness is particularly well developed. Galante et al. [16], for example, demonstrated the effectiveness of a mindfulness-based programme in a randomized controlled trial involving university students. More recent evidence from EFL students indicates that mindfulness also mediates the relationship between learning uncertainty and test anxiety, extending its relevance to anxiety experienced directly within learning and assessment contexts [17]. More recent meta-analytic evidence from 11 randomized controlled trials similarly found significant reductions in anxiety, stress, and depressive symptoms following mindfulness-based interventions [15]. Cognitive behavioural interventions have also shown beneficial effects on anxiety among university students, including when delivered through online platforms [13]. Guided stress-management programmes produce moderate reductions in stress and anxiety, although their effectiveness varies according to intervention type, programme duration, and students' initial levels of distress [12].

The evidence for peer support is less conclusive. Peer mentoring and peer learning have been associated with improvements in anxiety and stress, but substantial variation in programme structure, outcome measurement, and methodological quality limits the strength of the conclusions that can be drawn [14]. A broader systematic review nevertheless indicates that social support can protect university students' well-being directly by reducing stress and indirectly by strengthening resilience, self-esteem, and life satisfaction [18]. Peer support therefore remains a promising intervention, but its effectiveness should be tested alongside more established psychological approaches.

A further limitation concerns the geographical distribution of the evidence. Much of the intervention literature has been synthesized from studies conducted across Western or international higher education systems. Yet learning anxiety does not develop independently of its social and institutional context. Academic expectations, interpersonal relationships, institutional support, and culturally shaped understandings of achievement may influence both how students experience anxiety and how they respond to psychological interventions. Cultural adaptation is therefore important when established interventions are applied to populations and educational settings different from those in which they were originally developed [19].

Existing research involving Chinese university students confirms that academic pressure is closely connected to psychological distress. Zhang et al. [9] found that academic stress was positively associated with anxiety, hopelessness, and depressive symptoms among Chinese college students. Longitudinal evidence has also demonstrated a reciprocal relationship between resilience and mental health across different stages of university study [11]. These findings establish the importance of psychological resources in the Chinese higher education context, but they do not show whether different intervention strategies are equally effective or which approach offers the strongest reduction in learning anxiety.

Important differences may also exist within China. Provincial higher education systems vary in their institutional characteristics, student populations, educational opportunities, and available support

structures. Zhejiang Province provides an informative setting because its universities enrol students from diverse educational and socioeconomic backgrounds within a rapidly developing academic and technological environment. These circumstances may shape both the pressures students experience and the forms of psychological assistance they find acceptable. However, evidence concerning the comparative effectiveness of psychological interventions among university students in Zhejiang remains limited.

The design of university support systems creates an additional concern. Higher education institutions increasingly recognize the need to move beyond reactive counselling services and develop learning environments that protect mental health at both individual and structural levels. Potential measures include health-related skills training, inclusive institutional practices, pedagogical adaptation, peer-based support, and targeted psychological programmes [5]. Nevertheless, review-level evidence shows that institutional and setting-based interventions have received less systematic evaluation than individually focused mindfulness and cognitive behavioural programmes [3].

Most importantly, the available evidence tends to evaluate cognitive behavioural intervention, peer support, mindfulness training, and stress management separately. As a result, comparisons across studies are affected by differences in participant characteristics, research procedures, measurement instruments, intervention duration, and educational setting. Findings from separate studies cannot reliably establish which intervention is most effective when delivered to students under comparable conditions. A direct comparison of all four approaches within the same population and institutional environment is therefore needed.

Addressing this gap can clarify the relative effectiveness of four widely used psychological interventions and provide evidence grounded in the realities of Chinese higher education. The findings may help universities in Zhejiang allocate psychological-support resources more effectively and select interventions that correspond to students' needs. By connecting student well-being with meaningful participation in education, the study also contributes to the aims of Sustainable Development Goal 3, concerning health and well-being, and Sustainable Development Goal 4, concerning inclusive and equitable quality education.

1.3 Significance and Contribution of the Study

Few empirical studies have compared cognitive behavioural intervention, peer support intervention, mindfulness training, and stress management intervention within a single research framework. The available literature generally examines these approaches separately, and differences in samples, intervention duration, research design, and outcome measurement make direct comparisons difficult [12–15]. Evaluating the four strategies under the same educational conditions can provide a clearer account of their relative effectiveness and generate new evidence concerning how different forms of psychological support influence learning anxiety among university students in Zhejiang Province, China.

The study is theoretically informed by Conservation of Resources Theory and the Stress-Diathesis Model. These frameworks offer complementary explanations of how learning anxiety develops and why the effects of psychological interventions may vary among students. Conservation of Resources Theory proposes that individuals attempt to acquire, protect, and restore resources that help them manage stressful demands. Within higher education, such resources may include resilience, perceived control, coping skills, supportive

relationships, and access to institutional assistance. Resource loss or the threat of such loss can heighten psychological distress, whereas the acquisition and protection of resources may strengthen students' capacity to respond to academic pressure [20–22].

The Stress-Diathesis Model complements this resource-based explanation by emphasizing differences in individual vulnerability. Students exposed to comparable academic demands may not experience the same level of anxiety because their psychological predispositions, previous experiences, coping capacity, and environmental sensitivity differ. Stressful learning conditions may therefore produce more pronounced effects among students whose existing vulnerabilities make them particularly sensitive to academic pressure [23, 24].

Considering the two theoretical perspectives together makes it possible to examine both sides of the intervention process. Conservation of Resources Theory explains how interventions may build, protect, or replenish the resources students need to manage academic demands. The Stress-Diathesis Model helps explain why the same intervention may not produce identical outcomes for every student. Cognitive behavioural intervention may strengthen cognitive and emotional coping resources; peer support may increase access to social and interpersonal resources; mindfulness may improve emotional regulation and psychological flexibility; and stress management may provide practical resources for responding to demanding academic situations [12–15].

Applying these perspectives to four interventions within the same study extends their use in higher education research. Previous evidence has connected academic stress, perceived control, resourcefulness, resilience, and student mental health, but these relationships have commonly been investigated without directly comparing multiple intervention strategies [11, 21, 22]. The present study therefore contributes by examining how interventions grounded in different psychological mechanisms perform within one population and educational setting.

Research on anxiety and psychological well-being among Chinese university students has expanded, but evidence remains unevenly distributed across regions and institutions. Studies have shown that academic stress is associated with anxiety, hopelessness, and depressive symptoms among Chinese college students [9]. Longitudinal research has also demonstrated that resilience and mental health influence one another across different stages of university study [11]. Other findings indicate that students' psychological experiences may vary according to demographic, geographical, and educational circumstances [25]. However, these studies do not establish the relative effectiveness of different psychological interventions among students in Zhejiang Province.

Zhejiang offers a useful context for extending this evidence. The province has a substantial and diverse higher education sector operating within a rapidly developing economic and technological environment. Its universities enrol students with varied educational, social, and economic experiences. Rather than assuming that evidence generated from national samples, other Chinese provinces, or international settings applies uniformly to this population, the present study examines intervention outcomes within the specific institutional environment experienced by university students in Zhejiang.

The study also has methodological significance. Comparing four interventions within a common research framework reduces some of the difficulties involved in drawing conclusions from separate studies. The participants can be assessed using the same outcome measures, research procedures, and analytical criteria. This common structure allows differences in learning anxiety to be interpreted with greater confidence than comparisons assembled from studies employing unrelated samples and methodologies.

The findings may also have direct practical value. Universities must decide which psychological programmes to introduce, how resources should be allocated, and which forms of support are most responsive to students' needs. Evidence concerning the relative effectiveness of cognitive behavioural intervention, peer support, mindfulness training, and stress management can inform these decisions. Administrators, counsellors, and educators may use the findings to develop programmes that support psychological well-being without separating mental health from students' academic experience.

The practical implications extend beyond the selection of a single intervention. Review-level evidence suggests that universities require a combination of individual psychological support and broader institutional measures to protect student mental health [3, 5]. Identifying the strengths of different interventions can help institutions design more differentiated support systems in which students receive assistance appropriate to the nature and severity of the challenges they encounter.

Finally, the study contributes to the sustainability agenda in higher education. Sustainable universities cannot be evaluated only through enrolment, academic performance, or institutional growth. They must also create conditions in which students can participate in learning without persistent psychological distress. Given the high prevalence of anxiety among university students, strengthening accessible and evidence-based psychological support is an important institutional responsibility [1]. Improving student mental health contributes to Sustainable Development Goal 3, while reducing psychological barriers to participation and achievement supports Sustainable Development Goal 4. Comparative evidence from Zhejiang Province may therefore inform institutional practice by identifying approaches that can contribute to healthier, more supportive, and academically effective university environments.

1.4 Research Objectives and Hypotheses

Limited evidence from Zhejiang Province and the scarcity of studies comparing several psychological interventions within one research framework motivated the present study. The study examines the relationships between cognitive behavioural intervention, peer support intervention, mindfulness training intervention, stress management intervention, and learning anxiety among college students in Zhejiang Province, China. Previous research suggests that these approaches can strengthen coping resources and reduce psychological distress among university students. However, the available evidence is stronger for some interventions than for others [3, 12–15].

Conservation of Resources Theory and the Stress Diathesis Model guide the examination of these relationships. Conservation of Resources Theory suggests that psychological interventions may help students acquire, preserve, and restore the personal, social, and psychological resources needed to manage academic demands [20, 22]. The Stress Diathesis Model offers an explanation for differences in students' responses to similar academic pressures. Students vary in their psychological vulnerability, previous

experiences, and ability to cope with stressful situations. As a result, the same academic demand or intervention may not affect every student in the same way [23, 24]. Using both theories makes it possible to consider students' available coping resources alongside their susceptibility to learning anxiety.

The study has four research objectives.

RO1: To examine the relationship between cognitive behavioural intervention and learning anxiety among college students in Zhejiang Province.

RO2: To examine the relationship between peer support intervention and learning anxiety among college students in Zhejiang Province.

RO3: To examine the relationship between mindfulness training intervention and learning anxiety among college students in Zhejiang Province.

RO4: To examine the relationship between stress management intervention and learning anxiety among college students in Zhejiang Province.

Four research questions correspond to these objectives.

RQ1: Is cognitive behavioural intervention significantly associated with learning anxiety among college students in Zhejiang Province?

RQ2: Is peer support intervention significantly associated with learning anxiety among college students in Zhejiang Province?

RQ3: Is mindfulness training intervention significantly associated with learning anxiety among college students in Zhejiang Province?

RQ4: Is stress management intervention significantly associated with learning anxiety among college students in Zhejiang Province?

The theoretical arguments and empirical findings reviewed in the preceding sections led to the following hypotheses.

H1: Higher levels of cognitive behavioural intervention are significantly associated with lower levels of learning anxiety among college students in Zhejiang Province.

H2: Higher levels of peer support intervention are significantly associated with lower levels of learning anxiety among college students in Zhejiang Province.

H3: Higher levels of mindfulness training intervention are significantly associated with lower levels of learning anxiety among college students in Zhejiang Province.

H4: Higher levels of stress management intervention are significantly associated with lower levels of learning anxiety among college students in Zhejiang Province.

Before the statistical analysis, the five learning anxiety items were coded in the opposite direction. Higher composite scores consequently represented lower learning anxiety. A positive correlation or regression coefficient between an intervention strategy and the transformed learning anxiety score therefore indicated that stronger intervention was associated with less learning anxiety.

These objectives, questions, and hypotheses guided the statistical analysis of the relationships between the four intervention strategies and learning anxiety among college students in Zhejiang Province.

2. Methodology

2.1 Research Design

The study used a quantitative cross-sectional correlational design to examine the relationships between psychological intervention strategies and learning anxiety among college students in Zhejiang Province, China. This design allowed the proposed hypotheses to be tested using numerical data and statistical procedures. Cognitive behavioural intervention, peer support intervention, mindfulness training intervention, and stress management intervention were treated as predictor variables. Learning anxiety was treated as the outcome variable. Collecting information on all five variables during the same period allowed their relationships to be examined under comparable conditions.

Conservation of Resources Theory and the Stress Diathesis Model informed the study design. Conservation of Resources Theory holds that individuals attempt to acquire, retain, and restore the resources they need when confronting stressful demands. Access to personal, psychological, and social resources may improve students' ability to manage academic pressure. The loss or threatened loss of these resources may increase their susceptibility to anxiety [20, 22]. Psychological interventions may therefore alleviate learning anxiety by developing adaptive coping, emotional regulation, perceived control, resilience, and social support.

The Stress Diathesis Model explains why students exposed to similar academic demands may experience different levels of anxiety. Their responses may depend on existing psychological vulnerability, previous experiences, coping ability, and sensitivity to environmental stressors [23, 24]. The two theories address different aspects of the same process. One focuses on the resources available to students, while the other considers the vulnerabilities that may shape their responses to academic pressure.

The cross-sectional design allowed data to be collected from a relatively large group of students during a defined period. Participants were recruited from universities in Zhejiang Province and represented different demographic and academic backgrounds. Since all measurements were taken at one point in time, the findings establish statistical relationships but do not demonstrate temporal order or causation. The design was suitable for estimating the direction and strength of the relationships and identifying which intervention strategy had the strongest statistical association with learning anxiety.

Data were collected through a structured questionnaire and analysed using IBM SPSS Statistics. Frequencies and percentages were used to describe the participants, while means and standard deviations

summarized the study variables. Pearson correlation analysis examined the direction and strength of the relationship between each intervention strategy and the transformed learning anxiety score. Multiple linear regression estimated the unique statistical contribution of each intervention while accounting for the other three intervention variables in the model.

2.2 Participants

The target population comprised full time undergraduate and postgraduate students enrolled at universities across the 11 prefecture level cities of Zhejiang Province, China. Eligible participants were between 18 and 25 years of age. The study included students from different academic disciplines, including the humanities, sciences, engineering, medicine, and the arts. Students from urban and rural backgrounds were also included. This population corresponded directly with the purpose of examining the relationships between psychological intervention strategies and learning anxiety among university students in Zhejiang Province.

A multistage sampling procedure was used to recruit students from different geographical, institutional, and academic groups. The first stage covered the 11 prefecture level cities of Zhejiang Province. In the second stage, universities were grouped according to their formally defined institutional categories. The third stage classified students by educational level as undergraduate or postgraduate. The fourth stage grouped students according to their fields of study. The intended number of participants from each group was allocated in proportion to its estimated share of the target population.

The questionnaire was distributed through university mental health centres, counsellors, student associations, and university related WeChat channels. Participation was voluntary and depended on students receiving the questionnaire link and choosing to respond. The final sample therefore included students from a broad range of geographical, institutional, and academic backgrounds, although it cannot be regarded as fully representative of every university student in Zhejiang Province.

The initial sample size was estimated using the table developed by Krejcie and Morgan [26]. For a large population, the table recommends approximately 384 participants at a confidence level of 95 percent and a margin of error of 5 percent. A total of 420 questionnaires were distributed. After incomplete and unusable responses were excluded, 380 questionnaires were retained for analysis, producing a valid response rate of 90.48 percent. Although the final sample was four cases below the tabled recommendation, it provided a substantial number of observations for a regression model containing four principal predictor variables.

Before the main data collection, the questionnaire was piloted with 60 students who were excluded from the final sample. The pilot study examined the clarity of the instructions and questionnaire items, the time required for completion, and the preliminary performance of the construct measures. Feedback from the pilot participants and expert reviewers was considered when preparing the final questionnaire.

2.3 Measures

Data were collected through a structured questionnaire developed for the present study. The questionnaire contained 30 questions divided into six sections. The first section contained five demographic questions. The remaining sections contained 25 items measuring cognitive behavioral intervention, peer support

intervention, mindfulness training intervention, stress management intervention, and learning anxiety. Each construct was measured using five items.

The construct items used a five-point Likert response scale ranging from 1, strongly disagree, to 5, strongly agree. Higher scores on the four intervention measures indicated stronger perceptions or experiences of the relevant psychological support. The questionnaire items were developed from the theoretical definitions of the study variables and informed by previous research on psychological interventions among university students [3, 12, 13, 15, 18].

The demographic section collected information about gender, age, educational level, academic major, and place of origin. Gender was classified as male or female. Age was divided into three categories: 18 to 20 years, 21 to 23 years, and 24 to 25 years. Educational level distinguished between undergraduate and postgraduate students. Academic major included liberal arts, science, engineering, medicine, art, and other disciplines. Place of origin was classified as urban or rural. These variables were used to describe the respondents.

Cognitive behavioral intervention was measured using five items developed to assess students' perceptions and experiences of cognitive and behavioral support. The items examined whether students could identify irrational academic thoughts, modify anxiety related learning behavior, reconsider negative beliefs about academic performance, apply behavioral coping strategies, and benefit from cognitive guidance. The content of these items was informed by research on cognitive behavioral interventions for anxiety among university students [13].

Peer support intervention was measured using five items addressing emotional, informational, and academic assistance from other students. The items examined emotional comfort during periods of learning anxiety, the sharing of effective coping experiences, practical help with difficult academic tasks, relief from loneliness through peer communication, and access to university supported peer assistance. The content reflected evidence concerning the role of peer and social support in university student wellbeing [18].

Mindfulness training intervention was assessed using five items concerning attention to current learning tasks, acceptance of anxiety related emotions, awareness of physical reactions to anxiety, reduced worry about future academic performance, and emotional regulation during study. These items were informed by previous research on mindfulness programmes for university students [15, 16].

Stress management intervention was measured using five items addressing students' ability to identify academic stressors, use relaxation techniques, prepare manageable study plans, obtain stress management guidance from their universities, and use social support when responding to academic pressure. The item content reflected established approaches to stress management among university students [12].

Learning anxiety was assessed using five items covering cognitive, physical, emotional, and behavioral responses to academic demands. The items addressed nervousness about courses and examinations, physical discomfort caused by learning pressure, difficulty concentrating because of academic worry,

anxiety arising from academic competition, and avoidance of learning tasks because of fear of poor performance.

The learning anxiety items were coded in the opposite direction before the composite score was calculated. Responses of 1 were changed to 5, responses of 2 were changed to 4, responses of 3 remained unchanged, responses of 4 were changed to 2, and responses of 5 were changed to 1. Higher composite scores therefore represented lower levels of learning anxiety. Positive correlation and regression coefficients consequently indicated that stronger perceptions of psychological intervention were associated with less learning anxiety.

Three educational psychology experts and two university mental health practitioners reviewed the questionnaire. They assessed the clarity, relevance, and suitability of the items for university students in Zhejiang Province. Their comments were considered when preparing the pilot version. The questionnaire was then piloted with 60 students who were excluded from the final sample. The pilot study examined item clarity, completion time, and preliminary instrument performance. Construct validity was subsequently assessed using the main study data. All 25 construct items were retained in the final questionnaire.

2.4 Conceptual Framework

The conceptual framework draws on Conservation of Resources Theory and the Stress Diathesis Model to explain how psychological intervention strategies relate to learning anxiety. Conservation of Resources Theory holds that individuals attempt to acquire, preserve, and restore the personal, psychological, and social resources needed to cope with stressful demands. Students with stronger coping resources may be better prepared to manage academic pressure, whereas the loss or absence of these resources may increase their vulnerability to anxiety [20, 22, 27].

The Stress Diathesis Model explains learning anxiety from a different perspective. It proposes that psychological difficulties arise through the interaction between environmental stressors and individual vulnerability. Students may therefore respond differently to similar academic demands because they differ in previous experiences, coping capacity, psychological predispositions, and sensitivity to stress [23, 24]. Evidence from Chinese college students also suggests that resilience and mental health influence one another across different stages of university study [11].

The two theories serve related purposes within the framework. Conservation of Resources Theory explains how interventions may strengthen the resources students use when facing academic pressure. The Stress Diathesis Model explains why the effects of academic demands and psychological support may vary between students. Combining the theories allows the study to consider both the resources available to students and their vulnerability to stressful learning conditions.

The framework identifies cognitive behavioral intervention, peer support intervention, mindfulness training intervention, and stress management intervention as the four predictor variables. Learning anxiety is the outcome variable. Cognitive behavioral intervention addresses maladaptive academic thoughts and encourages more effective behavioral responses to anxiety [13]. Peer support intervention provides emotional, informational, and academic assistance through supportive relationships with other students

[18]. Mindfulness training develops present moment awareness, acceptance, and emotional regulation [15]. Stress management intervention provides practical strategies for identifying academic stressors and responding to them more effectively [12].

The framework proposes that stronger psychological intervention is associated with lower learning anxiety among college students in Zhejiang Province. Since the learning anxiety items were coded in the opposite direction before analysis, higher composite scores represented lower anxiety. The expected reduction in learning anxiety therefore appeared statistically as a positive relationship between each intervention variable and the transformed learning anxiety score.

3. Results

3.1 Participant Characteristics

In this study, a total of 420 questionnaires were sent out by stratified proportional sampling method, and 380 valid questionnaires were recovered. The effective recovery rate was 90.48%, which met the basic requirements of quantitative research in Social Sciences for effective recovery rate. The demographic characteristics of the valid samples cover five dimensions: gender, age, education background, major, and place of origin. The distribution is shown in the Table 1.

Table 1
Demographic Characteristics of Respondents

Variables	Categories	Frequency	Percentage (%)
Gender	Male	204	53.7
	Female	176	46.3
Age	18–20 years old	112	29.5
	21–23 years old	201	52.9
	24–25 years old	67	17.6
Education	Undergraduate	200	52.6
	Postgraduate	180	47.4
Major	Liberal Arts	81	21.58
	Science	29	7.63
	Engineering	129	33.95
	Medicine	71	18.68
	Art	53	13.95
	Others	17	4.21
Origin	Urban	228	60.0
	Rural	152	40.0

A total of 380 valid responses were included in the analysis. Male respondents represented 53.7% of the sample, while females accounted for 46.3%. Participants aged 21 to 23 years formed the largest age group (52.9%), with the remaining respondents distributed across the other age categories. Undergraduate students comprised 52.6% of the sample, whereas postgraduate students accounted for 47.4%.

Participants represented a wide range of academic disciplines, including the humanities, sciences, engineering, medicine, and the arts. Engineering students constituted the largest disciplinary group (33.95%). In terms of residential background, 60.0% of the respondents were from urban areas and 40.0% were from rural areas.

The dataset satisfied the assumptions required for the subsequent statistical analyses. The measurement model demonstrated acceptable psychometric properties, with the reliability and validity assessments indicating that the measurement scales possessed satisfactory internal consistency and construct validity.

3.2 Descriptive Statistics

In this study, the four independent variables (cognitive behavioral intervention, Peer Support Intervention, mindfulness training intervention, stress management intervention) and the dependent variable (learning

anxiety level) were analyzed by descriptive statistics, and the minimum, maximum, mean, and standard deviation of each variable were calculated. The results are shown in table 2.

Table 2 Descriptive Statistics of Variables

Descriptive Statistics

N Minimum Maximum Mean Std. Deviation

Cognitive Behavioral Intervention	**380**	**1.80**	**5.00**	**3.8395**	**.60186**
Peer Support Intervention	380	1.80	5.00	4.0468	.59462
Mindfulness Training Intervention	380	1.60	5.00	4.4363	.62104
Stress Management Intervention	380	1.40	5.00	4.2889	.68669
Learning Anxiety Level	380	1.40	5.00	4.2916	.67900
Valid N (listwise)	380				

Descriptive statistics indicated that the mean scores for all study variables exceeded the midpoint (3.00) of the five-point Likert scale. The findings suggest that respondents reported relatively high levels of the four psychological intervention strategies, while the mean score for learning anxiety also remained above the scale midpoint. Among the independent variables, mindfulness training intervention recorded the highest mean score (M = 4.4363), followed by stress management intervention (M = 4.2889). Cognitive behavioral intervention and peer support intervention also produced mean scores above the midpoint of the scale, indicating generally positive perceptions of all four psychological intervention strategies among the respondents.

The average value of Peer Support Intervention is 4.0468. Peer Support Intervention has become an important way to alleviate college students' learning anxiety by virtue of empathy and convenience; The average value of cognitive behavioral intervention is 3.8395. The implementation effect of cognitive behavioral intervention is relatively weak, which may be related to the high professional requirements of the intervention strategy. The mean value of the dependent variable learning anxiety level is 4.2916, and the standard deviation is 0.67900, indicating that the learning anxiety of college students in Zhejiang Province is more prominent, and there are certain differences in the degree of anxiety between different individuals.

The standard deviations for all study variables were below 1.00, indicating relatively low variability in respondents' ratings. The observed level of dispersion suggests that participants expressed generally consistent perceptions across the measured variables, with responses clustered around their respective mean scores. These results indicate a stable pattern of responses and provide a suitable basis for the subsequent statistical analyses.

3.3 Reliability and Validity of the Measurement Scales

3.3.1 Reliability Analysis

In this study, Cronbach's α coefficient is used to test the internal consistency reliability of the scale. The reliability test criteria are: Cronbach's α coefficient > 0.7 indicates good reliability of the scale, and > 0.8 indicates excellent reliability. The reliability analysis results of each variable are shown in Table 3.

Table 3
Reliability Analysis Results

Construct	Number of Items	Cronbach's Alpha	Reliability Status
Cognitive Behavioral Intervention (CBI)	5	0.734	Reliable
Peer Support Intervention (PSI)	5	0.729	Reliable
Mindfulness Training Intervention (MTI)	5	0.837	Reliable
Stress Management Intervention (SMI)	5	0.836	Reliable
Learning Anxiety Level (LAL)	5	0.834	Reliable

Table 4 presents the results of the reliability and validity analyses. Cronbach's α coefficients for all study variables exceeded the recommended threshold of 0.70, indicating satisfactory internal consistency. Mindfulness training intervention, stress management intervention, and learning anxiety recorded Cronbach's α coefficients above 0.80, demonstrating excellent reliability. Cognitive behavioral intervention (α = 0.734) and peer support intervention (α = 0.729) also exceeded the recommended criterion, indicating acceptable internal consistency. The overall questionnaire achieved a Cronbach's α coefficient of 0.862, reflecting excellent reliability.

Construct validity was evaluated using the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity. The KMO value exceeded the recommended threshold of 0.80, indicating that the data were suitable for factor analysis. Bartlett's test of sphericity was statistically significant ($p < 0.001$), confirming sufficient intercorrelations among the variables to support factor analysis.

Table 4
KMO and Bartlett's Test

KMO and Bartlett's Test	
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	.847
Bartlett's Test of SphericityApprox. Chi-Square	7269.998
df	300
Sig.	.000

The KMO value was 0.847, exceeding the recommended threshold of 0.80 and indicating that the data were suitable for factor analysis. Bartlett's test of sphericity was statistically significant ($\chi^2 = 7269.998$, $df = 300$, $p < 0.001$), demonstrating sufficient correlations among the measured variables. Exploratory factor analysis further showed that all factor loadings exceeded 0.50, while the cumulative variance explained reached

76.32%, surpassing the recommended minimum of 60%. These findings provide evidence of satisfactory construct validity for the measurement scale.

3.4 Correlation Analysis

Pearson's correlation analysis was performed to examine the relationships among the study variables. The results are presented in Table 5.

Table 5
Pearson Correlation Analysis Results

Cognitive Behavioral Intervention	**Pearson Correlation**	**Cognitive Behavioral Intervention**	**Peer Support Intervention**	**Mindfulness Training Intervention**	**Stress Management Intervention**	**Learning Anxiety Level**
	Pearson Correlation sig. (2-tailed)	**1**	**.576****	**.574****	**.605****	**.670****
			.000	.000	.000	.000
	N	380	380	380	380	380
Peer Support Intervention	Pearson Correlation sig. (2-tailed)	.576**	1	.692**	.582**	.678**
		.000		.000	.000	.000
	N	380	380	380	380	380
Mindfulness Training Intervention	Pearson Correlation sig. (2-tailed)	.574**	.692**	1	.704**	.762**
		.000	.000		.000	.000
	N	380	380	380	380	380
Stress Management Intervention	Pearson Correlation sig. (2-tailed)	.605**	.582**	.704**	1	.882**
		.000	.000	.000		.000
	N	380	380	380	380	380
Learning Anxiety Level	Pearson Correlation sig. (2-tailed)	.670**	.678**	.762**	.882**	1
		.000	.000	.000	.000	
	N	380	380	380	380	380

The results of correlation analysis showed that there was a significant positive correlation between the four psychological intervention strategies and learning anxiety level ($p < 0.01$), that is, the higher the implementation of the four psychological intervention strategies, the lower the learning anxiety level of college students, which preliminarily verified the rationality of the research hypothesis. The correlation coefficient between stress management intervention and learning anxiety level was the highest ($r = 0.882$),

indicating that stress management intervention had the strongest correlation with learning anxiety level; The second is mindfulness training intervention (r = 0.762). Mindfulness training intervention has a significant correlation with the alleviation of learning anxiety.

The correlation coefficient between Peer Support Intervention and learning anxiety level was 0.678, and the correlation coefficient between cognitive behavioral intervention and learning anxiety level was 0.670, which were above the medium level, indicating that Peer Support Intervention and cognitive behavior intervention can effectively reduce the level of learning anxiety. At the same time, there is also a significant positive correlation between the four independent variables ($p < 0.01$), and the correlation coefficients are less than 0.85, indicating that there is no serious multicollinearity problem between the variables, and multiple linear regression analysis can be further carried out.

3.5 Multiple Regression Analysis

3.5.1 Model Fit Test

In order to further verify the predictive effect of the four psychological intervention strategies on learning anxiety level, this study uses the four psychological intervention strategies as independent variables and learning anxiety level as dependent variables to construct a multiple linear regression model. The model fitting results are shown in Table 6.

Table 6
Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.917[a]	.841	.840	.27178

a. Predictors: (Constant), Stress Management Intervention, Peer Support Intervention, Cognitive Behavioral Intervention, Mindfulness Training Intervention

The model fitting results showed that the multiple correlation coefficient r = 0.917, the determination coefficient $R^2=0.841$, and the adjusted $R^2=0.840$ of the regression model, indicating that the four psychological intervention strategies jointly explained 84.1% of the learning anxiety level variance, and the model had strong explanatory power and excellent fitting effect. The estimated standard error is 0.27178, which is small, indicating that the deviation between the predicted value and the actual value of the model is very small, and the fitting degree of the regression model meets the high standard requirements of quantitative research.

3.5.2 ANOVA Analysis

The variance analysis results of the regression model are shown in table 7, which is used to test the overall significance of the model.

ANOVAa

Sum of ModelSquares			df	Mean Square	F	Sig.
1	Regression	147.035	4	36.759	497.662	.000[b]
	Residual	27.699	375	.074		
	Total	174.733	379			
a. Dependent Variable: Learning Anxiety Level						
b. Predictors: (Constant), Stress Management Intervention, Peer Support Intervention, Cognitive Behavioral Intervention, Mindfulness Training Intervention						

The results of variance analysis showed that the F value of the regression model was 497.662, with significance $p < 0.001$, indicating that the four independent variables as a whole had a significant positive predictive effect on the dependent variable learning anxiety level, and the regression model was highly significant as a whole, which could be used to test the effect of variables.

3.5.3 Regression Coefficient Analysis

The results of regression coefficient analysis are shown in Table 8, which is used to verify the independent positive impact of each psychological intervention strategy on learning anxiety level.

Table 8
Regression Coefficients Results

Unstandardized Coefficients				Standardized Coefficients Beta	t	Sig.
ModelB			Std. Error			
1	(Constant)	− .277	.111		-2.489	.013
	Cognitive Behavioral Intervention	.145	.031	.129	4.657	.000
	Peer Support Intervention	.152	.034	.133	4.433	.000
	Mindfulness Training Intervention	.184	.037	.168	5.028	.000
	Stress Management Intervention	.602	.031	.609	19.647	.000
a. Dependent Variable: Learning Anxiety Level						

The results of the regression coefficient showed that the standardized regression coefficient (beta) of the four psychological intervention strategies was positive, and the significance of the t test was $p < 0.001$, indicating that the four psychological intervention strategies had a significant positive impact on learning anxiety level, that is, the effective implementation of the four intervention strategies could significantly reduce the level of learning anxiety of college students.

Among them, the standardized regression coefficient of stress management intervention is the highest (beta = 0.609), which has the strongest positive effect on the level of learning anxiety, and is the core intervention strategy to alleviate learning anxiety; The second is mindfulness training intervention (beta = 0.168). Mindfulness training intervention can significantly alleviate learning anxiety by improving the ability to regulate emotions; The standardized regression coefficient of Peer Support Intervention was 0.133. Peer Support Intervention effectively reduced learning anxiety by virtue of emotional resonance and experience sharing; The standardized regression coefficient of cognitive behavioral intervention was 0.129, which alleviated anxiety by adjusting irrational cognition, and the effect was significant.

3.6 Hypotheses Testing Summary

Four research hypotheses are proposed in this study, and the hypothesis test is completed through regression coefficient analysis. The test results are shown in Table 9.

Table 9
Hypotheses Testing Summary

Hypothesis	Path	β	t-value	p-value	Decision
H1	Cognitive Behavioral Intervention → Learning Anxiety Level	0.129	4.657	< 0.001	Supported
H2	Peer Support Intervention → Learning Anxiety Level	0.133	4.433	< 0.001	Supported
H3	Mindfulness Training Intervention → Learning Anxiety Level	0.168	5.028	< 0.001	Supported
H4	Stress Management Intervention → Learning Anxiety Level	0.609	19.647	< 0.001	Supported

The hypothesis testing results confirmed that all four proposed hypotheses were supported. Cognitive behavioral intervention, peer support intervention, mindfulness training intervention, and stress management intervention each demonstrated a statistically significant association with reductions in learning anxiety among college students in Zhejiang Province. Collectively, these findings provide empirical support for the proposed research model and indicate that psychological intervention strategies are effective in addressing learning anxiety in the study context.

4. Discussion

All four psychological intervention strategies examined in this study were significantly associated with lower levels of learning anxiety among university students in Zhejiang Province, supporting each of the proposed hypotheses. Although cognitive behavioral intervention, peer support intervention, mindfulness training intervention, and stress management intervention all contributed to alleviating learning anxiety, their relative influence varied across the four approaches. This pattern aligns with the Conservation of Resources Theory and the Stress-Diathesis Model, which emphasize that strengthening individuals' psychological resources and coping capacities can lessen the impact of academic stressors and reduce vulnerability to anxiety. Viewed together, the results suggest that learning anxiety is best addressed through multiple forms of psychological support rather than reliance on a single intervention strategy.

Stress management intervention emerged as the most influential of the four psychological intervention strategies examined in this study. This outcome is unsurprising given the range of academic and personal pressures faced by university students, including examinations, coursework, career planning, and uncertainty about future employment. When students are equipped with practical strategies to recognize and manage stress, they are better prepared to cope with these challenges while maintaining their psychological well-being throughout the learning process. Rather than functioning as an isolated support service, stress management appears to be most effective when incorporated into routine university mental health and student development programmes. Within the higher education context of Zhejiang Province, this finding underscores the importance of embedding structured stress-management initiatives into institutional support systems so that students receive timely and sustained assistance in managing academic demands.

Mindfulness training also made a significant contribution to reducing learning anxiety, ranking as the second most influential intervention strategy identified in this study. This result may reflect the capacity of mindfulness practices to help students remain attentive to present experiences without becoming overwhelmed by negative thoughts or emotional reactions. By fostering greater emotional regulation and psychological resilience, mindfulness can help students respond more effectively to academic pressures and everyday learning challenges. The present findings suggest that mindfulness-based programmes could strengthen the range of psychological support available within universities, providing students with an additional approach to managing academic stress. This interpretation is consistent with earlier research reporting that mindfulness promotes psychological adjustment and emotional well-being among university students.

Peer support intervention was also associated with a significant reduction in learning anxiety among university students. A plausible explanation is that supportive peer relationships provide a space where students can openly discuss academic challenges, exchange practical coping strategies, and encourage one another during demanding periods of their studies. These interactions may ease feelings of isolation while strengthening the psychological resources needed to cope with academic pressure. The importance of peer support may be particularly evident in the Chinese higher education context, where collectivist cultural values place considerable emphasis on interpersonal relationships, cooperation, and mutual assistance. From a practical perspective, universities could strengthen student support by expanding

structured peer-support initiatives alongside existing counselling services, creating additional opportunities for students to seek guidance and encouragement from their peers.

Although cognitive behavioral intervention yielded the smallest standardized regression coefficient among the four intervention strategies, its association with lower learning anxiety remained statistically significant. This suggests that helping students recognize and challenge unhelpful patterns of thinking can still play an important role in reducing anxiety associated with academic demands. For many students, routine learning difficulties may become more manageable when they are encouraged to interpret setbacks from a more balanced perspective rather than viewing them as evidence of personal failure. Such changes in thinking may, in turn, support healthier coping behaviours and greater emotional resilience when facing academic pressure. These findings indicate that cognitive behavioral intervention remains relevant within the higher education context of Zhejiang Province, despite cultural and educational differences from many of the settings in which its effectiveness has previously been investigated.

The present study contributes to the literature by examining four psychological intervention strategies within a single empirical investigation conducted in Zhejiang Province. Much of the existing research has evaluated cognitive behavioral intervention, peer support, mindfulness training, or stress management separately, with many studies also drawing evidence from Western educational contexts. By comparing these approaches within the same university setting, the present findings offer a clearer understanding of their relative contributions to reducing learning anxiety among Chinese university students.

The findings also draw attention to the wider role of educational environments in supporting students' learning and wellbeing. Psychological assistance may be more beneficial when it is accompanied by effective teaching practices and sustained institutional support. In a different educational context, Ali et al. [28] found that teachers' organizational commitment and effective teaching practices were associated with better student learning outcomes in Pakistani secondary schools. Although their study did not examine university students, learning anxiety, or psychological interventions, it illustrates the broader importance of institutional and educational conditions in shaping students' experiences. Evidence from higher education also indicates that inclusive practices, health related skills, and adjustments to teaching and learning environments can support student mental health [5]. Psychological interventions should therefore be considered part of a wider institutional effort to create supportive conditions for learning and student wellbeing.

5. Conclusion

This study investigated how four psychological intervention strategies, namely cognitive behavioral intervention, peer support intervention, mindfulness training intervention, and stress management intervention, were associated with learning anxiety among university students in Zhejiang Province, China. Guided by the Conservation of Resources Theory and the Stress-Diathesis Model, the results indicate that all four intervention strategies were linked to lower levels of learning anxiety. Stress management intervention showed the strongest association, followed by mindfulness training intervention, peer support intervention, and cognitive behavioral intervention. Rather than pointing to a single solution, these findings indicate that learning anxiety is best addressed through a combination of complementary psychological

support strategies. Strengthening students' ability to cope with academic pressure, regulate emotions, develop more adaptive ways of thinking, and benefit from supportive peer relationships may together provide a more effective foundation for reducing learning anxiety in higher education.

The findings also have important theoretical implications. The Conservation of Resources Theory and the Stress-Diathesis Model provided a useful framework for understanding how psychological intervention strategies were associated with lower levels of learning anxiety among university students. Although both theories have been widely discussed in psychological and educational research, empirical evidence from Chinese universities remains relatively limited. Evidence from Zhejiang Province therefore broadens the contexts in which these theoretical perspectives have been examined and supports their relevance within Chinese higher education. The results further emphasize the role of psychological resources, effective stress management, and emotional resilience in helping students respond more successfully to academic challenges.

Another contribution of this study is the comparative examination of four widely used psychological intervention strategies within a single analytical framework. Much of the existing literature has investigated cognitive behavioral intervention, peer support, mindfulness training, and stress management separately, making it difficult to judge their relative contributions to reducing learning anxiety. Examining these approaches within the same study provides a more direct comparison of their effectiveness while offering a broader understanding of how different forms of psychological support may work together in higher education. The findings also add evidence from Zhejiang Province, contributing to a better understanding of student mental health within the context of Chinese universities.

The results also have practical implications for both higher education institutions and classroom practice. At the institutional level, the findings suggest that psychological support for university students is likely to be most effective when it is delivered through an integrated rather than fragmented approach. Instead of relying solely on isolated counselling activities, universities could combine stress management, mindfulness training, peer support, and cognitive behavioral intervention as complementary elements of a broader student support system. Because stress management intervention showed the strongest association with lower learning anxiety, structured stress management programmes may warrant particular attention while remaining closely connected with wider mental health initiatives. Additional support could be provided through mindfulness workshops, peer mentoring schemes, cognitive behavioral group counselling, and digital mental health resources that allow students to access assistance beyond conventional counselling services. Incorporating routine psychological screening into existing academic support services may also help identify students experiencing learning anxiety at an earlier stage, creating opportunities for timely intervention before academic performance is adversely affected.

Teachers play a central role in supporting students' psychological well-being because of their continuous interaction with learners throughout the academic journey. For this reason, universities could strengthen professional development programmes that equip lecturers and academic advisors with practical skills in stress management, cognitive behavioral approaches, mindfulness practices, and basic psychological support. Psychological intervention should also be considered an integral part of effective teaching rather than an activity confined to counselling services. Within the classroom, instructors can help reduce

unnecessary academic pressure by designing manageable learning tasks, encouraging collaborative learning, promoting realistic academic expectations, and incorporating simple techniques that support stress management and emotional regulation. Creating this kind of learning environment may not only help alleviate learning anxiety but also encourage students to participate more confidently, remain engaged with their studies, and develop greater resilience when facing academic challenges.

The findings should be interpreted in light of several limitations. First, because the study employed a cross-sectional design, the observed relationships between psychological intervention strategies and learning anxiety should not be interpreted as evidence of causality. The analysis was also based on self-reported questionnaire data, which may be affected by response bias despite the use of anonymous data collection procedures. In addition, participants were drawn exclusively from universities in Zhejiang Province, and caution is therefore needed when generalising the findings to other regions or educational contexts. Finally, the study focused on four psychological intervention strategies and did not examine other personal, institutional, or environmental factors that may also shape students' experiences of learning anxiety.

Several directions emerge for future research. Longitudinal and experimental studies would provide a stronger basis for examining how psychological intervention strategies influence learning anxiety over time while offering clearer evidence of causal relationships. Extending this line of research to universities in different regions of China, together with cross-cultural investigations, would help determine whether the present findings are applicable across diverse educational contexts. Future work could also examine additional psychological, educational, and contextual factors to achieve a more comprehensive understanding of learning anxiety and the processes through which different intervention strategies support students' psychological well-being. Further attention to differences across academic disciplines, year levels, and student backgrounds may also help universities develop intervention programmes that are better tailored to the needs of different student groups.

Overall, the findings indicate that psychological intervention strategies can make an important contribution to reducing learning anxiety among university students, with stress management intervention showing the strongest association among the four approaches examined. Combining established theoretical perspectives with evidence from universities in Zhejiang Province, this study adds to current understanding of how psychological support can contribute to student well-being within the context of Chinese higher education. The findings also offer practical insights for universities seeking to strengthen student mental health support through more coordinated and evidence-informed intervention strategies. More broadly, creating learning environments that promote effective stress management, emotional resilience, and psychological well-being has the potential to benefit both individual students and the wider higher education community. These outcomes are closely aligned with the aspirations of Sustainable Development Goal 3 (Good Health and Well-being) and Sustainable Development Goal 4 (Quality Education), highlighting the broader societal relevance of the study.

Declarations

Funding: No funding was received for conducting this study or preparing this manuscript.

Clinical trial number: Not applicable.

Ethics Approval: The study protocol was reviewed and approved by the Medical Ethics Committee of the Public Health School of Zhejiang University (Approval No. ZGL202306-9), which served as the coordinating ethics committee for this multi-site study. All research procedures were conducted in accordance with the ethical standards of the participating institutions.

Ethical Accordance: The study was conducted in accordance with the Declaration of Helsinki and the relevant ethical guidelines of the Chinese Psychological Society for research involving human participants.

Consent to Participate: Written informed consent was obtained from all participating students prior to data collection. Participants were fully informed about the study's purpose, procedures, voluntary nature, and their right to withdraw at any time without adverse consequences. Anonymity and data confidentiality were strictly maintained throughout the research process.

Ethics Approval: Ethical approval for this study was obtained from the institutional review boards of the participating universities in Zhejiang Province, China. Written informed consent was secured from all participating students, who were informed about the study's purpose, voluntary participation, and their right to withdraw at any time without consequences. Anonymity and confidentiality of responses were strictly maintained throughout the research process.

Consent to Participate: Written informed consent was obtained from all participating students prior to data collection. Participants were fully informed about the study's purpose, procedures, voluntary nature, and their right to withdraw at any time without adverse consequences. Anonymity and data confidentiality were strictly maintained throughout the research process.

Competing interests: The author has no relevant financial or non-financial interests to disclose.

Consent to Publish: The authors declare that this manuscript is an original work and has not been published previously nor is it under consideration for publication elsewhere. All authors have read and approved the final version of the manuscript and consent to its publication in the journal if accepted.

Data availability: The anonymised dataset is not publicly available because it contains data collected from minors and is subject to school confidentiality and parental-consent conditions. De-identified data, the item codebook, and supporting analysis records may be available from author on reasonable request, subject to permission from the participating school and applicable ethical requirements.

Authors contribution: W.M.W. and K.Z. conceptualized the study and designed the methodology; R.B. and K.A. performed the data collection and managed the survey administration across participating universities; A.B. and R.S.A. conducted the statistical analysis and interpreted the results; Z.Z. contributed to the theoretical framework and literature review; W.M.W. drafted the original manuscript; all authors reviewed, revised, and approved the final version for submission.

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Figures

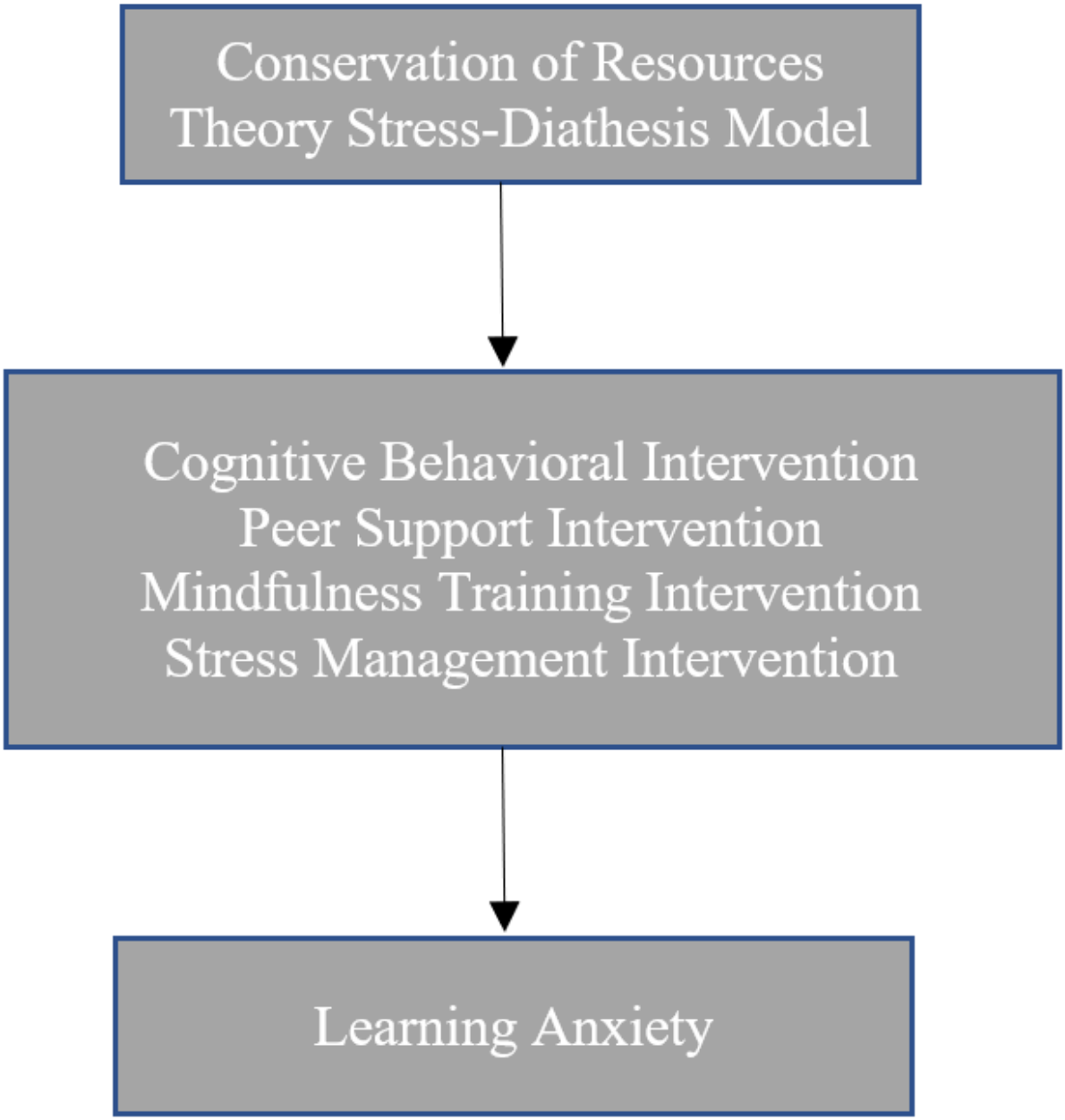


Figure 1

Conceptual framework illustrating the hypothesized relationships between university psychological intervention strategies and learning anxiety.