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Emotion regulation and stage anxiety management in Ruan students: Psychological interventions in performance education

Regulação emocional e gestão da ansiedade de palco em estudantes de Ruan: intervenções psicológicas na educação para o desempenho artístico

Zhenzhen Jia
Department of Chinese Music, Zhejiang Conservatory of Music, Hangzhou, Zhejiang, China
jiazz@zjcm.edu.cn

Abstract: The musical and personal growth of musicians is severely hampered by performance anxiety, yet there aren't many culturally relevant psychological programs available for students learning traditional Chinese instruments like the ruan. In order to lessen stage anxiety and improve emotion regulation, this study assessed an eight-week organized psychological program that included ruan-specific training with mindfulness exercises and cognitive behavioral strategies. Thirty-six Ruan students from four top Chinese conservatories were randomly divided into two groups: the experimental group had weekly 90-minute sessions integrated into their performance curriculum, while the control group received only traditional training. Standardized surveys, performance self-ratings, expert jury assessments of standardized extracts, semi-structured interviews, and acoustic analysis were used to evaluate the results. The experimental group demonstrated significant psychological improvement compared with the controls: general anxiety scores decreased from 62.0 to 54.0, adaptive reappraisal increased from 21.9 to 28.0, maladaptive cognitive regulation decreased from 56.0 to 46.5, and music performance anxiety scores decreased from 112.0 at baseline to 95.8 at follow-up. Jury scores improved across every musical

dimension (for instance, phrasing went from 3.2 to 4.4 on a five-point scale), and self-efficacy and visual analog performance assessments also increased consistently with these expert assessments. Acoustic measurements showed more consistent timing and pitch. Interview themes emphasized the importance of graduated exposure employing ruan-specific tremolo passages, pluck sequences, and recital walk-ons, and described increased poise, attention, and confidence on stage.

Keywords: Chinese music; music education; musicians; performance anxiety; psychological intervention; ruan.

Resumo: O crescimento musical e pessoal dos músicos é severamente prejudicado pela ansiedade de palco, contudo, não existem muitos programas psicológicos culturalmente relevantes disponíveis para estudantes que aprendem instrumentos tradicionais chineses como o ruan. Para diminuir a ansiedade de palco e melhorar a regulação emocional, este estudo avaliou um programa psicológico organizado de oito semanas que incluiu treino específico para o ruan com exercícios de mindfulness e estratégias cognitivo-comportamentais. Trinta e seis estudantes de ruan de quatro dos principais conservatórios chineses foram divididos aleatoriamente em dois grupos: o grupo experimental participou em sessões semanais de 90 minutos integradas no seu currículo de performance, enquanto o grupo de controlo recebeu apenas a formação tradicional. Foram utilizados questionários padronizados, autoavaliações de desempenho, avaliações de excertos padronizados por um júri especializado, entrevistas semiestruturadas e análise acústica para avaliar os resultados. O grupo experimental demonstrou uma melhoria psicológica significativa em comparação com o grupo de controlo: os escores de ansiedade geral diminuíram de 62,0 para 54,0, a reavaliação adaptativa aumentou de 21,9 para 28,0, a regulação cognitiva desadaptativa diminuiu de 56,0 para 46,5 e os escores de ansiedade da performance musical diminuíram de 112,0 na avaliação inicial para 95,8 no follow-up. As avaliações do júri melhoraram em todas as dimensões musicais

(por exemplo, o fraseado passou de 3,2 para 4,4 numa escala de 5 pontos), e a autoeficácia e as avaliações visuais analógicas do desempenho também aumentaram. Em consonância com estas avaliações de especialistas, as medições acústicas mostraram maior constância no ritmo e na afinação. Os temas das entrevistas enfatizaram a importância da exposição gradual, empregando passagens de tremolo específicas para o ruan, sequências de dedilhado e entradas triunfais no recital, e descreveram maior desenvoltura, atenção e confiança em palco.

Palavras-chave: música chinesa; educação musical; músicos; ansiedade de performance; intervenção psicológica; ruan.

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1. Introduction

One of the most commonly reported psychological issues among musicians in training and professional practice is music performance anxiety (MPA). In higher music education, prevalence estimates often range from 30% to 50%, with a significant minority of students exhibiting clinically serious symptoms (Barros et al., 2022; Gómez-López and Sánchez-Cabrero, 2023). Accuracy, expressiveness, and long-term well-being are all compromised by symptoms, which usually include bodily arousal, intrusive cognitions, negative self-evaluation, and decreased attentional control (Bakhtiari et al., 2025; Viator et al., 2024).

Many different types of therapies have been tried. The most well-established programs are mindfulness and cognitive-behavioral therapy (CBT), which have been shown to increase emotion regulation and reduce anxiety in both clinical and conservatory populations in a modest and long-lasting manner (Kinney et al., 2025; Mahony et al., 2022). Additional flexibility is demonstrated by preventive formats such as acceptance-based interventions and group-based coaching. Digitally distributed mindfulness or flow-training modules are examples of hybrid and technology-supported techniques that have increased accessibility and demonstrated quantifiable improvements in attentional control and coping (Gómez-López and Sánchez-Cabrero, 2024).

Scandinavian research highlights that expectations of excellence and self-efficacy strongly shape symptom intensity (Waehning et al., 2018). Research also emphasizes the significance of contextual and cultural elements. While Chinese studies demonstrate that psychological capital, including resilience, self-esteem, and flow, predicts performance outcomes, structured therapeutic programs are rarely incorporated into conservatory curricula (Jiang and Tong, 2024). In Chinese conservatories, social support has also been found

to be protective; nevertheless, there is still a lack of systematic application of psychological training strategies (Z. Fan and X. Fan, 2021).

Pedagogical demands interact with these psychological processes in instrument-specific ways. The ruan, a plucked lute central to traditional Chinese ensembles, requires mastery of the right-hand "Tan Tiao" technique. pluck sequences, rapid tremolo passages, and precise ensemble cuing (Zhang, 2024). These tasks are technically exacting and often performed under evaluative conditions such as juries or public recitals, which intensify attentional load and error salience (Ma and Chen, 2024).

There are still significant gaps in MPA research despite its expansion. First, the majority of intervention research is given at the level of "musicians in general," with little focus on how mistake patterns and technical demands vary by instrument and may necessitate specialized psychological training. Second, rather than assessing organized, curriculum-embedded interventions under realistic evaluative performance conditions, previous research in the Chinese conservatory context frequently focuses on correlational predictors (such as psychological capital and social support). Third, while much research focuses mostly on self-report results, fewer integrate psychological improvement with objective performance markers and independent performance evaluation (such as blindfolded jury judgments). Therefore, whether short, structured CBT-mindfulness programs can be included in instrument studios in a way that results in both reduced anxiety and quantifiable performance gains remains unknown.

There are eleven higher music conservatories in China that shape professional music training, systematic psychological support for traditional instruments remains rare. The Shanghai Conservatory of Music, the Central Conservatory of Music, the China Conservatory of Music and the Zhejiang Conservatory of Music are the four prestigious institutions that are the focus

of this study, which looks at how an eight-week program based on CBT and mindfulness can be incorporated into ruan performance education. From a psychological perspective, the study elucidates the emotional and cognitive underpinnings of stage anxiety; from a pedagogical perspective, it demonstrates how interventions can be tailored to the technical and expressive requirements unique to Ruan. Compared to traditional training, the method was supposed to reduce performance anxiety and enhance emotional control and musical results. The results provide a workable strategy for incorporating psychological research-based training into conservatory curricula, promoting student performance and well-being while supporting the culturally sound preservation of traditional Chinese music.

1.1 Literature review

In all musical specialties, music performance anxiety (MPA) is a common occurrence. High incidence rates among professionals and students are regularly reported by research. According to one of the first extensive studies, 16.5% of musicians had anxiety that was severe enough to affect their performance, and 21% had significant levels of anxiety (de Lima et al., 2024). According to recent polls, between 21% and 50% of student musicians report experiencing performance anxiety, which hinders their ability to prepare and perform in front of an audience (Bao and Yu, 2025). These numbers show how persistent the issue is and how it affects long-term engagement in music as well as skill development and confidence.

Extensive research into psychological therapies has been spurred by the need to address these negative effects. Evidence for cognitive-behavioral treatment (CBT) is the strongest. CBT and associated behavioral programs produced medium effect sizes (d = 0.53) in reducing MPA across varied cultural and instrumental settings, according to a meta-analysis of 14 trials involving 392 individuals (Faur et al., 2023). Conservatories are also increasingly adopting mindfulness-based programs;

eight-week courses have been linked to gains in attentional control and decreases in state and trait anxiety (Deshpande et al., 2024). Another potential strategy is acceptance and commitment coaching. The flexibility of acceptance-based techniques was demonstrated by a six-week pilot program that used musicians in dance and theater settings, resulting in quantifiable reductions in anxiety and increases in psychological flexibility (Bakhtiari et al., 2025).

These techniques are expanded upon by acceptance-based approaches. Acceptance and commitment coaching has been shown to lower anxiety and increase psychological flexibility in a six-week pilot program tailored for dance and theater performers. According to broader comprehensive evaluations, psychological therapies typically outperform passive or no-treatment controls. These interventions range from CBT and mindfulness to biofeedback and hybrid models (Nicholl and Abbott, 2025). Although there is currently little data from musician-specific samples, new developments, such as the combination of virtual reality and music therapy, have revealed further advantages for mental health and anxiety management (Liu et al., 2025).

The focus of recent research has shifted from only therapeutic approaches to situational adaptation and common coping mechanisms. According to empirical research, musicians frequently employ deep breathing, positive self-talk, focus, and prepared practice strategies to reduce performance anxiety (Irie et al., 2023). Another extensive analysis discovered that among the most common coping mechanisms used by musicians are emotion-focused techniques, including deep breathing, relaxation, rehearsal, and familiarity with the performance space (Gómez-López and Sánchez-Cabrero, 2023). Avoidance and seeking for social support have been associated with increased anxiety levels in musicians, according to broader coping theory (e.g., social support and avoidance positively correlated with MPA in conservatory students) (Biasutti and Concina, 2014).

There are still theoretical arguments. According to some studies, MPA should be reframed as a typical and occasionally helpful aspect of performance rather than being treated only as a problem (Westerlund, 2019). This viewpoint is consistent with stress models that differentiate between debilitative anxiety, which impairs performance, and facilitative anxiety, which increases attention. These viewpoints emphasize the need for adaptable interventions that strike a balance between tolerable arousal and reduced detrimental symptoms (Nurhidaya et al., 2025).

The experience of anxiety and the suitability of therapies are further influenced by the cultural environment. Anxiety symptoms are exacerbated in Chinese conservatories by the obligation to maintain cultural heritage and attain technical proficiency. According to surveys, many Chinese music students experience performance anxiety, which has an impact on their academic performance and general well-being (Blair and van der Sluis, 2022). Students who report strong peer and teacher support have considerably lower anxiety ratings than those with poorer networks, suggesting that perceived social support serves a protective effect (Huawei and Jenatabadi, 2024). These results highlight the need for interventions to be cognizant of institutional and cultural realities, as well as psychological factors.

Additionally, recent studies show that music performance anxiety should be considered as a factor that directly affects musical communication, interpretive control, and performance quality rather than only as a psychological illness. Performance anxiety is linked to strong evaluative pressure, perfectionist standards, and the cultural obligation associated with conventional music training in Chinese conservatory settings, all of which may limit expressive flexibility during performance (Bao and Yu, 2025). According to recent reviews, coping mechanisms such as breathing control, mindfulness, graded exposure, and cognitive restructuring are most effective when

applied to real performance scenarios rather than viewed as general relaxation methods (Bakhtiari et al., 2025). Additionally, better emotional regulation may facilitate increased attentional stability and embodied awareness during performance, according to mindfulness-based work with musicians (Paese and Schiavio, 2025). Anxiety management may affect how performers arrange sound, timing, phrasing, and stage communication, as psychological flexibility has also been linked to perceived performance quality (Viator et al., 2024). This viewpoint is especially pertinent to ruan performances, as the performer's emotional and physical control are intimately linked to right-hand articulation, tremolo continuity, tone color, phrase structure, and stage presence.

There are still holes in the research despite its scope. With little adaptation to Chinese environments, most interventions have been evaluated in conservatories in the West. Despite being a key plucked lute in traditional Chinese ensembles, there are still very few studies that are instrument-specific and almost none that concentrate on the ruan. Research on instruments such as the erhu and guzheng already shows that anxiety is heightened by cultural symbolism and technical demands, suggesting that ruan performers may face comparable or even greater difficulties (Yuan, 2024). One important gap in the literature is the lack of empirical research on this group.

Overall, research shows that between one-fifth and one-half of musicians suffer from MPA, that treatments such music therapy, acceptance-based methods, cognitive behavioral therapy, and mindfulness have moderate advantages, and that social context and emotional control have a significant mediating effect (Gómez-López and Sánchez-Cabrero, 2023). Nonetheless, a significant gap is highlighted by the paucity of culturally appropriate and relevant research on the Ruan. Interventions tailored to the cultural and pedagogical requirements of Chinese traditional instruments will be necessary to close this gap, preserve the musical legacy, and promote students' welfare.

1.2 Problem statement

Stage anxiety is common but not adequately handled in the formal curriculum in China, where music conservatories place a high value on technical proficiency and cultural preservation. No empirical research has been done on the ruan, a core plucked lute in Chinese traditional ensembles, although early studies have looked at anxiety among students of instruments like the guzheng and erhu. Both theoretical understanding and useful tactics for assisting student performers are constrained by this gap.

This study aims to assess the efficacy of psychological therapies tailored to the requirements of Ruan students, with a focus on mindfulness-based and cognitive-behavioral techniques.

The tasks used to achieve the aim of the study:

1. to perform a baseline survey on the degree of stage anxiety experienced by Ruan students.

2. to create and implement an intervention program that combines mindfulness and cognitive-behavioral methods.

3. to use performance evaluations and validated instruments to measure changes in anxiety and emotional regulation before and after the intervention.

4. to evaluate the effects of an intervention throughout a predetermined research period in comparison to a control group.

5. conducting and analyzing participant interviews in order to assess their subjective perceptions of the interventions.

2. Methodology

The randomized controlled research design, theoretical framework, participant recruitment and allocation, intervention content, study procedure, measurement tools, qualitative

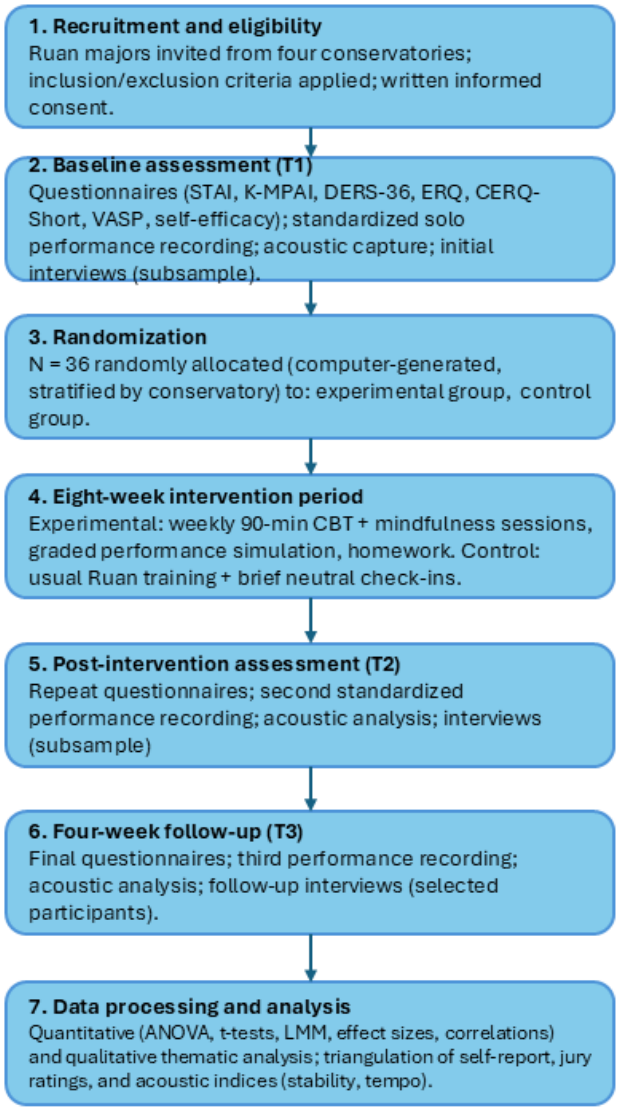
interview process, jury-based performance evaluation, statistical analysis, and acoustic analysis are all covered in this section. In order to assess the impact of the CBT-mindfulness intervention on stage anxiety, emotion control, and ruan performance quality, these subsections collectively describe how psychological, musical, behavioral, qualitative, and auditory data were gathered and examined.

2.1 Research design

Two parallel groups participated in the randomized controlled trial. The data-gathering period in 2024 was March through June. Four prestigious Chinese conservatories—the Shanghai Conservatory of Music, the Central Conservatory of Music, the China Conservatory of Music and the Zhejiang Conservatory of Music - were used to recruit participants. A computer-generated sequence was used to randomly allocate equal numbers of eligible students to the experimental and control groups. Both groups were reviewed after the intervention was implemented for 8 weeks. Three measurements were taken: baseline (pre-intervention), post-intervention, and follow-up. Changes in stage anxiety, emotional control, and performance outcomes were assessed using a combination of quantitative and qualitative methods.

Figure 1 shows the recruitment and baseline assessment (T1), randomization, the eight-week CBT + mindfulness intervention, the post-intervention assessment (T2), the four-week follow-up (T3), and the final quantitative–qualitative data analysis of the randomized controlled trial.

Figure 1 - Flow of participants and research stages



Source: developed by the author

2.2 Theoretical framework

The intervention was based on mindfulness techniques that promote nonjudgmental awareness of physical sensations and performance-related thoughts, as well as cognitive-behavioral models of music performance anxiety, which link MPA to maladaptive threat appraisals, increased self-focused attention, and avoidance-based coping. It was anticipated that cognitive restructuring, graded exposure, and mindfulness

training would reduce catastrophic thinking and promote more adaptive emotion regulation. The framework also drew on Chinese musical-aesthetic themes, particularly yun or qiyun (resonance, charm, and expressive vitality) and qi (breath, vital energy, and embodied flow), to reinforce the intervention's cultural foundation. These principles were viewed as educational concepts that connected respiration, physiological regulation, sound production, and expressive continuity in ruan performance rather than as distinct psychological characteristics. In this way, rather than being offered solely as clinical anxiety-management strategies, mindfulness and breathing exercises were connected to the performer's ability to maintain inner flow, tone resonance, phrase direction, and musical presence (Mynbayeva et al., 2025; Solovyeva et al., 2023; Zhou and Yu, 2024).

The selection of psychological, acoustic, and performance-related outcome measures was further influenced by self-efficacy theory, which postulated that repeated, scaffolded mastery experiences in simulated high-pressure contexts would strengthen performance self-efficacy and translate into lower anxiety and more stable, fluent execution.

2.3 Participants

36 Ruan students from four Chinese conservatories; Shanghai Conservatory of Music, the Central Conservatory of Music, the China Conservatory of Music and the Zhejiang Conservatory of Music, were chosen for the study using purposive and convenience sampling. Departmental announcements, studio class presentations, posters, and online resources (WeChat student groups, conservatory email lists, forums for traditional instrument learners) were all employed in the recruitment process. Written informed consent was given by each participant (Table 1).

An a priori power analysis suggested a minimal total sample of N=30 for a medium-to-large effect (Cohen's d≈0.75), α=0.05, power=0.80; a target of N=36 (18 each group) was set to account for attrition. A computer-generated randomization list generated in R (Random Sampling function) was used to randomly assign participants who met the inclusion criteria to either the experimental or the control group. The list was stratified by conservatory so that each institution contributed roughly equal numbers to both groups. Group assignments were carried out using numbered, sealed, opaque envelopes that were opened only after the baseline assessment was finished. The randomization sequence was created by a researcher who was not involved in data collection.

Inclusion criteria were as follows:

1. Three years or more of formal Ruan study.

2. Enrollment at one of the member conservatories on a full-time basis.

3. A score above the cut-off on the Spielberger State-Trait Anxiety Inventory (STAI) or the Kenny Music Performance Anxiety Inventory (K-MPAI) indicates elevated stage anxiety.

4. Range of ages: 15–25.

Exclusion criteria were as follows:

1. Diagnosis of mental illnesses, either current or previous.

2. Continuous medication or psychological therapy for anxiety.

3. Performance ability is limited by hearing or motor limitations.

4. Absent or partial consent.

Participants were divided into two groups at random: the experimental group (n = 18) received the intervention, while the control group (n = 18) continued their regular ruan training, which included weekly one-on-one professional lessons (60–90

min), technique classes with specific right-hand "Tan Tiao" pluck patterns, tremolo control and scale/arpeggio drills, repertoire coaching on assigned solo works, ensemble rehearsals (1–2 per week), and required individual practice (≈8–12 hours per week). Beyond standard teacher comments, the control group received no psychological materials (no performance-simulation exercises, mindfulness exercises, cognitive restructuring, or relaxation coaching).

Table 1 - Demographic characteristics of participants

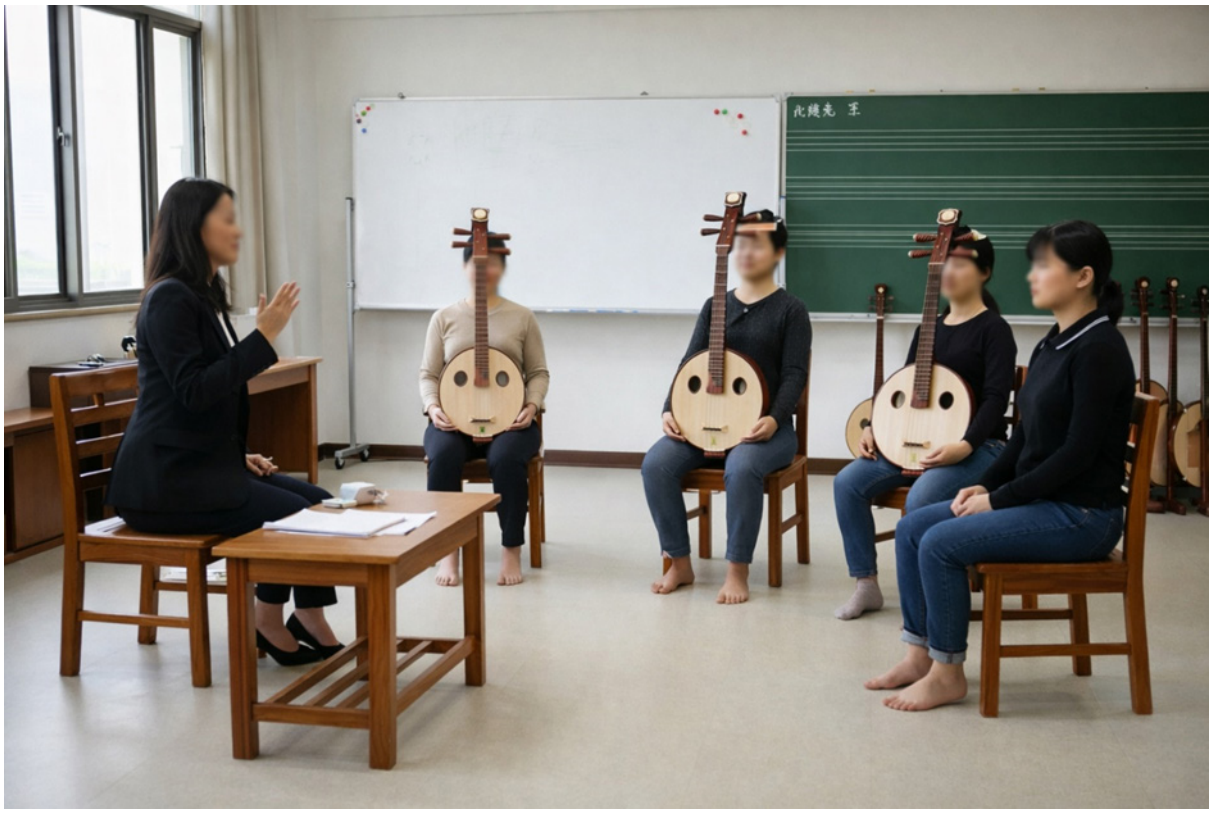
Variable	Experimental (n=18)	Control (n=18)	Total (N=36)
Age (M ± SD)	20.4 ± 1.8	20.6 ± 1.9	20.5 ± 1.8
Gender (F / M)	13 / 5	12 / 6	25 / 11
Years of ruan study (M ± SD)	6.2 ± 1.5	6.3 ± 1.4	6.2 ± 1.4
Conservatory – Central (Beijing)	5	4	9
Conservatory – Shanghai	4	5	9
Conservatory – China (Beijing)	4	5	9
Conservatory – Zhejiang (Hang-zhou)	5	4	9

Source: developed by the author

2.4 Interventions

The experimental group's weekly ruan performance-training regimen included an eight-week psychosocial intervention. Trained facilitators led each 90-minute session in small groups. Rather than being offered as a broad anxiety-reduction treatment, the curriculum included cognitive-behavioral and mindfulness-based strategies that were tailored to the technical and artistic demands of ruan performance. Figure 2 shows a typical small-group CBT-mindfulness session in a Ruan classroom.

Figure 2 - Simulation image of small-group CBT–mindfulness session in a Ruan classroom



There were five primary components to the intervention. Initially, students were assisted in identifying and replacing automatic negative ideas about jury evaluation, public errors, technological failure, and loss of expressive control using cognitive restructuring exercises. Second, diaphragmatic breathing and progressive muscle relaxation were used in relaxation training, with a focus on easing tension in the hands, wrists, shoulders, and upper body prior to performance. Third, mindfulness training promoted nonjudgmental awareness of physical sensations, sound production, attention, and performance-related thoughts. Fourth, right-hand Tan Tiao articulation, fast tremolo passages, phrase endings, dynamic shaping, ensemble-like cueing, mock jury examination, and simulated recital entrances were among the more challenging ruan performance scenarios that students encountered in graded performance simulation. Fifth, daily breathing,

mindfulness, and pre-performance self-regulation exercises served as brief homework assignments that reinforced the in-class activities.

In addition to helping students maintain musical continuity, expressive timing, tone stability, and stylistically controlled sound under evaluation pressure, these exercises were created to lessen anxiety. As seen in Figure 3, the performance-simulation component included technical exercises, ensemble-like cueing, mock jury role-play, and simulated recital entrances.

Figure 3 - In-person classroom practice of the intervention program

During these exercises, facilitators also discussed the connections between Chinese musical-aesthetic concepts of qi and yun and breathing, physical relaxation, and focused concentration. Pupils were urged to equate reduced physical strain to clearer tone resonance, to associate calm breathing with the continuity of musical energy, and to comprehend phrase ends as both technical completions and times of emotive

release. The development of solid sound, controlled tremolo, natural phrase flow, and emotive appeal under performance pressure were among the brief class talks that connected mindfulness practice with ruan-specific interpretation (Huang and Yang, 2025).

Individual lessons, technical sessions, repertoire coaching, ensemble rehearsals, and independent practice were all part of the control group's regular ruan instruction during the research period. Participants in the control group attended quick weekly check-ins that lasted ten to fifteen minutes in order to account for attention effects. These check-ins did not contain mindfulness exercises, cognitive restructuring, relaxation training, graded exposure, or other psychological intervention materials; instead, they concentrated solely on study progress and rehearsal planning.

2.5 Study procedure

Between March and June of 2024, information was gathered at the four participating conservatories. Participants completed the baseline assessment, which included standardized questionnaires, a recorded ruan performance test, and preliminary interviews with a selected subsample of students, following recruitment and eligibility screening.

Participants were randomly assigned to the experimental or control group after the baseline evaluation. After that, the experimental group finished the eight-week CBT-mindfulness intervention, while the control group kept up their routine ruan training and went to quick weekly check-ins without any psychological intervention material. Over the course of the trial, attendance, adherence to intervention activities, and participation in planned evaluations were all recorded.

All participants finished the post-intervention evaluation at the conclusion of the eight-week intervention. This comprised a second standardized ruan performance test, videotaped and

then assessed by blinded expert jurors, in addition to the same battery of questionnaires. A selective subsample of participants from both groups participated in semi-structured interviews to learn more about their experiences with stage anxiety, coping mechanisms, and perceived shifts in performance confidence.

Four weeks after the intervention concluded, a follow-up evaluation was conducted. At this point, participants finished the last battery of questionnaires, an additional recorded performance task, and, if necessary, follow-up interviews. All institutions used the same data-collecting techniques, and outcome assessors were kept in the dark about group assignment.

2.6 Instruments

The Spielberger State-Trait Anxiety Inventory (STAI) and the Kenny Music Performance Anxiety Inventory (K-MPAI) were used to quantify stage anxiety. The Difficulties in Emotion Regulation Scale (DERS-36), the Emotion Regulation Questionnaire (ERQ), and the Cognitive Emotion Regulation Questionnaire (CERQ-Short, 18 items) were used to measure emotional regulation (Cerolini et al., 2022).

The Visual Analog Scale for Performance (VASP) and the Music Performance Self-Efficacy Scale were used to assess performance self-beliefs. Three expert jurors used a predefined rubric to score standardized performance tasks that were videotaped; inter-rater reliability was computed.

2.7 Qualitative data collection

A purposive subsample of 8 individuals (six women, two men), evenly distributed between the experimental and control groups, participated in semi-structured interviews led by two experienced researchers. Interviews were planned for both the follow-up and the week after the post-intervention performance evaluation (Appendix A). The sessions took place in calm

classrooms at the various institutions and lasted between thirty to forty minutes each. A pre-planned interview technique served as a framework for open-ended questions that asked participants to reflect on their experiences with stage anxiety, their opinions on the intervention activities, and their self-reported improvements in performance confidence.

All interviews were audio-recorded, verbatim transcribed, and subjected to thematic analysis using a combination of theory-informed and data-driven coding in NVivo 14, with consent.

2.8 Performance assessment by jury members

The quality of the performances was evaluated by four experienced jurors, all of whom had taught and performed traditional Chinese instruments, including the ruan, for more than ten years. The jurors had no connection to the intervention and were oblivious to the group assignment.

Students were recorded performing a standardized passage from Wu Junsheng's modern Chinese ruan/zhongruan work, The Night of the Torch Festival ((*Huoba Jie zhi Ye* / 火把节之夜) at baseline, post-intervention, and follow-up. The passage was chosen because it incorporates common ruan techniques such as Tan/Tiao alternation, tremolo, accentuated plucking, dynamic contrast, and exposed phrase endings, along with lyrical melodic structuring and rhythmically energetic plucked-string composition. The passage was appropriate for evaluating how stage anxiety impacts technical stability and musical interpretation because of these qualities.

All recordings were anonymized and randomized prior to scoring. Stage presence, intonation, rhythm, tone quality, and phrasing were the five categories on which jurors rated each performance on a 5-point Likert scale. The jurors' scores were averaged for analysis. The two-way random intraclass correlation coefficient (ICC(2,k)) was used to assess inter-rater reliability, which demonstrated excellent agreement.

The scoring categories were created with Ruan-specific performance methods in mind. Technical stability was mirrored in rhythm and intonation, particularly in tremolo passages and alternating pluck patterns. The stability, projection, and color of sound generated by right-hand control were all considered aspects of tone quality. Phrasing evaluated cadential completion, phrase direction, and melodic grouping. Stage presence encompassed both the performer's ability to convey musical intention under evaluation pressure and their outward display of confidence. Instead of viewing performance solely as a technical outcome, the juror rubric linked psychological regulation to observable musical interpretation.

2.9 Statistical data processing

Data analysis was conducted using R 4.3.2 and SPSS 27. Means, standard deviations, and 95% CIs were computed as descriptive statistics. The Shapiro-Wilk and Levene tests examined homogeneity and normality. ANOVA and t-tests were used to analyze group differences, and linear mixed models were used to handle repeated measures. Cohen's d and partial η^2 were used to report effect sizes.

Using Pearson or Spearman correlations, relationships between practice logs and auditory characteristics were evaluated. NVivo 14 was used to analyze interview transcripts. Radar diagrams, boxplots, violin plots, scatter plots, and spectrograms were used to display the results.

A triangulation approach that integrated acoustic performance metrics, external jury evaluations, and self-report questionnaires was used to assess the results. This mixed-method approach enabled cross-validation of results spanning behavioral, auditory, and psychological domains.

Key statistics were calculated using standard formulas:

Arithmetic means of a variable X:

(1) $$\overline{X}=\frac{1}{n}\sum_{i=1}^{n}X_i$$

Standard deviation:

(2) $$s=\sqrt{\frac{1}{n\text{-}1}\sum_{i=1}^{n}(X_i\text{-}\overline{X})^2}$$

95% confidence interval for the mean:

(3) $$\overline{X}\mp t_{\frac{\alpha}{2},df}\cdot\frac{s}{\sqrt{n}}$$

Cohen's *d* for independent groups:

(4) $$d=\frac{\overline{x_1}\text{-}\overline{X_2}}{s_p}\ ,\ s_p=\sqrt{\frac{(n_1\text{-}1)s_1^2+(n_2\text{-}1)s_2^2}{n_1+n_2\text{-}2}}$$

Cohen's *d* for paired (pre–post) comparisons:

(5) $$d=\frac{\overline{D}}{s_D}$$

where $\acute{D}$ is the mean of the difference scores and is s_D their standard deviation.

2.10 Acoustic analysis

108 standardized solo performance recordings from 36 participants (18 experimental, 18 control) that were taken at baseline, right after the eight-week intervention, and at the four-week follow-up were subjected to objective acoustic analysis. Recordings were included if they (a) contained a complete take of the prescribed examination excerpt, (b) were free of obvious extraneous noise, clipping, or technical artifacts, and (c) were captured with the prescribed microphone position and level.

Digital audio was recorded in a quiet practice room using a cardioid condenser microphone placed about 30–40 cm from the Ruan and a 24-bit / 44.1 kHz audio interface. Praat and custom scripts were used to segment and analyze the main examination excerpt for each included performance.

Pitch standard deviation (Hz) around the target fundamental (intonation stability), local jitter (%) as a measure of cycle-to-cycle frequency fluctuation, and tempo variability, operationalized as the standard deviation of inter-onset intervals (ms) throughout the excerpt, were the three performance stability indices that were extracted. These parameters were first computed separately for each participant and time point and then averaged within group. For one student in the experimental group, the resulting acoustic indicators were triangulated with self-report measures, jury ratings, and illustrative spectrograms taken before and after the intervention. Pitch stability and jitter indicated the consistency of tone production, while tempo variability indicated whether anxiety-related hesitation or acceleration disrupted phrase continuity. These acoustic indicators were interpreted as supporting evidence of musical control rather than as replacements for artistic evaluation.

Tempo variability, operationalized as the standard deviation of inter-onset intervals (ms), pitch standard deviation (Hz) around the target fundamental, and local jitter (%) as a measure of cycle-to-cycle frequency fluctuation, was retrieved as a performance-stability metric. These indexes were not designed to penalize agogic timing, rubato, or expressive flexibility. Rather, they were employed to record inadvertent instability linked to stage anxiety, such as pitch fluctuations, erratic tremolo generation, hesitancy before exposed notes, hurrying through technically challenging parts, or inconsistent timing brought on by physiological arousal and hand stress.

Acoustic measurements were interpreted in conjunction with the jury assessments rather than separately in order to maintain this distinction. When intentional expressive timing assisted dynamic structuring, cadential motion, or phrase direction, it was deemed musically suitable. On the other hand, when they interfered with musical flow, sudden timing deviations, unstable attacks, excessive pitch fluctuation, and inconsistent tremolo continuity were perceived as anxiety-related instability. Thus, tempo variability revealed whether inadvertent hesitation or acceleration disturbed phrase continuity, while pitch stability and jitter indicated the consistency of tone generation. Instead of being used to replace artistic evaluation, these auditory markers were viewed as supporting evidence of musical control.

2.11 Ethical considerations

The ethics committees at the Shanghai Conservatory of Music (Protocol No. 72; Date of Approval: 7 February 2024), the Central Conservatory of Music (Protocol No. 9898; Date of Approval: 22 February 2024), the China Conservatory of Music (Protocol No. 887; Date of Approval: 25 February 2024), and the Zhejiang Conservatory of Music (Protocol No. 249; Date of Approval: 2 February 2024) approved the study procedure. Prior to enrollment, each subject gave written informed consent. Data was anonymized to preserve confidentiality, and recordings were stored on encrypted drives accessible only by the research team. Students may opt out at any time without incurring any penalties, as participation was entirely voluntary.

2.12 Limitations

The study's focus on four esteemed conservatories limits the applicability of its findings to smaller or less selective institutions, and its small sample size (N = 36) reduces statistical power and precludes robust subgroup analysis. Despite reflecting the normal demographics of Ruan programs, the sample's preponderance of female students skewed the gender

balance. Even with randomization, the data is susceptible to response biases like social desirability when self-report surveys are used. It's also possible that the four-week follow-up and eight-week intervention are insufficient to fully capture the long-term stability of improvements in emotion regulation and anxiety reduction. Lastly, only outcome assessors were blinded; participants and facilitators were aware of group assignment, which could have created anticipation effects.

3. Results

Stage anxiety, emotion control, performance self-efficacy, juror-rated performance, musical-interpretive shifts, and qualitative interview topics are the primary outcome categories for which the study results are presented in this section. The findings assess the impact of the CBT-mindfulness intervention on Ruan students using a combination of quantitative, acoustic, performance-based, and qualitative data.

3.1 Stage anxiety outcomes

The inclusion criteria were confirmed by baseline scores, which showed significantly higher general and stage-related anxiety in both groups, with mean STAI-Trait exceeding 40 and mean K-MPAI above 100. Stage-anxiety results varied between groups over the course of eight weeks. Table 2 illustrates that the experimental group's K-MPAI and STAI-State scores decreased, while the control group's largely remained the same.

Table 2 - Stage Anxiety Outcomes (K-MPAI Scores)

Group	Time	K-MPAI (M ± SD)	STAI (M ± SD)	Exp vs Ctrl (p)	Within-group Δ vs Baseline (Cohen's d, p)
Experimental (n=18)	Baseline	112.0 ± 13.8	62.0 ± 7.8	0.72	—
	Post-intervention	100.5 ± 13.2	56.0 ± 7.9	<0.001	K-MPAI: d=0.86, p<0.001; STAI: d=0.77, p<0.001

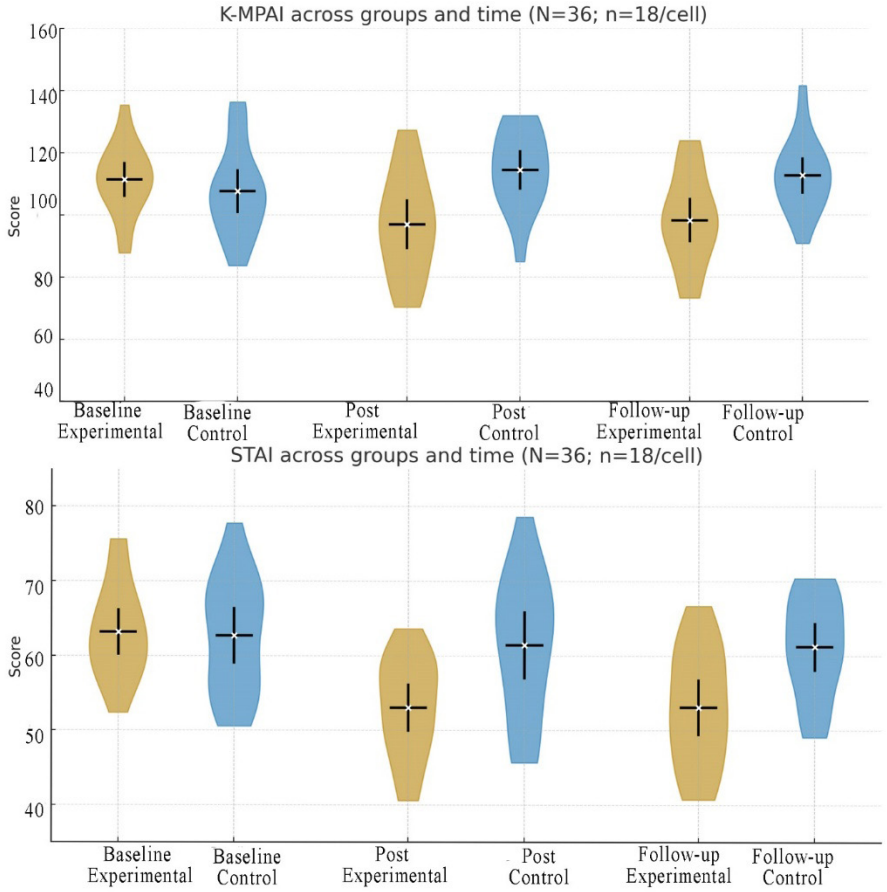
	Follow-up	95.8 ± 12.5	54.0 ± 7.4	<0.001	K-MPAI: d=1.22, p<0.001; STAI: d=1.05, p<0.001
Control (n=18)	Baseline	111.5 ± 14.6	62.7 ± 8.1	—	—
	Post-intervention	110.2 ± 14.2	62.1 ± 8.0	—	K-MPAI: d=0.09, p=0.48; STAI: d=0.07, p=0.56
	Follow-up	110.6 ± 13.7	62.4 ± 7.9	—	K-MPAI: d=0.06, p=0.62; STAI: d=0.04, p=0.69

Source: developed by the author

A significant Group × Time interaction was found for both measures in a 2 (Group) × 3 (Time) mixed ANOVA (K-MPAI: $F(2,68)=12.8$, $p<0.001$, $\eta p^2=0.28$; STAI-State: $F(2,68)=9.7$, $p<0.001$, $\eta p^2=0.23$). Only the experimental group showed significant declines according to post-hoc contrasts: STAI-State baseline→post $d=0.77$, $p<0.001$; baseline→follow-up $d=1.05$, $p<0.001$; K-MPAI baseline→post $d=0.86$, $p<0.001$; baseline→follow-up $d=1.22$, $p<0.001$. The observed gains were exclusive to the intervention, as all within-group comparisons in the control group were nonsignificant (all $p>0.45$).

The means, SDs, and 95% CIs for each group at each time point are presented in Table 2. Violin plots are shown in Figure 4, where the control distributions stay steady while the experimental distributions move lower with less spread at follow-up. All things considered, the findings show that the eight-week training significantly reduced both general and music-specific performance anxiety among Ruan students.

Figure 4 - Distribution of K-MPAI scores across groups and timepoints



Source: developed by the author

3.2 Emotional regulation outcomes

Changes in emotion regulation were centered in maladaptive cognitive strategies (CERQ-Maladaptive), as Figure 4 demonstrates. The two groups (n=18 per group) showed a significant, long-lasting decrease in rumination, catastrophizing, and related responses from 56.0 at baseline to 48.2 post-intervention and 46.5 at follow-up (SDs 8.6, 8.1, 7.9; 95% CIs ±3.97, ±3.74, ±3.64). The control group (55.6 → 55.2 → 55.1; SDs 8.4–8.3; CIs ±3.88–3.83) was virtually unchanged. This divergence is shown by the non-overlapping trajectory in Figure 4, where the control line is horizontal, and the experimental line declines quickly after training before stabilizing at follow-up.

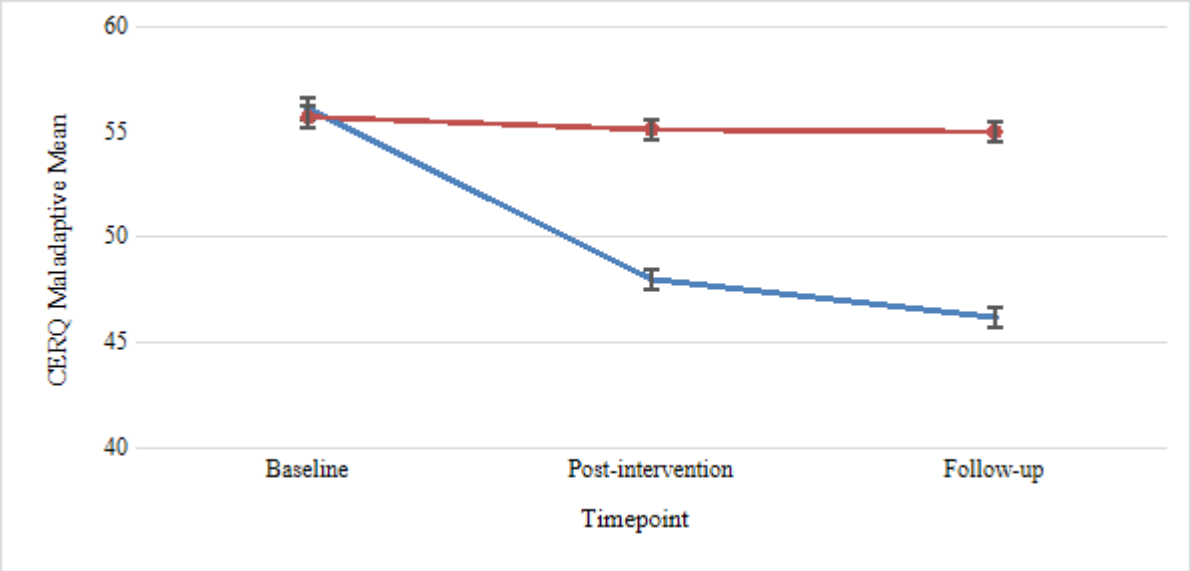
The other scales listed in Table 3 showed consistent trends: ERQ-Reappraisal increased (21.9→27.0→28.0), DERS decreased (92.0→80.1→76.0), and ERQ-Suppression decreased (17.5→14.5→13.8) in the experimental group, with negligible change in the controls. Together, Table 3 and Figure 5 reveal that the intervention increased adaptive techniques and decreased maladaptive regulation; at follow-up, CERQ-Maladaptive had the strongest group separation and maintenance.

Table 3 - Emotional regulation outcomes across groups and timepoint

Group	Time	DERS_M	DERS_SD	ERQ_ Reappraisa_M	ERQ_Reappraisa_SD	ERQ_Supp_M	ERQ_Supp_SD	CERQ_Mal_M	CERQ_Mal_SD
Experimental	Baseline	92	13.4	21.9	4.3	17.5	4	56	8.6
Experimental	Post-intervention	80.1	12.8	27	4.5	14.5	3.7	48.2	8.1
Experimental	Follow-up	76	12	28	4.4	13.8	3.6	46.5	7.9
Control	Baseline	91.5	13.6	22	4.2	17.4	3.9	55.6	8.4
Control	Post-intervention	90.8	13.4	22.5	4.2	17	3.8	55.2	8.3
Control	Follow-up	90.2	13.2	22.7	4.3	16.9	3.7	55.1	8.3

Source: developed by the author

Figure 5 - Changes in CERQ-Maladaptive scores across baseline, post-intervention, and follow-up



Source: developed by the author

Overall, the findings show that the intervention improved adaptive emotion regulation while decreasing maladaptive cognitive processes, with CERQ-Maladaptive showing the strongest group divergence.

3.3 Performance self-efficacy and self-evaluation

Prior to training, the groups' baseline scores on the Music Performance Self-Efficacy Scale and VASP were similar (Table 4), suggesting similar levels of confidence and self-perception. The experimental cohort (n = 18 per group) demonstrated significant improvements: VASP increased from 52.1 to 68.3 (+16.2 points; +31.1%), and self-efficacy increased from 58.7 to 71.4 (+12.7 points; +21.6%). After the intervention, changes were already noticeable (self-efficacy 68.2, VASP 65.7), and at follow-up, they were either maintained or somewhat improved. The control group, on the other hand, showed virtually no change (self-efficacy 59.2→61.0; VASP 51.7→53.2).

Rather than being measurement artifacts, these convergent improvements across two independent self-report indicators point to a significant increase in perceived competence and performance satisfaction. The pattern is consistent with a training-specific effect on confidence and self-evaluation that lasts for several weeks after the intervention as compared to the nearly flat control trajectory.

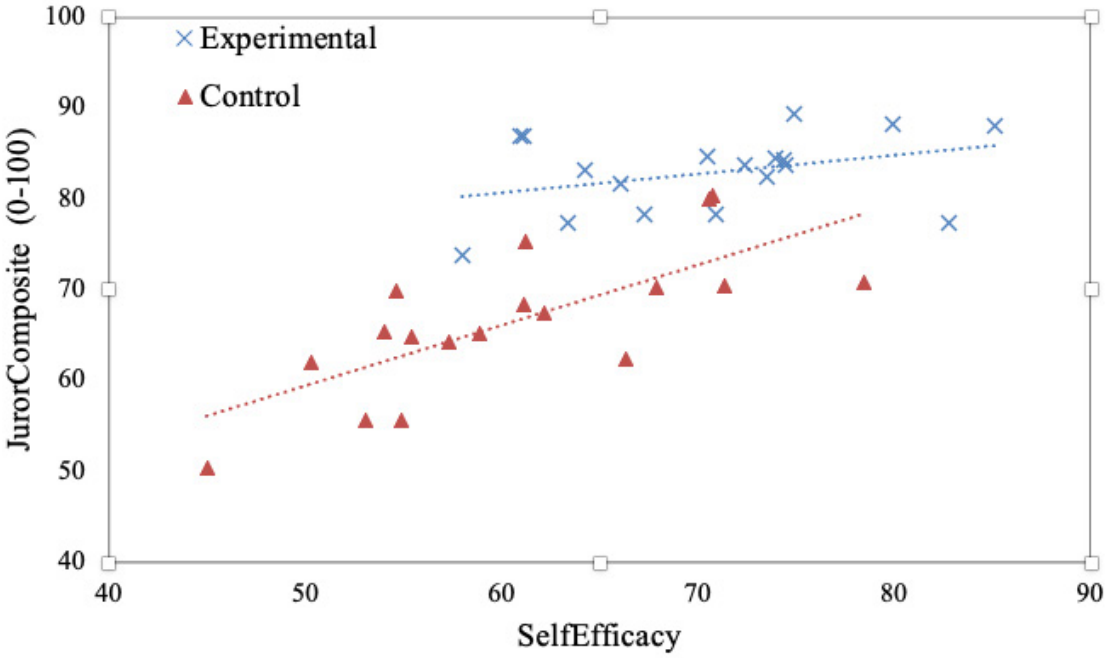
Table 4 - Descriptive statistics for Music Performance Self-Efficacy Scale and VASP across groups and timepoints.

Group	Timepoint	Self-Efficacy (M ± SD)	95 % CI (±)	VASP (M ± SD)	95 % CI (±)
Experimental	Baseline	58.7 ± 9.3	4.29	52.1 ± 10.1	4.66
Experimental	Post-intervention	68.2 ± 8.8	4.06	65.7 ± 9.2	4.25
Experimental	Follow-up	71.4 ± 8.6	3.95	68.3 ± 9.4	4.33
Control	Baseline	59.2 ± 9.1	4.21	51.7 ± 10.4	4.79
Control	Post-intervention	60.1 ± 9.0	4.16	52.6 ± 10.2	4.70
Control	Follow-up	61.0 ± 8.9	4.11	53.2 ± 10.1	4.66

Source: developed by the author

The relationship between internal confidence and external performance evaluation is seen in Figure 6. Students who felt more capable tended to earn higher scores on expert assessments, as evidenced by the strong positive association between self-efficacy scores and juror ratings across observations ($r = 0.61$, $p < .001$). The experimental group's regression line indicates that improvements in juror-rated performance were closely correlated with increases in self-efficacy following the intervention. This movement toward stronger confidence and higher scores is reflected in the experimental participants' grouping in the upper-right section of the plot.

Figure 6 - Self-Efficacy vs. Juror-Rated Performance



Source: developed by the author

When combined, these trends show that the intervention helped students convert psychological improvements into observable performance quality rather than only improving their subjective feelings. The results' ecological validity is strengthened by the convergence of self-efficacy, VASP scores, and juror evaluations, which also lends credence to the idea that improved self-belief is a crucial mechanism by which psychological training might boost musical outcomes.

3.4 Performance assessment (juror ratings)

All four metrics were clearly improved by the experimental group by post-intervention and follow-up. The average evaluations for rhythm rose from 3.3 to 4.3, tone from 3.0 to 4.1, phrasing from 3.2 to 4.4, and stage presence from 3.0 to 4.3. The control group, on the other hand, showed only slight, non-significant modifications (e.g., phrase 3.2→3.3, stage presence 3.1→3.3). Significant Group × Time interactions were found for

all four dimensions (all $p<0.001$) in a 2 (Group: experimental vs. control) × 3 (Time: baseline, post, follow-up) mixed analysis of variance on student-level mean ratings, suggesting that performance gains were specific to the intervention rather than to repeated testing or routine training.

At follow-up, there were significant differences between the groups: Cohen's d was roughly 1.6 for rhythm and tone, 2.2 for phrasing, and 1.8 for stage presence, all of which were consistent with significant intervention effects.

The reliability of the juror evaluations was supported by excellent inter-rater agreement (ICC(2,k)=0.87, 95% CI 0.82–0.91), indicating that measurement error is unlikely to account for the observed improvements.

A more thorough assessment that is in line with ruan education is provided by timbre and tempo stability. Phrasing and timbre showed the biggest gains, indicating improved line breath-shaping and steadier right-hand control (Tan Tiao, tremolo). Additionally, tempo stability significantly improved, consistent with respondents' reports of decreased physiological strain (Table 5).

Table 5 - Juror-rated performance outcomes across groups and timepoints (M ± SD, 5-point scale).

Group	Time	Rhythm Accuracy	Tempo Stability	Tone/Timbre	Phrasing	Stage Presence
Experimental	Baseline	3.3 ± 0.7	3.1 ± 0.6	3.0 ± 0.6	3.2 ± 0.7	3.0 ± 0.6
	Post-intervention	4.2 ± 0.6	4.1 ± 0.6	4.0 ± 0.6	4.3 ± 0.5	4.2 ± 0.6
	Follow-up	4.3 ± 0.5	4.2 ± 0.5	4.1 ± 0.5	4.4 ± 0.4	4.3 ± 0.5
Control	Baseline	3.3 ± 0.7	3.2 ± 0.6	3.1 ± 0.6	3.2 ± 0.7	3.1 ± 0.6
	Post-intervention	3.4 ± 0.6	3.3 ± 0.6	3.2 ± 0.6	3.3 ± 0.6	3.2 ± 0.6

	Follow-up	3.4 ± 0.6	3.3 ± 0.6	3.2 ± 0.6	3.3 ± 0.6	3.3 ± 0.6

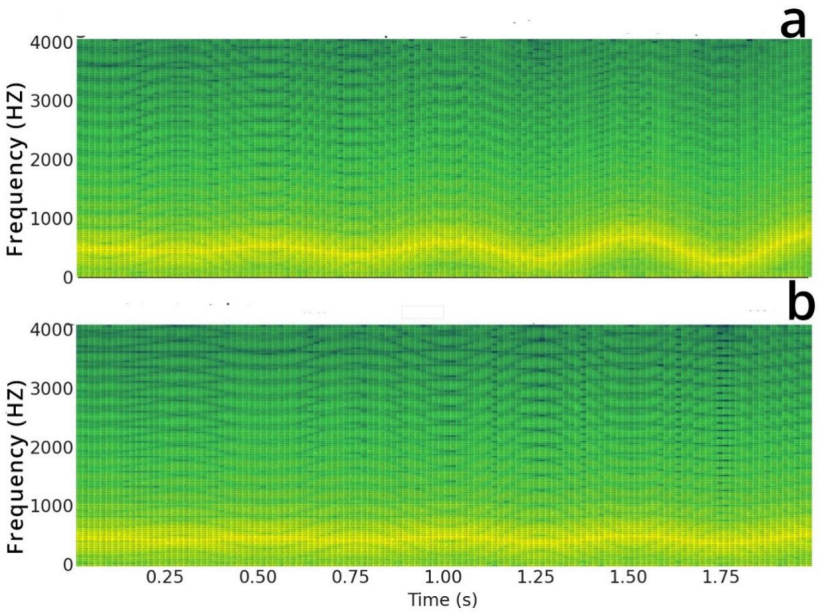
Source: developed by the author

Excellent inter-rater reliability was demonstrated by an intraclass correlation coefficient ICC(2,k)=0.87 (95% CI 0.82–0.91), which confirmed great juror consistency and bolstered confidence in the performance assessments.

These enhancements were validated by objective acoustic analysis of a representative selection of recordings. Pitch standard deviation for the experimental group dropped from roughly ±21 Hz at baseline to ±9 Hz at follow-up, suggesting more stable intonation. Jitter percentage (cycle-to-cycle frequency fluctuation) decreased from 2.3% to 0.9%, while tempo variability (inter-onset interval SD) decreased from 46 ms to 18 ms. These parameters changed very little in the control group (e.g., pitch SD ≈20 Hz, jitter ≈2.1%→2.0%). These patterns can be seen in Figure 7, where the post-intervention spectrogram (b) shows tighter harmonic bands and more stable attacks, whereas the pre-intervention spectrogram (a) shows more pitch drift and irregular harmonic structure. When combined, the jury ratings and acoustic data show quantifiable improvements in both perceived and objective performance quality.

Figure 7 - Spectrograms of representative student performances (a: pre- and b: post-intervention) illustrating improvements in tone stability and intonation accuracy

Source: developed by the author



3.5 Musical-interpretive changes in ruan performance

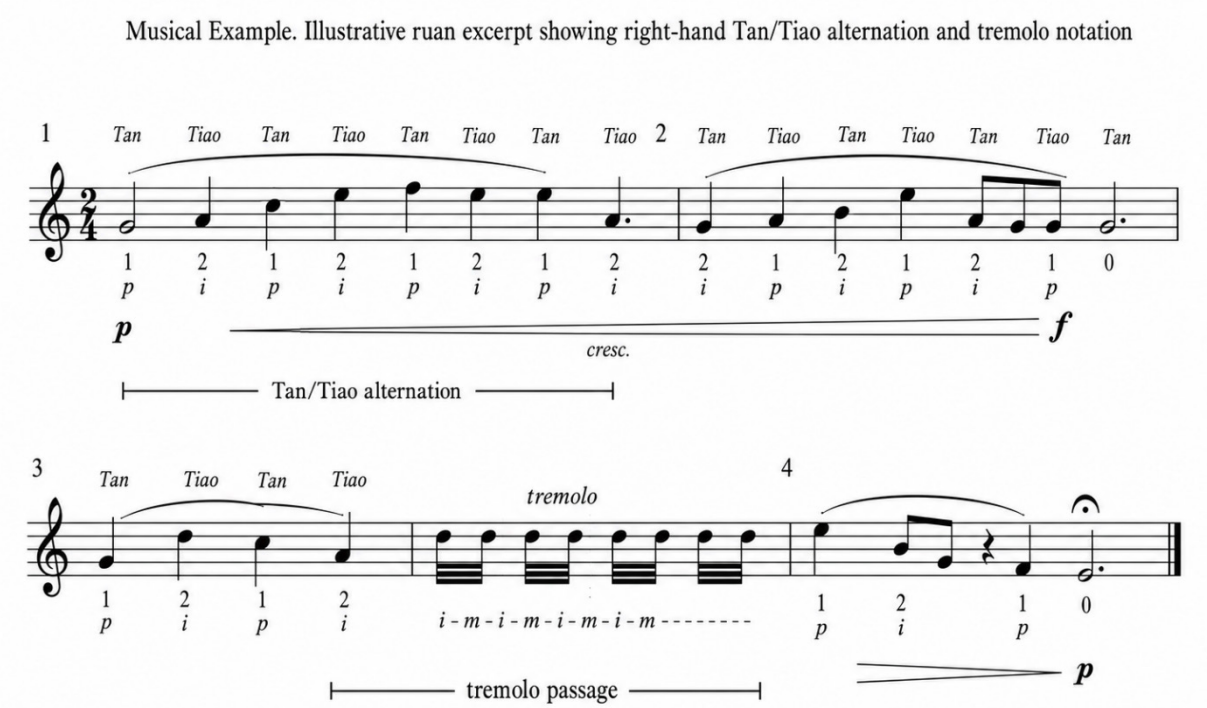
The results indicate that the intervention affected the musical arrangement of the performance, in addition to the numerical improvement in jury judgments. Improved control over melodic grouping, phrase endings, and transitions between technically challenging parts can be inferred from the experimental group's higher phrasing ratings. Tone and timbre improvements point to more steady right-hand control, especially in Tan Tiao articulation and tremolo sections, where a more equal and projected sound would have been supported by less physical tension. Since it implies that students were more adept at maintaining expressive intention under evaluation pressure rather than concentrating primarily on error avoidance, the increase in stage presence was also musically significant.

An author-prepared notated example of the right-hand Tan/Tiao alternation, tremolo notation, fingering/stroke indications, phrase-direction markings, and dynamic shaping used in the standardized ruan performance task is shown in Figure 8 to make the musical content underlying these results transparent. The purpose of the image is to make it clear that

the performance adjustments described here were based on particular ruan techniques rather than overall impressions of performance.

Figure 8 - Musical example from the standardized ruan excerpt used in the performance assessment, showing right-hand Tan/Tiao alternation and tremolo notation

Source: developed by the author



The extract proved particularly appropriate for deciphering anxiety-related changes in performance, as it requires the performer to simultaneously synchronize right-hand articulation, rhythmic precision, phrase direction, and tone projection. Stage anxiety can cause hand and shoulder stress in passages with Tan/Tiao alternation, syncopated attacks, or intervallic shifts, which can disrupt phrase continuity and make the plucked attacks less equal. Because they assisted students in reducing needless muscle contraction, maintaining attention to sound quality, and navigating technically challenging transitions

without interfering with the musical line, mindfulness and breathing exercises were therefore musically useful.

Cognitive load was also linked to rhythm and phrase. Students were required to simultaneously evaluate fingering, stroke direction, pace, tone color, and expressive shape during exposed portions. This multitasking might limit awareness of the larger statement and shift attention to avoiding mistakes under stress. Therefore, the decrease in tempo variability indicates improved control over inadvertent pausing, hurrying, and pulse disruption rather than the elimination of expressive flexibility.

As long as variability is properly understood, the acoustic results are consistent with this view. Reduced jitter and pitch fluctuation indicate fewer inadvertent micro-instabilities in tone creation, particularly in exposed or tremolo-based periods, rather than the performances becoming mechanically uniform. Similarly, agogic subtlety and expressive rubato are not eliminated by decreased tempo variability. It implies that hesitancy, hurrying, or irregular pulse caused by anxiety becomes less noticeable. Therefore, while deliberate expressive timing remained a component of musical interpretation, the observed acoustic alterations should be interpreted as increased control over unintentional instability. These results show improved musical communication, stylistic control, and interpretative continuity in ruan performance when combined with the jury evaluations.

3.6 Qualitative findings

Three major themes emerged from the examination of eight semi-structured interviews that were equally divided between the experimental and control groups. Coding saturation was deemed reached by the sixth transcript, as no additional categories emerged. Each theme was supported by a number of passages; sample statements with group attribution are shown in Table 6.

Prior to the intervention, students in both groups reported having high stage anxiety, which manifested in tense body language, trembling, and intrusive thoughts. One study participant said, "My hands still shook when I imagined the jury watching me, even after years of practice." After the eight-week training, experimental participants reported observable improvements, including better emotional regulation, sharper concentration, and greater composure during performance. They credited mindfulness, relaxation, and cognitive restructuring strategies for these improvements. On the other hand, a number of students in the control group said that their anxiety levels and coping mechanisms had not improved, and some of them still felt self-conscious following the study period.

Only those in the experimental group discussed performance-simulation activities such as jury role-playing and recital walk-ons, which they found stressful at first but ultimately beneficial. They claimed that regular exposure boosted their confidence, lessened their dread of being judged, and normalized evaluation settings.

Table 6 - Themes and representative quotes from student interviews

Theme	Description	Representative Quote	Group
Stage anxiety before intervention	Fear of mistakes, judgment, and physical symptoms such as trembling and rapid heartbeat.	"Before playing, I felt my hands were stiff, and my mind was full of thoughts about what could go wrong." (Control) / "Even after years of practice, my hands still shook when I imagined the jury watching me." (Experimental)	Control / Experimental
Benefits of intervention techniques	Cognitive restructuring reduced negative thoughts; relaxation lowered tension; mindfulness improved focus.	"The breathing exercise made me calmer before stepping on stage, and I could concentrate better on the music itself."	Experimental

Reactions to performance simulation	Jury role-play and walk-ons normalized evaluation situations, reducing fear and increasing readiness.	"At first it was stressful to play in front of a mock jury, but after a few sessions, I felt much less nervous when facing the real one."	Experimental
Post-study reactions of control group	Continued anxiety and unchanged coping patterns after the same training period.	"I practiced more, but the nervous feeling before walking on stage never really went away."	Control

4. Discussion

In keeping with earlier conservatory research without replicating its specific numbers, Ruan students in this study reported significant stage anxiety at baseline, frequent physical symptoms (such as hand tremor), and a strong dread of receiving a poor grade. In this context, the randomized trial demonstrated that, in accordance with the measured scales, a CBT- and mindfulness-based program integrated into Chinese traditional instrument training decreased anxiety related to music performance and general state anxiety and promoted more adaptive emotion-regulation patterns (fewer reported regulation difficulties, less maladaptive coping, greater use of reappraisal). Higher performance self-efficacy, better juror-rated rhythm, tone, phrasing, and stage presence, as well as more consistent intonation and timing in the acoustic analysis—all of which resulted from the methods outlined in the methodology—were associated with these psychological changes. The results support the importance of context-sensitive, instrument-specific psychological training for improving both subjective experience and objectively assessed performance quality, as the intervention explicitly practiced idiomatic Ruan demands such as Tan Tiao right-hand patterns, rapid tremolo passages, and ensemble cueing under evaluative pressure (Paese and Schiavio, 2025).

The majority of students in Turkish conservatories rely on informal, often inadequate coping mechanisms (such as "more practice" or vague self-motivation), and a significant

percentage report no coping mechanisms at all. Survey research has revealed a very high prevalence of music performance anxiety and frequent symptoms like shaky hands. In light of this, the current study demonstrates that Ruan students also have significantly higher baseline stage anxiety. However, a structured CBT-mindfulness program adapted to traditional Chinese instrument training can yield definite advantages, including decreased state anxiety and music performance, increased adaptive emotion regulation, increased performance self-efficacy and VASP ratings, and enhanced juror-rated rhythm, tone, phrasing, and stage presence. Crucially, both male and female Ruan students in the experimental group saw these improvements, indicating that focused, instrument-specific psychological training may help reduce previously noted gender disparities in anxiety related to music performance (Cornett and Urhan, 2021).

Music performance anxiety is positively correlated with self-consciousness and negative affect and inversely correlated with mindfulness, according to a recent network analysis of Spanish classical musicians. This highlights negative affect as a risk factor and mindfulness as a potential protective factor. The current Ruan-focused trial is conceptually consistent with these patterns but goes beyond them in terms of methodology: it employed a randomized experimental design with behavioral outcomes, blinded juror evaluations, and acoustic indicators unique to Ruan performance (intonation stability, timing, and tempo) in place of an exploratory, cross-sectional, self-report network model. By doing this, it provides causal evidence that systematic CBT and mindfulness-based training can reduce performance anxiety and yield quantifiable, objectively recorded, and externally evaluated improvements in idiomatic Ruan playing (Lecuona et al., 2023).

Prior studies employing self-management diaries with Taiwanese student musicians also documented the advantages of techniques including breathing, self-talk, mental rehearsal,

and staged performance scenarios. This study, along with ours, demonstrated that relaxation and cognitive restructuring effectively reduce symptoms. The current study, however, provided experimental evidence of causal effects, with greater decreases in maladaptive regulation and quantifiable auditory improvements, whereas the previous study focused on self-regulated coping and individual adaptability across time. This implies that the advantages of self-guided coping strategies might be enhanced by structured therapies (Huang and Song, 2021).

Following CBT and mindfulness-based therapies, our results of decreased stage anxiety and enhanced emotional regulation are consistent with previous research showing a negative correlation between mindfulness and MPA and a negative effect. The prior study primarily identified dispositional mindfulness as a protective factor in a correlational network, without testing interventions or performance outcomes, whereas our intervention demonstrated distinct reductions in maladaptive cognitive strategies (CERQ) and notable performance gains, as judged by jurors. Our Chinese Ruan students emphasized performance simulation and relaxation as especially beneficial, in contrast to their Spanish sample, in which self-consciousness was a major component of MPA. These findings collectively imply that mindfulness reduces MPA both actively and preventively (Lecuona et al., 2023).

Previous studies have demonstrated a substantial correlation between music performance anxiety and social phobia and perfectionism, especially when bolstered by parental criticism and self-doubt. Although risk variables were identified, the study did not assess treatment techniques. The current findings, on the other hand, offer experimental evidence that organized interventions can mitigate these vulnerabilities by enhancing adaptive control and reducing maladaptive cognitive

tendencies. This implies that both observable musical outcomes and underlying risk factors can be addressed by performance-focused psychological treatments (Dobos et al., 2019).

5. Conclusion

This study showed that an eight-week psychological program designed specifically for Ruan students, which included cognitive-behavioral methods with mindfulness exercises, consistently improved psychological and performance outcomes. In contrast to the control group, the experimental group demonstrated significant decreases in anxiety related to music performance and overall trait anxiety, as well as fewer challenges with emotion regulation, a decrease in the use of maladaptive cognitive processes, and an increase in the application of adaptive reappraisal. Higher VASP scores and self-efficacy in music performance reflected these shifts. Acoustic research revealed more consistent pitch production and cleaner temporal management, while jurors observed more pronounced improvements in rhythm, tone, phrasing, and stage presence. These results were supported by qualitative interviews, which revealed decreased evaluation anxiety, increased emphasis on musical expression, and favorable experiences with mindfulness, relaxation, and performance-simulation exercises.

The study's controlled, instrument-specific evidence that culturally contextualized psychological therapies can yield quantifiable improvements in emotional, cognitive, and behavioral outcomes for players of a traditional Chinese instrument is what gives it scientific validity. The work supports theoretical explanations that position self-regulatory abilities as a crucial mechanism through which psychological training improves performance by linking emotion regulation profiles, self-efficacy, expert ratings, and acoustic markers.

5.1 Practical implications and further research

The findings have applications in music education. By incorporating psychological skills training into instrumental courses, students can gain useful coping skills that lower anxiety, boost confidence, and increase performance satisfaction. The study emphasizes the importance of tailoring treatments to instrument-specific requirements, particularly for Ruan, to promote student well-being and cultural heritage preservation.

To increase generalizability, future studies should replicate the intervention in smaller regional conservatories, investigate gender-specific responses more systematically, and extend the follow-up period to assess the durability of benefits. Comparative research across tools and cultural contexts will also shed light on the interactions between the universal and context-specific components of interventions.

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Appendix A. Semi-Structured Interview Guide

Interview Questions

1. How do you often feel before doing a performance in front of a jury or audience?

2. During a performance, how do you feel physically or emotionally?

3. When performing, how do you usually handle tension or anxiety?

4. Which elements of the intervention-performance simulation, mindfulness, relaxation, or cognitive restructuring-did you find most beneficial?

5. Since finishing the program, have you observed any improvements in your ability to focus, your level of confidence, or your love of performing?

6. How did the performance simulation, which included recital walk-ons and a jury role-play, affect your stage comfort?

7. Did the mindfulness activities help you play with more awareness or focus?

8. What difficulties did you run into when using these methods on a regular basis?

9. How may psychological training for Ruan students be enhanced, in your opinion?

10. Do you think other musicians would benefit from this kind of intervention? Why not?