



Kuram ve Uygulamada Eğitim Yönetimi
Educational Administration: Theory and Practice
2022, Cilt 28, Sayı 2, ss: 161-178
2022, Volume 28, Issue 2, pp: 161-178
www.kuey.net



Empowering Music Students: An Investigation of Psychological Stress and Gender Effects on Piano Performance in Chinese Colleges

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	Abstract
<p>Article History</p> <p>Article Submission 12 July 2022</p> <p>Revised Submission 11 August 2022</p> <p>Article Accepted 8 September 2022</p>	<p>In Chinese institutions, piano performance is a well-liked and established area of study. Numerous colleges provide extensive music curricula with a focus on classical piano performance. Traditional musical education, such as music theory and history, as well as actual performance skills, are frequently covered in the curriculum. In addition to examining the effects of psychological stress and gender on piano performance in Chinese colleges, the study focuses on empowering music students and incorporates planned behaviour theory. There are 420 students from several Chinese institutions participated in an online and in-person survey that collected the data for the analysis. According to the findings of structural equation modelling (SEM), interactive music improves student performance. Additionally, the results of the study showed a connection between students' performance and musical congruence, interactive music, psychological stress, and student empowerment. Cross-sectional analysis, close-ended questions, and quantitative research are all used in the current study. In light of this, innovative and engaging teaching strategies are considered crucial in the field of education. Additionally, a lot of universities provide chances for students to take part in performances and contests, giving them useful experience and exposure to the music business. In general, Chinese institutions maintain high standards for piano performance, and many gifted musicians have graduated from these programme to pursue lucrative careers as soloists, accompanists, and music educators.</p> <p>Keywords: Congruence Music; Interactive Music; Psychological Stress; Planned Behaviour Theory; Student's Performance</p>

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Introduction

Chinese universities have grown and changed significantly over time, reflecting the shifting demands of Chinese society and the economy (Cohen & Bodner, 2019; Fekete, Maidhof, Specker, Nater, & Leder, 2022). Students' lives are significantly impacted by music education since it fosters their creativity, sense of accomplishment, and sense of personal fulfilment (Meinel & Bullerjahn, 2022). However, giving a concert can also cause psychological stress, particularly for kids aspiring to be musicians. This is especially true for piano students, who frequently face intense pressure to deliver excellent performances. Investigating the effects of psychological stress and gender on piano performance in Chinese universities is the goal of this study (Chiat, Ying, Piaw, & Ismail, 2022). The study will concentrate on the experiences of music students and the elements that affect how well they perform. The study's objectives include formulating plans for empowering music students, lowering mental stress, and advancing gender parity in music education. This study will give us important information about the problems music students face and how teachers can help them do well (Larwood & Dingle, 2022). When a piece of music's musical qualities mesh with the listener's individual musical tastes, a sense of resonance and delight is produced. This occurrence is known as music congruence (Baccarani, Donnadiou, Pellissier, & Brochard, 2023). Congruent music might assist people in controlling their emotions. For instance, relaxing music might help you unwind and lower emotional arousal when you're stressed or anxious. Similar to how listening to cheerful or energizing music can help improve your spirits when you're feeling down, it can also boost your positive feelings (Wang, 2022). Congruent music can improve mental health and mood. Music can stimulate good emotions, heighten enjoyment, and produce an emotional resonance when people listen to it. This is especially true when the music matches the listener's intended mood state or emotional resonance (Lu, 2022).

According to Ji, Yang, Lin, and Chen (2023), interactive music is a category of music that enables two-way, real-time connection between the performer and the audience. This method of creating music is distinct from conventional music performance, in which the artist crafts an established musical encounter for the viewers. Contrarily, interactive music enables a more responsive and dynamic musical experience, where the musician and audience members can work together to create original musical experiences (Woropay-Hordziejewicz, Buźniak, Lawendowski, & Atroszko, 2022). Technology breakthroughs that allow for the development of novel musical instruments and software have contributed to the rise in popularity of interactive music in recent years (Ding & Hung, 2021). Video games, installations, concerts, and other contexts frequently use this kind of music. Engaging music has the capacity to alter how people hear music by cultivating a more extensive and engaging musical backdrop (Peng-Li, Chan, Byrne, & Wang, 2020).

It is a typical and adapted reaction to different stressors, which can be either internal or external forces (Larwood & Dingle, 2022). It describes how well pupils are able to demonstrate their knowledge, skills, and talents as well as how far they have come, according to Woropay-Hordziejewicz et al. (2022). Standardised examinations, class assignments, and standardised exams are only a few of the ways that performance can be assessed (Baccarani et al., 2023). Each student has individual traits and factors that can have an impact on their success. Prior knowledge, learning preferences, drive, self-control abilities, and socioeconomic status can all affect how students interact with and respond to the learning environment. Student performance can be improved by developing efficient study habits, organisation, note-taking, time management, and other abilities (Larwood & Dingle, 2022).

The present study focus on empowering music students and an investigation of psychological stress and gender effects on piano performance in Chinese colleges. The current study established own planned behaviour theory. Planned behaviour theory defines as "assumes that individuals act rationally, according to their attitudes, subjective norms, and perceived behavioral control" (Ashaduzzaman et al., 2022). Although not often actively or explicitly taken into account, these elements serve as the framework for making decisions (Larwood & Dingle, 2022). In modern China, there are numerous different types of colleges. There are broad universities, research-focused colleges, and colleges that concentrate on particular academic disciplines. These ideas serve as the foundation for the conceptual framework proposed and really tested in this study; 1.

Music congruence significantly effect on students' performance. 2. Music congruence significantly effect on interactive music. 3. Music congruence significantly effect on psychological stress. 4. Interactive music mediates the relationship between music congruence and students' performance. 5. Psychological stress mediates the relationship between music congruence and students' performance. 6. Empowering students moderates the relationship between interactive music and students' performance. 7. Empowering students moderates the relationship between psychological stress and students' performance.

Literature Review

The present study focus on empowering music students: an investigation of psychological stress and gender effects on piano performance in Chinese colleges, as well as planned behaviour theory involved.

Planned Behaviour Theory

The Theory of Planned Behaviour (TPB) is a social psychological model that aims to predict and explain human behavior (Ashaduzzaman et al., 2022). According to the Theory of Behavioural people's intentions to engage in certain behaviours are influenced by their attitudes towards those behaviours, their subjective norms, and their sense of behavioural control (Scott, Connell, Thomson, & Willison, 2019). A person's attitudes are their positive or negative assessments of the behaviour in question. Subjective norms are a person's impression of what is significant to other people and what other people believe they should do. The ease or difficulty with which a person perceives their ability to manage their behaviour is known as perceived behavioural control (Larwood & Dingle, 2022). Planned behaviour theory has been extensively utilised to predict and explain a variety of health behaviours, including drug use, diet, and physical activity, as well as behaviours connected to environmental sustainability, such recycling and energy saving. The theory has been applied in a number of situations, such as those related to education, health, and public policy, to create successful interventions aiming at altering behaviour.

Students' intents to participate in musical activities might be influenced by their attitudes towards music, subjective norms, and perceived behavioural control, among other factors (Larwood & Dingle, 2022). For instance, students who sense behavioural control over musical activities may be more inclined to engage in them frequently, while those who have favourable views towards music may be more willing to listen to it when they have free time. Students' intents can also be influenced by subjective norms, or the perceived value of participating in musical activities as perceived by peers, family, and other significant persons (Giles, 2020). Educators and educational institutions might develop interventions aimed at boosting musical engagement and enhancing students' academic achievement by comprehending the part that TPB can play in influencing their involvement in musical activities (Hwang, Oh, & Scheinbaum, 2020). They might design educational initiatives that encourage pupils to have a favourable attitude towards music, for instance, or give students chances to participate in musical activities in a welcoming setting. In general, TPB offers a helpful framework for comprehending the connection between students' performance and their participation in musical activities, and it can guide the development of successful educational interventions targeted at fostering academic achievement (Scott et al., 2019).

Music Congruence and Students' Performance

The level to which the audience's musical choices match the music being performed is referred to as music congruence (Lin, Yang, Jiang, & Li, 2022). On the one hand, research indicates that students may exhibit increased levels of enjoyment and inspiration when they listen to music that is consistent with their particular tastes (Braden, Osborne, & Wilson, 2015). This might then result in higher results for learning and academic achievement. The relationship between music congruence and students' performance in Chinese colleges is an area that has received relatively limited research attention (Meinel & Bullerjahn, 2022). But because music education is so important in Chinese colleges, this is a very important area to look into. Similar to other nations, it is anticipated that a variety of individualised, task-related, and environmental factors will influence the relationship between music congruence and students' performance in

Chinese universities (Woropay-Hordziejewicz et al., 2022). For instance, studies suggest that when exposed to music that matches their particular tastes, students who are strongly motivated to study and who have a strong intrinsic interest in music may be more likely to do well (Ji et al., 2023). It is important for instructors and students in Chinese universities to take music congruence into account when choosing piano pieces to play and to aim for a balance between difficulty and fun (Peng-Li et al., 2020). More investigation is required to fully comprehend the connection between music congruence and students' performance as well as to pinpoint the circumstances in which music might either enhance or hinder learning (Chiat et al., 2022; Larwood & Dingle, 2022). The particular task or activity being carried out could also have an impact on how music congruence and performance are related (Ji et al., 2023). For instance, studies suggest that music may enhance performance for normal or repetitive tasks more so than for those requiring intense concentration and high levels of cognitive processing (Fekete et al., 2022). In conclusion, more study is required to comprehend the connection between music congruence and students' academic achievement in Chinese universities and to pinpoint the precise circumstances in which music can enhance or hinder learning.

H1: Music congruence significantly effect on students' performance.

Music Congruence and Interactive Music

The degree to which a piece of music fits into or is appropriate for a certain occasion or context is referred to as music congruence. On the other side, interactive music is described as music that modifies in response to human interaction or the surrounding environment (Ding & Hung, 2021). The relationship between music congruence and interactive music in the context of music and media is that interactive music can be used to dynamically modify the music congruence depending on the environment or scenario. This can make the environment more immersive and improve the overall experience (Hwang & Oh, 2020). For instance, the background music in a video game may adjust in real-time in response to the player's choices, making for a more dynamic and interesting soundtrack. Interactive music can be utilised in this way to improve the experience overall and increase musical congruence (Ramalho et al., 2022). The relationship between music congruence and interactive music on piano performance in Chinese colleges is complex and likely varies between individuals. Thus, the combination of music congruence and interactive music may lead to optimal piano performance in Chinese colleges (Lorente et al., 2021). When choosing songs to play on the piano, it's crucial for instructors and students in Chinese universities to take into account both interactive music and music congruence and to aim for a balance between difficulty and fun (Giles, 2020; Scott et al., 2019).

In Chinese colleges, the relationship between music congruence and interactive music is an active area of research and exploration. Collaboration between these two sectors has the potential to advance many facets of media and technology, including entertainment and education (Hwang et al., 2020). For instance, interactive music can be utilised in the classroom to design immersive learning experiences where the background music alters based on the students' actions. Better learning outcomes may result from a more interesting and motivating environment as a result. Interactive music can be utilised in the entertainment industry to produce dynamic and compelling soundtracks for video games and other media (Lin et al., 2022). This can help increase the music congruence and enhance the overall experience of the users. In general, in Chinese universities, the link between music congruence and interactive music is one of mutual improvement, where interactive music can be used to improve music congruence and the research of music congruence can influence the design of interactive musical platforms (Braden et al., 2015; Cohen & Bodner, 2019; Vaag, Bjerkeset, & Sivertsen, 2021). A user's experience can be made more immersive and engaging when the music fits the situation or environment. For instance, in a video game, the music's background music can be crafted to complement the game's actions and events, giving the soundtrack a more dynamic and cohesive feel. This may assist the gamer become more immersed in the experience and appreciate the game more all-around (Chiat et al., 2022; Hauck & Hecht, 2023). Music congruence can contribute to the creation of a more inspiring and productive environment in various interactive music applications, such as in educational or therapeutic settings. For instance, background music that reflects the culture of the language being taught can enhance and make the learning experience more engaging in a language learning app (Lu, 2022). The positive effect of music congruence on interactive music is that it can make the experience of

interactive music better as a whole (Fekete et al., 2022).

H2: Music congruence significantly effect on interactive music.

Music Congruence and Psychological Stress

Contrarily, music that doesn't fit the circumstance or setting can make people feel more stressed. For instance, trying to unwind or fall asleep while listening to loud, frantic music can stress out the atmosphere and make it difficult to unwind (Chiat et al., 2022). According to studies, listening to music that is congruent can significantly reduce stress. When the music fits the setting or context, it can assist lower stress and promote relaxation. The relationship between music congruence and psychological stress has been studied in light of the fact that music has the power to affect people's emotional states and act as a tool for emotional management (Lu, 2022). Emotional regulation techniques include listening to music that matches one's current emotional state or desired emotional state. For instance, when under stress, people could look for music that expresses their feelings at the time, whether it be upbeat music to lift their spirits or calming music to help them relax. Positive mood states can be facilitated by music congruence, which can lessen the negative effects of stress. An improved mood, a sense of enjoyment, and a diversion from stressors can all be derived from listening to music that is in line with pleasant feelings or individual tastes (Wang, 2022). Music can serve as a distraction, deflecting attention from stressors and refocusing attention. Engaging in music that appeals to one's tastes might provide a momentary escape, enabling people to temporarily divert their focus away from stressful situations or thoughts. It has been demonstrated that some musical genres, such slow or classical music, can cause the body to relax. When under stress, listening to calming music can encourage physiological relaxation, which lowers cortisol levels, lowers heart rate, and eases muscle tension (Chiat et al., 2022; Huang, 2022; Meinel & Bullerjahn, 2022). The term piano performance in Chinese colleges refers to a student's piano playing ability and musical aptitude (Vaag et al., 2021). In addition, music has therapeutic benefits for reducing tension and anxiety. Music may help create a tranquil and relaxing environment that can help induce relaxation and lower stress levels when it is in line with the person's preferences and needs (Baccarani et al., 2023; Chiat et al., 2022). It is significant to remember that each person's experience with the effects of music congruence on psychological stress will be unique because it depends on their own tastes, cultural background, and prior musical experiences (Huang, 2022). It implies that people frequently look for music that corresponds with, reflects, or fits their present psychological state or preferences. Numerous things, including pressures at work, strained relationships, financial troubles, or traumatic occurrences, can cause stress (Bermejo-Franco et al., 2022).

H3: Music congruence significantly effect on psychological stress.

Mediating Role of Interactive Music

Interactive music refers to music that responds dynamically to events or actions in real-time. Compared to traditional music, which is pre-recorded and replayed in a fixed and predetermined way, this genre is different (Fekete et al., 2022). Video games, virtual reality applications, and other interactive media frequently incorporate interactive music (Wang, 2022). In these circumstances, the music's engagement can produce a setting that is more stimulating and productive (Huang, 2022). Interacting as a mediator between many factors that have an impact on students' performance is what is meant by interactive music's mediating role (Peng-Li et al., 2020). Interactive music, for instance, can mediate the connection between a user's activities and their emotional state (Lorente, Vera, & Peiró, 2021). By responding dynamically to the student's actions in real-time, interactive music can help regulate and modulate emotions, reducing stress and increasing feelings of relaxation. Similarly, interactive music can also mediate the relationship between the user's actions and their cognitive performance (Giles, 2020). By responding dynamically to the student's actions, interactive music can create a more engaging and stimulating environment, which can improve focus and task performance (Scott et al., 2019). Interactive music can enhance the impact of music congruence on students' performance by creating a dynamic and responsive environment that can modulate the impact of the music on performance (Ding & Hung, 2021; Woropay-Hordziejewicz et al., 2022). By responding dynamically to the students' actions and needs, interactive music can create a more engaging and stimulating environment that can improve performance. For example, in educational settings, interactive music can be used to create a more engaging and effective learning environment by responding

dynamically to the students' needs and actions (Giles, 2020). By modifying the relationship between music congruence and performance, interactive music can help enhance the overall impact of music on learning and academic accomplishment (Ramalho et al., 2022). In conclusion, interactive music's mediating role stresses the importance of considering how it can be utilised to raise student achievement as well as how it can enhance learning settings by dynamically responding to students' needs and behaviours (Scott et al., 2019). In Chinese educational institutions, piano playing is regularly encouraged as a fundamental part of musical education and is usually used to gauge students' musical potential. In China, the piano is one of the most popular instruments, and many universities offer courses and programmes in the instrument (Hwang et al., 2020). The development of piano performance also requires effective practise and teaching, as well as possibilities for musical expression and creativity (Wang, 2022).

H4: Interactive music mediates the relationship between music congruence and students' performance.

Mediating Role of Psychological Stress

According to studies Baccarani et al. (2023); Hauck and Hecht (2023) music can significantly affect task performance and psychological stress levels. Music that doesn't fit the setting or activity at hand might make people more stressed out and less focused, which lowers performance. On the other hand, music that is appropriate for the setting or task can lower stress levels and sharpen focus, resulting in better performance (Bermejo-Franco et al., 2022). By affecting the effect of music on task performance, psychological stress can mediate the relationship between music congruence and students' performance (Wang, 2022). High levels of stress among students can have a negative effect on their ability to concentrate, think clearly, and perform as a whole (Huang, 2022). One of the most widely utilised instruments in China is the piano, and numerous colleges provide courses and programmes centred on piano performance (Peng-Li et al., 2020). At general, piano playing in Chinese universities is a vital part of musical education and culture in China and continues to have a big impact on students' and performers' musical life. According to studies Baccarani et al. (2023); Braden et al. (2015) music can have a considerable impact on psychological stress levels. Congruence, or how well a person's musical preferences match the music being listened to, can help people feel less stressed. When a person listens to music they enjoy, it can elicit pleasant feelings and make them feel relaxed, which lowers stress levels (Cohen & Bodner, 2019; Meinel & Bullerjahn, 2022). Therefore, it is important to consider musical congruence in stress management interventions involving music. Psychological stress can negatively affect students' performance in colleges (Wang, 2022). High levels of stress can also lead to physical symptoms, such as headaches or stomach problems that can further impede a student's ability to perform well in colleges (Woropay-Hordziejewicz et al., 2022). Stress can also have a bad effect on a student's motivation, making it challenging for them to muster the strength and drive necessary to finish their assignments and perform well on tests. While mild stress can be energizing, it's crucial for students to learn stress management techniques so they can achieve to the best of their abilities in Chinese colleges (Chiat et al., 2022). According to studies, Chinese college students experience high levels of psychological stress, especially those who pursue careers in highly competitive sectors like law and medicine (Braden et al., 2015; Larwood & Dingle, 2022; Lin et al., 2022). Increased stress levels might have a negative effect on kids' academic performance because of the high stakes environment and academic competitiveness. Additionally, traditional cultural norms in China, such as the emphasis on academic accomplishment and filial piety, may raise students' levels of stress (Lu, 2022; Wang, 2022). This can lead to students feeling a lot of stress and worry, especially with the increasing rivalry for jobs. The mediating effect of psychological stress emphasises the significance of taking into account how stress affects task performance and how stress-management techniques, like music, can be utilised to lower stress levels and enhance overall performance and well-being (Fekete et al., 2022).

H5: Psychological stress mediates the relationship between music congruence and students' performance.

Moderating Role of Empowering Students

A key component of education is empowering students, which focuses on developing their self-assurance, independence, and feeling of agency. Students are more likely to take responsibility of their learning, engage in active learning, and acquire critical skills and

competences when they feel empowered (Braden et al., 2015; Vaag et al., 2021). Give youngsters the chance to voice their thoughts, ideas, and perspectives. Allowing students to choose their own themes for projects or tasks is one way to provide them choice and autonomy in the learning process. Students can feel empowered and invested in their education by being encouraged to actively participate and having their voices valued. Give students the chance to collaborate on group projects, conversations, and problem-solving exercises. Collaboration not only improves their social skills but also enables kids to share knowledge, value different viewpoints, and grow a feeling of responsibility for the group (Larwood & Dingle, 2022). Colleges and universities may assist students in managing stress and achieving their full potential by creating an environment that is empowering and supportive (Woropay-Hordziejewicz et al., 2022). It is possible to empower students in a number of ways, such as by giving them the chance to participate in decision-making, encouraging learning autonomy, and encouraging a growth attitude (Bermejo-Franco et al., 2022). In Chinese institutions, empowering students can therefore be a successful strategy for lowering stress levels and enhancing academic achievement (Larwood & Dingle, 2022). Link classroom instruction to real-world situations and applications. Educate pupils on the practical applications of their knowledge and abilities. Students can be empowered by being shown the importance and effects of their learning by being given authentic learning opportunities and illustrating how their education is relevant (Braden et al., 2015; Cohen & Bodner, 2019). The empowering of students can play a moderating role in the relationship between interactive music and students' performances (Larwood & Dingle, 2022). Students who listen to interactive music or music that allows for some user involvement and control may find it to be a very effective way to relieve tension. However, the level of empowerment the student feels can influence how effective it is (Lin et al., 2022). Students are more likely to participate in interactive music activities and get the advantages of lower stress levels when they feel empowered. They might be more likely to participate actively, take charge of their education, and see obstacles and failures with optimism. The association between psychological stress and students' performance might be moderated by student empowerment (Peng-Li et al., 2020). Students may be better able to handle and cope with stress if they feel empowered. They might exhibit improved resilience, problem-solving techniques, and self-control, which can lessen the detrimental impacts of stress on their performance (Hwang et al., 2020).

H6: Empowering students moderates the relationship between interactive music and students' performance.

H7: Empowering students moderates the relationship between psychological stress and students' performance.

The following hypothesis has been formed using the aforementioned literature and hypothesis testing. Figure 1 shows the study framework.

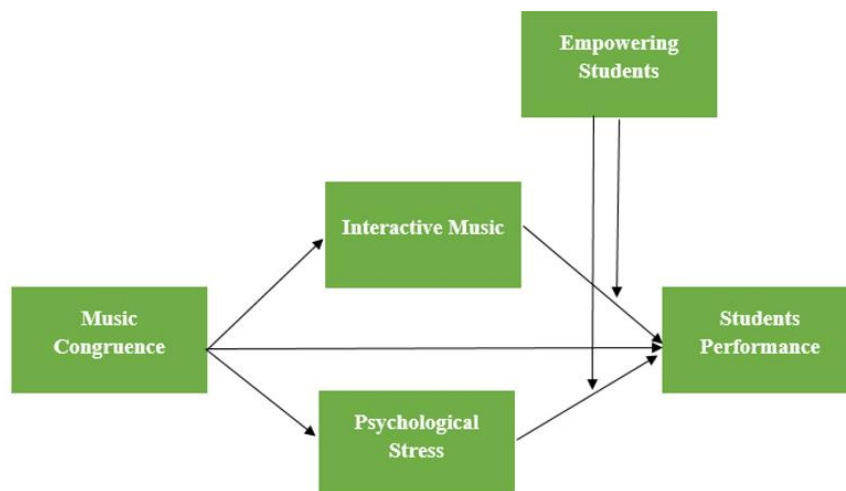


Figure 1. Study framework

Methodology

In order to collect information from 420 college students in China, a cross-sectional survey design will be used in this study. The data will be gathered using an online survey. Participant recruitment will be done through a practical sampling technique. Before distributing the questionnaire, each participant's informed consent will be requested. Demographic information, psychological stress levels, music interaction, and student performance will all be included in the questionnaire. The stress level section will include questions from the Perceived Stress Scale (PSS) to measure the participants' levels of stress. The music engagement section will include questions about the frequency and type of music activities engaged in by the participants. The academic performance will include questions about the participants' grades, study habits, and overall performance. During class, the participants will personally get the questionnaires. The questionnaire must be completed and returned to the researcher by the participants within 30 minutes. Data will be gathered during a two-week period. With the aid of descriptive and inferential statistics, the gathered data will be examined. The data will be summarized using descriptive statistics like means, standard deviations, and frequencies. The association between psychological stress and academic achievement will be investigated using inferential statistics, such as correlation and regression analysis. The ability to leave the study at any moment will be made clear to the participants. An example of a non-probabilistic sampling technique used to gather data for a study is convenient sampling. Instead of choosing individuals at random, this approach chooses them based on accessibility or availability. Convenient sampling has the benefit of saving the researcher from having to go through the laborious process of choosing volunteers from a broad population, making it a quick and simple option to get data.

Measurement Scale

A 20-item questionnaire was devised to determine the empowering music students: an investigation of psychological stress and gender effects on piano performance in Chinese colleges, as well as planned behaviour theory involved. In general, empowering students in the context of piano performance entails supporting their development as self-sufficient learners and artists, assisting them in the improvement of their skills, and giving them the tools and encouragement they require to realize their full potential.

Music congruence include "The ethnic music played in the ethnic restaurant met your expectations and the ethnic music played matched with the restaurant theme" adopted by Larwood and Dingle (2022). Interactive music includes "I could make a change in the background music and I heard additional melody on the original background music when I clicked on buttons on the website" adopted by Hwang and Oh (2020). Psychological stress includes "I worry about not being able to control my worries and feelings and my painful experiences and memories make it difficult for me to live a life that I would value" adopted by Bermejo-Franco et al. (2022). Empowering students include "I encourage students to communicate in using digital technologies based on their learning needs (e.g., using online meetings, discussion forums)" adopted by (Scott et al., 2019). Student's performance includes "Good adaptation to the new teaching and learning experience and mastery of difficult classwork" adopted by Bermejo-Franco et al. (2022).

Results

The present study focus on empowering music students and investigation of psychological stress and gender effects on piano performance in Chinese colleges, as well as planned behaviour theory involved. Descriptive statistics of the demographics for the current study (N=420) were produced based on the analysis of respondent data. SmartPLS3 was used to assess the structural and measurement models.

Demographics

Table 1 shows the demographic information, research findings, and social cognitive theory and social exchange theory information related to the influence of empowering music students and investigation of psychological stress and gender effects on piano performance in Chinese colleges. The model's evaluation of Chinese university students was found to be heavily influenced

by the students' gender, age, and educational attainment. Table 1 provides a demographic profile.

Table 1. Demographic profile

Demography	Description	No. of Responses	%
Gender	Male	250	60
	Female	170	40
Age	18-20	180	43
	20-24	150	36
	Above 24	90	21
Educational Attainment	FSC	280	66
	BSC	140	33

In Table 1, the gender of male students was 60% and female was 40%. College students age 18-20 were 43%, 20-24 students age were 36%, while the age above 24 was 21%. Education in FSC College students were 66%, while BSC students were 33% in China colleges.

Measurement Model

Partial least squares (PLS) structural equation modelling was used in the current study to evaluate the performance of the more successful model. This measurement was carried out using Smart PLS. This quality score takes into account the average variance extracted (AVE), confirmatory factor analysis (CFA), convergent validity, and discriminant validity. Validity and reliability are the two main criteria used in PLS analysis (Hamdollah & Baghaei, 2016). Commonly used measurement models include factor analysis, structural equation modeling, and item response theory. These models help researchers and practitioners to understand the underlying structure of the data and how the variables are related to each other, providing valuable insights for theory development, hypothesis testing, and decision-making.

Composite Reliability and Validity

Composite reliability refers to the degree to which a set of measures or items are consistent in their measurement of a latent construct. It is often measured using the Cronbach's alpha coefficient, which provides an estimate of the internal consistency of a set of items (Fornell & Larcker, 1981). Validity refers to the extent to which a measure or instrument accurately reflects the construct it is intended to measure. There are several types of validity, including face validity, construct validity, criterion-related validity, and content validity (Fornell & Larcker, 1981). The factor loadings, validity, and reliability of the data gathered from 420 college students in China were also evaluated using PLS-SEM. Details on the item factor loading, validity, and reliability for the PLS measurement model are provided in Table 2. When evaluating an item's internal consistency, the Cronbach's alpha test score is frequently utilised and must be 0.70 or higher (Fornell & Larcker, 1981). Cronbach's Alpha and the composite reliability ratings for the variables under investigation were both higher than 0.70. Because the average variance extracted (AVE) values for discriminant validity were higher than 0.50, convergence validity and high reliability were demonstrated (Fornell & Larcker, 1981). The composite reliability ratings above the threshold range of 0.70 and ranged from 0.803 to 0.925. Table 2 Composite Reliability displays values for Cronbach's alpha and average extracted variance.

Table 2. Composite reliability, Cronbach's Alpha, and AVE values

Construct	Item	Loadings	CA	CR	AVE
Music Congruence	MC1	0.863	0.788	0.873	0.697
	MC2	0.890			
	MC3	0.745			
Interactive Music	IM1	0.955	0.796	0.803	0.626
	IM2	0.956			
	IM3	0.228			
Psychocological Stress	PS2	0.894	0.756	0.891	0.804
	PS3	0.899			

Construct	Item	Loadings	CA	CR	AVE
Empowering Students	ES1	0.780	0.800	0.869	0.623
	ES2	0.815			
	ES3	0.744			
	ES4	0.817			
Students' Performance	SP1	0.862	0.892	0.925	0.755
	SP2	0.884			
	SP3	0.882			
	SP4	0.845			

"Note: CR=composite reliability; AVE=average variance extracted; CA= Cronbach's Alpha"

Discriminant Validity

Discriminant validity refers to the ability of a measurement model to distinguish between different constructs or latent variables (Fornell & Larcker, 1981). It is an important aspect of construct validity, which is concerned with the accuracy and appropriateness of a measurement model for measuring the construct of interest. Discriminant validity is typically assessed by comparing the correlation between the measures of two constructs (Hamdollah & Baghaei, 2016). If two measures are highly correlated, it suggests that they may be measuring the same construct or that one construct is interfering with the measurement of the other. This could result in inflated estimates of reliability and validity for one or both constructs, and may compromise the validity of the results obtained from the model. Additionally, each study technique must demonstrate its discriminant validity. The discriminant validity of one predictor variable shows why it is distinct from some of the other latent components (Fornell & Larcker, 1981). To assess the discriminant validity, the correlated factor variability, AVE value, and other range of fundamental values must all be lower than the AVE of the independent components (Hamdollah & Baghaei, 2016). Discriminant validity, which includes comparing a concept to other conceptions, is used to validate an idea. We conducted additional study for structural analysis once we were certain that the variables' reliability and validity met all standards. The HTMT results Table 3 further supports the discriminant validity.

Table 3. Discriminant validity

	ES	IM	MC	SP	SP
Empowering Students	0.790				
Interactive Music	0.608	0.791			
Music Congruence	0.701	0.533	0.835		
Psychological Stress	0.688	0.702	0.635	0.896	
Students Performance	0.723	0.607	0.648	0.652	0.869

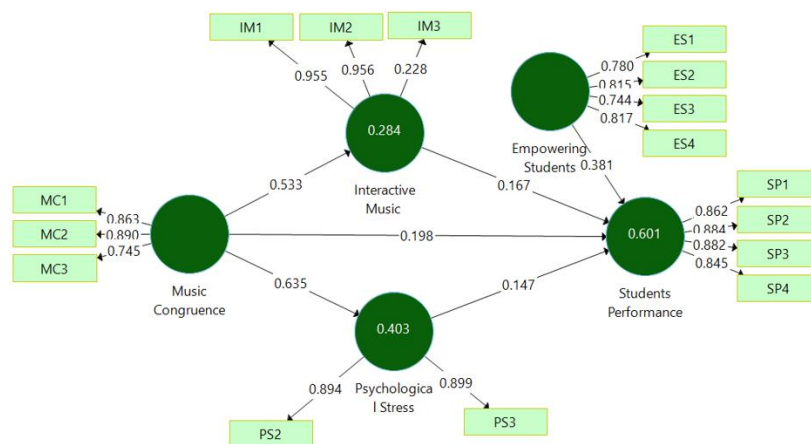


Figure 2. Assessment of Algorithm

Figure 2 shows that, aside from "PS1, PS4, IM4 and IM5", there is no issue for any other variables. Remove any indicators with outside loadings of less than 0.40 from the frameworks (Hamdollah & Baghaei, 2016). The external loading of lower-order structures was investigated using a PLS-SEM method. The findings demonstrate that all builds have Cronbach's Alpha values greater than 0.789. As a result, the survey's measurements all display a high level of consistency. The measurement model is valid since the Average Variance Extracted (AVE) surpasses the cutoff of 0.50.

R Square

The amount of variance in the dependent variable that is explained by the independent variables in a regression model is measured statistically as R-squared (R²) (Hamdollah & Baghaei, 2016). It gives a hint as to the model's goodness-of-fit. Table 4 shows the value of R square of interactive music were 0.284, psychological stress were 0.403 and value of students' performance were 0.601.

Table 4. Assessment of R square

	R²
Interactive Music	0.284
Psychological Stress	0.403
Students Performance	0.601

Structural Equation Model

Structural Equation Model (SEM) also enables the estimation of indirect effects and the assessment of model fit. It is widely used in fields such as psychology, sociology, and marketing research to study relationships in data. Using a PLS-SEM bootstrapping method, the structural model route coefficients representing the hypothesised correlations were statistically determined. This study shows the importance of planned behaviour theory in empowering music students and examines the impacts of psychological stress and gender on piano performance in Chinese colleges. For bootstrapping, accuracy scores are given for biases, variance, standard errors, coefficient of determination, and other parameters. The sample distribution of this method can be used to estimate almost any statistic that uses the survey method. Additionally, it can be used to develop tests for assumptions. It is generally used as an alternative to statistical approaches when a parametric model is incorrect, unavailable, or requires the use of complicated formulas to compute sampling error (Hair & Sarstedt, 2021).

Direct Relation

The direct relationship in PLS is represented by the loading weights, which are the coefficients of the predictors in the linear combinations. The magnitude of the loading weights indicates the relative importance of each predictor in the relationship with the response (Hamdollah & Baghaei, 2016). The results shows that the relationship between music congruence and students performance ($\beta = 0.198$, $t = 2.512$, $p = 0.012$). H1 is therefore acceptable. The results shows that the relationship between music congruence and interactive music ($\beta = 0.533$, $t = 8.213$, $p = 0.0001$). H2 is therefore accepted. The results shows that the relationship between music congruence and psychological stress ($\beta = 0.635$, $t = 12.042$, $p = 0.0001$). H3 is therefore accepted. In Table 5 direct relation of independent variables to dependent variables shows.

Table 5. Direct relation

	Original Sample	T Statistics	P Values	Decision
Music Congruence -> Students Performance	0.198	2.517	0.012	Supported
Music Congruence -> Interactive Music	0.533	8.213	0.0001	Supported

	Original Sample	T Statistics	P Values	Decision
Music Congruence -> Psychological Stress	0.635	12.042	0.0001	Supported

Mediating Effect

Music congruence play as a mediating variable, the link between interactive music and students' performance remained significant ($\beta = 0.089$, $t = 2.385$, $p = 0.017$, respectively). Music congruence play as a mediating variable, the link between psychological stress and students' performance remained significant ($\beta = 0.093$, $t = 1.997$, $p = 0.046$, respectively). In mediation, "the parties meet with a mutually agreed-upon neutral third party who aids them in the discussion of their differences," according to the Hamdollah and Baghaei (2016). In Table 6 mediating effect shows between music education and students' academic performance.

Table 6. Mediating effect

	Original Sample (O)	T Statistics	P Values	Decision
Music Congruence -> Interactive Music -> Students Performance	0.089	2.385	0.017	Accepted
Music Congruence -> Psychological Stress -> Students Performance	0.093	1.997	0.046	Accepted

Moderating Effect

The information in the Table 7 supports this assertion by showing how the association between interactive music and students' achievement is moderated by empowering students ($B = 0.381$, $P = 0.0001$). The information in the Table 7 supports this assertion by showing how the association between psychological stress and students' achievement is moderated by empowering students ($B = -0.147$, $P = 0.036$). In Table 7 moderating effect shows between education innovation and students' academic performance.

Table 7. Moderator hypothesis testing

	B-Value	T-Value	P Value	Decision
Interactive Music *Empowering Students -> Students' Performance	0.381	4.800	0.0001	Accepted
Psychological Stress *Empowering Students -> Students' Performance	0.147	2.103	0.036	Accepted

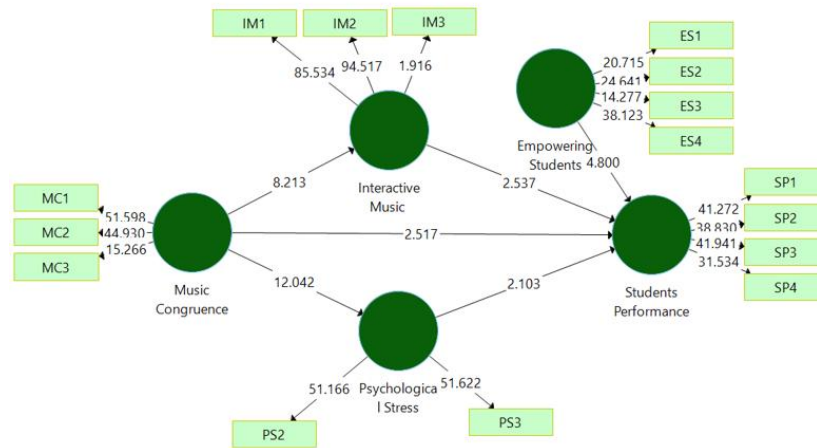


Figure 3. Assessment of bootstrapping

Figure 3 shows that, aside from "PS1, PS4, IM4 and IM5", there is no issue for any other variables. Remove any indicators with outside loadings of less than 0.40 from the frameworks (Hamdollah & Baghaei, 2016). The external loading of lower-order structures was investigated using a PLS-SEM method. The findings demonstrate that all builds have Cronbach's Alpha values greater than 0.789. As a result, the survey's measurements all display a high level of consistency. The measurement model is valid since the average variance extracted (AVE) surpasses the cutoff of 0.50.

Discussion

The current study focuses on empowering music students and looks at how gender and psychological stress affect piano performance in Chinese colleges. It also takes into account planned behaviour theory. Each of the theories is substantially supported by the evidence. The impact of music congruence, interactive music and psychological stress on student's performance is also being determined, as well as empowering students play role as moderator which effects on students' performance.

It would be fascinating to talk about the connection between music congruence and student performance. The study's findings shed light on how students' academic performance and outcomes may be impacted by the compatibility or alignment between the qualities of music and their cognitive, emotional, or situational states. According to the study, music congruence can also improve students' happiness and cognitive engagement, both of which can lead to better academic achievement. It can foster an environment that is more favourable to learning and encourage active involvement and participation in the learning process when students listen to music that connects with their cognitive and emotional requirements. Their conceptual understanding, memory for information, and critical thinking abilities may all be improved as a result, leading to increased academic success. The consequences of this relationship and its importance in relation to student performance are covered in detail in this discussion. The findings imply that there is a higher possibility of musical congruence when students actively participate in music-making or engage in participatory music experiences. The term "participatory music" describes activities like singing, playing an instrument, or group music-making when participants actively contribute to the creation of music. Through their active participation, children can develop a more intimate and engaged connection with the music they listen to.

The findings indicate a link between musical harmony and psychological stress. According to the results, a person's performance might be influenced by their level of psychological stress and how well the music fits their unique piano playing style. These findings indicate that at Chinese colleges, piano performance, psychological stress, and music congruence all have significant relationships. The findings imply that lower levels of psychological stress are related to musical harmony, which is defined as the pleasing and consonant combination of musical parts. The reward pathways in the brain may be activated and chemicals linked to pleasure and wellbeing,

such dopamine and endorphins, may be stimulated by listening to harmonious music. By fostering a state of relaxation and lowering stress-related symptoms including an elevated heart rate, high blood pressure, and increased levels of anxiety, this can counteract the physiological and psychological reactions linked to stress.

Music congruence play as a mediating variable, the link between interactive music and psychological stress and students' performance remained significant. The findings imply that the degree of music congruence with the task at hand can influence the relationship between the level of interaction between the performer and the music and the level of psychological stress on the one hand, and the students' performance on the other. This relationship exists between interactive music, psychological stress, and students' performance. In the interaction between interactive music, stress, and performance, music congruence can act as a moderator or buffer. This emphasis how crucial it is to take music congruence into account when creating music-based therapies aiming at enhancing performance or lowering stress. The study's conclusions imply that student empowerment moderates the association between interactive music and academic accomplishment. This suggests that the degree of empowerment students experience within their educational context influences the impact of interactive music on student performance. Students are more likely to participate completely in interactive music activities, put their skills and knowledge into practise, and persevere in overcoming obstacles when they feel like they have some control and agency over their learning. This engaged participation and ownership result in richer learning opportunities, greater motivation, and eventually enhanced academic performance. By giving students chances for choice and voice, building a collaborative and inclusive learning environment, and encouraging self-reflection and self-assessment, teachers and educational institutions can encourage student empowerment.

Conclusion

In conclusion, studies on piano playing in Chinese colleges point to a strong link between the congruence of the music, psychological strain, and performance outcomes. The results emphasise the significance of student empowerment and stress management in the context of music instruction in Chinese institutions. The study's limitations, which include the need for future research to confirm the findings' generalizability, take into account additional factors that can effect performance, and extend the study's scope beyond piano playing, should be taken into consideration when interpreting the results. However, the results show that teachers may help students perform better if they considered the links between similarity in music, psychological stress, and performance. The examination into the impacts of student empowerment, psychological stress, and gender on piano performance in Chinese colleges concludes by emphasising the significance of taking these aspects into account in the context of music instruction. According to the data, there is a substantial link between interactive music, psychological stress, and performance outcomes. This conclusion also suggests that giving students more control over their learning and tackling psychological stress can improve performance. When interpreting the findings, the limitations and the need for more research to confirm the generalizability of the results and account for any performance-impairing variables should be taken into consideration. The results suggest, however, that teachers may create a nurturing and effective learning environment that boosts student performance outcomes regardless of gender by considering the effects of student empowerment and controlling psychological stress. The findings can guide evidence-based practises in music education and advance our understanding of the variables that affect performance.

Implications

To lessen contributing effects that are unknown, new factors must be investigated. In addition to examining the effects of psychological stress and gender on piano performance in Chinese colleges, the study focuses on empowering music students and incorporates planned behaviour theory. Consequently, this work contributes significantly to literature. By empowering students and giving them more control and autonomy in the interactive music process, it is possible to

enhance the impact of the music on performance outcomes. This can be done through things like student-led music activities, writing music, and improvising music. In order to comprehend how these elements affect students' performance and come up with solutions, it is crucial to look at psychological stress and gender effects on piano performance in Chinese institutions. For instance, stress reduction strategies like mindfulness and relaxation exercises could be used to lower stress levels and enhance performance. As it offers a framework for comprehending the elements that determine behaviour and the impact of intentions, attitudes, subjective standards, and perceived control on behaviour, the Planned Behaviour Theory is equally pertinent in the context of music education. It is feasible to develop interventions that can help students perform better and overcome performance-related obstacles by studying the elements that influence music performance, including the role of psychological stress and gender. The findings on piano performance in Chinese universities have practical ramifications that can be used to improve student performance outcomes and the music education experience for all students. It is possible to increase the effect of interactive music on performance by encouraging students to participate actively in the process and offering them freedom and autonomy. Student-led musical activities, original music, and improvisation can all help with this. Educators can establish a supportive and inclusive learning environment for all students, regardless of gender, by having a better understanding of how gender affects performance. The effectiveness of interventions aiming at increasing performance outcomes can be increased by using the results of research on piano performance in Chinese colleges to guide evidence-based practises in music instruction.

Limitations and Future Research

Despite the study's several serious flaws, new fixes were offered to solve them. The opinions of participants or cutting-edge methods relating to music congruence cannot be accurately captured by a survey. Most likely, respondents to surveys don't always tell the truth. Even with the help of some organisation authorities, it was difficult to integrate the data from the questionnaire method into a cohesive design. Future comprehension will be mediated through educational tactics, educational music, and student participation. More people should participate in future study, and case studies will be undertaken using cutting-edge methods in addition to surveys. Focus groups, surveys, and interviews may have all been used in this study. Surveys asking on other issues could receive a variety of responses from participants. Sometimes choices are made before fully reading a question or its responses. Respondents' predisposition to hide information or draw quick conclusions frequently affects the credibility of the statistics. It was challenging to generate better and more accurate results due to the severe limits imposed by the study's limited sample size. A constant independent variable that is employed throughout the entire corpus of research is consumer education. To make sense of the results, the researcher was compelled to aggregate and synthesize the data into a plan. There was yet another drawback to using a quantitative, closed-ended questionnaire. The study's cross-sectional design makes it difficult to prove a cause-and-effect connection. It is possible to address concerns with effective suggestion use and determine what successful ways have been created to keep these recommendations for future use and flexibility through qualitative research and instructional activities. Future studies should make advantage of longitudinal research or field testing to demonstrate the links between the research constructs. The findings might not be applicable to other groups or circumstances or be true for all Chinese college students. The results are limited to piano performance in Chinese colleges and do not take into account other types of musical performance or other variables that could affect performance, such as musical genre, personal preferences, and musical ability. The relationship between music congruence, psychological stress, and performance can be better understood through longitudinal studies that track students over time. They can also aid in determining the variables that affect performance throughout musical training. Future research should account for additional variables that might affect performance, such as motivation, engagement, and musical ability, in order to more precisely assess the effects of music congruence and psychological stress. Future studies should broaden their scope beyond piano performance to include other musical genres, personal preferences, and other performance-related criteria, in addition to piano performance.

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