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## ORIGINAL

# "ENHANCING COGNITIVE AGILITY AND PERFORMANCE UNDER STRESS THROUGH SOLFEGGIO EAR TRAINING: A BIG DATA EVALUATION IN ARTS EDUCATION"

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### ABSTRACT

Digital music technology mainly refers to digital music production technology and multimedia operation technology. Digital music production technology is divided into software and hardware in two parts. Hardware includes the computer body and professional sound card, sound source, MIDI keyboard, tuning platform, and other external equipment. The research study determined that cognitive agility and performance related to stress through solfeggio era training. The Software, including music production and audio editing software, is the storage, editing, synthesis, transformation, output, and playback of digital sound information processing. Multimedia operation technology uses computers and related technical equipment to process text, graphics, images, audio, video, and other media information for digital collection, management, exchange, processing, systematic, and interactive operation technology. Although the digital education of video training in Chinese universities has grown steadily, there are still many deficiencies in the development of digital education: lack of scientific and systematic planning scheme; the leaders and teachers in schools lack sufficient professional knowledge and application technology of digital teaching; lack of efficient, practical and targeted digital teaching software. These are the problems that need to be overcome and solved in the development process of digital teaching. Because big data technology has a robust system and data information has the characteristics of a quantitative sea, in-depth analysis can be carried out to improve the integrity

of teaching quality evaluation. This requires higher vocational colleges to apply big data technology to construct teaching quality evaluation systems and strive to play a positive role.

**KEYWORDS:** Big Data System, Cognitive Agility, Performance, Art Education, Digital Teaching, Higher Vocational Colleges, Audio-visual and Ear Courses

## 1. INTRODUCTION

The increasing level of stress worldwide has not remained a hidden fact. All the healthcare sectors are facing the problem of sources related to the solution of mental health problems. This increasing stress level badly affects masses' cognitive agility and performance in different countries. So, there is a need to enhance both aspects to enhance performance under stress. One suitable way to enhance cognitive agility and performance under stress is through solfeggio ear training (Ghent, 2023). Although this is a new advancement in art education, it has gained much importance these days for enhancing performance under stress. The word solfeggio ear training is a special musical education based on the solfeggio system. This Education is related to recognizing musical pitches, intervals, and rhythms based on the solfeggio system. In this system, there is an assignation of syllables to musical notes. There are various Applications of this ear training system these days, such as it can be helpful in better pitch recognition. It is also valuable for enhancing sight singing Skills. It can be helpful for better musical understating. It is used for enhancing auditory skills (Le, 2017). The main application of this ear training system is that it can enhance people's cognitive skills. Here, we have focused on enhancing cognitive agility and performance under stress by using this ear training system. There are various ways by which cognitive agility can be improved by solfeggio ear training. The first way is improved attention and focus in solfeggio ear training. As we know, the most negative impact of stress is that it affects cognitive functions negatively; thus, it diverts any person's main attention and focus (Yin, 2023). So, to improve e attention and focus on these people, and then this job is done by solfeggio ear training. This system recognizes musical pitches based on syllables, so there is a stringent need to focus on it. In this way, we can say that the most important benefit of this ear training is improved cognitive agility by improving attention and focus. The other way solfeggio ear training can help enhance cognitive agility is that it is beneficial for enhancing memory in students. The role of neurons in the Brain for the development and recall of memory may be short-term or long-term memory (Kaasgaard, 2022). In stress conditions, neurons are degeneration because of various factors, leading, to poor memory in case of stress (Tang, Fan, Zong, Zhang, & Liu, 2023). In the case of this ear training, it is used Brainwork for the recognition of musical rhythms with the association of syllables, and this aspect is valuable because it will enhance memory in students. This enhanced memory is also an important part of enhancing cognitive agility.

In most cases, processing, speed decreases in Cases of consistent stressful conditions (Tsai, Tang, & Chen, 2022). The processing speed refers to the Time the human Brain takes to respond to a particular stimulus (Yaghobi, Soltanifar, Jafari, & Salmanzadeh, 2021). This important function undergoes deterioration because of conditions of stress and anxiety (Mei, 2024). But this ear training has solved this problem as well. Some tasks are provided to students to complete quickly, so they tend to respond earlier. In this way, the Brain's processing speed increases, which is an important positive impact of solfeggio ear training (Zhang, Zhang, Zhu, Chen, & Wu, 2023). The other important application of this ear training for enhancing cognitive agility is that it is also helpful for improving spatial reasoning. This ear training has various impacts on the neurological system, which helps to enhance cognitive functions. There is a great role of the auditory cortex in enhancing cognitive agility, so this ear training is beneficial for strengthening of auditory cortex by consistent training (Dornik, 2020). As we know, the Brain has two types of matter: white matter and grey matter. Their cognitive functions and cognitive agility are related to grey matter in the Brain. So, when there is an increase in grey matter, there is also an improvement in cognitive agility. In this way, we can say that this ear training is useful for improving cognitive agility by directly acting on grey matter in the Brain. As we know, we live in a society with diversity related to language and concepts. So, it is essential to improve language skills to develop better social relationships. These improved social relationships will help in improving performance under stress. This ear training easily improves these language skills. Mathematics is the root of every working organization these days. Therefore, better mathematical skills are required to improve performance these days. It is one of the applications of this ear training that will also enhance mathematical skills. Medical studies have proved that there are two types of intelligence in human beings: intelligence quotient and emotional quotient (Andrianopoulou, 2019). A better emotional quotient must be needed to handle the cognitive load to enable a person to work under stressful conditions. It has been seen that this ear training helps improve the emotional quotient of any person. A person learns to control his own emotions in stressful conditions. This aspect is important for improving performance and making space in any organization. This ear training helps a person learn different ways to control himself to improve his performance under stressful conditions. Therefore, fewer steps must be followed for effective and more positive impacts of ear training. These steps include setting an achievable goal, using various music styles, incorporating movements and gestures in practice, recording students' progress, and seeking professional guidance (Ouyang, 2023). Ear training will have a better role (Rui, 2007).

### **1.1 Research Objective:**

After an overview of these studies related to enhancing cognitive agility and performance under stressful conditions using solfeggio ear training, we can say that this ear training is quite useful in different ways.

## 2. Literature review

Researchers claim that earlier vocalists used to study vocal instruments to develop their skills. In the 19th century, the vocalist learned about vocalization by studying historical papers from different sources. The knowledge-gaining ability of vocalists through musical history is a great skill-polishing activity (Bythrow, 2023). Studies suggest that cognitive thinking allows people to group information into chunks. The chunking process involves grouping information to improve a person's cognitive skills. The musical data is divided into groups or chunks to understand the music's complexity. These chunks help in understanding the musical score and musical reading more comprehensibly. The youth learning piano is trained by providing them musical training in chunks (Dueck, 2023). Studies explain that critical listening education is a well-structured learning program for musical learning students. This program increases the importance of learning about the music after listening to its critical notes (Elmosnino, 2023). Also, studies reveal that learning music by playing it in a large orchestra gives students of different ages a chance to learn more about music. Orchestra allows music students to interact with numerous musical teachers and experts. This interaction allows students to gain more knowledge about music-related complexities. The interaction of musical students with music teachers allows them to improve their cognitive and social communication skills (Fu et al., 2024). Studies explain that VR is widely used in the teaching process to provide real-world stimulation to the pupils. In musical institutes, VR is made to develop musical instruments based on computer-based technology. Leap motion sensing technology is used to develop virtual piano systems. 3D technology is used to develop musical instruments that can provide real-time learning experiences to students (Feng, 2023). Studies suggest that music theorists provide different theories based on their own experiences. These theorists explain their reasons for choosing music for their skill development. Music theorists predict music makes a musical theorist more disciplined (Gates, 2023). Scholars reveal that identifying different errors is termed error detection. Error detection is an approach used in the musical training process to efficiently carry out professional music programs. The skill-developing program explains that error detection process is greatly used to detect in the aural skill training process (Fu et al., 2024). In the curriculum of aural skill development programs error detection training is provided to the students (Honerman, 2023). Studies suggest that music is a skill that helps people save their declining cognitive ability. Evidence-based on neuropsychological behavior suggests that the gaining process declines the cognitive skill in people. By indulging aging people in musical-based activities their cognitive skill declining process slows down (James et al., 2020). The performance of musicians in memory-related tasks is efficient. There are two types of musicians the one that gets trained and the other ones are self-taught musicians. Both types of musicians are categorized or grouped using the GMSI (Jimenez, 2022). Studies reveal that before the advancement of neuroimaging technology little was known about the process going on in learners' minds. The

recent development in the neurosciences field predicts that the learner's behavior depends on his cognitive ability. In musical institutes, the learning behavior of elementary music students is determined using the approach of neurosciences (Leahy, 2021). Studies suggest that music teachers use different musical teaching approaches for providing musical training. Contemporary music trainers use numerous procedures and methods for providing musical training. In music institute, music literacy is a subject included in the student's curriculum. Self-talk training is among the methods used by K-12 musicians for training music students (Limon, 2023). Studies concluded that middle school tough period for music learning students. Most of middle school students learn music by actively participating in choir. The participation in school choir improves students' psychological ability, making them ready for future musical training. Moreover, in middle schools, the vocal development methodology is applied (Nogueras, 2024). Studies explain that music teachers' or professionals' growth depends upon their music learning and training journey. Most musical teacher uses different notations to teach the students about musical codes. Using a pay-by-ear methodology while teaching music to students helps develop aural skills in young music students (O'Herlihy, 2023). Studies claim that in musical institutes people are provided with training that helps them learn about sound levels (Yang, 2023). This learning helps them to know their ability to hear different sound frequencies. This technique of estimation of sound level through special training prevents the problem of hearing loss in people (Riepma, 2023). Studies show that pedagogical innovative technology has enabled the learners of undergraduate aural skills to learn different music skills. The use of world music concepts and approaches in musical teaching programs holds immense importance, allowing music learners to acquire unique skills (Seow, 2024). Studies conclude that innovation in the modern music learning approach is made using instructions based on classical music. Classical music skills are improvised for modernization of musical training programs. This modernization approach burdens musicians cognitive thinking and allows them to grasp different complexities of musical codes (Stein, 2022). Studies elaborate that musicians of the US have been experts in performing in different styles and varieties. Most musical theatres are built to increase awareness about musical instruments among the people. The based scale development or advancement of music industry allows people to develop social communication skills. Also gaining large profits from musical theatres is a big benefit of advancing the music industry (Stephens, 2023). Studies predict that scaffold approach is used in secondary school training to minimize the cognitive load on students. The solfage syllabus is included in the curriculum of second grade students to improve their information related to national music literacy (Tanriguden, 2024). Studies of scholars suggest that brain developmental process gets improved by music. The soothing effect music gives to a person's brain allows him to improve his cognitive thinking ability. In New York and other states, the students are provided with music-based educational programs that help to evaluate the impact of music on EF of children. Also, the

impact of music on the behavioural activities of students is determined through educational music programs (Tate, 2022). Studies suggest that sound track based mediation beat helps people to get out of depression.to study the impact of binaural beats on people the use of a minimized method was made in research study.the results of the study predict that theta infuse beats positively influence people's psychological health (Thompson Jr, 2023).

## **2.1 Application of Big Data System in Dictation Training**

Let the student's dictation to the polytonic material. In the digital teaching environment of solfeggio and ear training, students can hear various formats of dictation materials, which can be played in various timbres. In class, you can also "bring" the audio materials played by the band, directly used for the dictation of solfeggio training lessons, so that the digital teaching of solfeggio training practice is closer to the actual music in multi-tone dictation. In the digital teaching environment of solfeggio, teachers and students can prepare dictation materials ahead of time and present them in class, thereby eliminating any errors in speed, intensity, and pitch that might arise under traditional teaching methods. This approach ensures zero errors in dictation, providing students with absolutely accurate materials that enhance their learning experience.

## **2.2 Application of Big Data System in Solfeggio Training**

Let the students listen to the solfeggio's original music and introduce the solfeggio's background and style in various ways. In a solfeggio ear digital teaching environment, we, through pictures, audio, video and text, and other forms of solfeggio creation background and style, play it is original sound - repertoire is mostly classic music fragments, and then combine fan sing, solfeggio, thus give students a deep, bright, rich and vivid impression, help students more fully experience and grasp each song songs. Let the students hear the realistic and perfect fan singing. Singers make a record, choose and combine the best and best results after singing, and finally present it to the audience and customers. In the digital teaching environment of solfeggio, recording can be carried out repeatedly, edited and combined into the ideal effect, and then played and demonstrated in class. Efficiently accomplishing pitch correction within the solfeggio and ear training course is paramount. The traditional pitch correction mode in solfeggio ear teaching often poses challenges for teachers, necessitating practice in a digital teaching environment. Correct pitch enables teachers and students to visualize, hear, and discern accurately (including subtle pitch variations). It facilitates transparent, precise, and repeated comparisons between incorrect and correct pitches, enhancing the overall teaching and learning experience. Let the students experience and grasp the music speed more accurately. In the traditional teaching mode, the speed value of music can only reach an approximate value, and the metronome only plays a complementary auxiliary role in the classroom. In the digital teaching

environment of solfeggio, setting music speed is more accurate and convenient than using a metronome. It can even make delicate music interpretations, such as gradually fast and slow, and fade out so that students can correctly and accurately experience, understand and grasp the speed value of music.

### 2.3 Application of Big Data System in Dictation Training

Let the student's dictation to the polytonic material. In the digital teaching environment of solfeggio and ear training, students can hear various formats of dictation materials, which can be played in various timbres. In class, you can also "bring" the audio materials played by the band, directly used for the dictation of solfeggio training lessons, so that the digital teaching of solfeggio training practice is closer to the actual music in multi-tone dictation. In the digital teaching environment of solfeggio, teachers and students can prepare dictation materials ahead of time and present them in class, thereby eliminating any errors in speed, intensity, and pitch that might arise under traditional teaching methods. This approach ensures zero errors in dictation, providing students with absolutely accurate materials that enhance their learning experience.

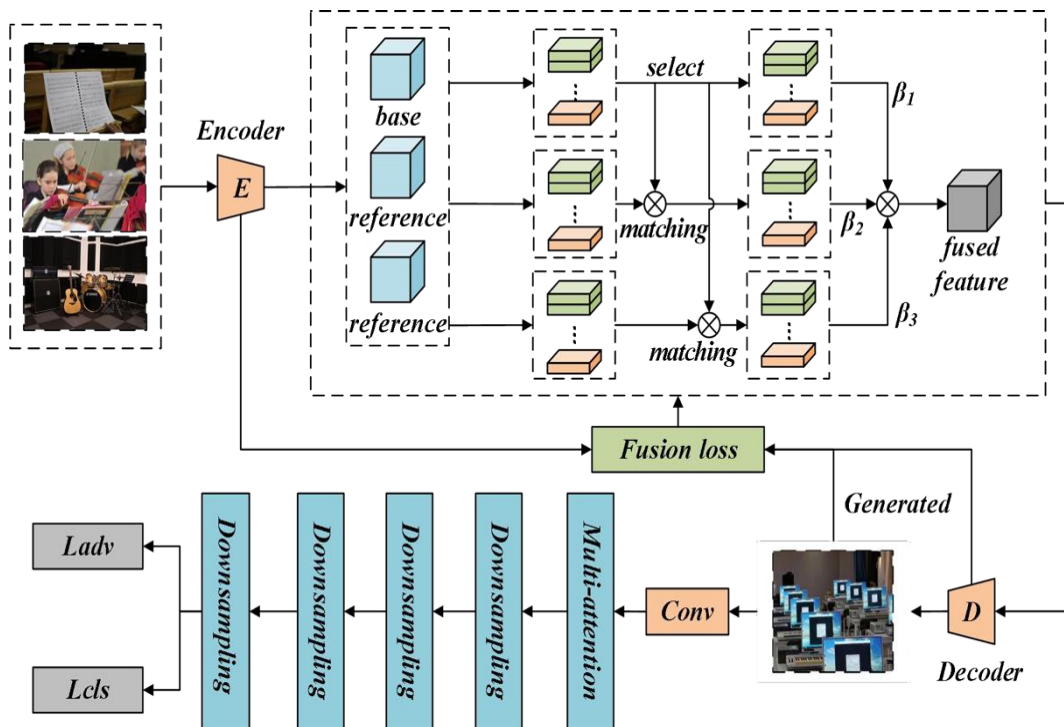


Figure 1: Application of big data system in dictation training

Figure 1 shows the application of an extensive data system in dictation training, which enriches dictation training by changing variable speed and reverse playback. In the digital teaching environment of solfeggio training, teachers can make the dictation content deviate from the average speed and change the tune instantly so that students can immediately realize the difficulty of the solfeggio training course. Teachers can also use audio workstations and

other software to reverse-play the dictation content to exercise students' rhythm dictation ability.

## 2.4 Application of Big Data System in Auditory Analysis and Training

Let the students understand the music colour, style, background and development track of the work from multiple angles. Under the traditional solfeggio course teaching mode, teachers often can only rely on word language to explain music composition, colour, and style. In the solfeggio digital teaching environment, teachers can, through multimedia concrete, vividly introduce music harmony, colour, melody, and structure, as well as introduce the cultural background and historical trajectory from the technical perspective of the analysis and research. Effectively use accurate sound material solfeggio ear digital teaching environment, teachers can use rich, natural sound material, music. They can use the digital software positioning function, make music material, music play, exit, pitch, change, and positioning operations so as to efficiently and accurately promote the students' auditory analysis training. Under the condition of polytone, strengthen the students' harmony with colour discrimination. Colour, volume, pitch and sound value are the four elements of mouth music and the four bases of music expression and music interpretation. In the teaching environment of traditional solfeggio ear training courses, timbre and auditory analysis are inherent deficiencies which need to be improved in the digital teaching of solfeggio ear training. Especially in the condition of polytone to strengthen students' harmony colour discrimination, a single piano timbre is different from the digital polytone. According to Table 1, the advantages of the digital teaching method of solfeggio training can be clearly seen.

**Table 1:** Digital Teaching Method of Solfeggio and Ear Training

<b>METHOD</b>	<b>DESCRIPTION</b>
<b>FAN SING PLAY</b>	Use the recorded fan sing, edit the combination many times, to provide the most ideal effect
<b>PITCH CORRECTION</b>	Accurate correction of pitch, including changes within the semitone, to assist teachers and students in identifying the contrast between correct and wrong
<b>MUSIC SPEED EXPERIENCE</b>	Use digital tools to accurately set the music speed, to achieve the gradually fast and slow other delicate interpretation
<b>MULTI-TONE DICTATION</b>	Provide a variety of timbre dictation materials, increase the practicality and diversity of dictation training

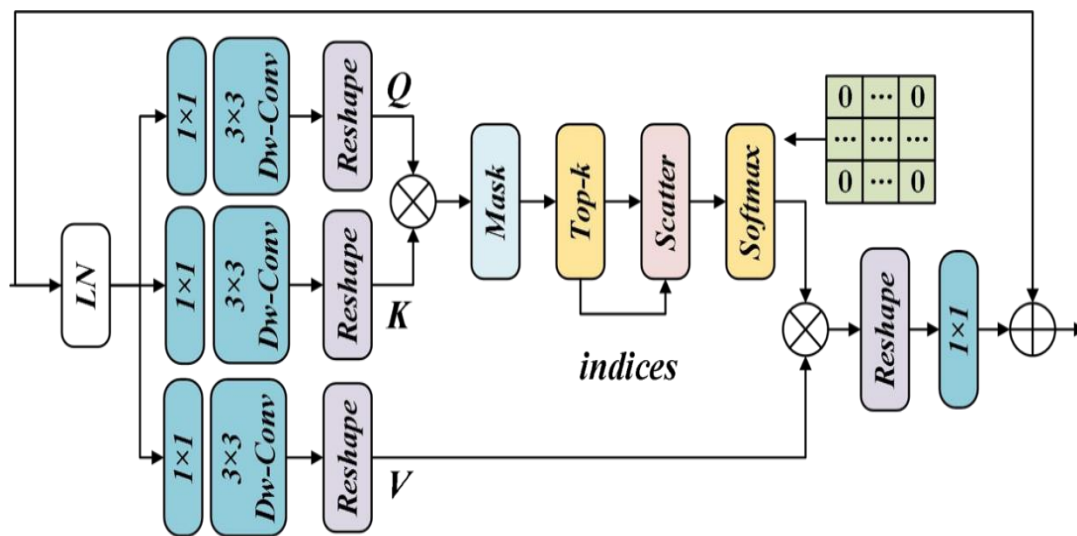
## 2.5 Compare the Advantages and Limitations of Traditional Solfeggio Teaching and Big Data Solfeggio Teaching

In terms of research methods, this study adopted various data collection methods, including questionnaire surveys, interviews, and extensive data analysis, to ensure the comprehensiveness and accuracy of the study. We



comprehensively considered vocational art colleges' different levels and backgrounds in sample selection to ensure the sample's representativeness. Regarding data analysis technology, we have adopted quantitative and qualitative analysis methods to more deeply explore the patterns and meanings behind the data.

The basic principle of choosing these methods is that they can comprehensively reflect students' learning situation, teachers' teaching situation, and the curriculum's implementation effect, thereby providing a scientific and objective basis for evaluating curriculum quality. Generally speaking, solfeggio ear training is divided into three parts: auditory analysis, dictation and solfeggio. These three links have their characteristics, and they are independent and interdependent with each other. The primary purpose is to train and develop students' musical and auditory abilities. However, due to the different teaching forms and methods, the results are also very different for traditional solfeggio teaching and considerable data solfeggio teaching. On the one hand, we can see the advantages of digital solfeggio and ear training teaching, and at the same time, it can let us feel its inevitable limitations.



*Top-k Sparse Attention (TKSA)*

**Figure 2:** Extraction of Teaching Elements in Big Data

Figure 2 shows the extraction of big data solfeggio teaching elements and ear training. In terms of intonation, at present, the actual teaching situation we face is that the piano cannot be adjusted at any time. Therefore, students must face a substantial hidden danger when practicing -"Standard sound is not standard". However, "pitch standard" is a trivial function for big data. It can provide accurate pitch and easily adjust specific pitch parameters, providing students with a standard and accurate listening environment. In terms of timbre, the cultivation of melody and harmonic listening discrimination ability is an essential link in ear training. However, due to equipment limitations and musical

instrument playing, this vital link has always had to be ignored. Considerable data solfeggio ear training has completely solved this problem. It is easy to play the same schedule, chord, and melody with different timbres, which is a significant advantage of extensive data teaching. In terms of multi-voice training, although solfeggio teachers have a specific keyboard foundation, there will inevitably be some problems in the performance, such as wrong sound, difficulty unifying speed, uneven voice strength and so on. Big data solutions and ear training teaching can solve this kind of problem, which can ensure not only the quality of teaching but also the diversity, flexibility, and unity of teaching. In terms of examination, in the face of various defects in the traditional solversiggio ear training examination, considerable data on solfeggio ear training pays attention to the examination of students' comprehensive musical ability in the examination. At the same time, it can also avoid the disadvantages of the traditional examination questions determined in advance and ensure the randomness, fairness and comprehensiveness of the examination. According to Table 2, the comparison of the solfeggio teaching mode can more clearly show the superiority of considerable data on singing teaching.

**Table 2:** Comparison of Solfeggio and Ear Training Teaching Mode

<b>FEATURE</b>	<b>TRADITIONAL SOLFEGGIO AND EAR TRAINING TEACHING</b>	<b>BIG DATA SOLFEGGIO AND EAR TRAINING TEACHING</b>
<b>INTONATION</b>	Restricted by the piano tuning, the pitch may be inaccurate	Provides absolutely accurate pitch, with adjustable pitch parameters
<b>TONE COLOUR</b>	Equipment and musical instrument performance are limited, and it is difficult to conduct polytone training	Convenient use of different timbre, strengthens the timbre discrimination ability
<b>MULTI-VOICE TRAINING</b>	Wrong sound, speed is not uniform and other problems	Ensure teaching quality and achieve diversity and flexibility
<b>EXAMINATION</b>	There are the disadvantages of the predetermined examination questions, and the lack of randomness and comprehensiveness	Emphasis on comprehensive musical ability to ensure the fairness and randomness of the examination

The teaching of solfeggio ear training faces certain limitations. Despite the diverse content of each training program, the intricate grading system can hinder students from achieving structured and planned learning progress. Furthermore, the interdependence of the content modules may give rise to unexpected and uncoordinated scenarios. Although standardization in rhythm and melody has improved, the established protocol remains intricate and requires greater flexibility, as the music often sounds inflexible compared to piano performances. The usability and accessibility of teaching software still require enhancement. Given the current scenario, while advancements in teaching equipment and teachers' pedagogical approaches are noteworthy, the significance of students'

extracurricular practice must be considered. A comparison of the advantages outlined in Table 3, which highlights the teaching environment's strengths within the context of big data, and the limitations presented in Table 4 provides a clearer picture of the strengths and weaknesses associated with data-driven teaching methodologies.

**Table 3:** Superiority of Solfeggio and Ear Training Big Data Teaching Environment

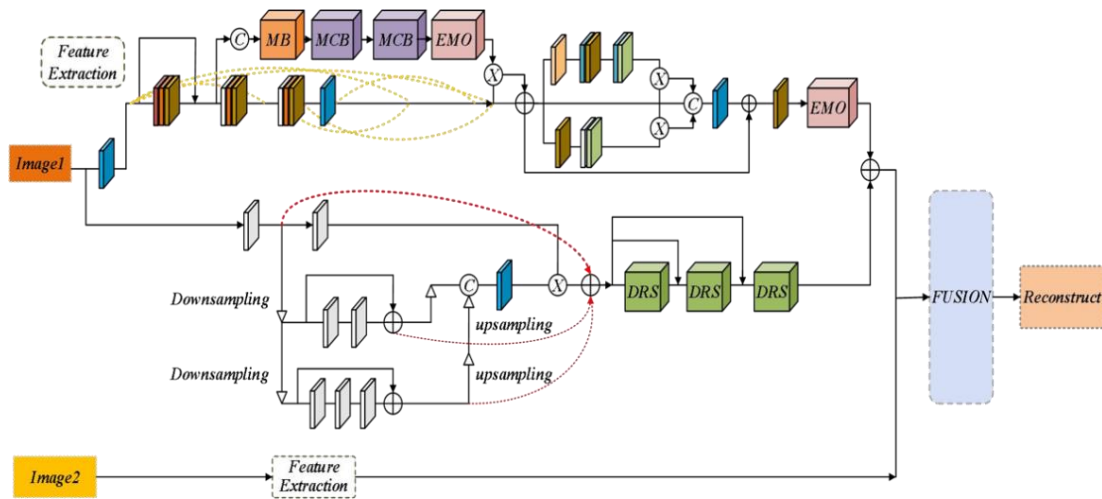
<b>SUPERIORITY</b>	<b>DESCRIPTION</b>
<b>RICH IN MUSICAL MATERIAL</b>	Use real and diverse music materials to improve the quality and efficiency of auditory analysis training
<b>MULTI-ANGLE MUSIC UNDERSTANDING</b>	Introduce the background and development track of music through multimedia means to deepen the students' understanding of music
<b>HARMONY AND COLOR</b>	Under the condition of polytone, strengthen students' ability to go bey and the limitations of traditional teaching

**Table 4:** Limitations of the Teaching Environment of Solfeggio and Ear Training on Big Data

<b>BOUNDEDNESS</b>	<b>DESCRIPTION</b>
<b>STUDY PROGRESS CONTROL</b>	Too detailed classification may make it difficult for students to grasp the learning progress, and a more effective progress synchronization and coordination mechanism is needed
<b>PROGRAM FLEXIBILITY</b>	The established procedure is difficult to change, and the lack of humanized
<b>POPULARITY AND CONVENIENCE</b>	The popularity and convenience of teaching software need to be improved, requiring more extensive equipment support and teacher training

## 2.6 Design of College Teaching Evaluation System Based on Big Data System Analysis

In the overall design of the teaching evaluation system in colleges and universities, the extensive data analysis system of teaching quality can realize the management, maintenance and data analysis of inspection, attendance and attendance related to the teaching quality evaluation. The system can maintain the essential functions related to the teaching quality evaluation activities, including post management, department management, user management system parameter setting, etc. The primary data in the teaching quality evaluation activities can be processed, including teacher data, class data, attendance data and class schedule data. Teachers, class, attendance, and class scheduling data are in the system. Abnormal data statistics and abnormal data retrieval can be carried out for abnormal data in the process of teaching evaluation and inspection. You can manage the lecture data, including the lecture arrangement, lecture feedback, lecture record and participating lecture information. Attendance data can also be counted, queried, and analyzed.



**Figure 3:** Overall Architecture Design of University Teaching Evaluation System

Figure 3 illustrates the university teaching evaluation system's comprehensive architecture, encompassing its functional modules' intricate design. These modules span system management, encompassing user management, department management, post management, and system parameter settings. User management oversees the administration of users, encompassing tasks such as user addition, deletion, and data import. Department management focuses on organizing and managing system users, involving adding, deleting, modifying, and importing data. Post management defines the roles and permissions of system users, including job assignments and access privileges. The evaluation system also facilitates system parameter settings, which govern various aspects such as the layout of tables on pages, the notification of teachers' availability after scheduling lecture activities, and the advance notification of teachers' scheduled days. Within the core menu settings of the system, critical functionalities for teaching quality evaluation activities are evident, including inspection management, attendance management, and a comprehensive data analysis system. Table 5 provides an overview of the extensive design of this data analysis system, underscoring its significance in enhancing the evaluation of teaching quality.

**Table 5:** Overall Design of the Big Data Analysis System for Teaching Quality

FUNCTIONAL MODULE	SUBFUNCTION	DESCRIPTION
INSPECTION MANAGEMENT	Exception data processing	View, manage, count, and query the abnormal data in the inspection process
ATTENDANCE MANAGEMENT	Attendance Data analysis	Statistics, query and analyze attendance data
LISTEN TO THE MANAGEMENT	Lecture management	data Manage the class arrangement, feedback, recording and other information
DA	Teaching quality analysis	quality The collected data were analyzed and the analysis results were presented to optimize the teaching management

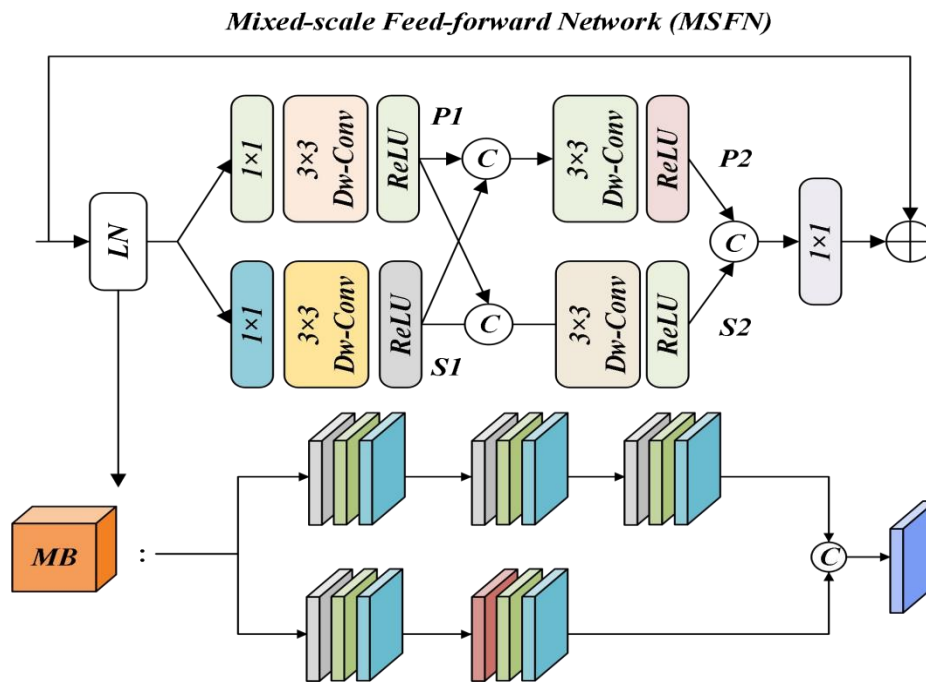
The data maintenance module is the maintenance of primary data related to teaching quality evaluation activities, including teacher data, class data, attendance data and class schedule data. The teachers 'data is the system of teacher management, functions including teachers' add and delete and data import; class data is the system management, functions including class deletion and data import; attendance data is the system attendance data management, functions including attendance data import, schedule data is the system schedule data management, functions including schedule data add and delete and data import. Inspection management is the management of abnormal data in the inspection process, including abnormal data view, abnormal data management, abnormal data statistics, abnormal data query and other sub-functions. The inspection management is based on the primary data of the "schedule", so before the inspection management, it is necessary to input or import the relevant schedule data in the "schedule data" under the "data maintenance". Attendance management is the management of attendance data, including sub-functions such as attendance data statistics, attendance data query and attendance data analysis. Attendance management is completed based on the primary data of "attendance". Before attendance management, it is necessary to import the relevant attendance data into the "attendance data" and the "attendance data" under the "data maintenance". Listening management is the management of listening data, including listening arrangement, listening feedback, listening record and other sub-functions. The management of lectures is based on the primary data of the "class schedule", so before the inspection management, it is necessary to input or import the relevant class schedule data of the "class schedule data" under the "data maintenance". In addition, at the same time obtaining the primary data, the system can analyze the data precisely and process the analysis results, showing them to users in a more intuitive way so as to facilitate users to find and solve problems in time so as to realize the purpose of optimizing teaching management means and improving teaching quality.

### **3. Results and Discussion**

#### **3.1 Specific Application of Big Data in Extracurricular Self-Study**

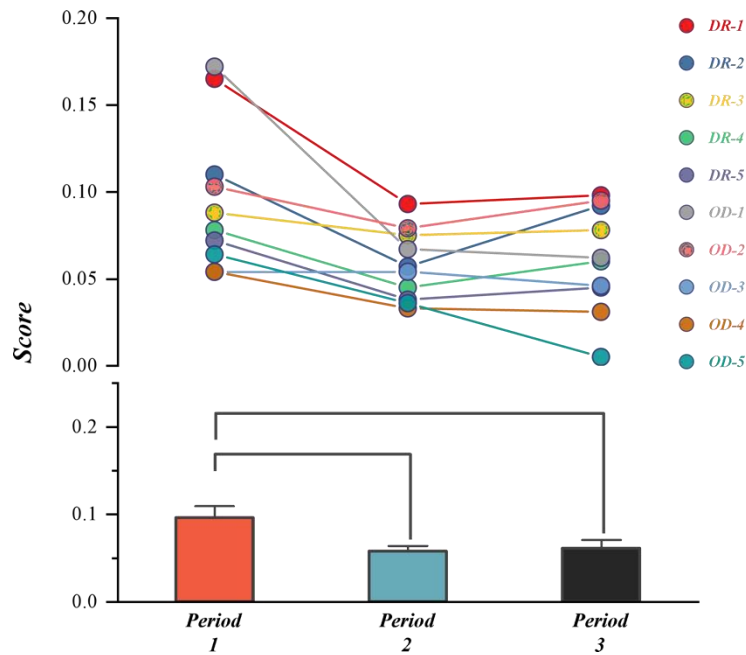
In the process of improving this study, we placed particular emphasis on the accuracy of statistical tests and the interpretability of results to ensure the rigor and reliability of the study. Firstly, in the data analysis stage, we employed various statistical testing methods, including but not limited to analysis of variance, correlation analysis, and regression analysis, to comprehensively examine the intrinsic connections and differences between the data. Secondly, we set an appropriate significance level and provided a detailed explanation of the test results, including analysis and discussion of data patterns, trends, and potential influencing factors. This helps us grasp the research problem more accurately and provides firm support and reference for subsequent research. By providing these detailed statistical tests and explanatory information on the

results, we hope to enhance the scientificity and credibility of this study and provide a more solid and reliable basis for evaluating the quality of sight singing and ear training courses in vocational art colleges. Digital hardware, software and systems create an excellent environment for students' extracurricular self-study. Multiple forms of interactive self-study can effectively promote students' solfeggio and ear training levels. This paper takes A your alia, an interactive solfeggio ear training teaching software developed by RISING in Australia, as an example to discuss how to make the software play the most effect in students' extracurricular self-study. Aurelia: The software is built with a virtual professor to guide students' learning. The following is a digital extracurricular self-study program for solfeggio and ear training courses. The digital extracurricular self-study program is taught by students majoring in Tourism Art Performance and Planning in the Art Performance Department of Guilin Tourism College. The teaching time is the autumn semester of the second academic year, and the corresponding teaching plan is attached.



**Figure 4:** Big Data Extracurricular Self-Learning Feature Extraction Architecture

Figure 4 shows the feature extraction architecture of extracurricular self-learning of big data. Teaching purpose and requirements: focus on seven chords and connections; practice fixed pitch in bE major; how to master syncopate rhythm and variation and apply it to the counterpoint and solfeggio. Teaching content: rhythm and beat: correspondence between other rhythm and two-part derived rhythm; solfeggio: 8~10 songs or music; pitch position: fixed pitch in each tone of the F-major; chord and pitch: the connection between the seventh and the seventh chord and the major. Teaching heavy and difficult points: understand the connection of the seventh and the connection to the seventh.



**Figure 5:** Evaluation of Homework Effect of Big Data System

Figure 5 shows the evaluation of the homework effect in the extensive data system. Homework: Review the two-part rhythm fragments learned in the solfeggio and ear training course, and review various rhythm exercises of the combination between other rhythm patterns and the attached rhythm patterns after one beat. At the basic sound level, perform various chords and intervals; the original transposition is minor seven, size seven, seven chord half and seven chord. The singing is performed on the seven tone levels of bE major, with the content of the chord and interval, as well as the connection between the secondary third chord, the third chord in be major, the subordinate seven and the seventh and seventh subordinate, and the solfeggio exercises to be learned in the fifth week of marching preview, among which 2 songs are sung, 4 songs are sung, and the rest of the songs are sung in general. Write two rhythm exercises with simple rhythm combinations between other rhythm patterns and one beat. Write two melody exercises with a combination of other rhythms and posterior rhythm, which requires them to be memorized and written down, or write several familiar songs and pieces. This homework, basically through Auralia and with the help of Overture, lets students learn through extracurricular study. The Auralia and Overture software can complement each other to make up for the lack of two-part rhythm and melody practice in the Auralia software. We can find the corresponding content and the corresponding level of training in the Auralia question bank. For example, the fourth section of the chord module, including all levels of chord progression, can be practised by the students themselves, and the practice is set from shallow to deep and has personalized difficulty. In the part of "chord progression", the software can propose a master chord confession to the students, let the students determine the tonic pitch and tone category, and the set tonic pitch is different each time, thus covering all the tonal exercises.

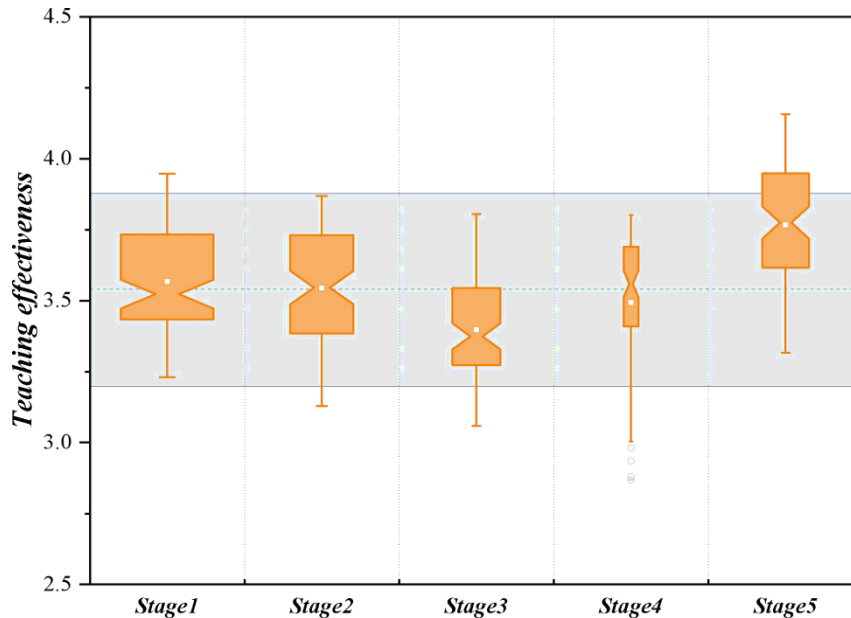
When we guide students to practice, we generally input multiple groups of two-part rhythm and melody-related exercises in advance for students' extracurricular dictation and set up the corresponding answers for students to proofread by themselves. As a result, students' extracurricular self-study solfeggio practice is more vivid and exciting, and students can be more targeted in the test at the same time so that teachers and students are better prepared for the next stage of teaching arrangement, and both sides can also better clear of the course of knowledge.

### **3.2 Multicultural Perspective of Big Data**

Through the intricate process of long-term evolution and development, music across diverse countries and ethnicities has given rise to uniquely defined musical systems, each embodying the distinct characteristics of their respective folk music cultures. In the context of Chinese traditional music education, it is imperative to ground our efforts in the cognizance and perpetuation of our nation's rich musical heritage and foster dialogue, communication, and mutual understanding with the vast multiverse of global musical traditions. West belongs to the maritime civilization, advocating science, rationality, and logic, emphasizing "man wins heaven". Hence, the melody is longitudinal; the rhythm is relatively fixed mechanical, in the law of twelve average, using the "written notation method", is a static reading, with certainty concept; the Eastern spiritual civilization and Western material civilization, Oriental civilization with traditional culture, literature, poetry, has the "beauty of neutralization", the pursuit of an artistic conception, hazy feeling, melody line diversity, mostly horizontal, so no certainty concept. Chinese traditional music beat concept is not necessarily based on the solid cycle rhythm, but in the music sentence pattern, sentence funny "meaning" and "feeling" for the rhythm, players have its subjective creative effect, using the qualitative "notation", is a dynamic way of the reading, or in the traditional "oral", no concept of certainty. The West puts more emphasis on singing, mainly sound, the pursuit of a "pure music" concept, while the East is primarily on local dialect style, emphasizing "sound unity", such as opera singing is "according to the words". However, Chinese solfeggio training has been assimilated by the sound sense training of the Western music solfeggio training system. On this basis, when analyzing Chinese culture, they began to pay attention to the sense of music training. They added more mother tongue training content so that the learning of the mother tongue music system was genuinely integrated into the development concept of modernization. Among them, du Yaxiong's "Carry Forward National Traditional Culture, Strengthen the Education of Music native Language" and other studies are more prominent, and Guan Jianhua also expressed his views. In his idea, music learning can be area as the primary way of division, in which looking for tone and tone and playing a variety of content, and in the context of learning and analysis, need to increase the different regional percussion drums by listening, reading, writing, so in the study of all kinds of cultural content, can add ancient poetry chanting and dialect rhyme



to explore. To sum up, the most important thing for the auditory training is to play Chinese-style music continuously, and the content of the visual and auditory training can more deeply integrate the regional musical styles and characteristics of Chinese music.



**Figure 6:** Multicultural analysis of big data

Figure 6 for big data multicultural analysis, as a multicultural solfeggio teaching, we also need to learn, compare and learn other countries' excellent teaching systems, such as Kodak, Alff, and Golden Music education system integrated teaching, they attach great importance to the content of national music culture but need to explore the spirit of the essence, rather than mechanically. Chen Yaxi mentioned that the music of the whole world has the characteristics of diversity. Therefore, when adding music knowledge to the teaching materials, we should attach importance to our own national culture and add more content related to national music theory knowledge. At the same time, we should also help students to add the content of solfeggio and ear training. Although these contents can bring exercise to students, more is needed. Therefore, it is necessary to integrate the international advanced management concept, start from the basic theory of the education system, and realize the cognitive analysis of the particular laws of the sense training of folk music. Deeply rooted in the fertile soil of domestic music culture, we can broaden our horizons and embrace the global stage. Central to our quest is extracting valuable insights from the theoretical framework of Western music, aiming to promote and disseminate Chinese music culture — a cardinal objective for modern music education. Solfeggio training instructors' daily educational mission involves not merely disseminating knowledge but also cultivating and enhancing their professional capabilities. By staying abreast with the times and engaging in continuous learning and development, they can enrich their educational repertoire, ensuring

their content remains vibrant and relevant. Furthermore, our daily curricula must incorporate diverse skills that foster multidisciplinary integration, thereby gradually elevating the quality and depth of the entire educational experience. In this case, the solfeggio teaching can be genuinely realized from the perspective of diversification. However, at present, most of the researcher's vision is to stay in the general sense and other related music courses cross (such as singing ear and music theory, harmony, music, chorus and appreciation, etc.), and lack of crossover and frontier disciplines (such as music anthropology, education anthropology, linguistics, philosophy, psychology, etc.). As Quist advocates, " College music teachers need more music training in different cultures, expanding their scope of at least one other music culture and their ability to use a variety of music knowledge in music teaching. "According to Table 6, music education from the multicultural perspective of big data can clearly see the help of big data in solfeggio and ear training courses.

**Table 6:** Music Education from the Multicultural Perspective Based on Big Data

<b>CULTURAL PERSPECTIVE</b>	<b>CHARACTERISTIC</b>	<b>TEACHING ADVICE</b>
<b>WESTERN MUSIC</b>	Maritime civilization background, twelve average laws, written notation	Introduce the western music theory, increase the pure music concept and the fixed rhythm training
<b>ORIENTAL MUSIC</b>	The beauty of neutralization, the pursuit of artistic conception, and the dynamic reading spectrum mode	Combined with Chinese traditional music, the combination of music and culture is emphasized, and the qualitative notation is adopted
<b>ETHNIC MUSIC EDUCATION</b>	Attach importance to the mother tongue based on music training, into the concept of modern development	Add the mother tongue training content, carry forward the traditional national culture, and strengthen the music mother tongue education

#### 4. Conclusion

The research study determines the cognitive agility and performance related to stress. According to the research study, the university teaching quality evaluation system based on extensive data analysis can well solve the paperless office and realize the purpose of resource-saving and easy storage. Support the flexible import and export of existing resource data such as classes, teachers, class scheduling and attendance. In the mobile office, the system can input data through mobile devices, tablets, and other mobile devices and query and analyze data through mobile devices anytime and anywhere so as to improve the effectiveness of data analysis. Data management is more advanced and sustainable. The equipment input by mobile devices can facilitate the attendance and class scheduling data of the third-party system and facilitate statistical analysis through classification and keywords. Real-time feedback, through the

system's extensive data analysis of the information, allows education administrators to check the feedback data of class inspection, attendance, and lectures at any time. The overall research concluded that direct and significant link between them. The teacher can immediately get feedback from the teacher and the students in the class. In case of abnormal situations in the class, the results can also be feedback through the system data the first time so as to facilitate the discovery and solution of problems in time. The digital teaching of extensive data systems has the characteristics that traditional teaching does not have and has an irreplaceable and irreplaceable role in the art education of higher vocational colleges in the new era. Although the course teaching and extracurricular self-study mentioned in this paper are only theoretical guidance, there are still many other problems in digital teaching practice, such as capital, technology, etc.; we believe that through our joint efforts, the scientific development and characteristic development of solfeggio singing and ear training in higher vocational art colleges will be realized.

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