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Effects of Mindfulness-Based Tibetan Dance on College Students' Resilience: The Mediating Roles of Mindful Attention Awareness and Perceived Stress

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Abstract

Background

College students face multiple challenges, including academic pressure, employment anxiety, and interpersonal difficulties, and their resilience has been declining. Strengthening resilience is therefore crucial for college students' comprehensive development. Tibetan dance, through its steady, restrained, and well-balanced bodily rhythms, embodies the cultural spirit of moderation, resilience, and harmony, reflecting the mindfulness traits of acceptance, non-judgment, and present-moment awareness. This study examined the effects of Tibetan dance on college students' resilience and the mediating roles of mindful attention awareness and perceived stress.

Methods

A 2 (group: Tibetan dance vs. aerobics control) × 2 (time: pretest vs. posttest) mixed design was used. In total, 208 female college students were randomly assigned and received a 15-week intervention (once weekly, 90 min/session); 202 valid participants remained. Resilience, mindful attention awareness, and perceived stress were measured pre- and post-intervention. Repeated-measures ANOVA, AMOS structural equation modeling, and bootstrap serial mediation analyses (5,000 resamples, bias-corrected 95% CIs) were conducted.

Results

The group × time interaction effects were significant for total resilience scores, mindful attention awareness, and total perceived stress scores ($p < 0.001$). At posttest, the Tibetan dance group had higher resilience and mindful attention awareness and lower perceived stress than the control group. Mediation analysis showed that the total effect of Tibetan dance on resilience was 0.523; the separate mediating effect of mindful attention awareness was 0.170, accounting for 32.5% of the total effect; the separate mediating effect of perceived stress was 0.123, accounting for 23.5% of the total effect.

Conclusions

Tibetan dance significantly enhanced college students' resilience, increased their mindful attention awareness, and reduced their perceived stress. Both mindful attention awareness and perceived stress mediated the relationship between Tibetan dance and resilience, and Tibetan dance was also directly associated with resilience. Thus, Tibetan dance not only directly promoted resilience but also exerted indirect effects by enhancing mindful attention awareness and reducing perceived stress.

Introduction

College students constitute a distinct social group, and university is a critical period for their intellectual growth, health literacy development. However, college students face multiple challenges, such as academic pressure, employment anxiety. Their psychological vulnerability and adjustment difficulties have become increasingly prominent, constraining their comprehensive development (Zhou SJ et al., 2024). A study jointly conducted by Tsinghua University and other research institutions found that an increasing number of college students exhibit “lack of motivation for learning activities, a sense of meaninglessness in the value of life, and difficulty in interpersonal social interaction” (Jiang F et al., 2021). Related research also indicates that from 2007 to 2021, resilience levels among Chinese college students showed a declining trend, which has had multiple adverse effects on their growth and development (Shi L et al., 2023). The rise of positive psychology has provided a new paradigm for the field of mental health. Positive psychology focuses on helping individuals achieve a happy, fulfilling, courageous, virtuous, loving, and meaningful life by cultivating positive thinking, enhancing resilience, and accumulating psychological capital. It emphasises not only reducing negative psychological factors but also shaping positive psychological qualities (Matthews SM, 2026). As a core component of college students’ psychological capital, resilience, together with hope, self-efficacy, and optimism, constitutes an internal resource system for coping with challenges (Lianov L et al., 2021). Research has shown that resilience is significantly negatively correlated with negative psychological indicators such as anxiety, depression, and stress-related disorders. Highly resilient individuals experience less loss of control and tension in stressful situations, are better able to buffer the impact of negative events on emotional health (Chen SY et al., 2021). By enhancing individuals’ adaptive capacity and sense of meaning, resilience helps stimulate positive emotional experiences, improve self-worth, and encourage a shift from passive coping to active growth, thereby facilitating a higher level of mental health and flourishing (Liu D et al., 2010). In summary, as a representative indicator of positive psychology, resilience embodies a perspective on individual psychological development characterised by “wholeness,” “flourishing,” and “building”, helping individuals shift from passive coping to active growth (Chye SM et al., 2024).

Mindfulness originates from the concept of “sati” in the Buddhist tradition, emphasising conscious, non-judgemental attention to present-moment experience (Hadash Y et al., 2026). Building on this concept, Brown and Ryan proposed mindful attention awareness (MAA), operationalising it as a receptive state of attention that includes self-regulation of attention and awareness of present-moment experience, and distinguishing it from the view of mindfulness as a combination of multiple skills (Brown KW et al., 2003). MAA may manifest as either a transient state or a relatively stable personality trait. Most current measurement tools, such as the Mindful Attention Awareness Scale (MAAS), primarily assess the latter by measuring the frequency of unaware or automatic states and indirectly inferring an individual’s level of MAA (Osman A et al., 2016). Research on the relationship between MAA and mental health has consistently shown that MAA is associated with higher subjective well-being and lower levels of depression and anxiety, a finding that has been verified in both adolescent and adult populations (Hepburn SJ et al., 2021). In clinical populations, MAA is also significantly negatively correlated with depressive mood and insomnia severity (Chen H et al., 2025). Longitudinal studies further indicate that MAA can predict students’ life satisfaction, depression, anxiety, and academic stress over time (Wang Y

et al., 2022). These results suggest that MAA not only reflects an individual's current state of awareness but may also constitute an important internal resource for stress adaptation and psychological regulation. With regard to mediating mechanisms, existing studies have shown that MAA often mediates the relationship between exercise or behavioural interventions and mental health outcomes (Guo H et al., 2026). In summary, as a core construct with both theoretical and empirical support, MAA provides an important entry point for understanding individual psychological states and their protective mechanisms.

Perceived stress was proposed by Cohen et al. in 1983. It refers to the subjective stress experienced by an individual after cognitive appraisal of external stressful events and involves the experience that life is unpredictable and difficult to control. Its essence is a subjective assessment following a comparison between environmental demands and individual coping resources (Cohen S et al., 1983). Yang Tingzhong et al. revised the Chinese version of the Perceived Stress Scale (PSS) to reflect local culture, dividing it into two dimensions: tension and loss of control. It has been widely used among Chinese adolescents, students, medical staff, and special occupational groups (Yang TZ et al., 2003). Related research shows that perceived stress is closely related to mental health status. High levels of perceived stress are significantly positively correlated with depression, anxiety, and loneliness, and significantly negatively correlated with life satisfaction and resilience (Yang T et al., 2024). Excessively high perceived stress consumes individual psychological resources, increases the risk of depression, and reduces life satisfaction, whereas positive psychological resources such as resilience, self-compassion, and cognitive flexibility can buffer these negative effects and reduce the emergence of negative emotions (Onieva-Zafra MD et al., 2020). Perceived stress is influenced by multiple factors. At the family level, parental educational anxiety is an important predictor, while at the individual level, cognitive flexibility, proactive personality, negative cognitive emotion regulation strategies, resilience, and self-compassion are also important predictors (Tang Y et al., 2025). Many mediation and moderation models also show that perceived stress often acts as a mediator, transmitting the effects of external risk factors on individual mental health (Fu HW et al., 2025). In intervention research, psychological programmes such as mindfulness training and mindfulness-based dance movement groups have been shown to reduce perceived stress and alleviate subjective feelings of stress (Gu L et al., 2024). Therefore, perceived stress can serve as an important early warning indicator of mental health. Research on perceived stress is thus of practical importance for identifying psychological risks and designing psychological interventions.

Tibetan traditional culture contains rich resources of mindfulness thought. The spiritual core of Tibetan culture includes four dimensions: moderation, upholding goodness, resilience, and harmony. Among them, "harmony" emphasizes reverence for and adaptation to nature, while "moderation" advocates viewing all things with a neutral and dialectical attitude. These ideas are highly consistent with mindfulness's emphasis on acceptance, non-judgment, and awareness of present-moment experience (Gongbaozhaxi et al., 2018). Among the rich cultural expressions of Tibetan culture, dance is one of the most vital carriers. As Gazang Ji states, dance is an art that arises from inner emotion and expresses it through external formal movements (Gazangji et al., 2011). Tibetan dance has distinctive ethnic and cultural characteristics, with a steady and restrained style and movements that are well balanced

between tension and relaxation. It is mainly characterized by drawing in the chest, holding the head upright, and bending, stretching, and trembling, fully embodying the Tibetan people's character of moderation and resilience (Liu MH et al., 2010). Different forms of Tibetan dance, such as Guozhuang and Xianzi, each have their own appeal and can stimulate positive emotions and cultivate body and mind through bodily rhythm and group interaction (Liu QM et al., 2019). Moderation and resilience are both the core ideological connotations of Tibetan dance and the most fundamental spiritual traits in its cultural inheritance.

Tibetan dance is not only an artistic expression but also a cultural practice with an educational function (Shi Y et al., 2016). This bodily expression, grounded in moderation and resilience, requires dancers to continuously attend to present movements and group rhythm amid bodily movement, and to achieve self-regulation of attention through repeated awareness training. This is intrinsically consistent with the core connotations of mindfulness and provides a unique cultural resource for cultivating positive psychological qualities. In recent years, research on Tibetan dance in promoting mental health has achieved preliminary results. At the level of emotional regulation, participation in Tibetan dance has significant effects on alleviating stress and regulating emotions among college students, and participants can derive pleasure and excitement from it (Zhang M et al., 2014). At the level of clinical intervention, Tibetan dance training has been proven to effectively alleviate anxiety in patients with schizophrenia during rehabilitation (Li HH et al., 2019); an emotional Daoyin method using Guozhuang dance as a carrier can also significantly improve patients' depressive states, further confirming the positive role of Tibetan dance in regulating emotions and improving psychological states (Ning H et al., 2023). In summary, with moderation and resilience as its cultural core, Tibetan dance, through steady, restrained, and well-balanced movements, can help participants improve negative psychological states and stimulate positive emotions, providing an effective path for cultivating individuals' positive psychological qualities (Du P et al., 2012).

In summary, resilience is an important protective factor for college students' positive adaptation and mental health, yet resilience levels among Chinese college students have shown a declining trend in recent years. Tibetan dance, with moderation and resilience as its cultural core and with demonstrated benefits for emotion regulation and mind–body health, may be an effective approach for enhancing college students' resilience. Mindful attention awareness reflects an individual's conscious, non-judgemental attention to present-moment experience and is closely associated with lower perceived stress and higher well-being. Perceived stress refers to an individual's subjective stress experience following cognitive appraisal of external stressors—often involving unpredictability and uncontrollability —and commonly serves as a mediating variable between risk factors and mental health. A comprehensive review of existing research suggests that Tibetan dance may enhance resilience by strengthening individuals' awareness of their present physical and mental states and reducing perceived stress; however, this mechanism has not yet been systematically tested. Based on this rationale, this study aimed to: (1) verify the effect of mindfulness-based Tibetan Dance on improving college students' resilience, mindful attention awareness, and perceived stress through a 15-week experimental

intervention; (2) examine the mediating roles of mindful attention awareness and perceived stress in the relationship between mindfulness-based Tibetan dance and resilience.

Methods

Design

This study consisted of two stages. In the first stage, an experimental intervention study with a pretest–posttest design was conducted, comprising an experimental group and a control group. The experimental group received a 15-week mindfulness-based Tibetan Dance intervention, whereas the control group received an aerobics intervention over the same period. Intervention effects were assessed using the Resilience Scale, the Mindful Attention Awareness Scale, and the Perceived Stress Scale (PSS). On the basis of the empirical results from the first stage, the second stage involved constructing a theoretical mediation model, with mindful attention awareness and perceived stress as mediating variables, to examine the mechanism through which mindfulness-based Tibetan Dance affects college students' resilience. The study protocol was approved by the Institutional Review Board of Tangshan Normal University (approval number: TSTC2026-2-3).

Participants and procedure

G*Power 3.1 was used to estimate the required sample size. A repeated-measures analysis of variance (ANOVA) was specified as the statistical test, with an effect size of f = 0.25, a significance level of α = 0.05, statistical power (1 − β) of 0.80, and a repeated-measures correlation of 0.50. The calculation indicated that at least 46 participants per group were required. Because mindfulness-based Tibetan Dance and aerobics are more popular among female students, the sample consisted mainly of female students. A total of 208 female college students were recruited from public physical education courses at a university in China and randomly assigned to an experimental group (mindfulness-based Tibetan Dance) or a control group (aerobics). Random assignment was performed by an independent researcher using a computer-generated random number sequence (random.org). To reduce the Hawthorne effect, neutral instructions were used, and the labels "experimental group" and "control group" were not used in class. Teaching manuals were standardised, and teacher attention, interaction, and classroom structure were standardised across groups. Questionnaire distribution, data entry, and statistical analysis were blinded. Course expectations, social desirability, and perceived teacher attention were monitored as procedural checks to confirm that the two groups did not differ in these respects across the intervention.The research procedure is shown in Fig. 1.

The inclusion criteria were: (1) female college students; (2) no history of major physical illness, mental illness, or drug addiction; and (3) voluntary participation, provision of informed consent, and ability to complete the questionnaires independently. The intervention adherence criterion was completion of the 15-week intervention and participation in at least 12 sessions, corresponding to an attendance rate of ≥

80%. After data collection, six participants with attendance below 80% were excluded, yielding a final total of 202 valid participants. The mean ages of the experimental and control groups were 19.83 years (SD = 1.32) and 20.11 years (SD = 1.17), respectively, with no statistically significant difference ($t = 1.58$, $p = 0.116$). All participants were female college students. There were no statistically significant differences between the two groups in baseline scores for resilience (75.23 ± 6.62 vs. 75.56 ± 4.81, $t = 0.33$, $p = 0.741$), mindful attention awareness (59.61 ± 4.11 vs. 60.37 ± 3.72, $t = -1.38$, $p = 0.169$), or perceived stress (26.50 ± 5.93 vs. 26.35 ± 3.80, $t = 1.71$, $p = 0.089$), indicating that the two groups were comparable. In all correlation and mediation analyses, age was treated as a continuous variable to maximise statistical power and avoid bias potentially arising from artificial categorisation.

Intervention

Before the experiment began, participants were informed of the relevant precautions, the experimental period, and the specific exercise schedule, and they received a brief orientation to the core mindfulness elements (i.e., attending to breath and bodily sensations and adopting a non-judgmental attitude) to ensure that they understood the mind–body nature of the intervention. After the formal intervention commenced, weeks 1–2 involved part-based practice to help participants master the mindfulness-based Tibetan Dance movements proficiently. A professional teacher led participants in learning each movement item by item and then guided them to perform all movements smoothly and continuously; during this stage, brief mindful breathing and body-scan practices were introduced, and participants were encouraged to adopt a “beginner’s mind” and a non-judgmental attitude toward imperfect movements. Weeks 3–15 constituted the systematic practice stage, during which the teacher led students in practising together on site. Each session consisted of a 10-minute warm-up, 70 minutes of mindfulness-based Tibetan Dance practice, and a 10-minute cool-down and recovery. The warm-up included mindful breathing, a brief body scan, and setting an attentional intention for the session; during the 70-minute practice, the teacher used standardized mindfulness cues to guide participants to sustain attention to foot pressure, knee flexion–extension, hip sinking, weight transfer, spinal alignment, muscle engagement, breathing rhythm, and fatigue, and to gently return attention when distracted; the cool-down included a body scan, breathing relaxation, and brief mindful reflection.

Following the principle of gradual progression, the practice content was arranged in a sequence of slow, moderate, and fast combinations: first, low-intensity practice of the Flexion–Extension Rhythm combination; then, moderate-intensity practice of the Xianzi Lean Step combination; next, moderate-intensity practice of the Kumala combination; and finally, high-intensity practice of the complete set of the three combinations. The Flexion–Extension Rhythm, Xianzi Lean Step, and Kumala combinations were each practised for 5 sets, and the complete set of movements was practised for 3 sets, with a rest interval of 2–5 minutes between sets. These rest intervals were used as “mindful rest,” during which participants observed their breathing, muscle tension, fatigue, and recovery with openness and acceptance rather than avoiding discomfort. The specific mindfulness-based Tibetan Dance intervention protocol is shown in Table 1.

Students in the control group received regular aerobics instruction within the university's public physical education course and followed the established course schedule. Each 90-minute session consisted of a 10-minute warm-up, 70 minutes of aerobics practice, and a 10-minute cool-down and recovery. Both groups were taught by the same instructor using a standardized teaching manual, and teacher attention, interaction, and classroom structure were standardized across the two groups. The aerobics course did not include mindfulness-based Tibetan Dance movement elements, ethnic cultural narratives, mindfulness guidance, or structured group psychological sharing. Exercise intensity (e.g., heart rate and subjective fatigue) was regularly monitored in both groups, and the aerobics course was adjusted so that the two groups showed no significant differences in average exercise intensity, duration, or subjective fatigue. Outcome assessors and data analysts were blinded.

Table 1
Mindfulness-Based Tibetan Dance Practice Project

Combination name	Movement name	Mindfulness guidance	Repetition	intensity
Flexion Extension Rhythm	Knee bending and stretching + hip sinking+flat step	Notice knee flexion–extension, hip sinking, foot pressure, and breath synchronization; observe initial incoordination without judgment	5	Low
Xianzi Lean Step	Single close step+three steps and one close+retracting step+close point step+point-turn-close	Notice weight transfer, single-leg close step, balance, and breathing rhythm;gently return attention when distracted	5	Moderate
Kumala	Trembling rhythm+lift-tread step+seven-step backward step+first basic step+second basic step+linked three steps+tick-tock step+three step	Notice trembling rhythm, lift-tread, backward steps, muscle tension, and fatigue; observe discomfort rather than avoid it	5	Moderate
Whole routine	Practice all movement	Sustain awareness of the complete sequence, breath, whole-body sensations, and emotional responses	3	High

Measures

Resilience Scale

The Resilience Scale was originally developed by Connor and Davidson and later revised for the Chinese context by Yu Xiaonan and Zhang Jianxin (Yu XN et al., 2007). It comprises three dimensions: fortitude, self-improvement, and optimism. The scale consists of 25 items, rated on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Total scores range from 25 to 125, with higher scores indicating greater resilience. In the present study, the scale showed high internal consistency, with Cronbach's α coefficients of 0.93, 0.91, and 0.89 for the fortitude, self-improvement, and optimism subscales, respectively. Confirmatory factor analysis (CFA) was conducted to re-examine construct validity in this sample. The correlated three-factor model showed acceptable fit: $\chi^2/df = 2.68$, CFI = 0.93, TLI = 0.92, RMSEA = 0.06, SRMR = 0.04. Factor loadings for all items were statistically significant and ranged from 0.63 to 0.86. The composite reliability (CR) for the three factors ranged from 0.88 to 0.92, exceeding the recommended threshold of 0.70, and the average variance extracted (AVE) ranged from 0.60 to 0.68, exceeding the 0.50 benchmark, supporting good internal consistency and convergent validity.

Mindful Attention Awareness Scale

The Chinese version of the Mindful Attention Awareness Scale (MAAS), developed by Brown and Ryan (2003) and revised by Chen Siyi et al. (Chen SY et al., 2012), was used to measure college students' level of mindful attention awareness. The scale contains 15 items, all reverse-scored, reflecting states of absent-mindedness or lack of mindfulness in daily life. It uses a 6-point Likert scale ranging from 1 (almost always) to 6 (almost never), with total scores ranging from 15 to 90; higher scores indicate greater attention to and awareness of present-moment experience. Reliability analysis showed that Cronbach's α for the scale in this study was 0.91. Given differences in item factor loadings, composite reliability (CR) was further calculated, yielding 0.95, far exceeding the recommended threshold of 0.70 and indicating excellent internal consistency. For validity, CFA was used to test the fit of the single-factor structure in the current sample. The results showed good model fit: $\chi^2/df = 2.46$, CFI = 0.95, TLI = 0.94, RMSEA = 0.05, SRMR = 0.04. Standardised factor loadings ranged from 0.59 to 0.85, and all were significant ($p < 0.001$). The AVE was 0.54, exceeding the recommended benchmark of 0.50, and the CR (0.95) was greater than the AVE, meeting the criteria for convergent validity.

Perceived Stress Scale

The Perceived Stress Scale was developed by Cohen et al. in 1983 to measure individuals' subjective feelings of stress over the past month and to assess the extent to which individuals perceive life as unpredictable, uncontrollable, and overburdening. The Chinese version of the Perceived Stress Scale (PSS) was revised by Yang Tingzhong et al. based on the Chinese cultural context. It contains two dimensions, loss of control and tension, with a total of 14 items (Yang TZ et al., 2003). Each item is scored on a 5-point Likert scale ranging from 0 (never) to 4 (always), with total scores ranging from 0 to 56; higher scores indicate higher levels of perceived stress. In this study, Cronbach's α coefficients were 0.88 and 0.86 for the loss-of-control and tension dimensions, respectively, and 0.91 for the total scale, indicating good internal consistency. CFA results showed that the two-factor model fit well: $\chi^2/df = 2.53$,

CFI = 0.94, TLI = 0.93, RMSEA = 0.05, SRMR = 0.04. Standardised factor loadings ranged from 0.56 to 0.84, and all were significant ($p < 0.001$). The CRs of the two dimensions were 0.89 and 0.87, respectively, and the AVE values were 0.58 and 0.56, respectively, all exceeding the recommended thresholds of 0.70 and 0.50, indicating good convergent validity.

Statistical analysis

All statistical analyses were conducted using SPSS Statistics 26.0 and AMOS 26.0. Before hypothesis testing, key assumptions were examined. Skewness and kurtosis values indicated no serious departures from normality (all |skewness| < 2, |kurtosis| < 7). Univariate outliers were screened using standardised z-scores; multivariate outliers were assessed using Mahalanobis distance ($p < 0.001$), and no extreme cases requiring exclusion were identified. Linearity was confirmed by visual inspection of scatterplots. Because participants were randomly assigned at the individual level, data independence was assumed and single-level analyses were appropriate; no intraclass correlation coefficients or multilevel models were required. Multicollinearity diagnostics showed that all VIF values were < 3.0 and all tolerance values were > 0.40.

A 2 (group: mindfulness-based Tibetan Dance vs. aerobic exercise) × 2 (time: pretest vs. posttest) repeated-measures ANOVA was conducted for resilience, mindful attention awareness, and perceived stress. Pearson correlations were used to examine bivariate associations among variables, with significance levels of $p < 0.05$, $p < 0.01$, and $p < 0.001$. Following the logic of mediation analysis, we first examined the total effect of mindfulness-based Tibetan Dance on resilience and then tested the indirect effects via mindful attention awareness and perceived stress. To examine these mediating roles, a serial mediation model was tested using structural equation modelling in AMOS 26.0. Group allocation (mindfulness-based Tibetan Dance = 1, aerobic exercise = 0) served as the independent variable; post-intervention resilience was the dependent variable; and post-intervention mindful attention awareness and perceived stress were entered as the first and second mediators, respectively. Age, pretest resilience, pretest mindful attention awareness, and pretest perceived stress were included as covariates. Model fit was evaluated using the chi-square/df ratio (χ^2/df), comparative fit index (CFI), Tucker–Lewis index (TLI), root mean square error of approximation (RMSEA), and standardised root mean square residual (SRMR). Direct and indirect effects were estimated using maximum likelihood estimation, and bootstrap analyses with 5,000 resamples were conducted to obtain bias-corrected 95% confidence intervals for indirect effects. An indirect effect was considered statistically significant if the 95% confidence interval did not include zero. The final dataset contained complete data for all analysed variables; therefore, multiple imputation was not required.

Results

The descriptive statistics for each resilience dimension and the total resilience score across experimental conditions are presented in Table 2. Repeated-measures ANOVA showed that the group × time interaction was significant for fortitude, self-improvement, optimism, and the total score: fortitude,

F(1, 200) = 46.91, p < 0.001, η_p^2= 0.190; self-improvement, F(1, 200) = 19.79, p < 0.001, η_p^2 = 0.090; optimism, F(1, 200) = 29.10, p < 0.001, η_p^2 = 0.127; and total score, F(1, 200) = 77.15, p < 0.001, η_p^2 = 0.278. Simple effects analyses indicated that posttest scores in the intervention group were significantly higher than its pretest scores, and both the posttest scores and the pretest-to-posttest improvement were greater than those in the control group. These findings indicate that the mindfulness-based Tibetan Dance intervention effectively improved college students' scores on each resilience dimension and on the total resilience scale.

Table 2
Descriptive statistics and repeated-measures ANOVA results for resilience by group and time.

Fortitude		**Pre-test**	**Post-test**	**F**	**P**	η_p^2
	Intervention	**37.67 ± 5.23**	**43.05 ± 5.91**	**46.91**	**< .001**	**.190**
	Control	38.12 ± 3.05	39.14 ± 3.13			
Self-improvement	Intervention	25.60 ± 3.50	29.06 ± 2.93	19.79	< .001	.090
	Control	25.21 ± 3.11	26.79 ± 2.01			
Optimism	Intervention	11.96 ± 1.70	14.03 ± 1.51	29.10	< .001	.127
	Control	12.23 ± 1.89	12.96 ± 1.92			
Total Score	Intervention	75.23 ± 6.62	86.14 ± 5.83	77.15	< .001	.278
	Control	75.56 ± 4.81	78.89 ± 5.09			

Note. N = 202. F, p, and η_p^2 represent Time × Group interaction effects for each outcome. Degrees of freedom for all interaction effects were (1, 200).

The descriptive statistics for mindful attention awareness scores across experimental conditions are presented in Table 3. Repeated-measures ANOVA showed a significant group × time interaction, F(1, 200) = 113.28, p < 0.001, η_p^2 = 0.362. Simple effects analyses indicated that posttest scores in the intervention group were significantly higher than its pretest scores, and the pretest-to-posttest improvement was significantly greater than that in the control group. These findings indicate that the mindfulness-based Tibetan Dance intervention effectively improved college students' mindful attention awareness.

Table 3
Descriptive statistics and repeated-measures ANOVA results for Mindful Attention Awareness by group and time.

Mindful attention awareness		**Pre-test**	**Post-test**	**F**	**P**	η_p^2
	Intervention	**59.61 ± 4.11**	**68.78 ± 5.16**	**113.28**	**< .001**	**.362**
	Control	60.37 ± 3.72	62.31 ± 5.50			

Note. N = 202. F, p, and η_p^2 represent Time × Group interaction effects for each outcome. Degrees of freedom for all interaction effects were (1, 200).

The descriptive statistics for each perceived stress dimension and the total perceived stress score across experimental conditions are presented in Table 4. Repeated-measures ANOVA showed that the group × time interaction was significant for loss of control, tension, and the total score: loss of control, $F(1, 200) = 53.84$, $p < 0.001$, $\eta_p^2 = 0.212$; tension, $F(1, 200) = 34.22$, $p < 0.001$, $\eta_p^2 = 0.146$; and total score, $F(1, 200) = 85.56$, $p < 0.001$, $\eta_p^2 = 0.300$. Simple effects analyses indicated that posttest scores in the intervention group were all lower than pretest scores, and the magnitude of decrease was significantly greater than in the control group. These findings indicate that the mindfulness-based Tibetan Dance intervention effectively reduced college students' loss of control, tension, and overall perceived stress.

Table 4
Descriptive statistics and repeated-measures ANOVA results for perceived stress by group and time

Loss of control		**Pre-test**	**Post-test**	**F**	**P**	η_p^2
	Intervention	**13.8 ± 3.59**	**10.13 ± 3.05**	**53.84**	**< .001**	**.212**
	Control	12.52 ± 2.94	12.07 ± 2.78			
Tension	Intervention	12.70 ± 3.07	9.57 ± 2.84	34.22	< .001	.146
	Control	13.83 ± 3.02	13.17 ± 3.06			
Total Score	Intervention	26.50 ± 5.93	19.70 ± 5.10	85.56	< .001	.300
	Control	26.35 ± 3.80	25.23 ± 5.32			

Note. N = 202. F, p, and η_p^2 represent Time × Group interaction effects for each outcome. Degrees of freedom for all interaction effects were (1, 200).

Common method bias test

To mitigate and assess potential common method bias in the self-reported measures of resilience, mindful attention awareness, and perceived stress, the present study employed both procedural controls (e.g., reverse scoring of selected dimensions and anonymous responding) and statistical techniques. Harman's single-factor test was conducted to evaluate common method bias. Exploratory factor analysis extracted multiple factors, with the first factor accounting for 26.30% of the total variance, which was below the 40% threshold. These results suggest that common method bias was not a serious concern in the present data.

To further assess common method bias, the present study also employed the unmeasured latent method construct (ULMC) approach. Two nested models were constructed in AMOS. The baseline model (M1) was a confirmatory factor measurement model containing the three core constructs: resilience, mindful attention awareness, and perceived stress. Model M2 added a common method latent factor to M1, with all 54 observed items loading simultaneously on their respective theoretical factors and the common method latent factor; the variance of the common method factor was fixed to 1 to ensure model identification. Model fit was compared using a chi-square difference test. The results showed that model fit did not improve significantly after adding the common method factor ($\Delta\chi^2$ = 62.17, Δdf = 54, p = 0.208), and the factor loadings of the core constructs did not change substantially. These findings indicate that common method bias was not a serious concern in the present data.

Correlation analysis

Correlation analysis (Table 5) examined construct-level associations among the posttest measures. As reported above, the mindfulness-based Tibetan Dance intervention produced significant group × time effects on resilience, mindful attention awareness, and perceived stress. At the construct level, the total resilience score was positively correlated with mindful attention awareness (r = 0.52, $p < 0.01$), and the three resilience subscales were moderately positively correlated with mindful attention awareness (r = 0.32–0.35, $p < 0.01$). The total resilience score and its subscales were significantly negatively correlated with perceived stress: associations were weakest for loss of control (r = − 0.22 to − 0.34), moderate for tension (r = − 0.25 to − 0.35), and strongest for the total perceived stress score (r = − 0.35 to − 0.51; all $p < 0.01$). Mindful attention awareness was, in turn, significantly negatively correlated with each perceived stress subscale and with the total perceived stress score (r = − 0.35 to − 0.53, $p < 0.01$). Within scales, the resilience subscales were strongly correlated with the total resilience score (r = 0.68–0.79), and the two perceived stress subscales were strongly correlated with their total score (r = 0.77 and 0.75); all VIFs were below 3.0, indicating stable regression estimates. After Bonferroni correction, the overall pattern of associations remained essentially unchanged, supporting the robustness of the core construct relationships.

Table 5
Correlations Among Variables

Fortitude	1	2	3	4	5	6	7	8
	1							
Self-improvement	.47***	1						
Optimism	.51***	.40***	1					
Resilience (total)	.73***	.68***	.79***	1				
Mindful attention awareness	.35***	.32***	.35***	.52***	1			
Loss of control	−.25***	−.22**	−.34***	−.31***	−.35***	1		
Tension	−.32***	−.25***	−.35***	−.35***	−.45***	.50***	1	
Perceived stress (total)	−.40***	−.35***	−.45***	−.51***	−.53***	.77***	.75***	1

Note. N = 202. Pearson correlations among posttest psychological variables. Fortitude, self-improvement, and optimism are subscales of resilience; loss of control and tension are subscales of perceived stress. *p<.05, **p<.01, ***p<.001 (two-tailed).

Structural model fit assessment

First, a total effect model was tested, with mindfulness-based Tibetan Dance as the independent variable and post-intervention resilience as the dependent variable. This model showed acceptable fit: χ^2/df = 3.17, CFI = 0.95, TLI = 0.92, RMSEA = 0.05, SRMR = 0.04. mindfulness-based Tibetan Dance significantly predicted resilience (β = 0.523, p < 0.001). Second, a serial mediation model was tested, with mindful attention awareness and perceived stress as the first and second mediators, respectively, and with age, pretest resilience, pretest mindful attention awareness, and pretest perceived stress as covariates. This model also showed acceptable fit: χ^2/df = 2.93, CFI = 0.95, TLI = 0.94, RMSEA = 0.06, SRMR = 0.05. As shown in Fig. 2, mindfulness-based Tibetan Dance positively predicted mindful attention awareness (β = 0.563) and negatively predicted perceived stress (β = −0.350). Mindful attention awareness negatively predicted perceived stress (β = −0.380) and positively predicted resilience (β = 0.302). Perceived stress negatively predicted resilience (β = −0.351). The direct effect of mindfulness-based Tibetan Dance on resilience was also significant (β = 0.156, 95% CI [0.078, 0.252]).

Bootstrap analyses with 5,000 resamples and bias-corrected 95% confidence intervals (CIs) were performed to examine the hypothesised mediating effects. In the serial mediation model, age, pretest resilience, pretest mindful attention awareness, and pretest perceived stress were included as covariates. As summarised in Table 6, the direct effect of mindfulness-based Tibetan Dance (MBTD) on resilience (R) after accounting for the two mediators was statistically significant (β = 0.156, 95% CI

[0.078, 0.252]), accounting for 29.8% of the total effect. The indirect effect mediated by mindful attention awareness (MAA) was 0.170 (95% CI [0.084, 0.275]), constituting 32.5% of the total effect. The indirect effect through perceived stress (PS) was 0.123 (95% CI [0.072, 0.209]), contributing 23.5% to the total effect. Furthermore, the serial mediating effect through both MAA and PS was 0.075 (95% CI [0.040, 0.123]), representing 14.2% of the total effect. Taken together, MAA and PS not only independently mediated the association between mindfulness-based Tibetan Dance and resilience but also operated sequentially as serial mediators. The three indirect pathways jointly accounted for 70.2% of the total effect. The total effect of mindfulness-based Tibetan Dance on resilience was 0.523 (95% CI [0.441, 0.634]). However, it should be noted that these proportions represent relative shares of the total effect decomposition and do not necessarily reflect fully independent contributions, as the mediators may share overlapping variance and the pathways may interact in the overall model.

Table 6
Results of Bootstrap Analyses

Mediating path	Effect	LLCI	ULCI	Proportion of total effect
MBTD→R	0.156	0.078	0.252	29.8%
MBTD→MAA→R	0.170	0.084	0.275	32.5%
MBTD→PS→R	0.123	0.072	0.209	23.5%
MBTD→MAA→PS→R	0.075	0.040	0.123	14.2%
Total effect	0.523	0.441	0.634	

Note: MBTD = Mindfulness-Based Tibetan Dance; R= Resilience; MAA = Mindful Attention Awareness; PS = Perceived Stress. All effects are standardized coefficients (β). LLCI = lower limit of bias-corrected 95% confidence interval; ULCI = upper limit of bias-corrected 95% confidence interval.

Discussion

Effects of mindfulness-based Tibetan Dance on college students' resilience, mindful attention awareness, and perceived stress

- Resilience is an important protective factor that buffers the adverse effects of stressful situations such as adversity and trauma and promotes psychological recovery (Yu S et al., 2022). College students' psychological development, academic achievement, employability, and interpersonal interactions all place high demands on their resilience. The present study showed that systematic participation in mindfulness-based Tibetan Dance (MBTD) was associated with significantly higher resilience among college students. With its unique movement forms, profound cultural connotations, and rich value implications, MBTD offers a new pathway for improving college students' resilience and provides new ideas for cultivating positive psychological qualities. The

emotional expression of MBTD is deeply rooted in the production, life, and cultural traditions of the Tibetan people. “Xie” and “Zhuo,” the two main types of Tibetan self-entertainment dance, are also important carriers of participants’ emotional self-regulation (Liu QM et al., 2019). MBTD requires participants to regulate their emotional states and bodily movements simultaneously, externalizing inner psychological experiences into movement expressions and thereby achieving mind–body integration. In this process, college students express themselves through bodily movement, which helps them form a positive psychological state and shape positive psychological qualities. Resilience comprises three dimensions—fortitude, self-improvement, and optimism—and the spiritual traits embedded in MBTD culture, such as perseverance, optimism, and positivity, are highly consistent with the core characteristics of resilience.

- From the perspective of intervention mechanisms, existing research has shown that dance movement therapy is a psychological intervention mediated by dance and movement and has unique advantages in expressing and releasing stress and emotions through bodily movement (Gu L et al., 2024). The Kumala combination in MBTD, with its well-regulated musical rhythm and movement arrangement, gives participants a sense of control and power. A free, controllable, and relaxed dance context helps reduce the consumption of cognitive resources by negative emotions, thereby indirectly enhancing the protective effect of resilience by promoting psychological harmony (Yang J et al., 2025). In addition, MBTD has developed relatively well-established emotion regulation functions through long-term cultural accumulation. Participants can actively regulate their emotions while dancing, face fear and unease more positively, restrain emotional impulses, and promote the transformation of negative emotions in a positive direction (Chen C et al., 2023). Related surveys also show that more than 86.7% of respondents affirmed the role of MBTD in emotion regulation and stress release, and 71.7% of students believed that participating in MBTD made them happier and more optimistic (Ning H et al., 2023). Thus, MBTD combines physical fitness with cultural immersion. Its emotion regulation function and mind–body integration practice characteristics can effectively promote the development of college students’ fortitude, self-improvement, and optimism, providing an intervention pathway for university mental health education that combines ethnic characteristics with practical feasibility.
- With respect to the two mindfulness- and stress-related outcomes, the present results further showed that, compared with the control group, the MBTD group reported significantly higher mindful attention awareness and significantly lower perceived stress at posttest. Mindful attention awareness is oriented toward the “present” and entails non-judgmental awareness of immediate experience; it is characterized by non-judgmental discernment and reduced susceptibility to external interference. Perceived stress, in contrast, is oriented toward the “future” and refers to individuals’ worry about and threat appraisal of potential threatening events, making it more susceptible to external environmental influences (Munusamy S et al., 2025). This divergence in temporal orientation and cognitive nature provides a theoretical rationale for specifying the order of the serial pathway. Existing research also supports this direction: among patients with depression comorbid with insomnia, mindful attention awareness is significantly negatively correlated with perceived stress, and the former can attenuate the promoting effect of perceived stress on insomnia (Chen H

et al., 2025). At the same time, because this serial pathway accounted for only a modest share of the total effect, the effects of MBTD on resilience may also operate through parallel mechanisms such as cultural identity, sense of group belonging, and physical self-efficacy, which may attenuate the relative contribution of a single serial pathway (Sun L et al., 2026).

- From the perspective of mindfulness, MBTD requires participants to continuously attend to body posture, breathing rhythm, and movement transitions during rhythmic movement. This focus on present-moment bodily experience shares important functional similarities with the state of present-moment awareness cultivated by mindfulness training (Lu XK et al., 2015). The present results indicate that MBTD effectively improved college students' mindful attention awareness, which may in turn make individuals more inclined to approach internal and external experiences with acceptance and awareness. Such an accepting and aware stance may help reduce repeated appraisal of and worry about future threats, thereby lowering perceived stress and potentially supporting the development of resilience (Veerabhadra Swamy DS et al., 2026). In summary, the present findings indicate that MBTD can effectively improve college students' mindful attention awareness and reduce their perceived stress levels. These two mindfulness- and stress-related resources may jointly contribute to the indirect pathway linking MBTD with resilience. However, because the mediators and the outcome were measured concurrently at posttest, this pathway should be interpreted as a statistically estimated association rather than a confirmed causal pathway.

The mediating role of mindful attention awareness between mindfulness-based Tibetan Dance and resilience

- Mindful attention awareness reflects an individual's current level of mindfulness and involves cognitive, emotional, and psychological processes in daily life. A high level of mindful attention awareness prompts individuals to become aware of their present emotions with a non-judgemental attitude and to inhibit automatic impulsive reactions, thereby enhancing emotion management ability (Solem S, et al., 2017). The present study showed that college students' mindful attention awareness increased significantly after participating in mindfulness-based Tibetan Dance. The underlying reason may be that mindfulness-based Tibetan Dance has both emotion regulation and control functions, whereas mindful attention awareness emphasises consciously maintaining attention on present-moment experience and becoming aware of one's current psychological state; the two share the core characteristic of "focusing on the present." At the theoretical level, prior research suggests that MAA supports more flexible attention allocation and emotion regulation and may facilitate non-judgemental acceptance of negative experience through prefrontal–amygdala pathways (Xu SY et al., 2022), thereby strengthening adaptive responding under stress. As the present study did not measure attentional or neural processes directly, this account should be read as a theoretical interpretation rather than a mechanism verified in our sample.
- The present study found that the mediating effect of mindful attention awareness between mindfulness-based Tibetan Dance and resilience accounted for the highest proportion (32.5%),

indicating that this pathway is a key internal mechanism by which mindfulness-based Tibetan Dance promotes resilience: the emotion regulation ability stimulated by mindfulness-based Tibetan Dance is transformed into an increase in mindful attention awareness, which in turn prompts college students to face life, study, and employment with a more positive mindset. Related research has indicated that mindful attention awareness can improve impulse control, emotional awareness, and emotion regulation strategies, reduce difficulties in emotion regulation, and is an important psychological resource for individuals' emotion management (Spataro P et al., 2025). Resilience is college students' adaptive capacity for coping with external pressure, and stress mostly arises from stressful stimuli. When stressors appear, they attract individuals' attention and activate stimulus–outcome associations. mindfulness-based Tibetan Dance, which has mindfulness-training qualities, helps college students evaluate stimuli more flexibly and prompts them to consciously reflect on and reappraise current stressors, thereby coping with stress more effectively (Liu FB et al., 2024). This process further illustrates that mindful attention awareness plays an important mediating role between mindfulness-based Tibetan Dance and resilience.

- In summary, mindful attention awareness plays a key mediating role between mindfulness-based Tibetan Dance and resilience, and its mediating effect accounts for the highest proportion, indicating that this pathway is an important internal mechanism by which mindfulness-based Tibetan Dance promotes resilience. By participating in mindfulness-based Tibetan Dance, college students can more effectively become aware of and accept present-moment experience and respond flexibly to stress, thereby enhancing their resilience.

The mediating role of perceived stress between mindfulness-based Tibetan Dance and resilience

- The present study found that perceived stress plays a significant mediating role between mindfulness-based Tibetan Dance and resilience; that is, mindfulness-based Tibetan Dance can not only directly enhance resilience but also indirectly strengthen resilience by reducing perceived stress. This result is consistent with existing research in several respects. The present study verified the negative predictive effect of perceived stress on resilience, consistent with the conclusion that stress perception negatively predicts resilience. The sense of loss of control and tension generated by individuals in stressful situations weakens their ability to mobilise physical and mental resources to cope with adversity, thereby manifesting as lower resilience (Jia XY et al., 2022). In this study, the mediating effect of perceived stress accounted for 23.5%, further highlighting the importance of this variable in mindfulness-based Tibetan Dance enhancing resilience. Related research also shows that resilience is significantly negatively correlated with perceived stress, and resilience plays a mediating role in the path of mindfulness alleviating perceived stress, supporting the stability and universality of the mechanism path of "reducing perceived stress—enhancing resilience" (Khalaf T et al., 2024).
- As an embodied cultural and artistic activity, mindfulness-based Tibetan Dance can effectively reduce perceived stress, and its mechanism can be understood from the perspective of mind–body

integration. mindfulness-based Tibetan Dance integrates rhythmic bodily movement, focused movement control, and cultural emotional expression, contains a large number of “flexion” and “extension” movement elements, and carries cultural identity and a sense of group belonging; dancers display an indomitable and positive spiritual character through a rich movement vocabulary. These characteristics are highly consistent with the “present-moment awareness” advocated by mindfulness training in core mechanisms and may help individuals reduce repeated appraisal of threatening stimuli. Existing research has shown that positive coping strategies such as problem solving, cognitive reappraisal, and social support are associated with lower perceived stress, whereas negative strategies such as fantasy, self-blame, avoidance, and social withdrawal are associated with higher stress (Onieva-Zafra MD et al., 2020); related research has also found that positive coping strategies such as problem solving and cognitive reappraisal are significantly negatively correlated with perceived stress (Tang Y et al., 2025). The learning process of mindfulness-based Tibetan Dance requires continuous adjustment of movement coordination and adaptation to setbacks, a process that may promote individuals’ cognitive flexibility and problem-solving ability, thereby reducing repeated appraisal of threatening stimuli. In addition, individuals with high trait emotional intelligence often have stronger coping self-efficacy and are more inclined to appraise stressful situations as challenges rather than threats, thus exhibiting lower perceived stress (Khalaf T et al., 2024). The emotional awareness and regulation emphasised by mindfulness-based Tibetan Dance may share similar psychological processes with this adaptive stress appraisal style. Accordingly, this study speculates that mindfulness-based Tibetan Dance may reduce perceived stress by promoting positive coping and reducing repeated appraisal of threatening stimuli, ultimately enhancing resilience.

- In summary, perceived stress is an important mediating variable in the effect of mindfulness-based Tibetan Dance on resilience. Through rhythmic movement, focused control, and cultural emotional expression, mindfulness-based Tibetan Dance helps individuals transform stress coping styles and reduce threat appraisal, thereby indirectly enhancing resilience.

Conclusion

- The empirical results indicated that the 15-week mindfulness-based Tibetan Dance intervention was significantly associated with improvements in college students’ resilience and mindful attention awareness and with reductions in perceived stress; the intervention group showed significantly greater posttest scores and pretest-to-posttest improvements than the aerobic control group. Mediation analyses further showed significant indirect associations between mindfulness-based Tibetan Dance group assignment and resilience via mindful attention awareness and via perceived stress, respectively, and the serial indirect path through mindful attention awareness and perceived stress was also significant. In the estimated model, mindfulness-based Tibetan Dance group assignment was significantly directly associated with resilience and was also significantly indirectly associated with resilience, possibly through enhanced present-moment awareness and reduced perceived stress. However, because the mediators and the outcome were measured concurrently at

posttest, these mediation paths should be interpreted as statistically estimated indirect associations and possible psychological mechanisms rather than a confirmed causal chain. Future research should use multi-wave measurements or experimental manipulation of the mediators to further test causal direction and long-term effects.

Limitations of the study

This study has several limitations. First, the sample consisted entirely of female college students, resulting in a single-sex sample and limiting the generalisability of the findings. Second, subjective rating scales were used; although common method bias was assessed, this approach has limited sensitivity. Third, only pretest and posttest measurements were administered, and no follow-up data were available to assess the long-term maintenance of intervention effects. Fourth, The control group received aerobics rather than a non-mindful Tibetan dance condition; therefore, the present design cannot fully isolate the unique effect of mindfulness from cultural, musical, and movement-specific elements of Tibetan dance. Future research could expand the sample to include male students and different grade and ethnic groups to enhance the representativeness of the findings; incorporate objective physiological indicators (e.g., EEG, heart rate) and behavioural measures to compensate for the limitations of subjective scales; and further explore parallel mediating mechanisms, such as cultural identity and sense of group belonging, to construct a more comprehensive theoretical model.

Declarations

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Author contributions

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Availability of data and materials

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

Ethical approval

This study involving human participants was reviewed and approved by the Ethics Committee of the Tangshan Normal University (TSTC2026-2-3). All methods were performed in accordance with the

relevant guidelines in Declaration of Helsinki. Participation in this study was voluntary. All students provided their informed consent and filled in anonymous questionnaires.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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Figures

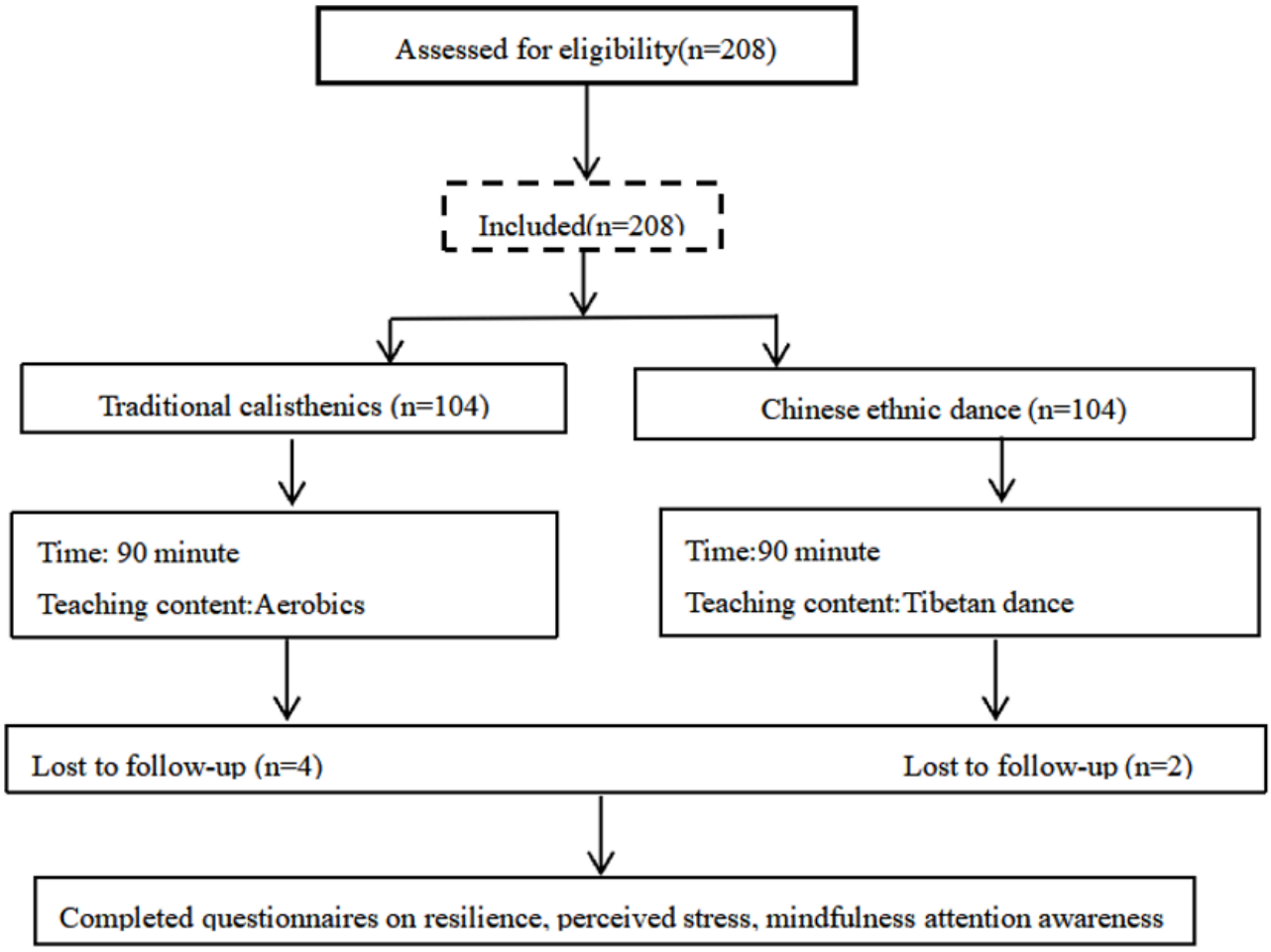


Figure 1

Research Procedure

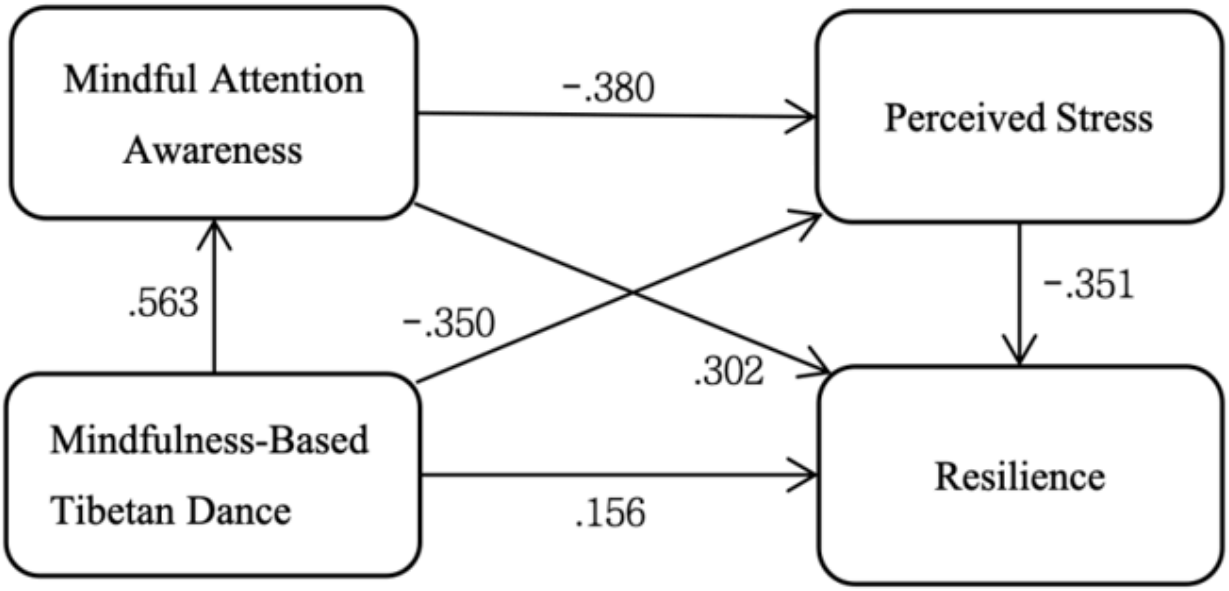


Figure 2

Mediation model showing the roles of mindful attention awareness and perceived stress in the relationship between mindfulness-based Tibetan Dance and resilience.