A SYSTEMATIC REVIEW OF RESEARCH IN MUSIC INTERVETNION FOR PEOPLE WITH CEREBRAL PALSY

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ABSTRACT

The purpose of this study was to synthesize research studies in music intervention for people with cerebral palsy. Nineteen experimental research studies published during 1976-2015 from PubMed, CHINAHL, ERIC, ThaiLIS, and ProQuest met the inclusion criteria of this review. A coding form, consisting of a) publications and researchers, b) research methodology, and c) research content and music intervention, was developed as a research instrument for collecting the characteristics data from these research studies. Descriptive statistics (frequency and percentages) were used to analyse the data and describe the research findings.

The result of the systematic review indicated that the largest number of research studies were articles (84.2%) which were published via journals in the field of medicine (57.9%) during 2011 - 2015 (52.6%). Single-case study, one group pretest-posttest, and randomized control group pretest-posttest were equally used as research design at 21.1%. Participants in the research studies were mainly diagnosed as Spastic Cerebral Palsy (26.3%) in adolescence to early adulthood (21.1%). In terms of research contents and music intervention, Neurological Music Therapy (NMT) was the most widely used theory for developing the music intervention (42.1%). Music movement was the most popularly used (52.6%). Songs were most commonly selected by researcher based on assessment (42.1%). Audio equipment was mostly used as the music instrument or material (25%). In respect of the number of sessions and the duration of time, the music intervention was given to participants only one time (26.3%) for 30 minutes mostly (36.8%). The outcomes were largely in the area of physical development (63.2%) such as gait, find motor, gross motor, and step cadence. Regarding the testing results, most of the research findings were based on the hypothesis (26.3%).

KEY WORDS: SYSTEMATIC REVIEW/MUSIC INTERVENTION/CEREBRAL PALSY

89 pages

การสังเคราะห์งานวิจัยด้านดนตรีสำหรับผู้ป่วยสมองพิการ

A SYSTEMATIC REVIEW OF RESEARCH IN MUSIC INTERVENTION FOR PEOPLE WITH CEREBRAL PALSY

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คณะกรรมการที่ปรึกษาวิทยานิพนธ์: สมชัย ตระการรุ่ง, Ph.D., นัทธี เชียงชะนา, Ph.D.

บทคัดย่อ

การวิจัยครั้งนี้ มีวัตถุประสงค์เพื่อสังเคราะห์งานวิจัยด้านดนตรีสำหรับผู้ป่วยสมองพิการ โดยทำการสังเคราะห์งานวิจัยจำนวน 19 เล่ม ที่ตีพิมพ์ในปี ค.ศ. 1976 – 2015 จากสืบค้นในฐานข้อมูลต่างๆ ประกอบด้วย PubMed, CHINAHL, ERIC, ThaiLIS, และ ProQuest เครื่องมือที่ใช้ในงานวิจัยในครั้งนี้คือ แบบบันทึกคุณลักษณะของงานวิจัย เพื่อใช้เก็บรวบรวมข้อมูลใน 3 ประเด็น ได้แก่ การตีพิมพ์และผู้วิจัย ระเบียบวิธีวิจัย และเนื้อหางานวิจัยและการใช้ดนตรี สถิติที่ใช้ในการวิเคราะห์ข้อมูลคือสถิติเชิงบรรยาย โดยทำการวิเคราะห์ความถี่และร้อยละของคุณลักษณะของงานวิจัยในแต่ละประเด็น

ผลการวิจัยพบว่า งานวิจัยส่วนใหญ่เป็นบทความวิจัย (ร้อยละ 84.2) ซึ่งตีพิมพ์ในวารสารด้านการแพทย์ (ร้อยละ 57.9) และตีพิมพ์ในช่วงปี ค.ศ.2011-2015 (ร้อยละ 52.6) ระเบียบวิธีวิจัยที่ใช้มากที่สุดคือ Single-case study, one group pretest-posttest, และ randomized control group pretest-posttest (ร้อยละ 21.1) ผู้เข้าร่วมการวิจัยส่วนใหญ่ได้รับการวินิจฉัยเป็นโรคสมองพิการชนิดเกร็ง (ร้อยละ 26.3) อยู่ในช่วงวัยรุ่นถึงผู้สูงอายุตอนต้น (ร้อยละ 21.1) สำหรับด้านการใช้ดนตรี พบว่า ทฤษฎีที่นำมาใช้พัฒนาดนตรีสำหรับการทดลองมากที่สุดคือ Neurologic Music Therapy (ร้อยละ 42.1) กิจกรรมทางดนตรีที่ใช้มากที่สุดคือการเคลื่อนไหวประกอบเพลง (ร้อยละ 52.6) ดนตรีที่ใช้ในการทดลองส่วนใหญ่ทำการคัดเลือกโดยนักวิจัยจากผลของการประเมินในขั้นต้น (ร้อยละ 42.1) สำหรับอุปกรณ์ที่ใช้มากที่สุดในการบำบัดคืออุปกรณ์อิเลกทรอนิค (ร้อยละ 25) เมื่อพิจารณาด้านระยะเวลาในการรับการบำบัด พบว่า ส่วนใหญ่ผู้เข้าร่วมการวิจัยจะได้รับกิจกรรมดนตรี 1 ครั้ง (ร้อยละ 26.3) ครั้งละ 30 นาที (ร้อยละ36) เมื่อพิจารณาผลของการวิจัยจำแนกตามพัฒนาการ พบว่า โดยส่วนมากเป็นทางด้านกายภาพ (ร้อยละ 63.2) และผลการวิจัยส่วนใหญ่เป็นไปตามสมมติฐาน (ร้อยละ 26.3)

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CHAPTER I
INTRODUCTION

1.1 Background of the Study

Cerebral palsy is a neurological disorder caused by a non-progressive brain injury that occurred in the period of infancy, early childhood, or permanently**.** The primary effects of cerebral palsy are both of body movement and muscle coordination. The cause of cerebral palsy is brain damage during pregnancy, childbirth, or after. The brian can be damaged because of metabolic disease, Rh incompatibility, anoxia (oxygen shortage), or an illness or infection of the mother such as rubella, toxoplasmosis in pregnancy period. During childbirth, the brain can be damaged because of premature birth, and anoxia. As to the after birth period, children might encounter head trauma, choking, poisoning, or tumor (National Institute of Neurological Disorders and Stroke, 2015; Sankar & Mundkur, 2005).

The early signs of cerebral palsy usually occur before the age of three years. The common signs are a lack of muscle coordination, stiff or tight muscles, exaggerated reflexes, walking with one foot or leg dragging, walking on the toes, a crouched gait, and muscle tone that is either too stiff or too floppy. Children with cerebral palsy often have brain damage during the first few months or years of life due to brain infections such as bacterial meningitis or viral encephalitis, head injury from a motor vehicle accident, or child abuse. Brain damage has an impact on physical development such as moving, walking, eating, seeing, hearing, or communication depending on the part of the brain (Sankar & Mundkur, 2005; Rosenbaum, Paneth, Leviton, Goldstein, & Bax, 2006; Rethlefsen, Ryan, & Kay, 2010; & National Institute of Neurological Disorder and Stroke, 2015).

The incidence of cerebral palsy in the western world is 2 children in 1,000 new born babies (International Cerebral Palsy Society, 2008). The investigation of the Centers for Disease Control and Prevention or CDC (2015) reported that there were 1 in 323 children diagnosed with cerebral palsy. In the United States, 10,000 babies

developed cerebral palsy, and also 1,200 to 1,500 children of preschool age were diagnosed with cerebral palsy for each year (Centers for Disease Control and Prevention, 2015). The average prevalence of cerebral palsy in the United States in 2004 was 3.3 per 1,000 people and was significantly higher in males than females (Arneson, et al, 2004). In Thailand, Srijantongsiri (2006) found that, in 2003, there were 296 children (male 58.1%, female 41.9%) who were patients at the Queen Sirikit National Institute of Child Health diagnosed with cerebral palsy. The major type was spastic quadriplegia which is inabilities to walk independently and the main causes were perinatal aspgyxia, and infection. Additionally, her study found that there were associated morbidity consisting of epilepsy, mocrocephaly, hearing loss, mental retradation, and blindness.

Treatment and care of children with cerebral palsy is determined by the severity of the diagnosis and condition. Relevant treatments may include pharmacological (drug) or mechanical interventions, surgery and various therapies. Both surgery and mechanical aids help to overcome impairments, including orthopedic surgeries for adjusting tendon or joints. Therapies for children with cerebral palsy include physical therapy, occupational therapy, speech therapy, and music therapy which may improve functional capabilities of children, (Patel, 2005; Hadkunachai, 2011). Previous studies indicate that music therapy has an impact on gait training, developing communication skills, and creating new neural tracts (Kwak, 2007; Perry, 2003; & Mark, 1986).

Music therapy provides benefits for people with cerebral palsy. Music therapy is the clinical and evidence-based use of music interventions to accomplish individualized goals within a therapeutic relationship by a credentialed professional who has completed an approved music therapy program (American Music Therapy Association, 2014).

According to published findings, using music and music therapy with cerebral palsy patients positively affects both mental and physical development of patients with CP. A study conducted by Yu, Liu, Li, & Ma (2009) indicated that using music for children with cerebral palsy reduced anxiety while receiving acupuncture, and improved creeping, kneeling, standing and walking. In 2007, Kwak found

improved gait performance, velocity and stride length with the use of music, and Kho (2011) found improved communication and social skill.

Cerebral palsy involves with the brain, and music also affects the brain. Therefore, music has potential for application in clinical work. Many studies have demonstrated the effectiveness of using music on the brain. The study of Stewart et al (2006) reviewed many research evidences from basic and clinical neuroscience. Their review reported that music listening involved many cognitive components with distinct brain substrates. Fukui and Kumiko (2008) found that using music listening repaired and regenerated the cerebral nerves by adjusting the secretion of steroid hormones that lead to cerebral plasticity. Steroids regulated the vital functions such as reproduction, feeding behavior, brain development, neurogenesis, neuroprotection, cognition, and memory. Besides using music listening to affect the brain, musical training or playing a music instrument also affect to the brain. Hyde et al, (2009) compared structural brain development between children in musical training or playing music instruments and children in control condition. This comparison showed that children in the musical training group had greater changes in motor brain areas such as the right precentral gyrus (motor hand area), the corpus callosum (Midbody), and the right primary auditory region (Heschl's gyrus). In addition, the differences of brain deformation were found in various frontal areas, in the left posterior peri-cingulate, and a left middle occipital region in children in the musical training group. Therefore brain plasticity is affected in brain regions that control primary functions because of playing music instruments. In terms of the effect of music on the brain with cerebral palsy, the study of Orita et al (2012) found that using music therapy with children with disabilities including cerebral palsy, showed a significant change in parasympathetic nervous activities. The parasympathetic nervous system is one type of autonomic nervous system which has an effect on several physiological processes such as decreasing heart rate, constricting the bronchial tubes in the lungs and pupils in the eyes, relaxing muscles, enhancing saliva production, and increasing the urinary output and sphincter relaxation. Stegemoller (2014) explained that using music therapy increased dopamine, which was a neurotransmitter in the brain that is involved in motivation and reward-seeking behavior, working memory, and reinforcement learning. Music stimulated the activation of dopaminergic regions of the brain in

order to provide motivation, reward, and learning. Therefore in the music therapy clinic, the target behaviors were improved by using music as the reward and motivation for the completion of target behaviors.

While there is some research literature that addresses the outcomes and benefits of music therapy for individuals with cerebral palsy, there are very few large-scale studies that discuss results that could be generalized to the wider population. Furthermore there is currently no compilation of research related to music therapy and treatment of individuals with cerebral palsy. A systematic review is one type of research methodology used in health care and medicine to locate, appraise, and synthesize the research evidence based on a clearly formulated question to provide informative answers for work in clinical practice, research, or policy (Boland, Cherry, & Dickson, 2013; Hanson-Abromeit, & Moore, 2014). Furthermore, systematic reviews help clinicians understand the current research findings and make an appropriate choice of treatment by summarising the evidence. Systematic reviews give a clear and consistent picture of research (Boland, Cherry, & Dickson, 2013).

1.2 Need for the Study

In recent years music therapy researchers have used the systematic review as a way to sumarize and analyze research literature with many populations. Engwell, & Duppils, (2009) sysnthesized research in the field of using music as a nursing intervention for post-operative pain. Wong, Chan, & Thayala, (2010) conducted a systematic review of the effectiveness of music listening in reducing depressive symptoms in adults. In 2011, Anderson, did a systematic review in the area of hospice and palliative care, and Naylor, Kingsnorth, Lamont, McKeever, & Macarthur, (2011) analyzed the research regarding effectiveness of music in pediatric health care.

For the systematic review research which had adults as the population, Carr, Odell-Miller, & Priebe, (2013) conducted a systematic review of music therapy practice and outcomes with acute adult psychiatric in-patients, and McDermott, Crellin, Ridder, & Orrell, (2013) synthesized research about music therapy with patients with dementia.

As mentioned above, there have been many systematic review researches in the field of music therapy with different populations, but no systematic review research in the field of music for cerebral palsy. Therefore, it is of value to systhesize research in the field of music for people with cerebral plasy in order to fullfill the evidence based in the area of the music therapy clinic.

The value of this study is the music therapy evidence based which benefits music therapists or clinicians in selecting music intervention for clients effectively. This research will reveal the wide extent of studies in this field.

1.3 Purpose of the Study

The purpose of this study was to synthesize research in music intervention for people with cerebral palsy. Three main characteristics were analyzed, comprising 1) publications and researchers, 2) research methodology, and 3) research content and music intervention.

1.4 Research Questions

1. What were the outcomes of published research regarding the use of music to treat individuals with cerebral palsy?

2. What research methodologies were discussed in the literature to investigate the use of music for people with cerebral palsy?

3. What were the characteristics of research in research content and music intervention of research studies in music for people with cerebral palsy?

1.5 Definition of Terms

A Systematic Review is a literature review that is designed for locating, appraising, and synthesizing the available evidence. Evidence-based research or EBR is defined as a research in medical sciences based on the scientific method and evaluates the published research in order to optimize the treatment and care of each

individual patient. The results of a systematic review are able to decide intervention, treatment for patients and to make changes in policy (Boland, Cherry, & Dickson, 2013; Hanson-Abromeit, & Moore, 2014; Chiappelli et all, 2004; & Friedland et al, 1998).

Music Intervention is the use of musical elements to accomplish individualized goals by a music therapist who has completed an approved music therapy program (American Music Therapy Association, 2014). In this study, music intervention can be used by clinicians, both certified music therapists and other professionals who are not certified but use music for non-musical goals including cognitive, physical, communication, social, and emotional domains.

People diagnosed with Cerebral Palsy (CP) are individuals with a neurological disorder caused by a non-progressive brain injury during prenatal, perinatal, and postnatal period. The symptom such as not being able to move, walk, eat, sit or stand with balance depends on the part of the brain damaged (National Institute of Neurological Disorder and Stroke, 2015). In this study, the meaning of people with cerebral palsy covers children and adults who have a neurological disorder caused by a non-progressive brain injury during the prenatal, perinatal, and postpartum period.

1.6 Thesis Organization

This master thesis consists of six chapters. The first chapter is the introduction which includes background of the study, need for the study, purpose of the study, research questions, definition of terms, and thesis organization. The second chapter is the review of related literature which focuses on cerebral palsy, music therapy, and systematic reviews. The third chapter is research methodology which comprises of research design, search strategy, selection criteria, coding form, inter-rater reliability, and data collection and analysis. The results are in chapter four, the discussion and recommendations are in chapter five, and the last chapter is the conclusion.

CHAPTER II
REVIEW OF RELATED LITERATURE

2.1 Cerebral palsy (C.P.)

2.1.1 Definition of Cerebral palsy

The term "Cerebral Palsy" is defined in many different ways by various organizations and scholars. The World Health Organization (1993) defined the term cerebral palsy as a disorder of muscle control that makes movement difficult due to brain damage. The International Cerebral Palsy Society (2008) defined CP as a group of disorders in movement development, causing limitations in physical development which are accompanied by disturbances of sensation, cognition, communication, perception, and behavior.

National Institute of Neurological Disorder and Stroke (2014) explained that the term "cerebral" refers to the brain and the term "palsy" refers to the impaired control of movement. Therefore, the term "cerebral palsy" means a long-term disorder that causes the impaired control of movement. The symptoms develop over the first few year of life and are caused by damage in the motor control part of the brain.

Shepherd (1995) referred to this term as a non-progressive group of brain disorders which results from an abnormal development during early infancy. The character of this disorder will show the poor control of movement, adaptive length change in muscle, and skeletal deformity.

According to the previous definition, the term "cerebral palsy" is defined as a non-progressive disorder of movement which was the result from the brain being damaged during prenatal, perinatal, and postnatal period. The symptoms depend on what part of the brain is damaged. In general, people who have cerebral palsy would encounter difficulty of movement such as walking, sitting and standing with balance, and dealing with daily life.

2.1.2 Causes of Cerebral Palsy

Brain damage is the major cause of cerebral palsy. Swasman, and Wu, (2006) explained that brain damage occurrs in three periods of pregnancy including prenatally, perinatally, and postnatally.

Prenatal period. The risk of this period is maternal mental retardation, hyperthyroidism, infection (Toxoplasmosis, Rubella, Cytomegalovirus, and Herpes simplex infection), estrogen, thyroid, history of previous abnormal pregnancies and fetal wastage, death, or stillbirth. Additionally, there are other factors causing cerebral palsy shown as follows:

- Maternal/intrauterine fetal infections
- Maternal illness with severe cardiorespiratory compromise
- Abdominal trauma during pregnancy
- Toxic/teratogenic agents from maternal ingestion from the environment, anticonvulsant treatment during pregnancy
- Genetic disposition
- Small-for-gestational age (SGA), intrauterine growth retardation, fetal deprivation or malnutrition, choric intrauterine anoxia
- Congenital malformations
- Socioeconomic factors-late/inadequate prenatal care

Perinatal period. In this period, multiple gestations, intrapartum hypoxia-ischamia, and neonatal sinovenous thromobosis are the causes. Asphyxia is considered the main etiological factor in this period. Metabolic acidosis in umbilical cord blood is a confirmation of perinatal asphyxia. The sick neonates, both systemic complications, and circulatory function lead to brain hypoxia. Hypoxic infarcts and intraventricular-perventricular bleeding are typical of prematures babies. In addition, neuonatal infections with septicemia, and meningitis may cause central nervous system damage.

Postnatal period. The factors are nonaccidental trauma, hyperbilirubinemia, and metabolic disorders such as hypoglycemia. The causes of neuromuscular deficit by a disease or result to the brain were designated after the acute stage passes and pathological processes brought under control. Additionally, encephalopathies, cerebrovascular accidents, poisoning, and other illness involving

hemorrhage, anoxia, ischemia, and other types of nonprogressive neuronal damage are risks in postnatal period as well.

In summary, brain damage is the main cause of cerebral palsy. The brain damage occurs differently according to period of pregnancy which were prenatal, perinatal, and postnatal. The examples of factors in prenatal period are hyperthyroidism, infection, genetic disposition, small-for-gestational age (SGA), and abdominal trauma during pregnancy, toxic etc. Regarding the perinatal period, factors are multiple gestation, intrapartum hypoxia-ischamia, and neonatal sinovenous thromobosis, while the postnatal factors consist of nonaccidental trauma, hyperbilirubinemia, and metabolic disorder.

2.1.3 Classification of Cerebral Palsy

Cerebral palsy can be classified to three different categories regarding the type of impairment, the number of limbs, and the severity of disability as follows:

1) Type of impairment.

Howle (1999), and Hadkunachai (2011) classified as spasticity, athetoid, alaxia, and hypotonia. Details are as follows.

1.1) Spasticity or spastic cerebral palsy is the most common type. It is characterized by increased muscle tone, prolonged reflexes, exaggerated deep tendon reflexes, clonus, and rigidity of the extremities during flexion, extension, and tendency in developing scoliosis and contractures. It is the result of effect on motor cortex or white matter projections and from the cortical sensory-motor in the brain.

1.2) Athetoid or Dyskinetic is a group of disorders in which movements are perceived to be uncontrolled and purposeless. This group consists of athetosis, rigidity, and tremors. Athetosis is the most common type while dyskinesia is associated with an impairment of basal ganglia and connections to the prefrontal and premotor cortex.

1.3) Ataxia is a primary disorder of balance and control in the timing of coordinated movements. Ataxia is the result of deficits in the cerebellum. Moreover, other effects can also be presented such as hypotonia, impaired force and

power production during voluntary movement, and impaired motor planning affecting sequencing of speech and rhythm and orderly progression for reciprocal gross and fine movement.

1.4) Hypotonia is characterized by a diminished resting muscle tension, a decreased ability to generate voluntary muscle force, excessive joint flexibility, and posture instability. It is not particularly related to a neural lesion, but it is seen as a transient stage in the evolution of atheosis or spasticity.

2) The number of limbs or disability of affected parts.

This category can be classified into five types consist of Monoplegia, Diplegia, Hemiplegia, Triplegia, and Quadriplegia (Bache, Selber, & Graham, 2003; Wong, 2003; Howle, 1999; Steele, 1992). Details are as follows.

2.1) Monoplegia: effect on one limb such as an arm. It makes difficulty in fine motor activities.

2.2) Diplegia: effect on both lower limbs with minimal involvement of the upper limbs.

2.3) Hemiplegia: effect on one side of body between right or left side. It causes difficulty in running, walking, and using hand of the affected side.

2.4) Triplegia: effect on three limbs of the body. It is usually associated with both legs and one arm, but it can also be both arms and one leg.

2.5) Quadriplegia: effect on both arms and legs of right and left sides. It also has an effect on trunk and neck. The result is difficulty in walking, running, using hands, speaking, eating, and toileting.

3) Severity of disability

Msall and Tremont (1999) classified cerebral palsy into four types as levels including mild, moderate, severe, and profound. Details are as follows.

3.1) Level 1: Mild developmental disability. It includes independent communication, self-care, and mobility in reading and writing at approximately fifth-grade level. Patients in this level can perform most of their daily living activities but they still need a little help. They are able to stand and walk without any assistance or tools.

3.2) Level 2: Moderate developmental disability. It includes the ability to communicate basic needs and the major academic challenges are reading,

and writing. Patients can take care of themselves; however, they need some assistance from others and assistant tools. They may have other co-morbidities such as intellective impairment, speech abnormality, vision impairment, hearing impairment, seizure, and emotional instability.

3.3) Level 3: Severe developmental disability. This level includes dependence in mobility, some self-care competency, and limited communication. Patients in this level can perform very few daily living activities, and rely on constant care from others. Their symptoms are noticeable clearly, and the treatment is hardly effective.

3.4) Level 4: Profond developmental disability. It consists of dependence in self-care, very poor communication, with high rates of epilepsy, and dysphagia. Patients are not able to help and take care themselves in daily living activities. They tend to suffer from seizure and have difficulty in swallowing. Therefore, patients in this level need humanistic interventions.

2.1.4 Treatment for Cerebral Palsy

People who are diagnosed with cerebral palsy are able to develop by receiving treatment and intervention according to individuals' needs. Goals of treatment consist of improved development, enhanced movement skill, and preventing secondary impairment. The treatment is administered by a team of health care professionals. The team may include physical and rehabilitation doctors, orthopedic surgeons, doctors, ophthalmologists, nurses, pediatricians, physical therapy, occupational therapists, speech/language pathologists, social workers and psychologists. A team might work with the clients' family for identifying the treatment goal and individual needs of clients. The concept of treatment is to motivate clients to take care and move by themselves independently (Puscavage at all, 2005; Rosenbaum, 2003).

In order to lead clients to reach the goal of treatment, the early intervention program (EIP) is necessary. The early intervention program, which focuses on the a child and parents, assists in maximizing the developmental outcomes of the child (Lekskulchai & Cole, 2001). Participants who appropriated in this program usually have delayed development in one or more areas such as physical, cognitive, language

and speech, psychosocial development, or have a diagnosis of a physical or mental condition (Hanft 1988; & Pelchat et al 2004).

This program starts with assessing the level of clients' development, and investigating the strengths and the weaknesses in order to prepare a program or treatment effectively. The program or treatment is based on two ideas comprised of the global child developmental approach, and individualized program.

The global child developmental approach covers all development including the five senses, motor skills, speech and language skills, daily life, and social interaction. In contrast, the individualized program provides the treatment regarding clients' individual needs, since each client has strengths and weaknesses. (Preuksananon, 2010).

Additionally, there are two different types of treatment which clients could get benefit from, consisting of drugs or medicine, and medical rehabilitation.

Using drugs or medicine affect muscle. It assists clients to have more control, and to reduce contraction of abnormal movement in order to support movement. Dantrolene, Diazepam, and Baclofen are the medicine for reducing contraction (Verrotti at all, 2006).

Medical rehabilitation including physical therapy, occupational therapy, speech therapy, and ophthalmologists. Physical therapy is the earliest therapy after diagnosis. The purpose of physical therapy is to increase motor skills such as sitting and walking, to enhance muscle strength, to prevent contractures, and to develop hand and leg functions. Occupational therapy motivates clients to use both gross and fine motor skills. This therapy covers daily living, appropriate interaction and communication, and also contributes to creating the splint and other adaptive devices. The purpose of occupational therapy was to educate clients to take care of themselves. The function of ophthalmologists is to check visual and auditory ability, and is to provide the treatment if clients have visual or auditory impairment. Clients who have difficulty with speaking or communicating needed to receive speech therapy. This therapy assists to promote communication, voice, and speaking. Moreover, for clients who have severe contracture, surgery may be recommended to lengthen affected muscles (Preuksananon, 2010).

In conclusion, the major goal in treating people who are diagnosed with cerebral palsy is physical development or movement skill; however, other developments are vital such as in social skill, interaction and communication. The principle of treatment is to encourage clients to move and to do the task by themselves. For children with cerebral palsy, the early intervention program (EIP) is necessary. There are two main treatments for people are diagnosed with cerebral palsy; 1) medicine of drug treatment for supporting and controlling movement, and 2) medical rehabilitation including many types of therapy and surgery for increasing over all development such as motor skill, interaction and communication, and daily life.

2.2 Music therapy

2.2.1 Definition of Music Therapy

Music therapy is the broad term used to combile various interventions with music. However, there is a difference between music therapy (a systematic music intervention designed to improve therapeutic outcomes) and the use of music by health care professionals which is associated with standard practice (Dileo, 1999).

There are many music therapy associations that have formulated definitions of music therapy. The American Music Therapy Association (2014) defined music therapy as a health profession which uses music to address physical, emotional, cognitive, and social individual goals within a therapeutic relationship. In the clinical process, after a music therapist assesses each client, the next step is to provide treatment consisting of creating, singing, moving, and/or listening. Music therapy provides avenues for communication which help clients who have difficulty with expressing themselves in words. Research in music therapy demonstrates the effectiveness in various areas such as facilitating movement, increasing motivation of clients to engage in their treatment, providing emotional support for clients and families, and providing an outlet for expressing of feelings.

The second definition referred to music therapy as the use of qualities and musical elements consisting of rhythm, melody, and tonality in order to provide the

means of relating within a therapeutic relationship. Music therapists use accessible music instruments and voice to create a musical language which reflects the emotional and physical condition. This builds the connection between music therapist and clients (British Association for Music Therapy, 2012**)**. The definition of Canadian Association for Music Therapy (1994) explained that music therapy is the use of music and musical elements by a certified music therapist in promoting, maintaining, and restoring mental, physical, emotional, and spiritual health. Music is nonverbal, with creative, structural, and emotional qualities that can be used in the therapeutic relationship to facilitate contact, interaction, self-awareness, learning, self-expression, communication, and personal development.

In summary, the term music therapy means the use of musical elements of high quality by accredited music therapists who complete the degree from an approved music therapy program. Music therapists serve the individual goal under the therapeutic relationship. The goal will be set regarding to clients' need consist of physical, emotional, cognitive, communication, or social needs.

According to previous definitions, the benefits of music therapy cover many populations from infants to people at the end of life, including people who have physical disability, emotional disorderd, delayed development, intellectual disabilities etc. Moreover, music therapy can use in the many fields and many healthcare units such as in pain and stress management, infant stimulation, adult day care, nursing homes, wellness programs, prison, and medical care (Davis, Gfeller, & Thaut, 2008).

People with cerebral palsy can get the benefit from music therapy in the same was as people who have physical disability.

2.2.2 Music Therapy for Cerebral Palsy

In the field of music therapy, cerebral palsy is considered as one type of physical disorder. Therefore, the therapeutic goals and music therapy techniques of people who have cerebral palsy are similar to those provided for people who have other diagnosis in the group of physical disorders such as muscular dystrophies, spinal cord injuries, and spinal bifida (Davis, Gfeller, & Thaut, 2008).

The therapeutic goals for people with cerebral palsy focus on the essential skills including motor skills, communication and social skills, and emotional skills

(Wigram, Pedersen, & Bonde, 2002; Davis, Gfeller, & Thaut, 2008). According to previous research and text books, the use of music therapy is provided to address all therapeutic goals comprehensively. Details are as follows.

1) Motor skills

Movement or motor skill is the most important development in rehabilitating children with cerebral palsy. Previous studies have shown that music had an effect on loaded sit-to-stand movement in children who were diagnosed as spastic diplegia (Peng, Lu, Wang, Chen, Liao, Lin, & Tang, 2011). The studies of Bean (1995) and Warren (1997) found that music enhanced self-awareness, self-control, independent movement, and physical awareness of children with cerebral palsy.

The music therapy technique is usually used to address this goal is Neurological Music Therapy (NMT). The purposes of using NMT cover strengthening of muscles, enhancing range of motion, increasing balance and gait performance, and training motor activities (Davis, Gfeller, & Thaut, 2008).

There are three main techniques in Neurological Music Therapy (NMT) to serve motor skills consisting of 1) Rhythmic Auditory Stimulation or RAS, 2) Patterned Sensory Enhancement or PSE, and 3) Therapeutic Instrumental Music Performance or TIMP.

Rhythmic Auditory Stimulation (RAS) is a technique for rehabilitating the movements such as gait. In practice, the music therapist walks with the patient (usually with a physical therapist in assistance) and applies a simple metronome according to patients' walk cadence or playing a song in 2/4 or 4/4 meter for cueing gait parameters. Music can be presented in both recorded music and live music played by the music therapist (Davis, Gfeller, & Thaut, 2008).

The studies of Tindal (2011); Kim, Kwak, Park, Kim, Song, & Cho (2011); and Kwak (2007) indicated that the rhythmic auditory stimulation (RAS) technique had an impact on walking skill or gait performance of children with cerebral palsy.

Patterned Sensory Enhancement (PSE) is the use of musical elements to improve gross and fine motor skills. This technique uses the temporal, visual-spatial, and dynamic patterns in music as the cue of movement for increasing desired movement. For example, in the task of putting on a shirt task, the first step of this task

is to raise and lower one's arm. The therapist may lead the client to move his/her arm by playing a melody of ascending tone for raising his/her arms, and playing a melody of descending tones for lowering his/her arms (Davis, Gfeller, & Thaut, 2008).

Therapeutic Instrumental Music Performance (TIMP) is to use musical instruments for rehabilitating motor movement or exercise. This technique deals with timing of movements, strength, flexibility, and range of motion. Moreover the sound and music provides the auditory feedback during training in this technique (Davis, Gfeller, & Thaut, 2008).

2) Communicational and social skills

Music is used to encourage communication and contact skills such as turn taking, sharing, reciprocal interaction, vocal or verbal expressions (Wigram, Pedersen, & Bonde, 2002). Perry (2003) conducted research related to communication development of children who had multiple disabilities including cerebral palsy by using an improvisational technique. The results indicated that musical interaction provided a framework of communication that increased communication skills. Therefore, music could be the tool for children to communicate more emotionally in a non-verbal or pre-verbal language (Malloch, & Trevarthen, 2008).

There is another music technique called the dyadic music therapy treatment (DUET). This technique significantly increases changes in dyadic communication and also built positive relationship between parents and their children (Gilboa, & Roginsky, 2010). Furthermore, Kho, (2011) determined that children with cerebral palsy who participated in music therapy session for over three months had an improvement in communication and socialization.

3) Emotional skills

People with cerebral palsy encounter disability-related experiences and they need to deal with emotional problems such as depression, grief, and loneliness. Music can offer help in coping with emotion (Davis, Gfeller, & Thaut, 2008). The study of Yu, Liu, Li, & Ma, (2009) found that listening to music decreased anxiety and pain while children with cerebral palsy were receiving acupuncture.

As mentioned above, music therapy has many positive effects on children with cerebral palsy including motor skills, communicational and social skills, and emotional skills. The music therapy technique usually used for increasing motor skills

is Neurological Music Therapy (NMT). For communication and social skills, the dyadic music therapy treatment (DUET) enhances communication skills and positive relationship between parents and their children. Music listening also decreased anxiety and pain during receiving acupuncture.

2.3. Systematic Review

2.3.1 Definition of Systematic Review

A systematic review is one of several methodologies in synthesizing research from many findings study. Hanson-Abromeit, & Moore, (2014) defined this term as a methodologically rigorous study or a stand-alone that summarizes the research on clearly formulated questions involved in clinical practice, research, or policy. Boland, Cherry, & Dickson, (2013) explained this term as a review of literature that was designed for locating, appraising, and synthesizing the available studies related to research questions. The systematic review provided the informative and evidence-based answers which are able to make changes in the policy. Another meaning that presented by Okoli, Schabram, (2010) is a systematic, explicit, and reproducible methodology in identifying, evaluating, and synthesizing the recorded works by researchers, scholars, and practitioners.

The term systematic review can be defined as the methodology for synthesizing the previous evidence based in order to complete the research questions. A systematic review has an impact on determining treatment, intervention, medicine, and changes to policy.

2.3.2 Types of Systematic Review

A systematic review can be classified into two types comprising 1) qualitative synthesis 2) quantitative synthesis (Jamonman, 1988).

1) Qualitative synthesis

This is to collect the qualitative studies and synthesize them from the aspect of narration or compare the results of qualitative study by using qualitative

methods (Jamonman, 1988; Wiradchai, 1999). There are two types of qualitative synthesis including meta-synthesis, and meta-ethnography.

Meta-synthesis is considered a new qualitative synthesis technique (Jensen & Allen 1996). The purpose of meta-synthesis is to develop an explanatory theory or model which explains the findings of a group of qualitative studies. Another purpose is to increase certainty in cause and effect conclusions of a particular area (Walsh, & Downe, 2005).

Meta-ethnography. The aim of Meta-ethnography is to accomplish a greater understanding or conceptual development than a finding in an individual study. It is an interpretation rather than aggregation but it also includes an element of aggregation. The concepts of meta-ethnography are translated within and across studies, and the synthesized product is a new interpretation. (Harden, 2010). For example, McDermott & Graham, (2005) used a meta-ethnography to synthesize research on teenage pregnancy and the experiences of teenage mothers in the United Kingdom.

2) Quantitative synthesis.

This type involves quantitative research. The statistical method is employed as the methodology or the way to answer research questions. There are three main types of quantitative synthesis.

Traditional Vote-Counting Methods. This method uses counting for synthesis. The process of synthesis is divided into three groups including 1) the significant and positive statistics, 2) the significant and negative statistics, and 3) no significance. After classifying the studies into three groups, the next step is to synthesize by counting the studies from each group (Wiradchai, 1999).

Meta-analysis is the use of statistical combination of at least two or many studies. The aim of meta-analysis is to produce an estimate of the effectiveness in the field of health, such as treatment and intervention. Meta-analysis usually uses the data in the form of randomized trials. The statistics in meta-analysis are used to evaluate the diversity (heterogeneity) among the results of different studies, to explore and explain the observed heterogeneity, and to estimate a common effect (Lau, Ioannids, & Schmid, 1997).

A Cochrane Review presents the reviews of primary research in the area of human health care. It investigates either the effects of treatment, interventions, and rehabilitation, or the accuracy of a diagnostic test in a specific patient population and setting. The data in Cochrane Review allow can be updated with new evidence being an electronic publications data. There are four types of Cochrane Review consisting of intervention, methodology, diagnostic test accuracy, and overviews of reviews (The Cochrane collaboration, 2014).

There is another type of systematic review which is not considered as qualitative or quantitative synthesis, which is the mixed method in systematic review. This type of systematic review collects data of both qualitative and quantitative studies. The methodology of the mixed review is to combine qualitative and quantitative methodology to address research questions (Heyvaert, Maes, & Onghena, 2013). There are many kinds of mixed method such as systematic review, content analysis, and mate-narrative review.

Systematic review is usually used in the field of medicine and health care. This method is used for determining treatments and intervention in particular. In addition, the result of systematic review leads to developing treatment and intervention as well (Gough, Oliver, & Thomas, 2012).

Content analysis is a flexible method for analyzing text, or content in the form of letters, diaries, newspaper content, and documents. It analyses the content with reference to the meanings, contexts and intentions contained in messages. The value of content analysis is to make valid, replicable and objective inference (Devi Prasad, B, 1994).

Meta-narrative review is used to synthesize the evidence in order to inform complex policy-making questions (Greenhalgh, Robert, Macfarlane, Bate, Kyriakidou, & Peacock, 2005).

Narrative review is a basic and early method. The main concept of this method is to summarize the research studies and to seek the differences and the similarities of data in each area of research. This method also requires identifying the topic for synthesis (Wiradchai, 1999).

Types of systematic review can be classified into three types based on the kind of data. The qualitative synthesis uses qualitative data for analyzing; the

quantitative synthesis allows the quantitative studies to be the data in analyzing process. In contrast, the data of mixed type covers both qualitative studies and quantitative studies.

2.3.3 The Process of Doing a Systematic review

There are many different ways to conduct a systematic review which have need developed by researcher and scholars. Kitchenham, & Charters, (2007) mentioned the three brief steps: (1) plan the review, (2) implement the review, and (3) report the review. Wiradchai, (1999) explained the way to do a systematic review in five steps: (1) determine research problems in order to predict the research's value, (2) analyze and define clear research problems by educating related principle and theory to be set research hypostasizes, (3) search, select, and collect related studies according to the established criteria, (4) synthesize, and (5) report the result.

There are the other ways of doing a systematic review that have more than five steps. They are the eight steps and the night steps. Details are as follows.

The eight steps were created by Okoli, Schabram, (2010).

Step 1: Purpose of the literature review. This step requires making the purposes and intended goals of the review.

Step 2: *Protocol and training*. This step is to make reviewers agree with the detailed procedure to be followed in case there is more than one reviewer.

Step 3: Searching the literature: The reviewer makes clear details of searching studies, and explains how comprehensiveness of searching was assured.

Step 4: Practical screen: The reviewer determines what studies will be included and which ones will be excluded.

Step 5: Quality appraisal: The quality of research included studies will be assessed in terms of research methodologies employed.

Step 6: Data extraction: The reviewer extracts the applicable information from each study systematically.

Step 7: Synthesis of studies: This step is about combining the facts extracted from the studies by using quantitative methodology, qualitative methodology, or both.

Step 8: Writing the review: This is to write the report that presents the result and gives sufficient details.

The use of nine steps was developed by Boland, Cherry, & Dickson, (2013) for assisting the graduate students to understand and to learn how to do a systematic review. The night steps consist of:

Step 1: Performing scoping searches, identifying the review question and writing your protocol. This step will help to identify the background literature, define review questions and to set the inclusion criteria. The research proposal needs to be written in this step.

Step 2: Literature searching. The aim of this step is to identify papers such as published and unpublished, and to use bibliographic databases or other evidence sources which help to address the review questions.

Step 3: Screening titles and abstracts. In this step, the researcher needs to read the titles and abstracts of each study.

Step 4: Obtaining papers. This step is to obtain the full-text papers of the studies.

Step 5: Selecting full-text papers. This step is to select the paper or study which fits to inclusion criteria.

Step 6: Quality assessment. The researcher needs to assess each full-text paper or study from the aspect of methodological quality.

Step 7: Data extraction. In this step, the researcher is required to summarize the data.

Step 8: Analysis and synthesis. This step is to synthesize the data in either narrative or meta-analysis.

Step 9: Writing up and editing. This is to write a research report consisting of background of the study, methodology, results, and conclusions.

In addition, there is another process of conducting systematic reviews established by Hanson-Abromeit, & Moore (2014) who are music therapists. Their process consists of five steps:

Step 1: Creating the foundation includes identifying the research plan and operationalizing the target questions.

Conducting a systematic review should begin with a clear research plan which consists of determining the research purpose, and specifying the methodology for the particular review (Brown, & Jellison, 2012). This process can be run by using the map which identifies how the synthesis should be conducted. It helps reviewers to identify the need in multiple and differing types of review processes for addressing the research questions (Gough, Thomas, & Oliver, 2012).

Step 2: Conducting the search includes collecting data, gathering, and performing an initial analysis for determining which studies to include.

This step is to collect data in which reviewers identify, gather, and organize existing literature related to the research questions, and to perform an initial analysis for determining article inclusion in the review.

Collecting data or searching the literature can be investigated in several sources, both published and unpublished. The published sources are commonly identified through online databases by reviewing literatures which differ from unpublished sources. Using published sources requires the skill of using electronic databases and the understanding of the structure and terminology for the various databases. The main idea of searching the literature is to include as much as possible in order to have the greatest relevance to the population and problem of the study (Cooper, 2010).

The databases that are usually used in music therapy search include MEDLINE, PsychINFO, PubMed, CINAHL, ERIC, and Social Sciences Abstracts (Dileo, 2005).

In the searching process, it is necessary to be aware of potential bias. Bias can be reflected through authors that have conformed to reviewer preferences or cultural norms in order to have a study published. To limit the bias, the literature will include both published sources that may not be available through a database search such as book chapters and gray literature (e.g., conference presentations, reference lists, the Internet) and unpublished sources that may be found through personal contacts, professional organization and research center websites, and

online open access journals (Cooper, 2010; Khan, Kunz, Kleijnen, & Antes, 2011; Dileo, 2005).

After focusing the searching process, it is then important to consider what the keywords that are used are in an effective searching process. Keywords are the terms that are used to find literature which is relevant to the problem statement, research questions, and conceptual and operational definitions. They should include the clear scope and purpose of the search, an emerging operational definition of concepts that are able to be identified, the availability of sources, the decisions regarding the management of time and the review process, and specificity as to the criteria for inclusion and exclusion of studies in the review. Moreover, the keywords used and dates of searching will be documented (Gough, Thomas, & Oliver, 2012; & Liberati, Altman, Tetzlaff, & Moher, D., 2009).

The last task in step 2 is to identify an inclusion and an exclusion criterion. This process will help to scope and to frame the time of the searching process. The keywords will identify inclusion and exclusion criteria in selecting the related literature. The selection criteria in a systematic review should be determined clearly. It is important to understand that if inclusion criteria are too broad, it may be difficult to synthesize the literature. On the other hand, if they are too narrow, it may limit interpretations in the answering of the research questions (Rew, 2011; & Khan, Kunz, Kleijnen, & Antes, 2011).

The characteristics for identifying the inclusion and exclusion criteria of studies should be related to study design, age range, publication year, publication language (e.g., English only), publication parameters (e.g., peer reviewed vs. non peer reviewed publications), diagnosis of participants in literature, and intervention and outcomes. In addition, the final selection criteria should be determined once the full texts of all potential relevant studies have been reviewed (Brown, Harniss, Schomer, Feinberg, Cullen, & Johnson, 2012; & Hanson-Abromeit, & Moore, 2014).

In order to identify the inclusion and exclusion criteria, there is a diagram called the PRISMA flow diagram which helps to organize explicit and clear reporting of inclusion and exclusion of studies (Liberati, Altman, Tetzlaff, & Moher, 2009).

Step 3: Data Extraction includes making the extraction of data from the included studies.

Creating a data extraction checklist is required in this step. It is an assessment of the quality of included literature for synthesizing of the studies. The bias needs to be considered when assessing and extracting data. Bias can be removed by examining the included studies in terms of selection of study, participants, intervention fidelity, manner in measuring, and transparent reporting of attrition. However, bias can be difficult to extract due to poor intervention reporting (Conn, & Groves, 2011; & Khan, Kunz, Kleijnen, & Antes, 2011)

Step 4: Synthesis and Analysis of the Data includes the synthesis of included studies and doing an in-depth analysis to answer research questions.

The analysis and explanation process is to fulfill each research question. These processes basically follow a common stage to create a narrative that are not only answering the research question, but also interprets the meaning. It includes identifying available data relevant to a particular research question, determining the patterns in the data, and explaining how the data answers the question (Gough, Oliver, et al., 2012). In presenting the synthesis results, it is important to interpret. Thus, the way to explain meaningfully is to use tables, diagrams, illustrations and figures. Finally, the results of the systematic review should offer meaningful answers, inform practice, and guide future research (Khan, Kunz, Kleijnen, & Antes, 2011; & Gough, Thomas, & Oliver, 2012).

Step 5: Evaluating the Strength of Evidence and Presenting the Results includes evaluating the strength of the evidence, and presenting results and outcome-based practice recommendations.

A systematic review is evaluated on the thoroughness of the study and on how well-considered the recommendations are. The explanation must be provided explicitly for each research question.

In evaluating the evidence strength, it needs to answer the question as to how well the results answered the research questions. The strength of evidence can be evaluated based on the applicability and consistency of the findings (Gough, Oliver, et al., 2012). The level of strength is determined by identifying the

publication or other forms of bias, and the study design and measurement. It is able to categorize as high, moderate, low, or very low the value of the results. This value has particular impact on clinical decisions or policies (Khan, Kunz, Kleijnen, & Antes, 2011; & Gough, Thomas, & Oliver, 2012).

Designating the levels of strength can determine how the information is interpreted and used by clinicians, clients or patients, and policy makers. High level strength may indicate reliable evidence that will be strongly recommended by professionals to clients or patients, and may have an impact on policy level such as on the administration of services. For moderate levels, the acceptability of the recommendations varies, while a low level indicates the outcomes that are based on individual preferences and values (Khan, Kunz, Kleijnen, & Antes, 2011).

In conclusion, the process of doing a systematic review is divided into five steps as follows.

First step is to consider the research foundation in order to make a research plan, including research questions, and purpose.

Second step is data collection. The data will be collected via electronic databases such as MEDLINE, PubMed, ERIC, and Social Sciences Abstracts. Keywords will be created in order to search the data. Data needs to relate to research questions and to be in the form of full-text paper.

Third step is to identify the selection criteria for extracting the data that are not related to research questions.

Fourth step is data analysis. In this step, the coding form will be created as the research tool and it needs to test the test interrater reliability. The SPSS program is usually used for analyzing the data.

Fifth step is the final process of doing a systematic review. This step is to report the result in the form of illustrations, tables, diagrams, and figures. The idea of presenting the result is to make the reader realize the value of the study.

2.3.4 The Advantages of Systematic Review

The systematic review developed from medical research in an effort to synthesize related literature. In the last twenty years, the systematic review has been

used to determine the viability and safety of an intervention but it was not conducted by using statistical analysis. Therefore, the systematic review has been developed into a methodologically rigorous process to answer research questions, and to unify the synthesis of the cumulative literature (Gough, Thomas, & Oliver (2012).

Greenhalgh (1997) explained the benefits of using a systematic review as (1) limiting the bias in identifying and rejecting studies, (2) being more reliable and accurate because of methodology, (3) assimilating the large amounts of information quickly by healthcare providers, researchers, and policymakers, (4) reducing the delay among research discoveries, implementation of effective diagnostic, therapeutic strategies, (5) formally comparing the results of different studies to establish the generalizability of findings and their consistency (lack of heterogeneity) formally, (6) identifying the reasons for heterogeneity (inconsistency in results across studies) and generating new hypotheses about particular subgroups, and (7) increasing the precision of the overall result by using quantitative systematic reviews (meta-analyses).

CHAPTER III
RESEARCH METHODOLOGY

The purpose of this study was to synthesize the research studies in the field of using music for people diagnosed with cerebral palsy. This chapter provides information including research design, search strategy, selection criteria, coding form, inter-rater reliability, and data collection and analysis.

3.1 Research Design

A systematic review was employed in this study in order to address the aims of the study which was to synthesize music research in the field of music intervention for people with cerebral palsy.

A systematic review was defined as a methodologically rigorous study or a stand-alone that summarized the research on clearly formulated questions involved in clinical practice, research, or policy (Hanson-Abromeit, & Moore, 2014).

Using a systematic review saves energy and time of clinicians in providing information about intervention and treatment. Every year, there are approximately 20,000 published research studies. Therefore, using a systematic review assists in estimating unrelated journals. A systematic review summarizes the available evidence-based information and produces a conclusion in order to help clinicians make the right choice of treatment and intervention for their patients.

A systematic review instead of a number of studies provides a clear and consistent picture of the research. Sometimes, the evidence-based information comes from a conclusion that was not a synthesis. Therefore, a systematic review is useful, if research studies demonstrate consistent information on particular topics, and draws attention to the shortcomings of the research (Kitchenham, 2004).

Generally, a systematic review is used in social and behavioral sciences, healthcare, and software engineering (Harden, 2010; Brown, & Jellison, 2012; &

Kitchenham, 2004). In the field of music therapy research, a systematic review assists researchers in understanding the process of performing systematic reviews because of for three main reasons: (1) it is a way to answer clinical questions and develop clinical practice guidelines, (2) it is a research methodology in educational curriculum, and (3) it is a phase of research project development (Hanson-Abromeit, & Moore, 2014).

The process of doing a systematic review in this study consisted of seven steps.

1) Determining the review research question and purpose, scope of searching, and writing protocol.

2) Collecting the data by searching the studies that relate to the research question, and selecting the full-text papers.

3) Identifying selection criteria.

4) Extracting the data.

5) Developing the coding form and test inter-rater reliability.

6) Coding the data by reading the full-text paper, and analyzing data by the using SPSS program.

7) Reporting the data.

In this study, three main characteristics were analyzed: 1) publications and researchers, 2) research methodology, and 3) research content and music intervention.

3.2 Search Strategy

All data were collected by a comprehensive search via the electronic databases: PubMed, CINAHL, ERIC, ThaiLIS, and ProQuest. In addition, the studies were collected from electronic journals: the Arts in Psychotherapy, Australian Journal of Music Therapy, Journal of Music Therapy, Music and Medicine, Canadian Journal of Music Therapy, Qualitative Inquiries in Music Therapy, and Nordic Journal of Music Therapy.

The electronic databases were searched by using these keyword phrases:

1) “music intervention for people or children with cerebral palsy”

2) “music therapy for people or children with cerebral palsy”

3) “music for people or children with cerebral palsy”

4) “the use of music with cerebral palsy’’

5) “the effect of music with cerebral palsy’’

6) “music intervention and cerebral palsy”

7) “music therapy and cerebral palsy”

8) ‘‘music and cerebral palsy’’

3.3 Selection Criteria

The research studies included were based on five selecting criteria as follows:

1) Only quantitative research design was included in this study.

2) The research study was in the field of music for people with cerebral palsy.

3) The participants in the study were diagnosed as having cerebral palsy with no restrictions as to age, gender, type of cerebral palsy, and setting.

4) The use of music as intervention was reported.

5) The result of the study reported nonmusical goals such as cognition, physiology, communication, social, and psychology.

3.4 Coding Form

To address the purpose of this study, a coding form was developed as the research instrument. It was developed by using documents, text-books, articles, and research relevant to this study. The coding form consists of twenty four items within three main topics including 1) publications and researchers, 2) research methodology, and 3) research content and music intervention.

The part of publication and researchers was developed by using the research study of the Office of the Education Council (2009) which is a meta-analysis of Thai education research as a guideline. This part analyzed year of publication, types of study, source of publication, and academic qualifications of researchers.

The second part of the coding form was research methodology. The seven items collected included experimental research design, sample size, selection of participants, assessment tools, and data analysis. This part was developed by using the text Research Methodology in Behavioral Sciences (Kamged, 2008), and the research study of the Office of the Education Council (2009).

The final part of the coding form was research contents and music intervention. This part consists of types of cerebral palsy, age of participants, music intervention, outcomes as developmental domains, types of outcome, and testing results. With regard to music intervention, there was eight sub-items which were established by using the Music-based Intervention Reporting Worksheet (Robb, Carpenter, & Burns, 2011). These sub-items included intervention theory or principles, intervention strategies or music activities, music selection processes, music delivery methods, music instruments and materials, number of sessions, duration of each session, and frequency of sessions. The part of outcomes as developmental domains and types of outcome was created by using the text book An Introduction to Music Therapy: Theory and Practice (2008). Finally, the testing result part was developed by using the research study of the Office of the Education Council (2009). The coding form and coding manual is shown in the Appendix.

3.5 Inter-rater reliability

To test the reliability of the coding form, inter-rater reliability was used as a method of testing in this study. This was done by analyzing the correlation of coding scores between two people, including researcher and expert. Pearson Product Movement Correlation was used to test consistency of the result of coding form between researcher and expert. Inter-rater reliability produced a strongly significant correlation ($r = .997$, $p = .01$). This demonstrated the high agreement of both researcher and expert.

3.6 Data Collection and Analysis

This was done by:

1) Collecting research studies that involve using music for people with cerebral palsy via electronic databases and electronic journals.

2) Selecting research studies which met the selection criteria by reading the topic and abstract.

3) Reading full text research studies and completing the coding form.

4) Transferring the data from coding form to SPSS program for the analyzing process.

5) Analyzing the data by using SPSS program and descriptive statistics including frequency and percentage.

CHAPTER IV
RESULTS

The purpose of this study was to synthesize research in music intervention for people with cerebral palsy included three main characteristics, comprising 1) publications and researchers, 2) research methodology, and 3) research content and music intervention.

There were 43 research studies found from searching process; however, only 19 research studies met the criteria for the synthesizing process. 24 studies did not meet the criteria because of being qualitative research design (25%), reporting musical goals (4.2%), missing information about music intervention (25%), using non-music intervention such as intensive voice treatment (12.5%), being a theoretical paper (29.1%), and including participants with cerebral palsy and other diagnoses which did not report the result separately (4.2%). The number and percentage of research studies in searching process shown in figure 4.1 and the result is presented, both the detail of research studies and the result of the synthesis.

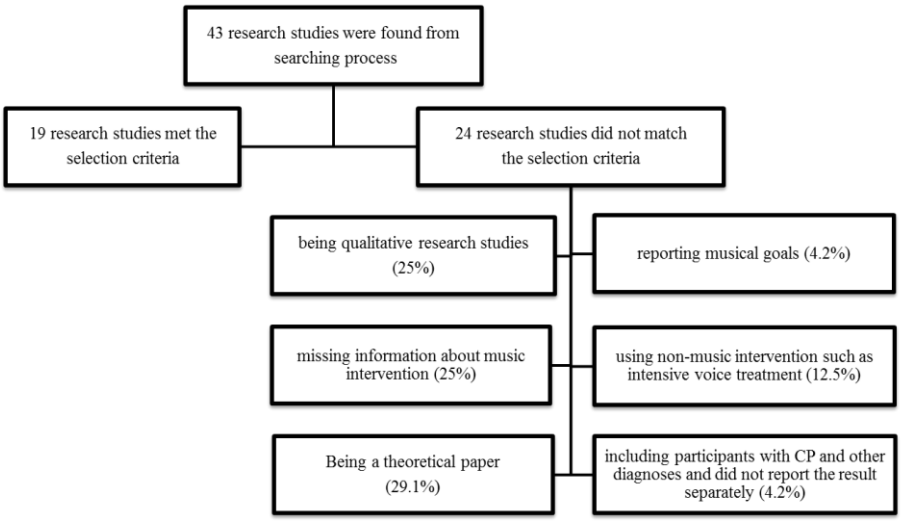

Figure 4.1 Number of research studies in the searching process

4.1 The detail of research studies

This result included authors, year of publication, name of journal, experimental research design, sample size, age of participants, type of Cerebral Palsy, music intervention, outcomes, assessment tools, and result. Details are shown in table 4.1.

Table 4.1 Detail of research studies

REF	Author/Year/ Name of Journal	Experimental research design	Sample size	Age/Type of CP	Music intervention	Outcomes	Assessment tools	Result
001	Yu et al. / 2009/ Journal of Traditional Chinese Medicine	Randomized control-group pretest-posttest design	60	Late Childhood - Adolescence (7 – 18 years old)/ Spasticity, & Flaccid	Listen to nursery songs or rhymes during acupuncture treatment for 30 minutes and play music instruments after acupuncture treatment for 30 minutes.	Clinical therapeutic effects	1. Comprehensive Functional Assessment Chart for Children with CP 2. Gross Motor Function Measure (GMFM)	1. Significant in creeping, kneeling, standing and walking skills (P<0.01). 2. Not Significant in the improvement of turning the body over from the prone position and in the functional aspects in sitting position (P>0.05)
002	Kima et al. / 2011/ NeuroRehabilitation	Pretest-Posttest Design with Nonequivalent Groups	14	Adolescence - Early adulthood(13 – 40 years old)/ Spastic Diplegia	Rhythmic Auditory Stimulation (RAS).	Gait pattern	1. Three-dimensional (3D) kinematic recordings 2. Six-camera Vicon 370 Motion Analysis system (Oxford Metrics Inc., OxOxford, U.K.) 3. Gait Deviation Index (GDI) 4. Temporospatial parameters	Significant at .05 in; • the pelvis, the maximal angle • the minimal angle of anterior tilt of pelvis • the sagittal plane, angles of maximal and minimal hip flexion • the transverse plane, external rotation of the hip joint at initial contact • the anterior tilt of pelvis at initial contact • the maximal hip flexion angle in the sagittal plane • the minimal angle of anterior tilt of pelvis • the household ambulators Not significant at .05 in; • the kinematic results of the knee, ankle, and foot • the community ambulators • walking velocity, step length, step time, single limb support, double limb support, stance phase, or swing phase

Table 4.1 Detail of research studies (continued)

REF	Author/Year/ Name of Journal	Experimental research design	Sample size	Age/Type of CP	Music intervention	Outcomes	Assessment tools	Result
003	Kim et al./ 2012/ Clinical rehabilitation	Randomized control-group pretest-posttest designs	28	Early adulthood (19 – 40 years old)/ Bilateral spasticity	Rhythmic Auditory Stimulation (RAS).	Gait pattern	1. Six-camera Vicon 370 Motion Analysis system (Oxford Metrics Inc, Oxford, UK) 2. Temporal parameters	Significant at .05 in ; • cadence, walking velocity, stride length and step length • internal and external rotations of hip joints • stride time and step time were significantly improved • anterior tilt of the pelvis and hip flexion during a gait cycle
004	Varsamis et al./ 2012/ International Journal of Special Education	One group pretest - posttest design	4	Adolescence - Early adulthood(13 – 40 years old)/ Mild Spastic, Etraplegia	Rhythmic Auditory Stimulation (RAS).	Controlling stepping cadence	OEMMEBI Profitness device	• decreased cadence, and increased training duration, • kept their heart rate between the aerobic exercise • decreased intra-individual standard deviations in both cadence and heart rate per minute.
005	Kwak/ 2007/ Journal of Music Therapy	Pretest-Posttest Design with Nonequivalent Groups	25	Early childhood - Early adulthood (3 – 40 years old)/ Spastic	Rhythmic Auditory Stimulation (RAS).	Gait performance	Stride Analyzer.	The RAS as therapist-guided training showed more significant difference in stride length, velocity, and symmetry ($p<.05$) than self-guided training.

Table 4.1 Detail of research studies (continued)

REF	Author/Year/ Name of Journal	Experimental research design	Sample size	Age/Type of CP	Music intervention	Outcomes	Assessment tools	Result
006	Francis/ 2011/ International Journal of Therapy and Rehabilitation	Single case design	2	Late Childhood - Early adulthood (7 – 40 years old)/ Not specify	Listen to recorded music	Behavioral outcome in 1. attention, concentration and engagement, 2. anxiety	1. Video recording for mood and attention 2. Observational recording: • Positive/calm responses • Negative/anxious responses • Listening/engaged behaviour • Distracted/not sure. 3. The Profound Education Curriculum (St.Margaret's School 2009) 4. Questionnaire from family, teaching, therapy and care staff	1. Attention to task and person engagement were changed positively 2. Mood was improved when listening to music
007	Yu et al./ 2009/ International Journal of Nursing Studies	Randomized control-group pretest-posttest designs	60	Infancy - Late Childhood (0 – 12 years old)/ Many types of C.P. such as Spastic, Dyskinetic, other	Listen to recorded music	Anxiety and pain	1. mYPAS for measuring anxiety 2. CHEOPS for measuring pain 3. FACES for measuring pain 4. Mean arterial blood pressure (MAP) 5. heart rate (HR) 6. respiratory rate (RR)	Significant at .05 in • anxiety • pain • Mean arterial blood pressure (MAP), • heart rate (HR) No significant at .05 in • respiratory rate (RR)
008	Chong et al./ 2013/ Journal of Exercise Rehabilitation	One group pretest - posttest design	5	Adolescence - Early adulthood(13 – 40 years old)/ Spastic, Dyskinetic	Therapeutic Instrument Music Performance (TIMP)	Hand function	Music Instrument Digital Interface (MIDI) of key pressing force.	1. Improved hand function 2. Improved manual dexterity and velocity of finger movement 3. all five fingers were improved, and the biggest improvement was found in fourth finger

Table 4.1 Detail of research studies (continued)

REF	Author/Year/ Name of Journal	Experimental research design	Sample size	Age/Type of CP	Music intervention	Outcomes	Assessment tools	Result
009	Peng et al./ 2011/ Gait & Posture	One group pretest - posttest design	23	Early childhood - Late Childhood (3 – 12 years old)/ Spastic Diplegia	Patterned sensory enhancement (PSE) music	Movement control in Load sit-to-stand movement	The Normalized Jerk Index (NJI)	Load sit-to-stand was improved in music condition
010	Orita et al./ 2012/ Tohoku Journal Exp. Med.	One group pretest - posttest time-series design	3	Adolescence - Early adulthood(13 – 40 years old)/ Not specify	Listen to Piano Playing for 50 Minutes	1.Parasympathetic activity 2.Sympathetic activity 3.Heart rate or HR	Electrocardiography	• Significant at .01 in Parasympathetic activity and Heart rate • Not significant at .01 in Sympathetic activity
012	Ahonen-Eerikäinen et al./ 2008/ The International Journal of Psychosocial Rehabilitation	Case study design	6	Early childhood - Late Childhood (3 – 12 years old)/ Not specified	Virtual Music Instrument (VMI)	Enhancing Participation and Restoring Self-Image	1. Video Observation 2. Clinician Notes	1. Enhanced full body participation, restored self-images and express feelings. Provided a sense of relationship 2. Reduced tension and anxiety in sharing experiences. 3. Offered the potential for positive, reinforced musical experiences.
013	Perry/ 2003/ Journal of Music Therapy	Case study design	7	Late Childhood (7 – 12 years old)/ Spastic	Selected Improvisation technique (Rainey Perry, 1999)	Communication	1. Video Recording 2. Communication profile (Raincy Perry, 1999)	The communicational skills of participants were developed in the areas of turn taking, attention, and engagement in the interaction.
014	Wolfe/ 1980/ Journal of Music Therapy	Single case design	12	Early childhood - Early adulthood (3 – 40 years old)/ Spastic	Listen to recorded music	Head Posturing	Mercury switch head device	Head control was improved during music condition.

Table 4.1 Detail of research studies (continued)

REF	Author/Year/ Name of Journal	Experimental research design	Sample size	Age/Type of CP	Music intervention	Outcomes	Assessment tools	Result
015	Jiang/ 2013/ Master thesis from the University of Miami	One group pretest - posttest time-series design	9	Early childhood - Late Childhood (3 – 12 years old)/ Spastic	Rhythmic Auditory Stimulation (RAS).	Gait	1. Gross Motor Function Classification System (GMFCS) 2. Gait parameters.	1.Increase velocity, cadence, and stride length 2. Improved walking speed and taking longer steps.
016.	Krakouer et al./ 2001/ International Journal of Psychosocial Rehabilitation.	Single case design	5	Early adulthood - Middle age (19 – 60 years old)/ Not specify	Music intervention was served for 45 minutes including; 1. Live music listening for relaxation 2. Active music activities to stimulate participation 3. Music instrument playing for enhancing individual goals	Individual target behavior changes in; 1. Hand movement 2. Striking action 3. Sitting posture 4. Feet movement 5. Eye contact	1.VDO recording 2. Behavioral observation	All of individual target behaviors were changed positively after receiving music intervention.
017	Tindal/ 2011/ Master thesis from Arizona State University	Single case design	1	Early adulthood (19 – 40 years old)/ Spastic Diplegia	Recorded Rhythmic Music Accompanied by Audible drum beat 1. Pre-gait training check-in or discussion and talking for (15 minutes) 2. Stretching (5 minutes). 3. Gait training (15-20 minutes) 4. Stretching (5 minutes) 5. Post gait training and relaxation (15-20 minutes)	Walking gait including; 1. endurance 2. cadence 3. velocity 4. emotional responsiveness 5. motivation	1. Viedo tape recording 2. Subject and researcher journals 3. A quantitative emotional responsiveness checklist 4. Interview	1. Increased endurance, cadence, and velocity 2. Improves positive emotion and motivation

Table 4.1 Detail of research studies (continued)

REF	Author/Year/ Name of Journal	Experimental research design	Sample size	Age/Type of CP	Music intervention	Outcomes	Assessment tools	Result
018	Johansson et al./ 2014/ Clinical Case Study	One group pretest - posttest design	3	Adolescence (13 – 18 years old)/ Diplegic C.P.	Synchronized Metronome Training	Motor timing, spatio-temporal movement organization, and upper-limb function	1.Applied SMT training equipment 2.Optoelectronic registrations 3.A questionnaire for assessing subjective experiences of changes in upper-limb functions and usability 4.Three-dimensional (3D) kinematic	1. Improved motor timing 2. Changed spatio-temporal movement positively 3. Increased movement control and reduced muscle tone 4. Made smoother and faster movement 5. Improved upper-limb kinetics 6. Improved functionality of hands/arms
019	Scartelli/ 1982 / Journal of Music Therapy	Randomized control-group pretest-posttest designs	6	Early adulthood (19 – 40 years old)/ Spastic	Sedative music-assisted EMG biofeedback relaxation training	Muscle tension	Biofeedback mechanism	Decreased muscle tension

4.2 The result of the synthesis.

Three main characteristics were synthesized consisting of publications and researchers, research methodology, and research content and music intervention.

4.2.1. Publications and researchers

The results of research characteristics in publications and researchers revealed that most of the studies were published during 2011-2015 (52.6%), followed by 2006-2010 (26.3%), and 2001-2005 (10.5%). Regarding types of the studies, most studies were research articles (84.2%) and Master Dissertation or Thesis (15.8%). In terms of publication sources, most research studies were published in journals in the field of medicine (57.9%), followed by journals in the field of music therapy (21.1%). Only one article was published in a journal in the field of special education (5.2%). Mostly, research studies were conducted by researchers who received master's degrees (15.8%). However, most research studies did not report the academic qualifications of researchers (63.2%). Details shown in table 4.2.

Table 4.2. The results of research characteristics in publications and researchers

Research Characteristics	f	%
Year of Publication		
1976-1980	1	5.3
1981-1985	1	5.3
2001-2005	2	10.5
2006-2010	5	26.3
2011-2015	10	52.6
Total	19	100.0
Types of study		
Article	16	84.2
Master Dissertation or Thesis	3	15.8
Total	19	100.0

Table 4.2. The results of research characteristics in publication and researcher (continued)

Research Characteristics	f	%
Sources of publication		
Journals in the field of music therapy	4	21.1
Journals in the field of medicine	11	57.9
Journals in the field of special education	1	5.2
University library data base	3	15.8
Total	19	100.0
Academic qualifications of researchers		
Master's degree	3	15.8
Master's degree, certified music therapist	2	10.4
Doctoral degree	1	5.3
Doctoral degree, certified music therapist	1	5.3
Not applicable	12	63.2
Total	19	100.0

4.2.2. Research methodology

In terms of research methodology, the result included experimental research design, sample size, selection of participants, assessment tools, and data analysis. The result of the experimental research design showed that one group pretest - posttest design, randomized control-group pretest-posttest designs, and single case study designs were equally frequently and conducted most (21.1%), followed by case study designs (15.7%), and one group pretest - posttest time-series design, and pretest-posttest design with nonequivalent groups (10.5%). The sample size indicated that the most common number of participants was one to five, and six to ten (26.3%), followed by eleven to fifteen (15.8%). The lowest number of participants were sixteen to twenty, and twenty six to thirty (5.3%) used equally often. Participants were selected by different selection criteria consisting of purposive selection assignment, random assignment, combined random selection and random assignment. The most common

selecting method was purposive selection (78.9%), followed by random selection and assignment (10.5%), and random selection (5.3%).

There were 27 assessment tools used in 19 research studies. They were classified based on the purposes of measurement tools into five types including physical measurement, emotional measurement, pain measurement, communicational measurement, and other measurement such as video, questionnaire, check list, and field note. The assessment tools most often used were to measure physical development (61.5%). The others assessment tools such as video, Questionnaire, Check list, and Field note, were often used (19.2%). Names of assessment tools were shown as followed.

Physical measurement.

- Gross Motor Function Measure (GMFM)
- Vicon 370 Motion Analysis system
- Gait deviation index (GDI)
- Stride Analyzer
- Kinematic parameters
- OEMMEBI Profitness device
- MIDI program with Cubase 6 and Velocity
- The Normalized Jerk Index (NJI)
- Gait parameter
- Applied SMT training equipment
- Optoelectronic registrations of goal-directed upper limb functions and usability
- Biofeedback mechanism
- Frequency Domain Methods (European Society of Cardiology and the North American Society of Pacing and Electrophysiology, 1996)
- Assessment, evaluation, and programming system for infants and children (AEPs)
- Mercury switch head device
- Comprehensive Functional Assessment Chart for Children with CP

- Three-dimensional (3D) kinematic recordings (six-camera, ProReflex, Qualisys Inc., Gothenburg, Sweden) of goal-directed upper-limb movements (pressing three light-switch buttons in a sequential order with a clenched fist)

Emotional measurement

- Anxiety Scale (mYPAS)
- A Quantitative emotional responsiveness checklist

Pain measurement

- Children's Hospital of Eastern Ontario Pain Scale (CHEOPS)
- Wong-Baker FACES Pain Rating Scale (FACES)

Communicational measurement

- Communication profile

Other measurement

- Field note, session description
- Journal of clients
- Observational check list/Recording
- Questionnaire
- Video recording, and audiotape

The result in terms of data analysis reported that the descriptive statistics and non-parametric (21.05%) were used equally often, followed by content analysis, t-test independent, One-Way MANOVA, and Paired-t-test (10.5%). Details are shown in table 4.3.

Table 4.3. The results of research characteristics in research methodology

Research Characteristics	f	%
Research design		
One group pretest - posttest design	4	21.1
One group pretest - posttest time-series design	2	10.5
Pretest-Posttest Design with Nonequivalent Groups	2	10.5
Randomized control-group pretest-posttest designs	4	21.1
Single case study design	4	21.1
Case study design	3	15.7
Total	19	100.0
Sample size		
1 – 5	5	26.3
6 – 10	5	26.3
11 – 15	3	15.8
16 – 20	1	5.3
21 – 25	2	10.5
26 – 30	1	5.3
56 – 60	2	10.5
Total	19	100.0
Selection of participants		
Purposive selection assignment	15	78.9
Random assignment	1	5.3
Purposive and random selection and assignment	2	10.5
Not applicable	1	5.3
Total	19	100.0

Table 4.3. The results of research characteristics in research methodology (continued)

Research Characteristics		f	%
Assessment tools			
Measure physical development		17	63.0
Measure emotion		2	7.4
Measure pain		2	7.4
Measure communication		1	3.7
Others (Video, Questionnaire, Check list)		5	18.5
	Total	27	100
Data analysis			
Content analysis		2	10.5
Descriptive statistics		4	21.05
t-test independent		2	10.5
Two-Way ANOVA		1	5.3
One-Way MANOVA		2	10.5
Non parametric		4	21.05
Paired-t-test		2	10.5
Thematic analysis & Descriptive statistics		1	5.3
Content analysis & Descriptive statistics		1	5.3
	Total	19	100.0

4.2.3. Research content and music intervention

The result in the area of research content and music intervention included types of cerebral palsy, age of participants, outcomes as developmental domains, type of outcome, testing results, and music intervention.

In type of participant, the result revealed that mostly participants who were diagnosed with spasticity participated in the study (26.3%), followed by Spastic Diplegia, Bilateral Spasticity, and many types or not limited types such as Spastic, Dyskinetic (10.5%). However, five research studies did not identify type of cerebral palsy (26.3%). Most participants in the studies were in the age of adolescence - early adulthood or 13 – 40 years old (21.1%), followed by early childhood - late childhood

or 3 – 12 years old, early adulthood or 19 – 40 years old (15.8%), and early childhood – early adulthood or 3 – 40 years old (10.5%).

With regard to outcomes as developmental domains, the result demonstrated that physical development was the most popular outcome (63.2%), followed by cognition, and both physical and social development (10.5%), and communication, emotion, and both social and communicational development (5.3%). In terms of type of outcome, the most common type was gait (15.8%), followed by step cadence and heart rate, and engagement and kinesthetic (10.5%).

According to the results of nineteen research studies, most of the results were based on the hypothesis (26.3%), followed by significant all variables at .05, significant some variables at .05, and significant all variables but NOT reporting P-Value (15.8%). Details are shown in table 4.4

Table 4.4. The results of research characteristics in research content.

Research Characteristics	f	%
Types of cerebral palsy		
Spastic Diplegia	2	10.5
Bilateral Spastic	2	10.5
Spasticity, Flaccid	1	5.3
Mild Spastic, Etraplegia	1	5.3
Spastic	5	26.3
Spastic, Dyskinetic, other	2	10.5
Diplegic	1	5.3
Not applicable	5	26.3
Total	19	100.0

Table 4.4. The results of research characteristics in research content (continued)

Research Characteristics	f	%
Age of participants		
Infancy - Late Childhood (0 – 12 years old)	1	5.3
Early childhood (3 – 6 years old)	1	5.3
Early childhood - Late Childhood (3 – 12 years old)	3	15.8
Early childhood - Early adulthood (3 – 40 years old)	2	10.5
Late Childhood (7 – 12 years old)	1	5.3
Late Childhood - Adolescence (7 – 18 years old)	1	5.3
Late Childhood - Early adulthood (7 – 40 years old)	1	5.3
Adolescence (13 – 18 years old)	1	5.3
Adolescence - Early adulthood(13 – 40 years old)	4	21.1
Early adulthood (19 – 40 years old)	3	15.8
Early adulthood - Middle age (19 – 60 years old)	1	5.3
Total	19	100.0
Outcomes as developmental domains		
Physical	12	63.2
Cognitive	2	10.5
Communication	1	5.3
Emotional	1	5.3
Social, and Communication	1	5.3
Physical, and Social	2	10.5
Total	19	100.0

Table 4.4. The results of research characteristics in research content (continued)

Research Characteristics	f	%
Types of outcome		
Fine motor	1	5.3
Gross motor	1	5.3
Gait	3	15.8
Neuro System	1	5.3
Interaction	1	5.3
Reduce Anxiety	1	5.3
Engagement and Pre-linguistic communication	1	5.3
Engagement and Kinesthetic	2	10.5
Gross motor, Fine motor, eye contact	1	5.3
Creeping and Kneeing Standing, Walking	1	5.3
Step cadence and heart rate	2	10.5
Stride Length, Velocity, Gait symmetry	1	5.3
Head Posturing	1	5.3
Cadence, Velocity, Gross motor	1	5.3
Finger Extensor muscle	1	5.3
Total	19	100.0
Testing results		
Not significant at .01	1	5.3
Significant at .01 (All variables)	1	5.3
Significant at .01 (Some variables)	1	5.3
Significant at. 05 (All variables)	3	15.8
Significant at .05 (Some variables)	3	15.8
According to hypothesis (If no statistic test)	5	26.3
Significant (All Variables, NOT reporting P-Value)	3	15.8
Not Significant (All Variables, NOT reporting P-Value)	2	10.5
Total	19	100.0

With regard to music intervention, eight characteristics were explained, consisting of intervention theory/ principle, intervention strategy/music activity, music selection process, music delivery method, music instrument/materials, number of sessions, duration of each session, and frequency of sessions.

The most common of intervention theory was Neurologic Music Therapy or NMT (42.1%), followed by Procedure Support, (10.5%), and Auditory Processing Theories of a French ENT Surgeon, Improvisational Technique, Electromyographic (EMG) Biofeedback (5.3%). Six research studies did not report intervention theory (31.6%).

Regarding music used, music movement was most used as the intervention strategy (52.6%), followed by music listening (15.8%), and combined music listening and playing music instruments. Music was selected by researcher mainly based on assessment (42.1%), followed by pre-selected by researcher (31.6%). A few research studies reported that music was developed based on theory, composed, and pre-composed by researchers; music also was selected from their own collection, and limited set (5.3%). Most common music delivery methods were live music and recorded music, used equally (47.4%). Audio equipment was occasionally used as music instrument or materials (25%), for example mp.3 player, computer sound system, cassette tapes, and headphones. Music instruments or materials used were percussion (20%), and keyboard/piano (17.5%). A small number of music instruments or materials were woodwind (2.5%).

The session in the experimental procedure was offered mostly for one time only (26.3%), followed by 15 times (15.8%), and 12 times (10.5%). However, three research studies did not identify the number of sessions (15.8%). In one case, the sessions were run for thirty minutes (36.8%) followed by sixty minutes (10.5%). There were five research studies that did not indicate the duration of each session (26.3%). Most experimental procedures were conducted one time only, and three times per week equally (21.1%). Six research studies did not identify frequency of sessions (31.6%). Details shown in table 4.5

Table 4.5. The results of research characteristics in music intervention

Research Characteristics		f	%
Intervention theory/ Principles			
Neurological music therapy		8	42.1
Procedural support		2	10.5
Auditory processing theories of a French ENT Surgeon		1	5.3
Improvisation technique		1	5.3
Electromyographic (EMG) Biofeedback		1	5.3
Not applicable		6	31.6
	Total	19	100.0
Intervention strategies/Music activities			
Listening		3	15.8
Playing instrument		1	5.3
Music movement		10	52.6
Listening and playing instrument		2	10.5
Singing and playing instrument		1	5.3
Singing, playing, and music movement		1	5.3
Not applicable		1	5.3
	Total	19	100.0
Music selection processes			
Selected by researcher based on assessment		8	42.1
Pre-selected by researcher		6	31.6
Develop based on theory		1	5.3
Participant selected from limited set		1	5.3
Participants' own collection		1	5.3
Composed		1	5.3
Pre-composed song by researcher		1	5.3
	Total	19	100.0

Table 4.5. The results of research characteristics in music intervention (continued)

Research Characteristics		f	%
Music delivery methods			
Live music		9	47.4
Recorded music		9	47.4
Both live and recorded music		1	5.3
	Total	19	100.0
Music instruments/materials			
Guitar/Ukulele		6	15
Keyboard/Piano		7	17.5
Woodwinds (tube)		1	2.5
Percussion		8	20
Metronome		5	12.5
Audio equipment		10	25
Voice		3	7.5
	Total	40	100
Number of sessions			
1.00		5	26.3
2.00		1	5.3
3.00		1	5.3
9.00		1	5.3
10.00		1	5.3
12.00		2	10.5
15.00		3	15.8
20.00		1	5.3
24.00		1	5.3
Not applicable		3	15.8
	Total	19	100.0

Table 4.5. The results of research characteristics in music intervention (continued)

Research Characteristics		f	%
Duration of each session (minutes)			
15.00		1	5.3
20.00		1	5.3
30.00		7	36.8
40.00		1	5.3
45.00		1	5.3
50.00		1	5.3
60.00		2	10.5
Not applicable		5	26.3
	Total	19	100.0
Frequency of sessions			
One time only		4	21.1
One time per week		1	5.3
Two times per week		3	15.8
Three times per week		4	21.1
Five days per week		1	5.3
Not applicable		6	31.6
	Total	19	100.0

CHAPTER V
DISCUSSION AND RECOMMENDATION

This chapter presents both discussion and recommendation. The discussion presents three main interesting issues according to the purpose of this study, including publication and researchers, research methodology, and research content and music intervention. In terms of recommendation, this chapter provides suggestions for conducting future research in the field of using music for people with cerebral palsy, and suggests the implications for music therapists or clinicians who work with cerebral palsy to apply in their clinic.

5.1 Discussion

5.1.1 Publications and researchers

Year of publication was discussed in this part. The result from this synthesis reported that most research studies were conducted during the period 2011 – 2015 (52.6%) which was the period of establishing a professional organization of neurologic music therapy. Neurologic Music Therapy established a professional organization in 2002 and provided a training program and research (Clair, Pasiali, & LaGasse, 2008). Therefore, there were many research studies used the music techniques of neurologic music therapy as music intervention that published in this period. Examples are the studies of Kwak, in 2007; Kim, et al in 2011; Kim, et al in 2012; Varsamis, et al in 2012; and Jiang in 2013 used the Rhythmic Auditory Stimulation technique (RAS), the study of Chong, et al in 2013 used the Therapeutic Instrument Music Performance (TIMP) technique, and the study of Peng, et al in 2011 used the Patterned Sensory Enhancement (PSE) music technique.

5.1.2 Research methodology

In the part of research methodology, there were two topics were discussed consisting of sample size, and assessment tools.

Sample size

According to the result, not many participants took part in experimental procedure. Most research studies were conducted by including one to five, and five to ten participants. This result relates to the research design, which requires a few participants such as the Single case study design. For the studies that were able to include more participants in the experimental process such as the One group pretest - posttest design, and Randomized control-group pretest-posttest designs, this refers to the clinical guideline of treatment for cerebral palsy which suggested the treatment should be prepared individually due to the differences in patients' needs (Levitt, 1995). The examples of research studies included a few participants in the experimental process: the studies of Varsamis et al (2012) used the one group pretest - posttest design with four participants; the study of Chong et al (2013) used the one group pretest - posttest design with five participants; the study Orita et al (2012), and Johansson et al (2014) used the one group pretest - posttest design with three participants; the study of Scartelli (1982) used the Randomized control-group pretest-posttest designs with six participants; and the study of Jiang, (2013) used the one group pretest - posttest time-series design with nine participants.

Assessment tools

The result of synthesis in assessment tools showed that the most common assessment tools were the measurements for measuring physical development. This finding matched with the highest frequency of the outcome or independent variable, which reported that physical development was the most frequent outcome. Therefore the most frequently used assessment tools were the tools for assessing physical abilities such as Gross Motor Function Measure (GMFM), Vicon 370 Motion Analysis system, Gait deviation index (GDI), Stride Analyzer, Gait parameter, Comprehensive Functional Assessment Chart for Children with CP, and Three-dimensional (3D) kinematic recordings of goal-directed upper-limb movements.

In additional, many assessment tools in this synthesis were used in clinical work by other professionals such as physical therapists, and occupational therapists (Fetters, 1991; Wagner et al., 2011; Aneja, 2004).

5.1.3 Research content and music intervention

The discussion in this part includes type of cerebral palsy, outcome as developmental domain, intervention theory, intervention strategy, music delivery method, frequency of session, and testing result.

Type of cerebral palsy

With regard to type of cerebral palsy, the result showed that most of participants were spastic cerebral palsy cases. The result accorded with the finding of Asher, and Schonell (1950) who investigated the four hundred cerebral palsy children from Birmingham, Coventry, Stoke-on-Trent, and Walsall. Their study found that the highest number of cerebral palsy children suffered from spasticity, followed by Athetosis, Mixed Spastic and Athetoid, Ataxia, and Flaccid. Therefore, the most common type of cerebral palsy from this synthesis was spastic cerebral palsy, the same as in the investigation of Asher, and Schonell (1950).

Outcome as developmental domain

Physical development was presented as the most frequent outcome from 19 research studies in this systematic review. This fits with goals of treatment for cerebral palsy. In the standard treatment and care of cerebral palsy, the goals focus on improving physical development including motor skills, and preventing secondary impairment (Rosenbaum, 2003)**.** To increase physical development, therapists or clinicians work on improving self-care activities, increasing ambulation, enhancing adequate speech, and making the appearance of being normal (Deaver, 1995). Moreover, the goals of treatment and therapy comprehend other areas of human development such as developing forms of communication, independence in daily activities, abilities to play, hobbies, and form of locomotion and independent mobility such as wheelchair, and driving motor vehicles (Levitt, 1995).

Intervention theory

The Neurologic Music Therapy or NMT was the most pupolar intervention theory or principle for developing music intervention of people with cerebral palsy.

NMT shares common ground with the theory of treatment for people with cerebral palsy such as neurological approaches, and neurodevelopmental therapy (NDT). Both of these theories are frequently used by other professionals including physical therapists, and occupational therapists (Fetters, 1991; Preuksananon, 2010).

NMT is a research-based system of standardized clinical techniques, which provide a structure for the music therapy clinic. The structure is based on scientific knowledge about physiology, neurology, and psychology. The research of NMT indicated the effective applications in neurodevelopmental therapy including people with cerebral palsy, and also reported the effective interventions in the other areas such as neurologic rehabilitation, neuropediatric therapy, and neurogeriatric therapy. The NMT was developed by Dr. Michael Thaut and his colleagues at the Center for Biomedical Research in Music, Colorado State University (Clair, Pasiali, & LaGasse, 2008).

Intervention strategy

In the aspect of intervention strategy or music activity, the result of the synthesis indicated that music movement occurred with the highest frequency. This result correlated with the previous research evidence in the field of using music movement. For instance, the study of Jun et al (2012), reported that music movement therapy increased both physical and psychological states of stroke patients, and the study of Humburg, & Clair (2003) indicated that movement with music enhanced gait speed in healthy older adults. In children, music movement led to increasing locomotor skill, and motor performance in jumping and dynamic balance in preschool children (Derri et al., 2001; Zachopoulou et al., 2004). Therefore, in order to improve physical development as the main goal of treatment, music movement was required to be used as the intervention strategy.

Music delivery method

The finding showed that music delivery methods were in the form of live music or recorded music. However, many previous studies demonstrated more positive effects of using live music. For example, Segall (2007) indicated that live music had significantly more effect than recorded music on both physiological and behavioral states in end-of-life patients. This study suggested that live music had vital implications for being the role music therapy in hospice programs, and for using as the

nonverbal communication in evaluating the responds of patients. Bailey (1983) compared the effect between live music and tape-recorded music in hospitalized cancer patients. The result revealed that patients exposed to live music showed significantly less tension anxiety and more vigor than with tape-recorded music. Walworth (2010) compared the effect between using live music and recorded music undergoing Magnetic Resonance Imaging (MRI), reporting that live music had significantly better perception than recorded music.

As seen in research mentioned above, using live music was more beneficial than using recorded music, which contradicted the result of this synthesis. The result of this synthesis identified that either live music or recorded music was able to be applied in clinics for people with cerebral palsy. Additionally, the research mentioned above studied and compared the effect of using live music or recorded music with clients in palliative care. The result of these studies are not entirely relevant for people with cerebral palsy. Therefore, the music delivery method for people with cerebral palsy should be either live music or recorded music.

Frequency of sessions

Regarding the result, the session was mostly run three times per week for thirty minutes. This was more frequent than the recommendation of Kong (1969), which suggested only once or twice a week for those participating in therapy. Additionally, from the perspective of good research methodology, collecting data many times leads to gaining deeper data. Therefore, in order to provide more effective and deeper data, therapists or clinicians and researchers should provide music for thirty minutes and three times per week.

Testing result

With regard to testing result, this systematic review found that the result from nineteen research studies mostly accorded with the hypothesis. The result of this systematic review is in accord with the results of previous music therapy research which showed the benefit of using music. For instance, the study of Nickel et al. (2005) revealed that music therapy was an effective intervention for clients with migraine, and chronic pain; Standley (2002) reported that music therapy had effectiveness with premature infants; Vasionyte, & Madison (2012) demonstrated that there were large positive cognitive, physiological, and behavioral effects on patients

with dementia. Therefore music intervention should be one type of therapy also for people with cerebral palsy.

5.2 Recommendation

5.2.1 Future research

The result of this systematic review showed that there were only a few research studies in the field of using music intervention for people with cerebral palsy. Therefore, it is valuable to continue and encourage the researcher who is interested in this field to conduct future research. The recommendation is to conduct both experimental and non-experimental research.

To conduct experimental research, the recommendation is to use the randomized control-group pretest-posttest design, the single-case design, and the case study design in order to investigate deeper information. In terms of participants in the study, the number of participants should be more than ten people for the randomized control-group pretest-posttest designs and should be one to ten for the single case and case study design. Participants should include other types of cerebral palsy such as Athetoid, Ataxic, and Hypotonia cerebral palsy, because these types were rarely selected for participation in experimental research. Although reserch on spastic cerebral palsy is the most commonly conducted, this focus still needs to be continued in future reserch. The recommendation for the age of participants is to include participants from infancy to late childhood (0 – 12 years old) and early adulthood to middle age (19 – 60 years old) which showed the lack of study in this systematic review. Additionally, future experimental research should investigate the effectiveness of music intervention on other independent variables consisting of emotion, communication, social skills, and cognition.

The recommandations for nonexperimental research is to do both qaulitative research and quatitatve research. The example for qualitative research is historical research which leads to understanding the development of music intervention for cerebral palsy. It is quantitative research to survey research in order to

investigate music intervention from music therapists or clinicians who work with cerebral palsy. The figure 5.1 presents the recommendations for conducting future research.

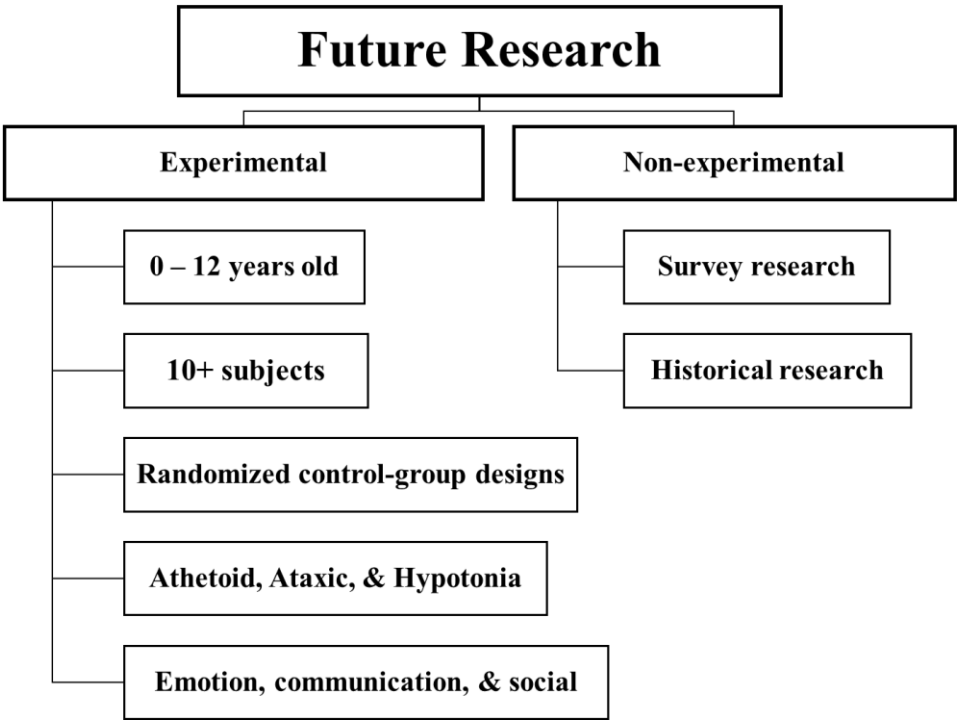

Figure 5.1. The recommendations for conducting future research.

5.2.2 Implications for clinics

With regard to the music therapy clinic, the results of this systematic review demonstrated that music interventions were applicable to people with cerebral palsy. The goals of using music interventions covered to physical development, emotion, communication, social skills, and cognition. Music interventions were prepared differently according to the goal.

To improve physical development, music interventions are created by using Neurologic Music Therapy as intervention theory, and Electromyographic (EMG) Biofeedback. Music movement, playing instruments, and music listening are music activities for increasing motor skills. Music should be selected by music

therapists based on assessment and could be in the form of live or recorded music. Music instruments are both audio equipment and percussion. For this purpose, music should be used for at least thirty minutes, and three times per week (Yu et al, 2009; Kima et al, 2011; Kim et al, 2012; Varsamis et al, 2012; Kwak, 2007; Chong et al, 2013; Peng et al, 2011; Wolfe, 1980; Jiang, 2013; Krakouer et al, 2001; Tindal, 2011; Johansson et al, 2014; Scartelli, 1982).

For reducing anxiety as to the emotional outcome, the intervention theory is Procedural Support. Music intervention for this purpose is provided by listening to recorded music which is selected from a limited set. The session was run for at least thirty minutes, for one time (Francis, 2011; Yu, et al, 2009).

The intervention theory for promoting communication is improvisational techniques. Music strategies are playing instruments and singing. Live music is required for the music delivery method. A variety of music instruments can be used such as percussion, piano, and guitar. The music interventions should serve at least thirty minutes, and two times per week (Kho, 2011; Perry, 2003).

In order to promote social skills, music interventions are based on improvisational techniques. Music activities are playing music instruments and music listening. Music is presented in the form of live and recorded music. The music therapy session should be scheduled for thirty minutes, and two times per week (Francis, 2011; Kho, 2011; Ahonen-Eerikäinen et al, 2008).

The last goal of treatment is cognition. Listening to recorded music is used to improve attention, and to have an effect on Parasympathetic activity. The duration for listening to music is fifty minutes. The song for listening should be selected by the researcher (Francis, 2011; Orita et al, 2012).

Details of music intervention guidelines for people with cerebral palsy is presented in table 5.1.

Table 5.1. Music intervention guidelines for people with cerebral palsy.

Goal	Intervention theory	Music Activity	Music selection	Music delivery	Instrument	Duration (minutes)	Frequency	REF
Physical development	• Neurological music therapy • Electromyographic (EMG) Biofeedback	• Music Movement • Playing instrument • Music listening	• Selected by researcher based on assessment	• Live and Recorded music	• Audio equipment • Percussion	• At least 30	• Three time per week	• 001-005, 008-009, 014-019
Emotion	• Procedural support	• Music listening	• Participant selected from limited set	• Recorded music	• Audio equipment	• At least 30	• One time only	• 006-007
Communication	• Improvisation technique	• Playing instrument • Singing	• Pre-selected by researcher	• Live music	• Percussion • Guitar • Piano	• At least 30	• Two times per week	• 011, 013
Social skills	• Improvisation technique	• Playing instrument • Music listening	• Pre-selected by researcher	• Live and Recorded music	• Percussion • Guitar • Piano • Audio equipment	• At least 30	• Two times per week	• 006, 011, 012
Cognition	N/A	• Music listening	• Pre-selected by researcher	• Recorded music	• Audio equipment	• 50	• At least one time	• 006, 010

CHAPTER VI
CONCLUSION

This research study is a systematic review which synthesized research studies as a secondary source in the areas of using music intervention for people with cerebral palsy. A systematic review is the methodology of synthesizing previous research in order to complete research questions. The benefits of a systematic review are to determine treatment, intervention, and medicine, and to make changes to policy (Hanson-Abromeit, & Moore, 2014; Boland, Cherry, & Dickson, 2013; & Okoli, Schabram, 2010). Owing to the lack of the study in the field of using music intervention for people with cerebral palsy, this synthesis benefit to music therapists or clinicians in selecting music intervention for clients effectively and fullfill music therapy based on evidence.

The purpose of this study was to synthesize research in music intervention for people with cerebral palsy. Three main characteristics were analyzed, including 1) publication and researchers, 2) research methodology, and 3) research content and music intervention.

Research studies were collected via both electronic databases and electronic journals such as PubMed, CINAHL, ERIC, ThaiLIS, ProQuest, the Arts in Psychotherapy, Australian Journal of Music Therapy, Journal of Music Therapy, Music and Medicine, Canadian Journal of Music Therapy, Qualitative Inquiries in Music Therapy, and Nordic Journal of Music Therapy. The keywords for searching were “music intervention for people or children with cerebral palsy”, “music therapy for people or children with cerebral palsy”, “music for people or children with cerebral palsy”, “the use of music with cerebral palsy’’, “the effect of music with cerebral palsy’’, “music intervention and cerebral palsy”, “music therapy and cerebral palsy”, and ‘‘music and cerebral palsy’’

The coding form was developed as the research instrument. Inter-rater reliability of the coding form produced a strong significant correlation ($r = .997$, $p =$

.01) which means a high agreement from both researcher and expert. Data was analyzed by using SPSS program and descriptive statistics including frequency and percentage.

According to data collected, nineteen research studies met the selection criteria. The result of this synthesis reported that most research studies were articles (84.2%), published via journals in the field of medicine (57.9%), during the years 2011 - 2015 (52.6%). Single-case study, one group pretest-posttest, and randomized control group pretest-posttest were equally used as research design (21.1%). Participants in the research studies were mainly diagnosed as Spastic Cerebral Palsy (26.3%) from adolescence to early adulthood (21.1%). Neurological Music Therapy (NMT) was the most used as the theory for developing music intervention (42.1%). Music movement was the most popularly used (52.6%). Songs were most commonly selected by researchers based on assessment (42.1%). Audio equipment was the most used (25%). Music intervention was presented to participants only one time (26.3%) for 30 minutes mostly (36.8%). The outcomes were largely in the area of physical development (63.2%) such as gait, fine motor, gross motor, and step cadence. Regarding the testing results, most of the research findings were based on the hypothesis (26.3%).

Because of the small number of research studies in the field of using music intervention for people with cerebral palsy, it is vital to continue future research. The recommendations for future research are to conduct both experimental research and non-experimental research. Experimental research should be conducted by using randomized control-group pretest-posttest design, the single-case design, and the case study design. Participants should include other types apart from spasticity such as Athetoid, Ataxic, and Hypotonia cerebral palsy, and should allow participants from the age of infancy to late chilhood (0 – 12 years old), and early adulthood to middle age (19 – 60 years old) to participate in the experimental process. In addition, future research should investigate the effectiveness of music intervention on other independent variables such as emotion, communication, social skills, and cognition. For non-experimental research, the recommendation is to conduct historical research to understand the development of music intervention for cerebral palsy, and to conduct

survey research in order to investigate music intervention by music therapists or clinicians who work with cerebral palsy patients.

With regard to the application to the music therapy clinic, result of this systematic review reported that music intervention benefits people with cerebral palsy and should be used in clinics. There are five major goals of using music intervention for people with cerebral palsy including physical, emotional, communicational, social, and cognitive development. For each goal, music interventions are developed differently. The detail of music intervention is explained as follows:

To improve physical development, music interventions are created based on Neurologic Music Therapy or NMT, and Electromyographic (EMG) Biofeedback. Music movement, playing instrument, and music listening are the music activities. Music instruments are audio equipment and percussion. Therapists select music based on assessment and schedule for at least thirty minutes three times per week (Yu et al, 2009; Kima et al, 2011; Kim et al, 2012; Varsamis et al, 2012; Kwak, 2007; Chong et al, 2013; Peng et al, 2011; Wolfe, 1980; Jiang, 2013; Krakouer et al, 2001; Tindal, 2011; Johansson et al, 2014; Scartelli, 1982).

In reducing anxiety or emotional outcome, Procedural Support is the intervention theory. Music listening is used. Therapists should provide opportunities for clients to select music. The session should run at least thirty minutes, and one time (Francis, 2011; Yu, et al, 2009).

For promoting communication, the intervention theory is Improvisational Techniques. Music strategies are playing music instruments and singing. Live music is the music delivery method. Music instruments include percussion, piano, and guitar. The intervention should be at least thirty minutes, and two times per week (Kho, 2011; Perry, 2003).

In the area of social development, intervention theory is as same as the theory for developing communication. Music activities are playing music instruments and music listening. Music is delivered in the form of live and recorded music. The session is similar to music intervention for communication (Francis, 2011; Kho, 2011; Ahonen-Eerikäinen et al, 2008).

The last goal of using music intervention is cognition. Listening to recorded music is used to improve attention and to have an effect on Parasympathetic

activity. Therapists prepare songs for the client to listen to for at least 50 minutes (Francis, 2011; Orita et al, 2012).

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*Note: * citation of research studies in synthesis process*

APPENDICES

APPENDIX A

Coding Form

Code: …….

Title: ……..……

Author name: …… Year of publication: ……..

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1. Publications and researchers
- 1.1 Year of publication [ ][ ]
- 1.2 Types of study [ ][ ]
- 1.3 Sources of publication [ ][ ]
- 1.4 Academic qualifications of researchers [ ][ ]

2. Research methodology
- 2.1 Research design [ ][ ]
- 2.2 Sample size [ ][ ][ ]
- 2.3 Selection of participants [ ][ ]
- 2.4 Assessment tools [ ][ ]
- 2.5 Data analysis [ ][ ]

3. Research content and music intervention
- 3.1 Types of cerebral palsy [ ][ ]
- 3.2 Age of participants [ ][ ]
- 3.3 Music intervention
  - 3.3.1 Intervention theory/ Principles [ ][ ]
  - 3.3.2 Intervention strategies/Music activities [ ][ ]
  - 3.3.3 Music selection processes [ ][ ]
  - 3.3.4 Music delivery methods [ ][ ]
  - 3.3.5 Music instruments/Materials [ ][ ]
  - 3.3.6 Number of sessions [ ][ ]
  - 3.3.7 Duration of each session [ ][ ]
  - 3.3.8 Frequency of sessions [ ][ ]
- 3.4 Outcomes as developmental domains [ ][ ]
- 3.5 Types of outcome [ ][ ][ ]
- 3.6 Testing results [ ][ ]

APPENDIX B

Coding Manual

No	Variable	Code
1.Publications and researchers		
1.1	Year of publication	01 = 2001 – 2005 02 = 2006 – 2010 03 = 2011 – 2015 04 = 1996 – 2000 05 = 1991 – 1995 06 = 1986 – 1990 07 = 1981 – 1985 08 = 1976 – 1980 09 = Others
1.2	Type of studies	01 = Article 02 = Doctoral Dissertation/Thesis 03 = Master Dissertation/Thesis 04 = Thematic Paper 05 = Not applicable 06 = Others
1.3	Source of publication	01 = Journal in the field of music therapy 02 = Journal in the field of medicine 03 = Journal in the field of music 04 = Journal in the field of special education 05 = University library data base 06 = Not applicable 07 = Others
1.4	Academic qualifications of researchers	01 = Bachelor degree 02 = Bachelor degree, certified music therapist 03 = Master degree 04 = Master degree, certified music therapist 05 = Doctoral degree 06 = Doctoral degree, certified music therapist 07 = Not applicable 08 = Others

No	Variable	Code
2.Research methodology		
2.1	Experimental research design	01 = One group pretest - posttest design 02 = One group posttest only design 03 = One group pretest - posttest time-series design 04 = Posttest Design with Nonequivalent Groups 05 = Pretest-Posttest Design with Nonequivalent Groups 06 = Control-group pretest-posttest time-series design 07 = Randomized control-group posttest-only designs 08 = Randomized control-group pretest-posttest designs 09 = Randomized Solomon four-group design 10 = Single case design 11 = Case study design 12 = Others
2.2	Sample size	01 = 1 – 5 02 = 6 – 10 03 = 11 – 15 04 = 16 – 20 05 = 21 – 25 06 = 26 – 30 07 = 31 – 35 08 = 36 – 40 09 = 41 – 45 10 = 46 – 50 11 = 51 – 55 12 = 56 – 60 13 = Not applicable 14 = Others
2.3	Selection of participants	01 = Purposive selection assignment 02 = Random assignment 03 = Purposive selection and random assignment 04 = Not applicable 05 = Others
2.4	Assessment tools	00 = No 01 = Yes

No	Variable	Code
2.Research methodology (cont.)		
2.5	Data analysis	01 = Content analysis 02 = Descriptive statistic 03 = t-test dependent 04 = t-test independent 05 = One-Way ANOVA 06 = Two-Way ANOVA 07 = Three-Way ANOVA 08 = Z-test 09 = One-Way MANOVA 10 = Two-Way MANOVA 11 = Three-Way MANOVA 12 = Non parametric 13 = Not applicable 14 = Paired-t-test 15 = Thematic analysis & Descriptive static 16 = Content analysis & Descriptive statistic 17 = Repeated ANOVA 18 = Others
3. Research content and music intervention		
3.1	Types of cerebral palsy	01 = Spastic Momoplegia 02 = Spastic Diplegia 03 = Spastic Hemiplegia 04 = Spastic Triplegia 05 = Spastic Quadriplegia 06 = Athetoid/Dsykinesia/Extrapyramidal Momoplegia 07 = Athetoid/Dsykinesia/Extrapyramidal Diplegia 08 = Athetoid/Dsykinesia/Extrapyramidal Hemiplegia 09 = Athetoid/Dsykinesia/Extrapyramidal Triplegia 10 = Athetoid/Dsykinesia/Extrapyramidal Quadriplegia 11 = Ataxic Momoplegia 12 = Ataxic Diplegia 13 = Ataxic Hemiplegia 14 = Ataxic Triplegia 15 = Ataxic Quadriplegia 16 = Hypotonia Momoplegia 17 = Hypotonia Diplegia 18 = Hypotonia Hemiplegia 19 = Hypotonia Triplegia 20 = Hypotonia Quadriplegia 21 = Not applicable

No	Variable	Code
3. Research content and music intervention (cont.)		
		22 = Bilateral Spasticity 23 = Spasticity, Flaccid 24 = Mild Spastic, Etraplegia
		25 = Spastic 26 = Spastic, Dyskinetic, other 27 = Diplegic C.P. 28 = Ataxic, Athetoid, Spastic 29 = Others
3.2	Age of participants	01 = Infancy (0 – 2 years old) 02 = Early childhood (3 – 6 years old) 03 = Late Childhood (7 – 12 years old) 04 = Adolescence (13 – 18 years old) 05 = Early adulthood (19 – 40 years old) 06 = Middle age (41 – 60 years old) 07 = Old age (61 – above 61 years old) 08 = Not applicable 09 = Adolescence - Early adulthood(13 – 40 years old) 10 = Infancy - Adolescence (0 – 18 years old) 11 = Late Childhood - Early adulthood (7 – 40 years old) 12 = Early childhood – Adolescence (3 – 18 years old) 13 = Early childhood - Late Childhood (3 – 12 years old) 14 = Early childhood - Early adulthood (3 – 40 years old) 15 = Late Childhood - Adolescence (7 – 18 years old) 16 = Infancy - Late Childhood (0 – 12 years old) 17 = Early adulthood - Middle age (19 – 60 years old) 18 = Others
3.3	Music Intervention	
3.3.1	Intervention theory/ Principles	01 = Neurological music therapy 02 = Procedural support 03 = Not applicable 04 = Auditory processing theories of a French ENT Surgeon 05 = Dyadic Therapy

No	Variable	Code
3. Research content and music intervention (cont.)		
		06 = Improvisation technique 07 = Electromyographic (EMG) Biofeedback 08 = Others
3.3.2	Intervention strategies/Music activities	01 = Singing 02 = Listening 03 = Playing instrument 04 = Music movement 05 = Not applicable 06 = Listening and playing instrument 07 = Sing and playing instrument 08 = Singing, Playing, and music movement 09 = Others
3.3.3	Music selection processes	01 = Selected by researcher based on assessment 02 = Pre-selected by researcher 03 = Develop based on theory 04 = Participant selected from limited set 05 = Participants' own collection 06 = Composed 07 = Not applicable 08 = Pre-composed song by researcher 09 = Others
3.3.4	Music delivery methods	01 = Live music 02 = Recorded music 03 = Both Live and recorded music 04 = Not applicable 05 = Others
3.3.5	Music instruments/materials	00 = No 01 = Yes
3.3.6	Number of sessions	01 – 99
3.3.7	Duration of each session	001 – 999 Minute
3.3.8	Frequency of sessions	01 = One time per week 02 = Two times per week 03 = One time per mount 04 = Two times per mount 05 = Not applicable 06 = One time only 07 = Three time per week

No	Variable	Code
3. Research content and music intervention (cont.)		
		08 = Five days per week 09 = Others
3.4	Outcomes as developmental domains	01 = Physical 02 = Cognitive 03 = Social 04 = Communication 05 = Emotion 06 = Social, and Communication 07 = Physical, and Social 08 = Others
3.5	Types of outcome	1. Physical 011 = Fine motor 012 = Gross motor 013 = Gait 014 = Motion 015 = Balance 016 = Respiration 017 = Sensory perception 018 = Speech 019 = Not applicable 110 = Creeping and Kneeing Standing, Walking 111 = Step cadence and decrease heart rate 112 = Stride Length, Velocity, Gait symmetry 113 = ว่างไว้ ช่างมัน 114 = Head Posturing 115 = Cadence, Velocity, Gross motor 116 = Kinematic 117 = Finger Extensor muscle 118 = Others 2. Cognitive 021 = Attention/Concentration 022 = Memory 023 = Not applicable 024 = Neuro System 025 = Others

No	Variable	Code
3. Research content and music intervention (cont.)		
		3. Social 031 = Relationship 032 = Not applicable 033 = Eye contact 034 = Others 4. Communication 041 = Expressive communication 042 = Receptive communication 043 = Not applicable 044 = Interaction 045 = Others 5. Emotional 051 = Reduce symptom of depression 052 = Relax 053 = Reduce stress 054 = Not applicable 055 = Reduce Anxiety 056 = Others 061 = Engagement and Pre-linguistic communicative interaction 062 = engagement and Kinesthetic 063 = Gross motor, Fine motor, eye contact 064 = Others
3.6	Testing results	01 = Not significant at .01 02 = Not significant at .05 03 = Significant at .01 (All variables) 04 = Significant at .01 (Some variables) 05 = Significant at. 05 (All variables) 06 = Significant at .05 (Some variables) 07 = According to hypothesis (If no statistic test) 08 = Not according to hypothesis (If no statistic test) 09 = Significant (All Variables But NOT reporting P-Value) 10 = Not Significant (All Variables and NOT reporting P-Value)

APPENDIX C

Human Subjects Approval Document

Certificate of Exemption from Ethical Review

The Committee for Research Ethics (Social Sciences)

★★★★★★★★★★★★

Certificate of Exemption No.: 2015/004.2001
MU-SSIRB No.: 2015/057 (B1)
Title of Project: A SYSTEMATIC REVIEW OF RESEARCH IN MUSIC INTERVENTION FOR PEOPLE WITH CEREBRAL PALSY
Principal Investigator: Mr.Puchong Chimpiboon
Name of Institution: College of Music, Mahidol University

The Committee for Research Ethics (Social Sciences) is in full compliance with International Guidelines of Human Research Protection such as Declaration of Helsinki, The Belmont Report, CIOMS Guidelines and the International Conference on Harmonization in Good Clinical Practice (ICH-GCP)

Date of Determination: January 20, 2015

Chairman
(Emeritus Professor Dr.Santhat Sermsri)

Head of the Institute
(Assoc.Prof.Dr.Wariya Chinwanno)
Dean of Faculty of Social Sciences and Humanities

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โครงการวิจัยนี้ได้รับการรับรองจริยธรรมการวิจัยในคนจากคณะกรรมการจริยธรรมการวิจัยในคน
สาขาสังคมศาสตร์ มหาวิทยาลัยมหิดล แล้ว

หากผู้วิจัยต้องการปรับเปลี่ยนรายละเอียดบางส่วนของโครงการวิจัย ขอให้ผู้วิจัยแจ้งมายังสำนักงานคณะกรรมการจริยธรรมฯ โดยกรอกแบบฟอร์ม "แบบขอปรับเปลี่ยนโครงร่างวิจัย (Protocol Amendment)" เพื่อขอรับการพิจารณารับรองก่อนเริ่มดำเนินการวิจัย เมื่อคณะกรรมการจริยธรรมฯ พิจารณารับรองแล้ว จะมีหนังสือตอบรับ (Acceptance Letter) แจ้งไปยังผู้วิจัย โดยระบุวันที่พิจารณารับรอง ผู้วิจัยจึงสามารถเริ่มดำเนินการวิจัยต่อไปได้

This research project had been certified by MU-SSIRB.

If the researcher wanted to amend some details of the research project, the researcher had to inform MU-SSIRB by completing the Protocol Amendment Form for consideration and certification before beginning doing the research. After considering and certifying, MU-SSIRB would send the researcher an acceptance letter with date of consideration and certification. After that, the researcher was able to begin doing the research.

BIOGRAPHY

NAME	Puchong Chimpiboon
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