

# Exploring the Diverse Impact of Music on Alleviating Academic Stress in University Students during the Post-Pandemic Era

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**Abstract:** This study explored in mitigating academic stress among university students, with an emphasis on its impact on language learning and stress management in a post-pandemic context. Employing a mixed-methods research design, this investigation utilized stratified random sampling to collect data from 1,063 students during the fall semester of 2022. Data collection was conducted through an online survey designed to assess changes in musical behavior, levels of academic stress, and the incorporation of music as a coping strategy in the post-pandemic context. The survey included both quantitative and qualitative items, with analysis involving descriptive and inferential statistics, including t-tests, Pearson correlation, and multiple regression. Qualitative responses were analyzed using content analysis. Results of the study revealed that males reported higher levels of academic stress than females, yet no significant gender differences were observed in the use of music as a coping mechanism. A notable change in musical behavior post-pandemic correlated with a higher likelihood of using music for stress relief. Regression analysis identified depression as a significant predictor of increased post-pandemic music use. Content analysis of qualitative responses underscored music's multifunctional role in creating supportive learning environments, emotional release, and companionship. These results suggest that incorporating music into online educational settings can effectively manage academic stress and promote student well-being. This study has important implications for educational strategies post-pandemic, highlighting music's therapeutic potential in learning environments.

**Keywords:** Academic Stress, Post-pandemic, Online Classes, Music Behavior, Coping Strategy, Psychological Well-being

## 1. Introduction

The COVID-19 pandemic has had a significant impact on various aspects of life, including education. In an effort to contain the outbreak, many countries implemented measures such as lockdowns, travel restrictions, and social distancing protocols. While online learning has been a viable alternative to traditional classroom instruction during the pandemic, it has also presented several challenges for students. For university students in particular, the prolonged isolation and lack of social support resulting from the pandemic to their lives and instructional techniques has had significant effects on their mental health and academic performance[1]. Studies have shown that prolonged isolation can lead to a range

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of psychological effects, including stress, fear, loneliness, and overthinking[2]. Moreover, online learning results in a lack of contact with student surroundings, which adds to the stress students feel[3]. The increased academic stress that university students face as a result of the pandemic has also led to anxiety and depressive symptoms. As a reaction to this situation, students have resorted to utilizing music as a mechanism to manage stress. Research has shown that using music as a coping strategy for academic stress can be effective in reducing the stress levels of college students[4-6]. Music has been found to be a powerful emotional trigger, with the ability to evoke multiple emotions at once through different musical components[7]. The rhythm, tonality, melody, and lyrics of a song can all influence a listener's emotional state, while dynamic rhythms and movement with music have been found to improve mood[8][9].

It is believed that enjoying music can aid in stress recovery by eliciting satisfying emotional responses. This assumption is supported by research indicating that pleasant emotions activate the brain's 'pleasure and reward center,' which releases hormones like serotonin and dopamine that help reduce the physical and psychological effects associated with the stress response[10]. Playing or listening to music activates various parts of the brain, including brainstem responses, emotional contagion, mental imagery, episodic memory, and musical anticipation. Consequently, music can help regulate the neurological and physiological mechanisms that contribute to stress[11]. Research has also shown that listening to music is more effective than silence or audio control in helping people recover from stress-related symptoms such as heart rate, blood pressure, anxiety, and mood swings[12].

The expansion of online learning across educational sectors has certainly accelerated as a result of the COVID-19 pandemic and is still actively used in the educational environment[13][14]. Therefore, academic stress regarding online learning and use of music to cope with this stress is an essential topic to assist the emotional support for effective learning online. In other words, the examination of music's role in coping with academic stress and its beneficial aspects warrants attention. This topic has been explored with the following research questions:

- (1) What is the level of academic stress of students attending online classes in the post-pandemic era?
- (2) To what extent has music been used by students as a mechanism to cope with academic stress in the post-pandemic era?
- (3) What specific patterns in musical behaviors have emerged among students as a coping strategy since the pandemic?

In line with this, the study aimed to assess the impact of music as a coping mechanism for academic stress in the context of online education during the post-pandemic period.

## **2. Literature Review**

### **2.1 Academic Stress among University Students: Evolving Perspectives**

Academic stress among university students has emerged as a critical area of concern in contemporary educational research. The unique pressures of university life, including intense coursework, impending deadlines, and the looming uncertainty about future careers, contribute significantly to this stress. Studies have shown that these factors can lead to a range of psychological issues, such as heightened anxiety, depression, and a decrease in overall mental well-being[15]. Additionally, academic stress can impair cognitive functions, affecting students' ability to concentrate, process information, and retain knowledge[16]. The physical repercussions of such stress are equally concerning, with reports of disrupted sleep patterns, changes in eating habits, and other stress-induced health issues becoming increasingly common[17]. Furthermore, the transition to online learning environments has introduced new dimensions to academic stress. While online education offers flexibility and accessibility, it also

presents challenges like technical difficulties, reduced face-to-face interaction, and the need for self-motivation and discipline[18]. These factors can exacerbate the feeling of isolation among students, further impacting their mental health. The financial burden of acquiring technology for online learning, along with the uncertainty of job markets, adds to the stress experienced by students[19]. Recognizing these challenges is crucial in developing effective strategies to support students' mental health and academic performance, highlighting the need for comprehensive research and intervention programs tailored to the evolving landscape of higher education.

## **2.2 The Role of Music in Coping and Resilience**

Music's role in stress management and emotional well-being has gained increasing recognition in recent years. Studies exploring the impact of music on the brain reveal that it not only alters mood but also enhances cognitive functioning and resilience in stressful situations[20]. The concept of "musical coping," where individuals use music for emotion regulation and stress reduction, has been gaining traction[21]. Furthermore, research into music therapy has shown promising results in alleviating symptoms of anxiety and depression, enhancing the case for its integration into mental health interventions[22]. The growing body of evidence supports the idea of incorporating music into strategies aimed at reducing academic stress, particularly in online learning environments.

## **2.3 Bridging the Gap: Building Upon Existing Research**

The integration of insights from these areas—the evolving nature of academic stress, the challenges of online learning, and the therapeutic potential of music—provides a comprehensive framework for understanding and addressing the challenges faced by university students in the post-pandemic era[1][9][20]. This study seeks to delve deeper into how music can be a vital tool in mitigating the negative effects of academic stress, especially with the increasing dependence on online education platforms. By examining the interconnections between these elements, the research aims to contribute to a richer understanding of student well-being in the digital age and to inform the development of more effective educational and mental health practices.

# **3. Research Methodology**

## **3.1 Research Design**

The study employed a mixed-methods approach to achieve a comprehensive understanding of the impact of music on academic stress management among university students post-COVID-19. This design was chosen to leverage the strengths of both quantitative and qualitative research methods. Quantitative data were collected and analyzed to provide statistical evidence of patterns and relationships, while qualitative data offered deeper insights into individual experiences and behaviors. The survey instrument was designed to capture a wide range of data relevant to the study's objectives, including demographic information, music behavior patterns, and academic stress levels.

## **3.2 Research Instrument**

The primary tool for data collection was a structured online survey developed through a rigorous process involving expert consultation and pilot testing. The instrument incorporated input from experts in the field of psychology and music education. Prior to administration, the instrument was subjected to pilot testing to assess its clarity, comprehensibility, and relevance to the study objectives. This iterative

process of refinement contributed to the validity and reliability of the measures employed in the study. The survey comprised three sections: (1) demographic and background questions, (2) questions assessing music use and its relationship to stress management, and (3) open-ended questions for qualitative insights into changes in music behavior post-pandemic. This instrument was designed for online distribution to facilitate ease of participation and to reach a wide sample of students across different academic years and disciplines.

### 3.3 Participants

The present study employed an online recruitment method to obtain responses from a sample of students majoring in arts and other related fields in a major university in China. Prior to participating in the survey, all participants were provided with an informed consent form emphasizing voluntary participation and the option to withdraw from the survey at any point without consequences. This study obtained ethical approval from Dankook University's Institutional Review Board (IRB) under protocol number 2022-12-017-005, ensuring compliance with established guidelines. To maintain the anonymity and confidentiality of responses, all data were securely stored and accessible only to the research team. The participants consisted of students from all academic levels, ranging from freshmen to seniors. A total of 1,207 college students responded to the online survey, of which 1,063 responses were considered valid after removing outliers and incomplete answers. Prior to completing the questionnaire, the participants were provided with an informed consent form to ensure that they were fully informed of the study's objectives and content.

[Table 1] Demographic Characteristics of Participants

	Options		Number of People	Percentage (%)
Gender	Male		305	28.7
	Female		758	71.3
Age	18-20		385	36.2
	21-23		618	58.1
	24-27		60	5.6
School Year	Freshman Year		312	29.4
	Sophomore Year		291	27.4
	Junior Year		254	23.9
	Senior Year		206	19.4
History of COVID-19 Infection	Oneself	Yes	874	82.2
		No	189	17.8
	Family/Relatives	Yes	651	61.2
		No	412	38.8
Propensity on Music	Attitudes toward Music	Like	1046	98.4
		Dislike	17	1.6
	Prior music learning experience	Yes	793	74.6
		No	270	25.4
Total			1063	100.0

Based on the data presented in [Table 1], the participants' demographic characteristics were as follows: 758 (71.3%) were female, and 305 (28.7%) were male. The majority of the participants (58.1%) were between the ages of 21 and 23, while 36.2% were under the age of 20. Of the total participants, 874 students (82.2%) reported having experienced COVID-19, and 651 (61.2%) reported having had a family member or close relative infected with COVID-19 in the previous two years. In terms of musical preferences, 1,046 (98.4%) participants reported enjoying listening to music. Additionally, 793 (74.6%) students reported that they had received music education outside of school at some point during their lives.

### 3.4 Data Collection and Analysis

Data were collected through an online survey distributed via university email lists and social media platforms. The survey link directed participants to a Google Forms questionnaire. Prior to beginning the survey, participants were presented with an informed consent form that outlined the study's purpose, confidentiality measures, and their rights as participants. Upon agreeing to participate, respondents completed the survey at their convenience. The data gathering phase was conducted over a four-week period to ensure ample time for participation.

For data analysis, the study utilized SPSS software (version 26.0) to perform both descriptive and inferential statistical analyses. Descriptive statistics provided an overview of the sample's demographic characteristics and basic trends in music behavior and academic stress. Inferential statistics, including t-tests and Pearson correlation analysis, were employed to examine differences and relationships between variables of interest. Furthermore, multiple regression analysis was used to identify predictors of increased music use as a stress-coping mechanism post-pandemic. The combination of these statistical tools allowed for a robust analysis of the quantitative data, while content analysis was applied to the qualitative responses to identify themes and patterns in music behavior changes.

## 4. Results

### 4.1 Academic Stress due to Online Classes after the Pandemic

With an increasing number of university students turning to online programs in light of the pandemic, the way in which students are coping with the academic demands of such programs is worthy of investigation. To this end, a survey was conducted, the results of which are presented in [Table 2]. This table provides an analysis of the self-evaluation carried out by participants with regard to the academic stress they are shouldering while taking online classes. The academic stress level was found to exhibit a statistically significant difference by gender, with males demonstrating higher levels of academic stress due to online class than females. However, the average scores for males ( $m=2.48$ ) and females ( $m=2.32$ ) indicate that the stress level is moderate for both genders.

[Table 2] Academic Stress Levels by Gender

Items		N	M	SD	<i>t</i>	<i>p</i>
Gender	Male	305	2.48	1.079	2.235	.026*
	Female	758	2.32	.949		

\* $p < .05$

Next, the study examined the situations wherein the students used music to cope with stress regarding online class and learning. While the students' academic stress levels were measured using the perceived stress scale, their use of music for stress relief due to online classes was measured using a 5-point Likert scale (1=Never used, 2=Hardly ever used, 3=Sometimes used; 4=Often used; 5=Always used). [Table 3] indicated that although there were significant differences in academic stress levels in gender between male and female students, there was no statistically significant difference in the use of music for coping with stress by gender. [Table 3] also indicates that in all situations where academic stress was felt at a level of 3 or higher on the perceived stress scale, university students increased their use of music for coping stress during online classes compared to before the pandemic. These findings suggest that university students increased their use of music as a coping strategy while taking online classes.

[Table 3] Use of Music as a Coping Strategy for Online Classes

Situations of Music Use	Gender	N	M	SD	<i>t</i>	<i>p</i>
When finding it difficult to understand due to one-way online learning	Male	305	3.12	1.031	-1.044	.297
	Female	758	3.19	.931		
When feeling depressed due to online instruction	Male	305	3.16	1.094	-.570	.569
	Female	758	3.20	.926		
When feeling anxious about participating in online classes	Male	305	3.12	1.049	-.269	.788
	Female	758	3.14	.922		
When experiencing difficult to communicate in online classes	Male	305	3.12	1.091	-.084	.933
	Female	758	3.12	.915		
When feeling bored due to online format of lecture	Male	305	3.19	1.074	-.603	.547
	Female	758	3.15	.939		

#### 4.2 Perceived Changes in Use of Music as Stress Coping Strategy

The challenging changes in the learning environment due to the pandemic have affected the way in which students approach learning. As music is a viable medium in the environment, the study inquired into students' perceptions of any changes in their musical behavior due to the academic stress. The results showed that 466 participants (43.8%) reported a change in their musical behavior. These changes could be attributed to the increased personal time due to restrictions imposed by the pandemic. Additionally, the study examined the extent to which students used music to cope with academic stress by taking online classes. Participants were asked to rate their level of music use on a scale of 1 (not at all) to 5 (extremely much) according to the six situations. The results of examining the extent of music use among students on each situation are presented in the following [Table 4].

[Table 4] Student's Perception of Changes of Musical Behavior Before and After the Pandemic

Situations of Music Use	Group	N	M	SD	<i>t</i>	<i>p</i>
When finding it difficult to understand the content due to online learning format	1	597	3.11	.997	-2.603	.009
	2	466	3.26	.906		
	Total	1063	3.17	.961		
When feeling depressed due to online instruction	1	597	3.13	1.010	-2.355	.019
	2	466	3.27	.928		
	Total	1063	3.19	.977		
When feeling anxious about participating in online classes	1	597	3.06	.984	-2.929	.003
	2	466	3.23	.919		
	Total	1063	3.13	.960		
When experiencing difficult to communicate in online classes	1	597	3.05	.999	-2.689	.007
	2	466	3.21	.920		
	Total	1063	3.12	.968		
When feeling bored due to online format of lecture	1	597	3.08	1.017	-3.135	.002
	2	466	3.27	.919		
	Total	1063	3.16	.979		

Note: 1=Group that perceives little or no difference in the level of music use before and after the pandemic, 2=Group that perceives a difference in the level of music use before and after the pandemic.

In most situations, the participants reported using music to alleviate their academic stress caused by taking online classes. However, [Table 4] indicates that they listen to music most frequently when they

feel depressed or bored due to online instruction. Furthermore, the results demonstrate that students who perceived changes in the level of music use before and after the pandemic were more likely to use music as a stress-coping strategy compared to those who perceived little or no change. These results highlight the potential of music as a coping mechanism for managing stress while taking online classes after the pandemic. Overall, these findings suggest that incorporating music into online classes may be an effective way to manage stress and promote well-being among students.

### 4.3 Use of Music for Academic Stress

In this section, we aim to examine how music functioned as a coping strategy for managing academic stress after the pandemic. Participants were asked about their perceptions of musical use using a five-point Likert scale ranging from '1 = no change at all' to '5 = very significant change. To examine which variables had the most significant impact on the level of music use in managing academic stress caused by taking online classes, correlation and regression analyses were conducted among the relevant variables. Firstly, correlations between music use and academic stress factors, such as 'difficulty in understanding content,' 'depression,' 'anxiety,' 'difficulty in communication,' and 'boredom,' were examined. As shown in [Table 5], the level of music use was found to have significant correlations with all five academic stress variables caused by taking online classes.

[Table 5] Correlations between Academic Stress and Music Use

	Music Use	Difficulty in Comprehension	Depression	Anxiety	Difficulty in Communication	Boredom
Music Use	1					
Difficulty in Comprehension	.194**	1				
Depression	.224**	.683**	1			
Anxiety	.176**	.613**	.783**	1		
Difficulty in Communication	.156**	.618**	.740**	.782**	1	
Boredom	.139**	.573**	.718**	.761**	.795**	1

\*\**: The correlation coefficient is significant at the 0.01 level.*

After the correlation analysis, in order to examine the predictors that could predict the change in music use levels, a stepwise multiple regression analysis was conducted with academic stress variables such as 'difficulty in understanding content,' 'depression,' 'anxiety,' 'difficulty in communication,' and 'boredom' due to online classes as independent variables. The results of the regression analysis indicated that the model was a good fit with an F-value of 56.232 ( $p < .001$ ) and as shown in [Table 6], the significant predictor that influenced the change in music use levels before and after the pandemic was 'depression' ( $\beta = .224$ ), suggesting that students who experienced higher levels of depression during online classes were more likely to increase their music use. No multicollinearity issues were observed, indicating that the predictor variables were independent of one another. However, the model explained only 5% of the total variance, suggesting that there may be other complex mechanisms at play, influencing the changes in music use for academic stress from the pandemic. The low level of variance explained by the model indicates the need for further investigation into the various factors that may be influencing use of music in this context, such as changes in daily routines, social isolation, and psychological stressors.

[Table 6] The Impact of Academic Stress on Music Use

Model	Non-standardized regression coefficients		<i>Beta</i>	<i>t</i>	<i>p</i>	Collinearity	
	<i>B</i>	SE				Tolerance	VIF
(constant)	2.233	.090		24.736	.000		
Depression	.203	.027	.224	7.499	.000	1.000	1.000
R	.224						
R <sup>2</sup>	.050						
Adj. R <sup>2</sup>	.049						
Durbin-Watson	1.946						

These findings highlight the importance of understanding the multifaceted nature of music use in relation to online classes, as well as the need for targeted interventions to support the emotional and psychological well-being of university students dealing with academic stress. The results provide evidence that incorporating music into online teaching practices can have a positive impact on students as they handle the difficulties, challenges, and potential frustrations in online classes. Overall, these results suggest that educators consider integrating music into their online teaching practices to help students manage the challenges of learning in an online environment.

#### 4.4 Content Analysis on the Musical Behaviors for Coping Academic Stress

We analyzed the patterns of music-related behaviors before and after the pandemic using open-ended surveys and categorized the responses using coding techniques. In this analysis, only 270 participants provided descriptive responses pertaining to their use of music for academic stress. Their responses were analyzed to derive themes related to their purposes for using music and its benefits within the categories and sub-categories. The analyses showed that music has played a role in helping university students cope with stress, as reflected in the emergence of music-related behaviors, such as increased music listening and singing. The qualitative responses were initially examined to identify recurring themes, which were then organized into the established categories and sub-categories.

The most representative categories analyzed were the level of music use (increase, decrease, or the same), types of music behavior (singing, listening, playing, etc.), and benefits of music (relaxation, vitalization, companionship, etc.). Responses were categorized into subcategories during the process of categorization. In addition, the sub-categorical themes which elaborate the benefits pertaining to musical behavior are derived based on the following operational definitions as shown in [Table 7].

[Table 7] Benefits of Musical Behavior

Categories	Sub-categories	Operational Definition
Listening	Relaxation	Sedating state of body or resuming more positive state of mind
	Vitalization	Being entrained by music to feel a heightened energy level
	Companionship	Having music when alone and feeling that music is with the person
Singing	Tension Release	Letting go of any embodied heaviness or negative affect
	Expanded Repertoire	Learning different genre of songs and accumulating musical resource
Playing	Productive use of time	Utilizing the physical time to improve musical technique or expressiveness in music
Reduced musical behavior	Lack of music resource	Loss of connections with people to share music or a decrease in the size of the music group experiences not available anymore.
	Lack of motivation	Loss of personal interest in music or motivation to seek any form of music experiences



The categories of classified items were quantified, and the proportions of each item were compared and analyzed. As [Table 8] shows, among music activities, listening increased the most (49.6%) followed by singing (29.3%). With regards to music-listening behavior, the most commonly reported function of music was ‘relaxation’ (33.3%). The second most frequently reported musical function of their music listening, accounting for 8.5% of responses, was ‘vitalization.’ Participants placed significant emphasis on aspects such as rhythm, inventiveness, strength, and energy, suggesting that music provides them with a sense of vitality and vigor.

Another prominent function of music to cope with their academic stress was ‘companionship’ (7.8%). Amidst the pandemic, social distancing measures led to feelings of loneliness and anxiety among individuals and music served as a companion that provided a sense of comfort and solace during these challenging times[13][23]. For those who reported constant music listening after the pandemic, the accompaniment played a critical role in creating an immersive and engaging musical experience that helped alleviate academic stress and improve their overall well-being. In other words, music created a sense of companionship like friends and family, and as a result, students seemed to become more dependent on it. The fact that many of them mentioned feeling “dependent on music” highlights how significant music had been in their lives. These findings underscore the potential therapeutic benefits of music as a companion in the post-pandemic era, where the accompaniment serves as a key element in providing emotional support and comfort. Such findings suggest that music has served multiple functions for the students such as creating a particular atmosphere, releasing emotional energy, and has the potential to act as an energizer, providing a boost to the listener.

Another key finding from the content analysis was that singing (27.8%) was beneficial in relieving academic stress. Some participants reported changes in their singing habits, suggesting that the pandemic affected their singing musical behavior. This finding is consistent with previous research that suggested that singing can have a positive impact on individuals’ well-being, including reducing stress and anxiety levels, and improving mood and self-esteem[24]. Additionally, there were some respondents (2.6%) who reported an increase in music-playing behaviors as a coping strategy. In contrast, some respondents (18.5%) reported a decrease in their musical activities due to the reasons such as home isolation and decreased social interaction resulting from the increased use of online learning formats. These findings underscore the importance of investigating the causes behind such musical behavior changes. Further investigation is required to identify the underlying causes of these musical behaviors.

[Table 8] Changes in Music Behaviors after Pandemic for Coping Academic Stress

	Categories	Sub-categories	Excerpt examples	N (%)	
Increase of Music behaviors	Listening	Relaxation	I listen to music more often while working, before sleeping or doing other tasks to feel more at ease.	90(33.3)	134(49.6)
			I make a list of songs that play over and over to set myself a certain mood.		
			I continue to use the song as a background music to create a calm environment.		
			I feel music helps me relax and break out from the tense and uneasy environment of the present.		
			I feel more comfort and release when I listen to music.		
		Vitalization	I think music gives me some strength to hang in.	23(8.5)	
			I like to listen to music with a strong sense of rhythm, which makes me full of energy.		
			I often listen to songs which provides me with an energetic drive and inspiration.		
		Companionship	When I was feeling bored, music kept me accompany. Music helped me to feel less bored.	21(7.8)	
			I became more dependent on music when I am alone.		

	Singing	Tension Release	When I sing, I feel my stress is released.	75(27.8)	79(29.3)
			Singing is a way for me to feel vent tension		
	Expanded song repertoire	I switched from singing rock or hip-hop music to lighter songs. I try to sing different musical styles.	4(1.5)		
	Playing instruments	Productive use of time	I have more time to devote to playing instruments. I have more time to work on my musical expression.	7(2.6)	
Due to online learning, I have time to try different instruments.					
Decrease of Music Behavior	Reduction in musical activities	Lack of motivation	I am losing motivation to try anything new. I don't have the energy to listen to music. Due to long isolation at home from school, I lost interest of music.	50(18.5)	50(18.5)
Total				270 (100%)	

## 5. Discussion

Many institutions have adopted online learning as a means to maintain educational continuity[24][25] during and after the pandemic. Adjusting to this new learning environment was challenging for the students. While this transition was necessary, it has had a profound impact on the academic and emotional well-being of students[26]. Amongst many, the benefit of online connections beyond spatial limitation was an eye-opening discovery for many educators and it became an essential mode of learning[27][28]. Ever since the pandemic, the online platform for most educational activities has offered great contribution and diverse learning opportunities for university education as well. Along with this expanded online learning environment, university students are also learning to adapt to using online platforms. This adaptation is supported by this study's result that the participants' perceived level of academic stress was average when compared before and after the onset of the pandemic. Interestingly regarding gender, it was found that the academic stress level of males was statistically higher than those of females. This may be due to the unique trait of communication, namely synchronous communication, which involves real-time interaction through platforms.

The existing research literature indicates that such forms of communication often drive high engagement due to its real-time nature; however, it can be highly challenging for the students as it enforces preestablished structures and learner discipline[29][30]. Previous research on gender-based differences in synchronous and asynchronous learning suggests that male students typically favor the former. This study, however, found a surprising contrast: male students reported significantly more academic stress in relation to synchronous learning than their female counterparts. Such results may suggest a difference in how each gender comprehends the mechanisms inherent in the synchronous learning system, as well as the study material itself. Further it may be due to the need of strong self-regulation and time management skills, and more importantly the ability to regulate their interactions independently[31].

Secondly, most of the participants' musical behaviors increased a great deal, adopting to the online learning environment. Results showed a notable quantitative link between changes in music use and academic stress, utilizing music as a coping mechanism to handle their academic stressors. Among the participants who stated that their musical behavior increased after the pandemic, some of them provided the descriptive narration relating their musical behaviors. This finding is in line with previous research findings indicating that listening to preferred music can effectively reduce stress[32]. More specifically, the results in this study revealed that negative emotions caused by taking online classes were the main factor that led to increased musical behavior for the university students[26]. Different musical behaviors

increased in relation to the feelings of negative emotions such as frustration, depression, boredom, challenge, etc. among different musical behaviors increased. Among them, listening increased the most (49.6%) compared to singing (29.3%) and playing (2.6%). This is due to the receptive aspect of music experience that can be very sedating and has affective regulatory function. The use of music to reduce stress is one way of a palliative coping to minimize distress[33]. At the same time, it should be noted that the explanatory power of this finding was somewhat low, suggesting that changes in music use due to the pandemic may be influenced by other complex factors beyond academic stress.

Third, the participants' responses regarding music benefits were interesting in that both listening and singing offered moments of vitalization and tension release. Listening entails passive musical participation whereas singing is an active behavior of making music using our own voice which is an embodied instrument[34]. In fact, no matter what the musical behavior is, music is the rhythm that can regulate one's energy level and arousal state. This regulation may be due to music's entrainment function, which means one's physiological variables would synchronize with the rhythm and tempo of music[35]. Overall, the statistical data showed that music has played a crucial role in helping students cope with academic stress after the pandemic. The stress coping nature of music is consistent with previous research that has shown the potential therapeutic benefits of music on mental health and well-being[36]. Difficulty coping with stress causes emotional issues among students which further leads to using one's cognitive and intellectual potential to the fullest for the students.

In summary, the study revealed that the university students are exposed to academic stress related to the pervasive use of online formats for learning since the COVID-19 pandemic has begun. The findings provide insights into the potential benefits of incorporating music into the daily lives of university students coping with academic stress. In education, for example, educators can add background music to online lessons or organize group music activities. Therapists can use music therapy to help individuals manage stress, working with educators to implement these techniques. Policymakers can support adding music to school curriculums, investing in music programs, and funding research on music's benefits for stress relief in schools. Moreover, the results highlight the diverse use of music ranging from receptive to expressive experience matching individual needs. This study provides important groundwork for the potential of music as a stress coping strategy for university students learning from the online platforms. Further research is now needed to expand upon these findings and delve deeper into the mechanisms of receptive as well as expressive musical behaviors for stress management. As educational institutions continue to navigate the challenges of online programs, the findings of this study can be used to inform interventions using music that support student well-being and academic success.

However, this study has several limitations that need to be addressed in future research. Firstly, the sample size was limited to students from a single university in China, which may constrain the generalizability of the findings. The experiences and responses of these participants may not fully represent the broader population of university students, particularly those in different cultural or educational contexts. Given the sample's limited scope to a single university in China, further research encompassing a broader and more culturally diverse population is crucial to validate and extend our findings on music's role in mitigating academic stress. Secondly, the study focused mainly on exploring the relationship between academic stress and music behavior, without delving into the psychological factors that influence this relationship. Therefore, future research should aim to conduct a more comprehensive investigation into the causal relationship between various psychological factors and music behavior. Thirdly, while this study relies on self-reported data, future research should aim to establish causal relationships between music use and stress alleviation to minimize bias. Additionally, exploring demographic differences and longitudinal effects can offer a deeper understanding of how music can be used as a coping strategy in varying contexts and over time.

## 6. Conclusion

This study provides valuable insights into the impact of the COVID-19 pandemic on academic stress among university students in China and the potential of music as one of several coping strategies. It suggests integrating music into educational support services and calls for further research to explore gaps in the current study, offering specific methodologies, populations, or theoretical frameworks for future investigations. The primary objective was to explore how students had adapted to the pervasive use of online formats for learning and how music had been utilized as a stress coping mechanism, among other strategies. The results of the study indicated that the shift to online classes significantly increased academic stress. However, students developed various musical behaviors, from receptive listening to active singing, to manage this stress. The results of the study highlighted the importance of incorporating music as a valuable component into educational support services for student well-being and academic success. Future research should expand on these results, exploring the causal relationships between psychological factors and music behaviors in stress management. The study underscored the need for educational institutions to recognize the therapeutic potential of music in online learning environments. In conclusion, this study shed light on the impact of the pandemic on academic stress among university students in China and highlighted the potential of music as a coping strategy, with practical implications for educational policy and practice in enhancing student well-being and academic success.

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