공학석사학위논문

Comparison Studies of Chinese Five-element Music Therapy and Western Orchestral Music Therapy on Moderate Depressive Disorders

2017 년 8 월

서울대학교 융합과학기술대학원

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이 논문을공학석사학위논문으로 제출함

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이호영의 석사학위논문을 인준함

2017 년 6 월

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Abstract

With the developments of society, pace of life has been increased with more intense competition and greater pressures which would drive people into confusion, anxiety, and even depression. The word ‘depression’ people usually talk refers to Major Depressive Disorder (MDD) according to clinical manifestation. According to statistics by WHO, depression has become the 4th disease around the world and would probably become the 2nd disease in 2020.

For quite a long time, all possible clinical treatments have been conducted in order to cure this mental disease. However, the therapeutic effects were not ideal and depression always relapses. With study on depression goes deeper, music was discovered to be magic power. Music can work on cerebral cortex by regular vibration of sound waves and then inspire spirits. Thus music can be used to alleviating stress or pain. This is to say that music must be a powerful tool in curing depression. China is one of the oldest cradles of music therapy. Two thousand years ago, five-element music was proposed to cure depression. However, some original medicine works has been lost from past generations. Modern Chinese music therapists conduct clinical treatment with five-element music on the basis of their own understanding on the special effects of five musical modes which needs to be verified.

In this dissertation, series of experiments are designed in turns in

order to explore whether five-element music cures MDD through modes and if five-element music has better therapeutic effects on MDD than western orchestral music. In order to realize the purposes, comparisons are made between traditional Chinese five-element music and western classical orchestral music in clinical MDD treatment. On the basis of experiment results and music feature analysis, new explanations of the mechanism of music therapy are proposed. Further suggestions on music therapy in MDD treatments are also given.

This dissertation contributes to studies of music therapy, especially five-element music therapy. First, this dissertation provides novel experimental designs on therapeutic effects comparisons between different kinds of music on MDD treatments. Second, the formation of misunderstandings in traditional Chinese music therapy is analyzed from theoretical and clinical aspects. Being different from the traditional theory of musical mode effects, new explanations are proposed based on experimental results and computerized analysis. Third, this study conducts surveys on MDD patients and originally points out the lack of music during self-treatment outside the hospital on the basis of feedbacks. Advantages and feasibility of music therapy outside the hospital are then analyzed.

Key words: music therapy, five-element music, MDD, mode, acoustic resonance

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Chapter 1

Introduction

This dissertation explores the therapeutic effects of five-element music and western classical orchestral music on depression clinical treatment. By analyzing experimental data and music features, Chinese long-believed but baseless theories of specific correspondences between Chinese pentatonic scale and five inner organs are rejected. Based on the experimental data, novel explanations of the mechanism that how five-element music as well as western classical orchestral music works on curing depression are further proposed. This chapter presents the motivation and the goals of this dissertation, and the thesis organization.

1.1 Motivation

With the developments of society, pace of life has been increased with more intense competition and greater pressures which would drive people into confusion, anxiety, and even depression. Depression is a common psychological disorder. Usually, the word ‘depression’ refers to moderate depressive disorders (hereinafter referred to as MDD). The pathogenesis of MDD is still unknown to human beings. Its main clinical manifestations are appreciable and lasted black mood and even

committing suicide for patients in severe depression. 16% of human beings would be stuck into depression during some specific period of their life. According to statistics by WHO, depression has become the 4th disease around the world and would probably become the 2nd disease in 2020, only next to coronary heart disease.

For quite a long time, all possible clinical treatments have been conducted in order to cure this terrible mental disease. However, the therapeutic effects were not ideal and depression always relapses. With study on depression goes deeper, music was discovered to be magic power in curing depression.

Since 19th century, quantities of researches have been done on how music influences health. Music is a special language, a kind of traditional artistic appreciation. It is the only carrier than express all the feelings aroused by real world as well as mental activities. And thus, music has a unique advantage to moderate people's emotions. Meanwhile, music also arouses sympathetic responses with organs in human body. Music can work on cerebral cortex by regular vibration of sound waves and then inspire spirits. Thus music can be used to alleviating stress or pain, cure diseases, and relieve anxiety and so on. This is to say that music must be a powerful tool in curing mental diseases. Music reduces patients' negative emotions caused by internal and external factors and helps them moderate their emotions until calming down. Besides, music constructs bridge which connects the real mental world. This helps patients tortured by depression experience feelings they were eager to own and relax themselves.

China is one of the oldest cradles of music therapy. As early as two thousand years ago, five-element music was proposed to cure diseases. It is said that in the ancient Chinese medical work, *Yellow Emperor's Canon of Internal Medicine*, the five inner organs are influenced by five

music elements separately. However, this theory has been lost from past generations. No further theoretical researches or clinical experiments have ever been done to probe its authenticity. Modern therapists have always been looking forward to verifying the existence of relationships between five inner organs and five music elements by combining ancient theories with their own understandings on five-element music. It is never new that music influences emotions but the theory of music effecting on five inner organs has never been explicitly confirmed. Some music therapists have conducted clinical experiments with five-element music and concluded that five-element music is therapeutic. However, no control experiments which check the effect of non-five-element music were conducted at the same time. And thus whether or not five-element music has unique therapeutic effects as is believed by modern Chinese music therapists or other non-five-element music also has the same therapeutic effects is still unknown. Furthermore, if both five-element music and non-five-element music have the same therapeutic effects, reasonable explanations are worth to be discussed such as their common features, their common working mechanism and so on.

1.2 Goals

Goals of this dissertation can be presented as five sub-goals:

(1) Verifying five-element music has significant therapeutic effects on curing MDD by conducting control experiment with pharmacotherapy;

(2) Exploring whether five-element music takes effects through modes as is recorded in traditional Chinese medicine works by setting control experiments with five-element and non-five-element music;

(3) Comparing the effects of five-element music and western classical orchestral music on curing MDD by setting control experiments;

(4) Analyzing how the long-believed theories are developed and why they are unsound. And then proposing reasonable explanations on the experiment results as well as the mechanism that how music works on MDD treatment.

(5) Further discussing how music therapy better effects MDD treatments. Surveys on hospitalized patients are conducted six months after their leaving the hospital. Suggestions from them are collected and analyzed. And then suggestions on MDD music therapy are proposed to make life easier for MDD patients.

1.3 Organization

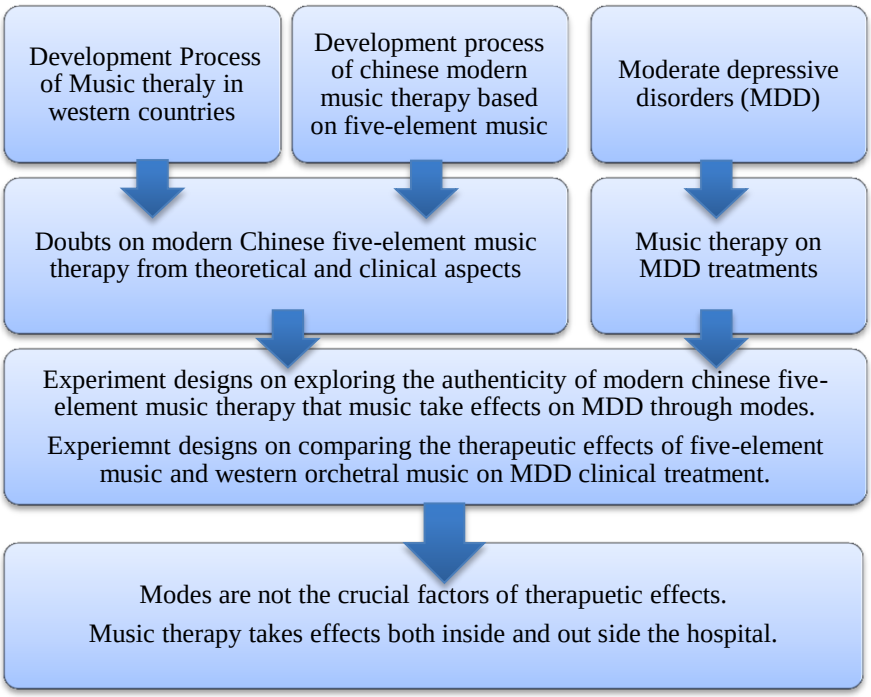

Figure 1.1: Organization of this dissertation

This dissertation consists of five chapters.

Firstly the medical and musical backgrounds are introduced in chapter 2. The development processes of music therapy in western countries and China are separately introduced. Doubts on the authenticity

of modern Chinese five-element music therapy are proposed in chapter 2.7 which is the motivation of the following experiments.

Chapter 3 states experiment designs with details. There are two main experiments and one supplementary experiment in this dissertation: Chapter 3.1 describes the first experiment design which aims at verifying five-element music has significant therapeutic effects on MDD clinical treatments. Chapter 3.2 states the second experiment design which aims at comparing the therapeutic effects of five-element music and western orchestral music on MDD clinical treatments.

Chapter 4 presents the experiment results and statistical analysis.

Chapter 5 further discusses the experiment result from clinical aspects. False theories in long-believed five-element music therapy are pointed out and analyzed. New explanation on how music cures diseases is proposed. Finally, suggestions on music therapy are proposed.

Chapter 6, as appendix of this thesis presents the supplementary experiment which aims at checking if five-element music in a specific mode has special therapeutic effects on alleviating stress for healthy volunteers.

Chapter 2

Background

2.1 Introduction

According to the definition of ‘health’ by World Health Organization, ‘health’ is “the perfect conditions in physiological, psychological and social adaption ability”. Thus it can be seen that people’s understanding of ‘health’ has always been changing with the developments of times. And health is never equal to physiological condition without any disease. It has been pointed out the most terrible kind of disease which destroys human beings has shifted from infectious diseases that would destroy human body to mental diseases. People are always looking for effective treatment methods to keep healthy.

In this chapter, backgrounds of this dissertation are introduced.

2.2 Music Therapy in Western World

The mechanism of music therapy is utilizing the therapeutic effect of music to cure abnormal mental behavioral disorders. The meaning of music here is not only traditional artistic appreciation but also a powerful tool used by music therapists to cure targeted patients. In other words, music therapy is a functional use of music.

2.2.1 Twelve-tone Equal Temperament

Modern western music is mostly composed on twelve-tone equal temperament – a universal temperament which divides octave into twelve semitones and defines the frequency ratio of each musical note in western music. A semitone is also called a minor second and two semitones consist of a major second. Twelve musical notes are thus defined. Also, the frequency of each musical notes in an octave can be calculated.

According to the definition of octave, the frequency ratio of its start and end musical notes is 1:2. If the frequency of the start musical note in an octave is noted as f, the frequency of its end musical note must be $2f$. All the 13 musical notes in the frequency interval [f,$2f$] can be calculated as f, $f*2^{1/12}$, $f*2^{2/12}$, …, $f*2^{11/12}$, $2f$. Take the middle octave as an example: the frequency of the start musical note middle A is 440Hz, and thus frequencies of all 13 musical notes in this octave can be calculated. As is shown in the following picture:

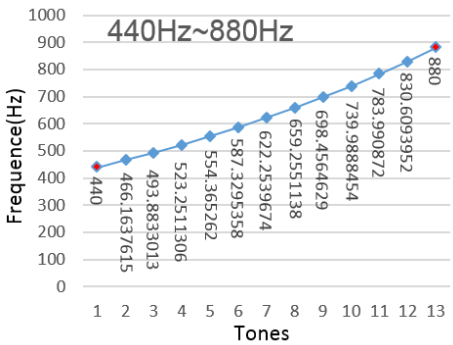

Figure 2.1. Twelve-tone Equal Temperament

2.2.2 Modern Western Music in Clinical Treatment

Western music historians usually regard ancient Greek music as the origin of western music. From ancient times, music has been applied to cure patients. In ancient western world, the sorcerers in the tribes are in fact in charge of both music activities and medical treatments. In ancient Greek legend, Apollo is also a god who is in charge of music and medical treatments [1]. Pythagorean proposes that melodies can alleviate lust, hopelessness, anger and other negative emotions [1].

Modern music therapy originated from the United States in the 1950s. As an emerging inter-discipline, music therapy has integrated music, medical science, aesthetics, music psychology and special education. It is the application and development of music in addition to traditional artistic appreciation [1]. The extensive uses of music in the fields of medical science and psychotherapy and its encouraging effects in clinical treatment have proved an ancient belief of human beings: music possesses the functions of curing diseases and improving health, and has a significant meaning for the survival of human beings [1]. We have already seen that in the early human activities and in currently remaining primitive tribes, music has been playing a very important role in their lives. However, music at this time has very limited aesthetic meaning. With the highly professional development of music and the advanced development of human civilization, people gradually forgot some functions that music activities initially possessed.

It was not until the modern times that the significance of music for the survival of human beings was gradually recognized again. Professor Bruscia, a famous music therapist, has defined music therapy as follows: music therapy is a systematic process of intervention [1]. In this process, by adopting all forms of music experience, as well as the therapeutic

relationship which has been developed in the process of treatment and is taken as the incentive of treatment, the therapist helps the person being treated achieve the purpose of health. The development of modern music therapy started during the Second World War. At that time, music was used to help soldiers stabilize their emotions and recover the physiological functions of their organisms. Between 1944 and 1946, Michigan State University and University of Kansas in the United States set up courses of music therapy successively, which marked the birth of music therapy as an emerging discipline.

Combining the theories and practices of multiple disciplines, such as music, medical science and psychology, modern music therapy is transforming toward the bio-psycho-social medical model, and has been developing rapidly in a relatively short period due to its features of strong applicability, outstanding curative effect and no side effects. It has become a helpful assistant in combined treatment on MDD [2].

2.3 Music Therapy in China

China is one of the oldest cradles of music therapy. As early as two thousand years ago, five-element music was proposed to cure diseases. It is said that the first medicine work that introduces music into medical field is *Yellow Emperor's Canon of Internal Medicine* by Yellow Emperor. From then on, five-element music was tightly connected to other traditional theories such as five-element theory. And thus five-element music therapy is constructed on the basis of five-element theory, corresponding five music elements of Gong, Shang, Jue, Zhi and Yu with five elements, five internal organs, and five emotions in order to cure diseases [3].

2.3.1 Five-element Music

In ancient Chinese medicine works, five music elements have two definitions: generalized as well as narrow definition. Generalized five music elements refer to all sounds around the world. Narrow definition of five music elements refer to five modes of Gong, Shang, Jue, Zhi and Yu which are in one to one correspondence with C, D, E, G, A in twelve-tone equal temperament in turn. These five musical notes consist of Chinese musical scale. Such five-element musical scale does not only exist in China. It is also widely used in other regions all around the world, such as Japan, South Korea, Hungary, Scotland, and Africa and so on.

Five-element musical scale is quite different from the universal heptachord which consists of C, D, E, F, G, A, and B. For the most important, no minor second exists in the scale. Then only major second or minor third exists between two neighboring musical notes. Each octave consists of two minor thirds and three major seconds. The picture below shows the five octaves starting with five different musical notes.

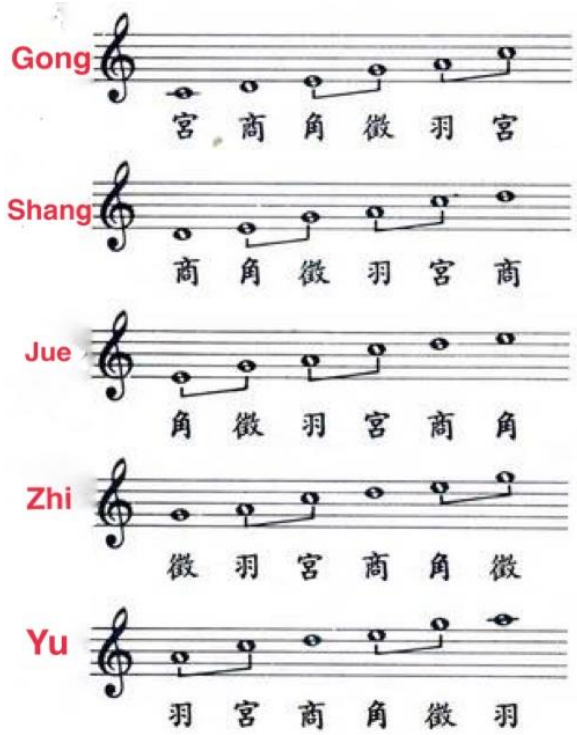

Figure 2.2. Pentatonic Scale

It is obviously that in different modes, three major second and two minor thirds have different locations. This determines the uniqueness of each mode which means they cannot be transferred as what has been done in music composed on twelve-tone equal temperament.

2.3.2 Five-element Music Therapy in Clinical Treatment

Yellow Emperor's Canon of Internal Medicine is one of the greatest traditional Chinese medicine works which initially introduced five music elements into medical field during the Warring States. "There exist five music elements in the universe: Jue, Zhi, Gong, Yu, and Shang; there exist five elements on the ground: wood, fire, earth, metal and water; and there exist five internal organs in human body: liver, heart, spleen, lung and kidney." In its chapter of 'Five modes and Five Tastes', the correspondences of five modes and five emotions are recorded as "Gong-mode sings for thoughts; Shang-mode sings for anger; Jue-tong sings for sadness; Zhi-mode sings for happiness; and Yu-mode sings for fear". In another traditional Chinese medicine work *Su Wen* [3], features of five music elements and their correspondences with five elements are recorded as "Jue-mode represents for upright wood; Zhi-mode represents for passionate fire; Gong-mode represents for tolerant earth; Shang-mode represents for strong metal; and Yu-mode represents for tender water." During the same period, another traditional Chinese medicine work of *Ling Shu* [3] recorded the correspondences between five music elements with five internal organs according to the features of different elements. "Gong-mode enters spleen; Shang-mode enters lung; Jue-mode enters liver; Zhi-mode enters heart; and Yu-mode enters kidney." Correspondences between five music elements and five internal organs were also proposed. On the theory basis of *Yellow Emperor's Canon of Internal Medicine,* together with the traditional Chinese medicine works

mentioned above, five-element music therapy was systematically constructed [4].

According to the uniqueness of five modes and the theories of five-element music therapy, different modes can uniquely moderate diseases originated from their corresponding internal organs. Gong-mode music is applied to cure diseases in spleen and stomach. Shang-mode music can moderate abnormal functions of lung. Jue-mode music alleviates pain caused by liver. Zhi-mode music might be helpful in curing heart diseases. Yu-mode music is used in kidney diseases treatment [4].

Anxiety, depression, and insomnia are three main issues in clinical five-element music therapy.

In the clinical treatment of anxiety, Gong-mode and Yu-mode music are mainly used. According to traditional medicine theory, Gong-mode strengthens the functions of spleen and Yu-mode inspires the spirits of patients with anxiety [5]. Li Lin et al conducted experiments on animal and discovered that Yu-mode effectively decreased the degree of anxiety [6]. He Jin et al conducted experiments with 60 senior high school students who were faced with college entrance examinations [6]. They discovered that after conducting acupuncture therapy with Yu-mode and Gong-mode music, the clinical manifestation of anxiety was significantly alleviated [6]. Liu YuLei et al conducted an experiment on 60 pregnant women and found that music therapy significantly helped them successfully delivery [5].

In the clinical treatment of insomnia, Gong-mode and Yu-mode music also have excellent performance. Feng ShuJuan et al conducted a control experiment with 35 patients with insomnia, treating then with Gong-mode music. After a treatment period of 30 days, the effective rate of experiment group was 91.43% with 68.75% of control group. Meanwhile,

the degree of satisfaction to clinical treatment from experiment group was 88.75% which was obviously higher than that of the control group [6]. You Yang et al treated 30 aviators who were tortured by insomnia using Gong-mode and Yu-mode as supporting aid to regular treatment and found that the cured rate, effective rate and PSQI were all higher than those of the control group [6].

2.4 Patterns of Music Therapy

Currently, patterns of music therapy can be classified from both perspectives of patients and therapists. From the perspective of patients, depending on the degree that they actively take part in the music treatment activities, they are classified into two classes: passive pattern and interactive pattern [7].

For patients who are classified as ‘passive’, they listen to the selected music to realize therapeutic purposes. Prevalent clinical treatments are as follows: 1) Song discussion. Therapists choose music first. After listening, patients are led by therapists to talk about their thoughts or understanding. By doing this, useful information can be collected by therapists. For example, therapists can understand the way their patients view the outside world, the way they communicate with others, their personalities and so on. Such information can play crucial rules during the following treatment period. On the other hand, discussion helps patients develop or reconstruct self-confidence and alleviate their fears or anxiety. 2) Sympathetic response with music. According to Gestalt Therapy, human body as well as mental generates sympathetic response with music. Specific music generates positive physiological and mental changes. 3) Musical imaginary. Music selected by both patients and therapists tells patients’ past life. by leading patients imagine future or past freely, therapists get to know patients’ mental conflicts deeply

hidden in mind and then take proper treatments to cure mental diseases.

For interactive pattern, patients not only listen to music but also take part in the activities of singing, playing musical instruments and so on. Impromptu playing without specific topic is a common kind of interactive treatment activity. Also, topic can be assigned by therapists, patients play as their own understandings. As an aid of clinical treatment, sometimes training is also necessary.by observing patients' choices (such as choices of musical instruments) and performances (loud or low voices, ranges of motions and so on), therapists collect information of their patients. They understand patients' personalities, rules in human interchanges, ways they express emption, how they adjust themselves to the environments and so on. Also, take part in music treatment activities can help patients gain sense of success and fulfillment which will possibly help them concur difficulties in the following treatments.

Meanwhile, from the perspective of therapists, to utilize the music medical theories into clinical treatment, scientific psychological treatment methods must be employed. At present, five patterns are applied by music therapists: 1) Analysis of mental states. Patients select specific music which is significant in their past live. Or therapists select music and then lead patients to imagine freely. Usually music makes patients drop down their resistance and conflicts in their sub consciousness can thus be easily revealed and analyzed. 2) Behavioral treatments. Before clinical treatments, therapists fist get to know patients' music preferences, target the problem existed in patients' behaviors and then make treatment plan. Music is used to motivate patients to participate and coordinate. 3) Consulting. First therapists and patients enjoy listening to or playing music together and generate sympathetic response with music. Then under the guidance of therapists, patients gradually talk about their problem or their thoughts recalled by the music. 4) Relaxing training. In

relaxing training, slow and soft music is played which can make people calm down. Together with other supporting treatments like massage, anxiety, anger or fear can be alleviated. Negative thoughts are gradually swept from patients' mind. Breath is adjusted in accordance with music and bodies are relaxed. 5) Electric shock treatment. This method was originally created by Chinese therapists. The first clinical treatment was conducted in September, 1979 in Shandong Province, China. Music is transformed into electronic current and then penetrated into specific acupuncture points to cure specific disease. In this thesis, electric shock treatment are conducted under the guidance of professional music therapists.

2.5 Depression with Traditional Pharmacotherapy

Depression is a common psychological disorder. According to American Psychiatric Association, moderate depressive disorders (MDD) is a chronic diseases which influences patients' moods, minds and behaviors and then leads to long-time grief and even committing suicides [8]. According to WHO, approximate two thirds of MDD patients have ever thought about committing suicides. As is claimed by Center for Disease and Prevention of the United States, 9.1% of the American population suffers from this disease. Meanwhile, according to statistics from WHO, there are about 350 million people all around the world suffer from MDD – it has become the first disease to cripple people nowadays. 16% of human beings would be stuck into depression during some specific period of their life. According to statistics by WHO, depression has become the 4th disease around the world and would probably become the 2nd disease in 2020, only next to coronary heart disease [9].

Up until now, the pathogenesis of MDD is still unknown. However,

people have never stopped fighting this terrible disease. During the process of curing MDD, pharmacotherapy has always played the core rule which attracts the most attention. Traditional pharmacotherapy relies on Tricyclic antidepressants (TCAs) [10]. Recently, it has been gradually replaced by new antidepressants including selective serotonin reuptake inhibitors (SSRIs), noradrenaline reuptake inhibitors (NARIs), and serotonin norepinephrine reuptake inhibitors (SNRIs) etc [10].

Although more and more drugs for MDD are discovered, people have never been satisfied with their therapeutic effects for two reasons: terrible toxic and side effects, and high rate of relapse.

The toxic and side effects of traditional medicine of TCAs include toxic effects on central nervous system and toxic effects on cardiovascular system[11]. Physical symptoms include epilepsy, anxiety, and cardiac arrest, etc. The toxic effects of new drugs include anorexia, anxiety, insomnia, arrhythmia, etc. MDD patients tortured by such toxic and side effects usually feel helpless and hopeless. Besides, the withdrawal reaction of pharmacotherapy is also terrible which further aggravate pains of MDD patients [11].

High relapse rate of MDD is now a new topic. As a disease with high relapse rate, its clinical manifestations usually present as repeated outbreak and intermittent relief [12]. High relapse rate directly causes high hospitalization rate, high cripple rate, and high suicide rate [13]. And therefore, MDD ranks the first place in disease burden for many countries. Factors that cause the relapse of MDD are diverse including withdrawal reaction to pharmacotherapy, genetic factors, environmental stimulus, social support and so on [12].

Nowadays, more and more scholars and doctors have realized that only pharmacotherapy or only psychotherapy cannot cure MDD patients with good therapeutic effects. A combined therapy of pharmacotherapy

and psychotherapy has been more and more widely accepted all around the world. Besides, Doctors are always keeping looking for new therapeutic methods to cure MDD. As a helpful method except for pharmacotherapy and psychotherapy, music therapy is more and more used in clinical treatment of MDD.

2.6 Depression with Music Therapy

In terms of the clinical treatment of patients with depression, apart from pharmacotherapy and psychotherapy, there are many effective treatment methods, and music therapy is one of them. Patients with depression often develop negative feelings like depression, despair and anxiety [8]. The fact of having to be confined at a close-ended place in the hospital with a monotonous environment will all the more aggravate the patient's anxiety and fear. Music therapy can play a role that medicine treatment can't do — ameliorating symptoms, adjusting negative feelings, reducing pathological experience, and promoting rehabilitation, so it has become a useful supplement in mental disease treatment [14].

2.6.1 Western Music Therapy in Depression Treatment

The therapy of treating depression with music has a long history. According to Records of the Grand Historian, "music can activate blood vessels, benefit spiritual vigor and regulate thoughts." And as described in Egyptian classical literature in ancient times, music is "medicine for the soul". In the West, David had cured King Solomon's depression by playing fair-sounding music with his harp.

The systematic research on the value of music in medical and clinical treatment started from the 20th century. In the 20th century, especially since the invention of phonograph, people were able to record

music and play it repeatedly, which made it convenient for music to be used in the processes of clinical treatment [15]. So some hospitals began using music to help patients fall into sleep [16], reduce their tension and anxiety in the processes of surgeries, and aid anesthesia and analgesia [17]. Meanwhile, some psychological doctors began applying music to the treatment of psychological disorders such as depression, and they obtained incredible effects [18].

Nowadays, as a necessary auxiliary means, music therapy is helping a large number of patients with depression turn over a new leaf. It also has a certain effect on ameliorating depression or the state of depression. As is found by Moradipanah et al, appreciating 20 minutes' relaxing music had a better effect than 20 minutes' lying on bed on ameliorating the anxiety and depression of patients who had undergone coronary angiography [19]. And as found by Chan et al, a period of music therapy could effectively ameliorate the depression symptoms of adults, but the effect of using music therapy every day wouldn't be more significant than using it every week. They suggested that music therapy treatment should last for more than 3 weeks, because a cumulative effect would be more excellent [20].

Apart from above, music therapy also has an obvious effect on improving the sleep quality of patients with depression. Deshmukh et al carried a study, in which they divided patients with depression into two groups to give them music hypnotic therapy and sleeping pill therapy respectively. According to the MADRS and PSQI, the sleep qualities of both of the two groups were improved, with the effects being quite equivalent [21]. In a recent randomized controlled trial, patients with depression were treated with improvisation music therapy. The 79 patients were randomly divided into two groups: one group received standard treatment (including medicine therapy and psychological

interview), and the other group received individual music therapy along with standard treatment. As shown in the subsequent follow-up, the patients who received the comprehensive treatment made more significant progress in terms of ameliorating their depression symptoms and anxiety symptoms as well as enhancing their social functions [22].

Also in a single-blind randomized controlled trial, Srkmo et al discovered that treating patients who had a MCA (middle cerebral artery) acute stroke within a month with accepted music therapy could effectively enhance their verbal memory and attention, and that the depressive feelings of the patients who were treated with accepted music therapy were more significantly ameliorated, compared with the control group and the verbal treatment group [23]. Recently, a review of geriatric depression found out that music therapy combined with a standard treatment could play a significant role in ameliorating the symptoms of geriatric patients with depression [24].

2.6.2 Five-element Music Therapy in Depression Treatment

According to five-element music therapy theory, depression is caused by the abnormal functions of liver and can be cured by Jue-mode music. And thus, in clinical treatment of depression, Jue-mode music is most used. Li Lin et al conducted a control experiment. Patients in control group were treated by regular treatment with Chinese medicine. Patients in experiment group were treated by both regular treatment and five-element music. After a 2-month treatment period, the therapeutic effects in experiment group were significantly better than the control group [26]. Liu SongJiang et al treated patients with depression by combining regular therapy with five-element music and achieved ideal effective rate [27]. Xiang ChunYan et al conducted clinical treatment on patients in depression condition with acupuncture therapy and

five-element music aid separately. They found that the effects of both therapies could lower the points of Standard Hamilton Depression Scale (HAMD), ZUNGS Depression Scale and Kappa value. No differences were shown according to statistical standards [28]. Liu XueFeng et al conducted an experiment on 35 patients with depression and confirmed the conclusions drawn by Xiang ChunYan [29].

2.7 Doubts on Five-element Music Therapy

Music therapy, nowadays, has become a new interdiscipline of music, medical science, psychology, and pedagogy. Meanwhile, it is also a healthy non-drug treatment under the medical pattern of creature – psychology – society. During its propagation process in different countries, especially countries with long histories, distinctive medical treatments have been developed to which Chinese five-element music therapy belongs.

The five-element theory is the beginning of traditional Chinese philosophy which has always been influencing Chinese people. For quite a long time, five-element music therapists applied five-element theory to explain the mechanism of music on curing diseases. However, with the development of modern medical science and modern music therapy, some Chinese scholars have casted doubts on traditional five-element music therapy, especially on the one-to-one correspondence between five modes and five inner organs.

Unfortunately, there are seldom theoretical researches as well as clinical experiments on exploring the correspondences between five modes and five inner organs. And thus five-element music therapy has been applied into clinical treatments without further study.

In this dissertation, new experiments will be conducted in order to check whether the correspondences between five modes and five inner

organs exist. Furthermore, a comparative study of five-element music and western orchestral music will be conducted. Experiment designs are presented with details in the next chapter.

Chapter 3

Experiment Design

3.1 Introduction

The experiments in this dissertation consist of three experiments in turns. Firstly, significant therapeutic effects of five-element music on curing depression are checked. Once the positive effects of five-element music on MDD is confirmed, the second experiment on exploring whether mode is the crucial factor–which is the long-believed theory in Chinese music therapy field–on curing MDD is explored. Finally, comparative studies of five-element music and western classical orchestral music on curing MDD are made by control experiments.

3.2 Experiment 1. Explore Therapeutic Effects of Five-element Music on Depression Clinical Treatment

This experiment aims at exploring the therapeutic effects of five-element music in curing depression

3.2.1 Patients Information

80 patients who were diagnosed with depression in the same hospital (during March 2016 to September 2016) are recruited for this experiment. 80 patients were randomly divided into two groups: experiment and control group. There are 40 patients per group. According to Chinese diagnostic standard of phrenoblabia, their clinical manifestation should be diagnosed as depression. Standard Hamilton Depression Scale (HAMD) is used as the diagnostic criterion. Results are specifically classified with Hamilton Anxiety Scale (HAMA). All the patients agreed that their physiological data could be collected for experiment analysis. None of the 80 patients are in special physiological conditions.

3.2.2 Experiment Method

Control group: Regular Fluoxetine treatment: 20 mg per day.

Experiment group: on the basis of regular fluoxetine treatment, five-element music was applied as supporting treatment. All five modes of Gong-mode, Jue-mode, Shang-mode, Zhi-mode and Yu-mode music were chosen as experiment materials. According to different causes of depression, different combinations of music were played to different patients. In traditional Chinese medical works, depression is caused by liver and Jue-mode is the corresponding music element. And thus every combination was made up of Jue-mode music and another kind of music in the rest modes. Music was played 40 minutes per day. The treatment

period lasted for 8 weeks with 40 times of music treatment. Data should be collected for 5 times: before the start of treatment, the second, forth, sixth, eighth week.

3.2.3 Test of Therapeutic Effects

Standard Hamilton Depression Scale (HAMD) is used as the diagnostic criterion. Points lower than 7 represent healthy mental condition. Class of 7~15 points is defined as mild depression, and class of 16~24 points represents moderate depression, points higher than 24 is diagnosed as severe depression. Results are specifically classified with Hamilton Anxiety Scale (HAMA). Four classes – Not Effective, Effective, Obviously Effective and Healed are then defined. All the patients agreed that their physiological data could be collected for experiment analysis. None of the 60 patients are in special physiological conditions. As assistant test, Pittsburgh Sleeping Quality Index was also used to test patients' sleeping quality.

3.2.4 Statistical Methods

The results were analyzed by MATLAB R2014a T-test and χ^2-test were applied to analyze differences of control and experiment groups.

3.3 Experiment 2. Explore Therapeutic Effects of Five-element Music and Western Classical Orchestral Music on Depression Clinical Treatment

This experiment aims at comparing the therapeutic effects of five-element music and western classical orchestral music on depression clinical treatment. Besides, this experiment also acts as the evaluation of conclusions drawn by previous discussions in this dissertation –

five-element music does not take effect on curing depression by special modes compared with western music.

3.3.1 Patients Information

160 patients who were diagnosed with depression in the same hospital (during September, 2016 to Feburary, 2016) are recruited for this experiment. 160 patients were randomly divided into four groups: three experiment groups and one control group. There are 40 patients per group. According to Chinese diagnostic standard of phrenoblabia, their clinical manifestation should be diagnosed as depression. Standard Hamilton Depression Scale (HAMD) is used as the diagnostic criterion. Results are specifically classified with Hamilton Anxiety Scale (HAMA). All the patients agreed that their physiological data could be collected for experiment analysis. None of these 160 patients are in special physiological conditions. None of these 160 patients have participated previous experiments in this dissertation.

3.3.2 Experiment Method

Control group: Regular Fluoxetine treatment: 20 mg per day.

Experiment Group 1: on the basis of regular fluoxetine treatment, Gong-mode music was applied as supporting treatment. Music was played twice per day. The treatment period lasted for 8 weeks with 40 times of music treatment. Data should be collected for 5 times: before the start of treatment, the second, forth, sixth, eighth week.

Experiment Group 2: on the basis of regular fluoxetine treatment, Jue-mode music was applied as supporting treatment. Music was played twice per day. The treatment period lasted for 8 weeks with 40 times of

music treatment. Data should be collected for 5 times: before the start of treatment, the second, forth, sixth, eighth week.

Experiment Group 3: on the basis of regular fluoxetine treatment, randomly selected western classical orchestral music was applied as supporting treatment. Music was played twice per day. The treatment period lasted for 8 weeks with 40 times of music treatment. Data should be collected for 5 times: before the start of treatment, the second, forth, sixth, eighth week.

Music was played at the same time for all three experiment groups every day and lasted for the same time period.

3.3.3 Test of Therapeutic Effects

Standard Hamilton Depression Scale (HAMD) is used as the diagnostic criterion. Points lower than 7 represent healthy mental condition. Class of 7~15 points is defined as mild depression, and class of 16~24 points represents moderate depression, points higher than 24 is diagnosed as severe depression. Results are specifically classified with Hamilton Anxiety Scale (HAMA). Four classes – Not Effective, Effective, Obviously Effective and Healed are then defined. All the patients agreed that their physiological data could be collected for experiment analysis. None of the 80 patients are in special physiological conditions. As assistant test, Pittsburgh Sleeping Quality Index was also used to test patients' sleeping quality.

3.3.4 Statistical Methods

The results were analyzed by MATLAB R2014a. Chi-square test were applied to analyze differences of control and experiment groups.

Chapter 4

Experiment Results and Discussion

4.1 Introduction

The mechanism of music therapy is utilizing the therapeutic effect of music to cure abnormal mental changes or behavior. The meaning of music here is not only traditional artistic appreciation but also a powerful tool used by music therapists to cure targeted patients. In other words, music therapy is a functional use of music. Detailed experiment results and statistical analyses are presented in this chapter.

4.2 Results of Experiment 1

4.2.1 Results

	Number	Healed	Obvious Effective	Effective	No Effect	Gross
Control	40	5	4	6	25	15
Experiment	40	11	9	7	13	27

Table 4.1. Comparisons of therapeutic effects

Groups	Effects	No effect	Total	Cure rate
Control	15	25	40	0.375
Experiment	27	13	40	0.675
Total	42	38	80	0.525

Table 4.2. Comparisons of Cure Rates ($\alpha = 0.05$)

Table 4.1 shows the overall therapeutic effects in this experiment. Clinical treatment was effective in both control and experiment since more than half of the patients got positive therapeutic effects after 8 weeks. The number of patients who were positively cured in experiment group is 27, larger than that in control group of 15. Patients who were healed and obviously effective in experiment group were more than control group.

Table 4.2 shows the comparison of two cure rates. The cure rate of control group is 0.375(denotes as p_1) while that of experiment group is 0.675(denotes as p_2). In order to check if p_2 is significantly larger than p_1, Chi-square test was conducted. Since χ^2 is 7.22, it can be concluded that p_2 is significantly larger than p_1 – that is to say the cure rate of experiment group is significantly larger than that of the control group. The therapeutic effects of experiment group are significantly better than that of control group.

Apparently, five-element music was significantly helpful as a supporting aid for traditional regular fluoxetine treatment.

		Before	2nd week	4th week	6th week	8th week
Control	HAMD	24.5±7.2	20.2±7.8	16.3±6.4	13.5±6.8	10.2±6.7
	HAMA	19.1±9.5	17.5±8.1	14.3±7.6	11.2±6.3	8.7±6.9
Experiment	HAMD	24. 9 ±8.2	19.1±8.0	14.3±7.5	6.7±13.2	8.5±5.1
	HAMA	20.9±11.2	16.2±10.6	12.2±8.5	9.7±7.1	7.6±6.2

Table 4.3. Comparisons of HAMD and HAMA

Table 4.3 shows the detailed information during 8-week treatment period. The averages of both control and experiment groups became lower in the 8th week than before. Data of experiment groups had a larger decrease compared with control group.

	Number	Before	2nd week	6th week
Control	30	16.82±1.58	9.89±1.99	6.69±1.53
Experiment	30	16.68±2.15	14.02±2.46	10.33±2.28

Table 4.4. Comparisons of PSQI

Table 4.4 shows the PSQI results. The level of sleeping quality in experiment group became higher after the treatment started. At the end of treatment period, PSQI of experiment group was still higher than that of control group. This indicates that patients in experiment group slept better than patients in control group during treatment period.

4.2.2 Discussion

Results of this experiment shows that the therapeutic effects of experiment group, which takes five-element music therapy as an aid of

regular fluoxetine treatment is better than control group which only takes regular fluoxetine treatment. The degree that patients' clinical manifestation in experiment group being alleviated was higher than that in control group. Besides, sleeping quality in experiment group was higher than that in control group. On the basis of the results, a conclusion that five-element music has significant therapeutic effects can be reached.

4.3 results of Experiment 2

4.3.1 Results

	Number	Healed	Obvious Effective	Effective	No Effect	Gross
Control	40	3	7	6	24	16
Group 1	40	12	8	7	13	27
Group 2	40	9	10	6	15	25
Group 3	40	16	12	12	4	36

Table 4.5. Comparisons of therapeutic effects

Table 4.5 shows the overall therapeutic effects in this experiment. Clinical treatment was effective in both control and experiment groups since more than half of the patients got positive therapeutic effects after 8 weeks. The number of patients who were positively cured in control group is 16. In experiment groups, the numbers of patients who were positively cured are 27, 25, and 36 in group 1, 2, and 3.

Groups	Effects	No effect	Total	Cure rate
Control	16	24	40	0.40
Group 1	27	13	40	0.675
Total	43	37	80	0.5375

Table 4.6. Comparisons of Cure Rates ($\alpha = 0.05$)

Table 4.6 shows the comparison of two cure rates between control group and experiment group with Gong-mode music. The cure rate of control group is 0.40(denotes as p_3) while that of experiment group is 0.675(denotes as p_4). In order to check if p_4 is significantly larger than p_3, Chi-square test was conducted. Since χ^2 is 6.08, it can be concluded that p_4 is significantly larger than p_3 – that is to say the cure rate of experiment group 1 is significantly larger than that of the control group. The

therapeutic effects of experiment group 1 with Gong-mode music are significantly better than that of control group.

Groups	Effects	No effect	Total	Cure rate
Control	16	24	40	0.40
Group 2	25	15	40	0.625
Total	41	39	80	0.5125

Table 4.7. Comparisons of Cure Rates ($\alpha = 0.05$)

Table 4.7 shows the comparison of two cure rates. The cure rate of control group is 0.40(denotes as p_3) while that of experiment group is 0.625(denotes as p_5). In order to check if p_5 is significantly larger than p_3, Chi-square test was conducted. Since χ^2 is 4.05, it can be concluded that p_5 is significantly larger than p_3 – that is to say the cure rate of experiment group 2 is significantly larger than that of the control group. The therapeutic effects of experiment group 2 with Jue-mode music are significantly better than that of control group.

Groups	Effects	No effect	Total	Cure rate
Control	16	24	40	0.40
Group 3	36	4	40	0.90
Total	52	28	80	0.65

Table 4.8. Comparisons of Cure Rates ($\alpha = 0.05$)

Table 4.8 shows the comparison of two cure rates. The cure rate of control group is 0.40(denotes as p_3) while that of experiment group is 0.90(denotes as p_6). In order to check if p_6 is significantly larger than p_3, Chi-square test was conducted. Since χ^2 is 21.98, it can be concluded that p_6 is significantly larger than p_3 – that is to say the cure rate of experiment group 3 is significantly larger than that of the control group. The therapeutic effects of experiment group 3 with western orchestral music are significantly better than that of control group.

Groups	Effects	No effect	Total	Cure rate
Group 1	27	13	40	0.675
Group 2	25	15	40	0.625
Total	52	28	80	0.65

Table 4.9. Comparisons of Cure Rates ($\alpha = 0.05$)

Table 4.9 shows the comparison of two cure rates. The cure rate of control group is 0.675(denotes as p_4) while that of experiment group is 0.625(denotes as p_5). In order to check if p_5 is significantly larger than p_4, Chi-square test was conducted. The value of χ^2 is 0.22. The χ^2 value is 3.841 at significant level 0.05 with degree freedom of 1. The null hypothesis cannot be rejected. That is to say, no significant difference exists between the therapeutic effects of experiment group 1 and 2 – to be specific, no significant therapeutic effects exist by Gong-mode and Jue-mode music.

Groups	Effects	No effect	Total	Cure rate
Group 1	27	13	40	0.675
Group 3	36	4	40	0.90
Total	63	17	80	0.7875

Table 4.10. Comparisons of Cure Rates ($\alpha = 0.05$)

Table 4.10 shows the comparison of two cure rates. The cure rate of control group is 0.675(denotes as p_4) while that of experiment group is 0.90(denotes as p_6). In order to check if p_6 is significantly larger than p_4, Chi-square test was conducted. Since χ^2 is 6.05, it can be concluded that p_6 is significantly larger than p_4 – that is to say the cure rate of experiment group 3 is significantly larger than that of the experiment group 1. The therapeutic effects of experiment group 3 with western orchestral music are significantly better than that of experiment group 1 with Gong-mode music.

Groups	Effects	No effect	Total	Cure rate
Group 2	25	15	40	0.625
Group 3	36	4	40	0.90
Total	61	19	80	0.7625

Table 4.11. Comparisons of Cure Rates ($\alpha = 0.05$)

Table 4.11 shows the comparison of two cure rates. The cure rate of control group is 0.625(denotes as p_5) while that of experiment group is 0.90(denotes as p_6). In order to check if p_6 is significantly larger than p_5, Chi-square test was conducted. Since χ^2 is 8.352, it can be concluded that p_6 is significantly larger than p_5 – that is to say the cure rate of experiment group 3 is significantly larger than that of the experiment group 2. The therapeutic effects of experiment group 3 with western orchestral music are significantly better than that of experiment group 2 with Jue-mode music.

4.3.2 **Discussion**

. In experiment 2, multi-comparative clinical experiments were conducted. This experiment studies the therapeutic effects of Gong-mode music, Jue-mode music, and western orchestral music.

Seeing from the cure rates, the therapeutic effects of all three experiment groups are significantly better than control group. This indicates that music therapy is significantly effective.

The therapeutic effects of Gong-mode and Jue-mode groups are not significantly different from each other. This means Gong-mode and Jue-mode music have no difference on curing depression. This experiment result obviously conflicts with modern five-element music theories which claims Jue-mode music has better curing effects on diseases originated from live, such as depression.

The therapeutic effect of western orchestral music is significantly

better than other experiment groups, which implies that western orchestral music is significantly effective in depression clinical treatment compared with Gong-mode and Jue-mode music. In the next chapter, a possible explanation on the experiment results are proposed.

Chapter 5

Conclusion

5.1 Summary of Contributions

The theoretical basis of modern five-element music therapy comes from the ancient Chinese medical work of *Yellow Emperor's Canon of Internal Medicine*. Modern five-element music therapists believe every specific mode of five-element music cures diseases originated in its corresponding inner organs. However, there are seldom theoretical researches or clinical experiments testing the validity of this long-hold belief.

This dissertation checks the validity of widely used five-element music therapy theories in China by original experiment designs. To be specific, Jue-mode music is thought to have significant therapeutic effects on depression because depression originates in liver. In this dissertation, experiments are conducted to check if such theory really holds in clinical treatments compared with other kinds of music.

The first experiment confirms that five-element music has significant therapeutic effects than regular medicine treatment.

The second experiment indicates that in clinical treatment on curing depression, Jue-mode music has no significantly better therapeutic effects than Gong-mode music as well as western orchestral music. In this experiment, the therapeutic effects of western orchestral music are significantly better than other music.

The supplementary experiment in Chapter 6 confirms Jue-mode music has no significant better therapeutic effects than Gong-mode and western orchestral music in alleviating mental stress on healthy people.

To sum up, when applying ancient theories into modern clinical treatment, therapists should treat the ancient theories more seriously. Also, they should conduct more theoretical researches and clinical experiments should be beforehand.

5.2 Doubts on Five-element Music Therapy

Modern Chinese five-element music therapists claim that the long-believed theories developed from ancient Chinese medical works. However, with the development of modern medical science, the authenticity of ancient words needs more tests by practice because they are being used to save more and more MDD patients. The authenticity of ancient words can be tested from theoretical and clinical aspects.

5.2.1 Doubts in Theoretical Research

In western music theory, musical scale is equal to mode. Similarly, modern five-element music therapy theories generally treat Chinese musical scale as mode, and then conclude five modes can cure diseases generated from their corresponding inner organs. It must be pointed out that this is a superficial understanding of traditional five-element music theories and five-element music.

First, as is known to all, the earliest record of five-element music therapy appears in *Yellow Emperor's Canon of Internal Medicine*. However, the conception of 'mode' in traditional Chinese music appeared about one thousand years later than *Yellow Emperor's Canon of Internal Medicine*. Before the conception of 'mode', five musical elements of Gong, Shang, Jue, Zhi, and Yu widely refer to pitch. By this token, equating Chinese musical scale to mode is not proper.

The conception of 'mode' generated in western music theory. And thus if Chinese musical scale cannot be equal to five modes, the theoretical basis of modern five-element music therapy never exists, let along curing diseases caused by inner organs.

Second, in other medical works appeared at the same time with *Yellow Emperor's Canon of Internal Medicine*, five musical elements of

Gong, Shang, Jue, Zhi, and Yu refer to musical alphabets rather than modes. In recent years, more and more western music works have been translated into Chinese. During this translation process, the word of 'mode' might have been mistaken used that modern five-element music therapists misunderstood the true meaning of ancient theories.

Third, in the book of *Yellow Emperor's Canon of Internal Medicine*, five musical elements refer to five voices generated by five emotions. According to modern five-element music therapy theories, Gong-mode, Yu-mode and Jue-mode are connected with kidney, spleen and liver because inner organs generate five musical elements. Obviously, misunderstandings exist here. In *Yellow Emperor's Canon of Internal Medicine*, it is recorded that inner organs resonate with different sounds. Since the Chinese characters of 'sound' and 'mode' here are the same one, it is possible that they were mistaken with each other.

Forth, the order of five musical elements is not in accordance with that of mutual generation of five natural elements. The theories of mutual generation of five natural elements appeared hundreds later than five musical elements. In *Yellow Emperor's Canon of Internal Medicine*, five musical elements of Gong, Shang, Jue, Zhi, and Yu are in one-to-one correspondences with the earth, the metal, the wood, the fire, and the water. However, according to the theories of mutual generation of five natural elements, the order should be the wood, the fire, the earth, the metal, and the water which is in correspondence with Gong, Zhi, Shang, Yu, and Jue, a totally different order from the musical scale.

All the four points above indicate that the simple correspondences between five musical elements with five natural elements together with five inner organs are misunderstanding by modern scholars.

5.2.2 Doubts in Clinical Experiments

There were previous clinical experiments, even if not many, also casting doubts on modern five-element music therapy theories.

Yulin Wei (2005) conducted an experiment on the conduct of Gong-mode acoustic wave in a healthy body and the results turned out that such acoustic waves only conducted along lower limbs which meant the hypothesis of Gong-mode music effects spleen were not verified [30]. Since the theories of the five inner organs with five-element music in *Yellow Emperor's Canon of Internal Medicine* has been lost from past generations, it is unclear whether or not the five-element music applied in current clinical treatments are in accordance with the five-mode music in the ancient medicine works. In other words, whether or not five-mode music can be defined by Gong, Shang, Jue, Zhi and Yu musical notes is still unclear.

The five-element music used in this experiment is created on the basis of five modes in Gong, Shang, Jue, Zhi and Yu. If the five music elements recorded in *Yellow Emperor's Canon of Internal Medicine* refer to five modes rather than five musical notes, five music elements are connected with five modes. Is that to say musical mode is crucial in influencing inner organs? Or is that to say music in a specific mode can cure a specific kind of disease?

5.3 Explanations on the Mechanism of Music Therapy

Being the same as the unknown pathogenesis of depression, the mechanism of music therapy is also undiscovered. People know that music can cure several diseases but they are not sure how music cures patients. And thus music therapists have never stopped exploring the mechanism of music therapy and have already proposed several

reasonable explanations.

5.3.1 Previous Explanations

Some scholars proposed that music effects emotions and then further effects related inner organs. In ancient Chinese medicine works, this theory was elaborated as five music modes effect five emotions, then effect five inner organs which means musical mode is the crucial factor in effecting emotions. Similarly, there is modal music in ancient western music theories. Different modes were thought to own different functions on effecting emotions according to such theories. For example, the mixed Lydia mode makes people sad and painful while other modes alleviates anger and makes people calm down [2].

Such mode theories originated in a period during which scholars had not understood the scientific features of music. Modern scholars have developed new understandings: the crucial factor of music deciding emotions are essential musical elements (including pitch, tonality, tempo, rhythm, etc.) rather than modes.

Weiping Huang (2011) conducted an experiment exploring the potential relationship between music elements and emotions of undergraduate students [31]. Several conclusions are listed as follows: 1) Regardless of modes, beats or different combinations of these two elements, emotions of undergraduate students were significantly driven by tempo. Music in fast tempo significantly made students excited or at least generate positive emotions while music in slow tempo caused sadness, hopelessness or other negative emotions; 2) modes of music had no significant influence on emotions of undergraduate students. However, modes combined with different tempo significantly influenced the emotions of undergraduate students; 3) beats of music had no significant influence on emotions of undergraduate students. However, beats

combined with different tempo significantly influenced the emotions of undergraduate students; 4) regardless of musical modes, music in triple time with fast tempo generated more positive emotions than other music while music in duple time with slow tempo generated more negative emotions than other music. In this experiment, tempo was the crucial factor in influencing emotions rather than modes which were thought to be the crucial factor from past generations. How musical elements influence people's emotions is quite a complicated problem. From the experiment in this dissertation, mode is not a crucial factor which significantly influences people's emotions. No special correspondence has been found so far. And thus no specific correspondence between Jue-mode music with the liver can be concluded.

Apart from the tonality theory mentioned above, some scholars propose that the so called 'five music elements' in fact refer to five musical notes which have a fixed vibrational frequency separately. This proposition is totally different to the traditional tonality theory. It emphasizes a correspondence between specific musical frequencies with specific internal organs. Gao YeTao et al(2005) developed an apparatus which analyzed the frequencies of five music elements. This apparatus could further divide the frequency intervals of five music elements into 25 smaller intervals [32]. By checking similarities of frequency, correspondence between frequencies and internal organs could then be made. The mechanism of such apparatus is that the vibration frequency of internal organs and that of the five music elements are similar. As long as diseases occur, the vibration frequency of the internal organ would change accordingly. By detecting the most similar music frequency, diseases could thus be diagnosed.

Actually in the United States, there is a similar music therapy called 'Toning'. Patients sing freely at their comfort musical zone, from low

pitch sounds to high pitch sounds until the right pitch which generates the best sympathetic response with his or her body. Then the patient would be made to stop on this pitch for a long time in order to cure diseases in the corresponding organs [32]. Different from Gao(2005), this therapy did not detect frequency by five music elements but they have similar mechanisms and effects.

5.3.2 **New Explanation**

Seeing from the clinical experiments in this dissertation which aims at verifying the correspondences of five music elements and five internal organs, modes are not the crucial factor in music therapeutic treatment. Both western orchestral music and five-element music take effects on curing depression. This phenomenon indicates that crucial factors must be universal features of these two kinds of music. Meanwhile, the therapeutic effects of western orchestral music were significantly better than that of five-element music implies that compared with five-element music, western orchestral music owns some unique features which make its therapeutic effects better.

Based on the experiment results, we propose that music take effects on curing diseases by acoustic resonance.

In string physics theory, every fundamental bit of matter is an infinitesimal string vibrating in one way or another. Since different materials consist of different substances, every material has its own inherent frequency. Every piece of substance has a natural resonant frequency – the speed at which it will vibrate if bumped or otherwise disturbed by external force or stimulus, such as an acoustic wave – as does every other substance on Earth. When the inherent frequency of the material and the external stimulus are the same or almost the same, maximum amplitude will be generated which is the resonant frequency

[33]. Generally speaking, a specific system has a fixed inherent frequency. However, this system can resonate with several different external frequencies. This means a system owns several different resonant frequencies and those resonant frequencies are multiples of its inherent frequency. If the external stimulus is composed of different frequencies, the system will resonate with its resonant frequencies while filter others.

In ancient Chinese philosophy work of Master Guan, the length of Chinese zither string and pentatonic scale are defined, from which the vibrational frequency of five notes can be easily calculated [34]. Nowadays, with the development of western music theory, vibration frequencies of all musical notes are defined which can be used in clinical experiments of music therapy.

For human beings, collateral channels and acupuncture points certainly have specific resonant frequencies. Previous experiments have already confirmed this phenomenon and calculated the resonant frequencies of several collateral channels and acupuncture points. Xu Jizong et al conducted clinical experiments to explore the vibration frequencies of twelve channels and acupuncture points in human body [35]. The picture below shows vibration of the channel in charge of liver.

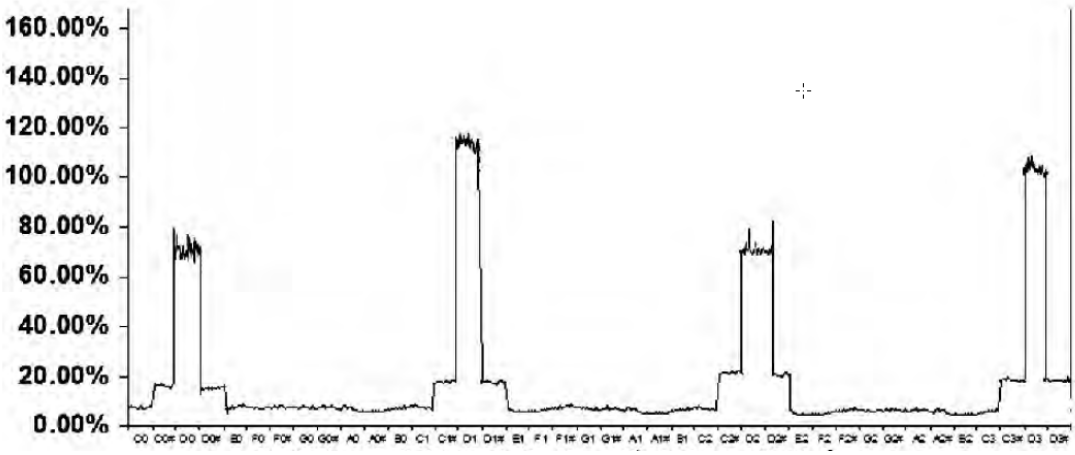

Figure 5.1. The Vibration of Liver Channel

The horizontal axis represents the sound wave of musical notes. The vertical axis shows the changes of this channel. Seeing from the picture, this liver channel resonates within the frequency interval between C and D notes rather than E note. The same phenomenon also happens in other channels which are thought to take charge of different inner organs. Picture 4 shows the vibration of heart channel.

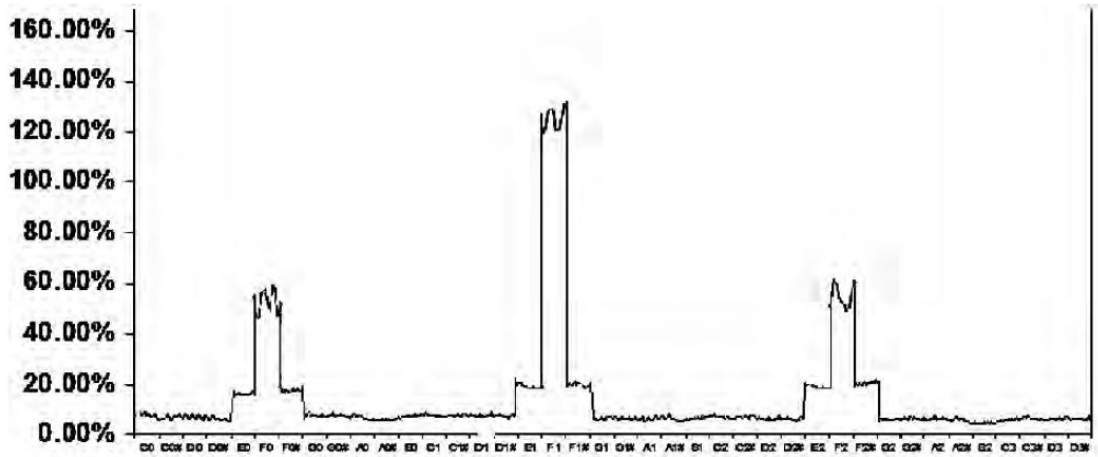

Figure 5.2. The Vibration of Heart Channel

As is shown in Figure 5.2, the maximum resonance happens as F note appears – this is totally different from the theories of five-element music therapy because there is no F note in five-element music.

This provides new explanations for the clinical experiments conducted in this dissertation.

Compared with western orchestral music, five-element music owns a unique musical charm. The famous Chinese folk song *Jasmine Flower* is a representative of five-element music. However, compared with western orchestral music, five-element music generates much less resonances with human body since it lacks several vibration intervals generated by F, B, and other 5 semitones.

Music, or sound wave – according to previous studies mentioned in this dissertation – take effects on curing diseases via resonances with inner organs. In modern medical science, the therapeutic treatment of

depression is quite a complicated process since it is usually originated by different diseases and will cause all kinds of complications. All the inner organs and collateral channels involved have different inherent frequencies. These inherent frequencies constitute a larger frequency interval without break. Western orchestral music contains all 12 musical notes with different pitch. The frequency interval of the whole piece of music might cover most parts of the frequency interval generated by inner organs while the frequency interval of five-element music certainly contains several break points. Such frequency lacks probably cause worse therapeutic effects on curing depression in the clinical experiments.

To sum up, five-element music does not take effect by its special five modes on curing depression patients but by some universal music features which can be shared with other kinds of music such as western classical orchestral music. Acoustic resonance between music notes and inner organs is proposed as the crucial factor that decides the therapeutic effects.

5.4 Further Discussion on MDD Music Therapy

According to statistics from WHO [9], depression ranks the forth in disease burden ranking worldwide. Also according to statistics from chinses government, expenses burden of depression occupies nearly 50% of all expenses for mental disorders. As is shown in a survey launched by Chinese ministry of health, the World Bank, WHO, and Harvard University, the direct expenses burden of depression is 14.1 billion dollars per year and the indirect expenses burden is 48.1 billion dollars per year [37]. China has already ranks the second place with a total expense burden of 62.2 billion dollars, only second to the United States. In western countries, studies on the depression expense burden were conducted several years before China [37]. According to Greenberg PE et al, the average expense in the United States is 83.1 billion dollars per year,

which accounts for 31% of the total medical cost. Among the total cost, mortality cost occupies for 7% [37]. These results are consisted with the features of depression: high mortality rate and high relapse rate.

Since the expenses are decided by diverse factors, such as the economic developments of different countries, the medical patterns, targeted patients and so on, the surveys on expense burden can only roughly reflects the general situation. The actual expenses are definitely huger than those in the survey because there are always some expenses cannot be calculated by money.

As is discussed in previous chapters, MDD is notorious with its terrible high rate of relapse. Since the pathogenesis of depression is still undiscovered, the standards which are used to estimate patients' actual recovery states are not that reliable.

For many hospitalized MDD patients, leaving hospital is the start of another treatment. Patients usually need to take medicines for quite a long period to maintain the positive therapeutic effects. Taking medicines for long periods on the one hand, brings heavy economical burdens to their family. On the other hand, taking medicines can usually bring the sense of stigma to patients. The sense of stigma has become a heavy psychological burden for not only MDD patients, but also all the dysphrenia patients [13]. It generates from traditional public discrimination on psychopath, public misunderstandings of mental diseases, and patients' self-isolation from the public and so on. As a result, MDD patients, or all the psychopath usually keep silent on self-conditions, isolate themselves from others, and lose self-confidence and self-esteem. All these negative emotions would make patients miss the best treatment timing and lose social functions. Song Xiaohong et al conducted a survey on 500 MDD patients and they discovered that most MDD patients, although they have been hospitalized, are still facing the double challenges and tortures of

mental disability and sense of stigma [38]. For MDD patients, the sense of stigma is the worst block during the process of improving life quality and regaining social functions. The most direct and worst influence by the sense of stigma is that it prevents patients following the doctors' advices to take MDD medicines. According to Chen Liqun et al, 61.8% of MDD patients are relapse cases [13]. Survey by Ten Doesschate et al shows that among all the MDD patients, 39.1%~52.7% (with middle of 47%) of them do not follow doctors' advices because they feel shame to take medicine every day [39]. However, seeing the current situation, there are few more effective treatment methods other than pharmacotherapy for patients outside the hospital. And thus new treatment method is badly needed to improve such terrible conditions.

Music, as is presented before, has a magical power on curing patients. Many medical institutions and scholars have already realized the therapeutic power of music and have already conducted theoretical and clinical studies on music therapy. However, compared with pharmacotherapy or other methods of psychotherapy, music therapy is still at the first step of development. Besides, current studies on music therapy mostly concentrate on music intervene during clinical treatment inside the hospital. But as is analyzed in this chapter before, leaving hospital for many hospitalized patients is just the start of another – even life-long – treatment period. To explore how music could help them outside the hospital is of the same importance with clinical music intervene.

In clinical treatment, combined therapy of pharmacotherapy and psychotherapy is the most common treatment method for MDD patients. The experiment results in this dissertation also support the better therapeutic effects of combined therapy. Based on such facts, it is reasonable to believe that music therapy can also take effects during the

process of self-treatment for MDD patients outside the hospital.

Further surveys have been conducted on patients take participate in experiment 1 in this dissertation. More than 60% of them mentioned the lack of music during their self-treatment after leaving the hospital. According to them, the reasons why they want music in self-treatment process outside the hospital include:

(1) Pharmacotherapy together with music can help imitate clinical treatments during hospitalization. Most patients themselves are actually not confident with self-treatment. They trust the doctors more than themselves. And thus they want to imitate the treatments they received in the hospital as more as possible. That's why they complained on the lack of music during self-treatment outside the hospital. Clinical music intervenes in MDD treatment have been proved to be significantly effective. In the condition that patients take the same medicine inside and outside the hospital, if music therapy is added into their normal everyday-pharmacotherapy treatment, better therapeutic effects can probably be expected；

(2) Music can make them the same as normal people. Taking medicines everyday makes them feel liking being patients all the time and people around would treat them differently – which makes them feel rejected by others. This is in accordance with the analysis of the sense of stigma. Several patients believe that pharmacotherapy together with music can relieve pains and even shorten their treatment process. Curing disease by listening to music rather than taking medicines everyday makes them feel more or less free from discriminations around them.

(3) Music therapy, compared with pharmacotherapy, saves money for them. As is mentioned before, the expense burden of MDD

treatment is quite heavy for not only countries but also for patients themselves. MDD Drugs are expensive. And patients have to take MDD drugs for a comparatively longer period than other diseases which further make the expense burden heavier. Different from pharmacotherapy on this point, music has a unique advantage that it can be played repeatedly only if it is legally acquired.

To make MDD music therapy available outside the hospital is not only beneficial for patients diagnosed with MDD. Normal people who are potential patients or patients with mild depression can also benefit from music therapy because music designed for MDD can more or less relieve pains for them. And this to some extent saves clinical medical resources for hospitals which also helps reduced expense burden.

To sum up, music has great potential on MDD treatment. Music therapy may take effects both inside and outside the hospital. It will absolutely become a powerful tool helping patients and doctors fighting MDD diseases.

Chapter 6

Appendix

Since the pathogenesis of depression and mechanism of music therapy are still unknown, music is regarded as a tool to alleviate patients' mental stresses and negative emotions. The experiment presented in this chapter works as supplementary experiment for experiment 2. In experiment 2, control experiment was conducted on patients who were diagnosed as MDD. Three different kinds of music were used to check the therapeutic effects of music therapy. In this experiment, the same kinds of music were used to check the effects of alleviating mental stresses on healthy volunteers.

6.1 Experiment 3. Explore the effects of different kinds of music on alleviating stresses with acupuncture therapy

This experiment aims at exploring the mechanism of how music works on human organs – to be specific, whether or not the correspondences of modes with internal organs exist.

6.1.1 Volunteers Information

100 volunteers (59 men and 41 women) were recruited beforehand. All the volunteers are undergraduate students in healthy physiological condition. The range of age is from 20 to 24. All the 100 volunteers were randomly equally divided into 4 groups – 25 volunteers per group. 4 groups were then randomly assigned to be control or experiment group. In this experiment, 3 experiment groups and 1 control group were assigned. 3 experiment groups were noted as G1, G2 and G3 while control group was noted as G4.

6.1.2 Experiment Equipment

a. 1 HB-EDT-A type of acupuncture therapy apparatus which can record the volume of electric current passing targeted acupuncture points;
b. Several MP3 players (five kinds of music have been stored beforehand – Yu-mode music, Gong-mode music, Jue-mode music, western classical orchestral music and pop songs);
c. Several cards with composition topics printed on them (each card has only one topic). All the composition topics were at the same level and act as psychological stresses;
d. Stopwatch;
e. Surgical spirit.

6.1.3 Experiment Methods

This experiment aimed at measuring changes of electric current passing the selected acupuncture points to check the differences among two kinds of five-element music and western classical orchestral music in alleviating stress by measuring the changes of electric current passing specific acupuncture points. Especially, a corresponding relationship between Jue-mode Chinese music and Tai Chong acupuncture point which was recorded as the point in charge of liver in traditional Chinese medical works would be checked.

In this experiment, twelve acupuncture points were selected for measuring electric current. They are left Tai Xi acupuncture point, right Tai Xi acupuncture point, left Tai Yuan acupuncture point, right Tai Yuan acupuncture point, left Shen Men acupuncture point, right Shen Men acupuncture point, left Da Leng acupuncture point, right Da Leng acupuncture point, left Tai Bai acupuncture point, right Tai Bai acupuncture point, left Tai Chong acupuncture point and right Tai Chong acupuncture point. Besides, two symmetrical none-acupuncture points were also chosen as control factors.

Acupuncture therapy apparatus were set to measure the volume of electric current passing the 14 targeted points. Stresses were then put on both control and experiment groups. Volunteers were asked to choose a card and write a composition according to the corresponding topic in 10 minutes. In order to strengthen sense of nervous, time was count down every 1 minute. Electric current were immediately measured as soon as the countdown ended. And then 3 kinds of music were played separately to 3 experiment groups. Gong-mode music was played for G1. Jue-mode music was played for G2. Western classical orchestral music was played for G3 and no music for G4. The listening period lasted for 10 minutes. No additional requirements were made during this period. As soon as

10-minute period ended, electric current passing 14 points was measured again.

6.1.4 Statistical Methods

The results was analyzed by MATLAB R2014a T-test and repeated measure were applied to analyze differences of control and experiment groups.

6.2 Results of Experiment 3

6.2.1 Results

Acupuncture Points	Before Stress (M±SD)	After Stress (M±SD)	t
Left Tai Yuan	25.602±3.065	42.211±4.437	-15.399
Right Tai Yuan	26.863±3.008	44.526±4.344	-16.714
Left Da Leng	28.698±5.327	47.474±5.075	-12.760
Right Da Leng	26.436±5.424	42.105±5.311	-10.320
Left Shen Men	27.003±3.645	41.053±4.210	-12.615
Right Shen Men	24.645±4.042	43.789±4.468	-15.887
Left Tai Bai	27.622±4.504	46.842±4.104	-15.771
Right Tai Bai	26.058±4.457	42.474±4.071	-13.598
Left Tai Chong	25.797±3.811	35.895±3.805	-9.289
Right Tai Chong	28.932±3.520	39.842±3.293	-11.317
Left Tai Xi	28.902±4.009	42.632±4.151	-11.896
Right Tai Xi	30.196±3.443	44.579±3.958	-10.451

Table 4.12. electric current volume before and after stress

Table 4.12 shows that the differences of average electric current

volume passing all the 12 acupuncture points before and after putting stress were significant. This means speedy composition test successfully caused significant stress among inner organs. This reflection guaranteed the following experiments which aimed at checking how music could alleviate stress.

Music	Music	Difference of Mean	Standard Deviation	p
(I)	(J)	(I-J)		
Control	Gong-mode	1.15733	3.165	.716
	Western music	7.39041	3.154	.022*
	Jue-mode	.81523	2.897	.797
Gong-mode	Control	-1.15733	3.165	.716
	Western music	6.23308	3.205	.056
	Jue-mode	-.34211	2.754	.915
Western music	Control	-7.39041	3.154	.022*
	Gong-mode	-6.23308	3.205	.056
	Jue-mode	-6.57519	3.066	.044*
Jue-mode	Control	-.81523	2.897	.797
	Gong-mode	.34211	2.754	.915
	Western music	6.57518	3.066	.044*

Table 4.13. Effects of music interference

Table 4.13 shows the effects of different kinds of music in alleviating stress. The differences between all three experiment groups and control group are positive. This means that music interference performed better compared with no interference. The difference between Group 3 and control group (Group 4) is negative and significant ($p<0.05$). This indicates that western classical orchestral music had a better performance in alleviating stress put by speedy composition than no

interference. The difference between Group 3 and Group 2 is negative and significant ($p<0.05$). This means that compared with Jue-mode music, western classical orchestral music had a better effect on alleviating stress. The difference between Group 3 and Group 1 is not significant ($p>0.05$). This represents that no significant difference existed on the effects of alleviating stress between western music and Gong-mode music. However, the difference was negative which hints that the effect of western music was better than that of Gong-mode music. The difference between Group 2 and Group 1 is also not significant ($p>0.05$). Meanwhile, the difference is positive which indicates that the effect of Gong-mode music was better than that of Jue-mode music. Thus, to sum up all the results in one inequality which represents the sequence of music interference effects in alleviating stress:

No interference
< Jue-mode music
< Gong-mode music
< Western classical orchestral music

One thing needs to be strengthened is that significant difference only existed between western music group and control group. This is to say in this experiment, western classical orchestral music had the best performance in alleviating stress put by speedy composition while no significant differences existed between Gong-mode and Jue-mode group and control group.

Acupuncture Points	After Stress	After Music Interference	t	p
Left Tai Yuan	42.211±4.437	37.579±3.784	1.360	.191
Right Tai Yuan	44.526±4.344	40.842±4.899	-.411	.686
Left Da Leng	47.474±5.075	42.211±3.745	1.401	.178
Right Da Leng	42.105±5.311	38.212±4.121	1.279	.217
Left Shen Men	41.053±4.210	30.053±3.732	1.745	.098
Right Shen Men	43.789±4.468	38.158±3.732	1.467	.160
Left Tai Bai	46.842±4.104	31.421±3.218	2.279	.035*
Right Tai Bai	42.474±4.071	28.895±3.393	2.186	.047*
Left Tai Chong	35.895±3.805	24.579±2.857	2.016	.051
Right Tai Chong	39.842±3.293	29.947±2.878	1.704	.106
Left Tai Xi	42.632±4.151	38.474±3.206	1.295	.212
Right Tai Xi	44.579±3.958	38.789±2.941	1.418	.173

Table 4.14. electric current volume before and after Jue-mode music interference

Table 4.14 shows the changes of electric current volume passing all 12 acupuncture points before and after music interference. The data above indicate that listening to Jue-mode music had some positive effect on alleviating stress but was only significant effective to Tai Bai Acupuncture Point. According to traditional Chinese medical theories, although the origins of depression are diverse, all these origins must cause the diseases of liver and then directly cause depression. Tai Chong Acupuncture Point is in charge of channels and collaterals of liver. In this experiment, the p-value of left Tai Chong point is almost the same as significance level ($p = 0.05$) but the p-value of right Tai Chong point is higher than 0.05. This indicates that Jue-mode music did not significantly alleviate the stress on Tai Chong point.

Acupuncture Points	Music	After Stress	After Music Interference	t	p
Left Tai Chong	Western	36.948±3.108	21.463±3.398	3.363	.017*
	Gong-mode	34.265±4.368	25.824±4.933	1.649	.114
	Jue-mode	35.895±3.805	23.579±2.857	2.016	.051
Right Tai Chong	Western	37.693±3.057	22.895±3.168	3.361	.017*
	Gong-mode	31.135±4.094	24.938±3.689	1.124	.198
	Jue-mode	39.842±3.293	27.947±2.878	1.704	.106

Table 4.15. effects of different music on Tai Chong Acupuncture Point

Table 4.15 shows the effects of different kinds of music on alleviating stress of Tai Chong Acupuncture Point. Western classical orchestral music had the most significant effects on Tai Chong Acupuncture Point ($p < 0.05$) when alleviating the stress put by speedy composition. Gong-mode and Jue-mode music also had positive effects on alleviating stress of Tai Chong Acupuncture Point but not significant according to statistical standards. No significant differences existed between Gong-mode and Jue-mode music on alleviating stress.

6.2.2 Discussion

To sum up, the differences of average electric current passing all the 12 acupuncture points before and after putting stress were significant. This means speedy composition successfully caused stress on human body and all volunteers generated stress reactions. When people were under stress, electric potential of their bodies are changed and volume of electric current passing acupuncture points, channels and collaterals

becomes larger.

Conclusions can be drawn that music interference – no matter Gong-mode music, Jue-mode music or western classical orchestral music – can more effectively alleviate stress than no interference. Among the three experiment groups, western classical orchestral music had the best effects on alleviating stress than other two kinds of music. Significant differences exist between western music group and Gong-mode, Jue-mode group while no significant difference exists between Gong-mode and Jue-mode group.

Western music has the most significant effect on alleviating the stress on Tai Chong Acupuncture Point. Jue-mode and Gong-mode music also had effect on alleviating stress on Tai Chong Acupuncture but not significant with statistical standards. Besides, no differences existed between Gong-mode and Yu-mode music on alleviating stress on Tai Chong Acupuncture Point. Listening to Jue-mode music had significant effect on Tai Bai Acupuncture Point while no significant effect was caused on Tai Chong Acupuncture Point.

The results further support the conclusions of experiment 2. In experiment 2, western orchestral music best cures MDD patients compared with Gong-mode and Jue-mode five-element music. In this supplementary experiment, western music also has better alleviating effects on mental stresses than five-element music on healthy volunteers.

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