The Effect of Musical Mode, Major or Minor, on Motivating Children with Asperger's Syndrome

by

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ABSTRACT

The purpose of this research project is to explore which musical mode, major and minor, is more effective to motivate children with Asperger's syndrome. To determine the more effective mode, the researcher has conducted experiments with seven students, two female and five male, with Asperger's syndrome on motivation for participation. Simple dance movements were used as a method of measurement for their motivation. The subjects' task was copying the researcher's simple dance with music, in major or minor mode, or with no music. There were three conditions, no music, major music, and minor music. However, the first dance of the experiments that had no music condition was not measured as it was a pre-test. All of the subjects followed the dance movements three times. The second and third dances of the experiments that were major or minor music conditions were used to determine which musical mode is more effective. To determine subjects' motivation from major and minor music, there were three areas of measurement; competency (level of execution) of movements, facial expression, and concentration on the dance for each experiment. All of the experiments were video-recorded for the evaluation. As a tool of measurement, a seven-point Likert scale was used. In addition, there were three evaluators: a professional music therapist, MT-BC; an undergraduate music therapy student at ASU; and a music education student of master's degree at ASU. In the evaluation on the measurements, the scores of the major music condition were slightly higher than the scores of the minor music condition in all three areas; competency of movements, facial expression, and concentration on the dance. However, the differences of the results in all three areas were not statistically significant.

DEDICATION

To my Wife, Daughter and Family

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I am grateful to God who always leads and guides me on his way.

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CHAPTER I: INTRODUCTION

Children with autism spectrum disorder, including Asperger's syndrome, have general symptoms which include restricted ability for communication, narrowed capacity for social interaction, and presence of repetitious stereotyped behavior (American Psychiatric Association, 2000). A number of researchers have studied the effectiveness of music therapy through quantitative and qualitative research to improve the main problems facing individuals with autism, including communication, social skills, and behavior. Music therapists also studied various areas, such as motor skills, cognitive domains, emotional and psychological realm, musical ability, and sensory sensitivities (Reschke-Hernandez, 2011). Although there are many research projects about children with autism spectrum disorders, surprisingly, there are almost no research projects about children with Asperger's syndrome in music therapy. In addition, quantitative research about the effect of musical mode, major or minor, on client participation is limited. These are very rare, and only a couple of research papers were discovered (DiGiacomo & Kirby, 2006; Pittenger, 2003; and Suda, et al., 2008). Due to this need for research in music as therapy, this study quantitatively researched the effect of musical mode, major or minor, on the participation of children with Asperger's syndrome.

Asperger's syndrome

Asperger's syndrome is another type of pervasive developmental disorder similar to autism (Peters, 2000). In another reference, Asperger's syndrome is identified as an Autism Spectrum Disorder (ASD) that is divided into autism spectrum, pervasive

developmental disorder, not otherwise specified (PDD-NOS) and Asperger's syndrome (http://en.wikipedia.org/wiki/Autism). Children with Asperger's syndrome are classified with a specific category of "high-functioning" autism, even though Asperger's syndrome and high-functioning autism are not the same. They are sometimes typical in appearance and intelligent, although they lack ability in diverse social areas, including understanding social interactions, reading cues, taking hints, and perceiving metaphors. They also have the classical problems that others on the autism spectrum experience, including social interaction deficit, communication limitation, and severe preoccupation with any single interest or repetitive movement, like children with autism (Harvard Medical School, 2005). Children with Asperger's syndrome are considered good candidates for music therapy, because they can spontaneously participate in various music therapy activities, such as performing instruments, playing a musical game and dancing in music therapy sessions.

Music as therapy

Bruscia (1987) introduced two forms of music for therapy – "music *as* therapy" and "music *in* therapy." For this research, the concept of music as therapy was used. "When used *as* therapy, music serves as the primary stimulus or response medium for the client's therapeutic change" (p. 9). In this form, music is the center and the core of the method for all of the therapeutic processes. The role of music in music as therapy becomes the tool to directly affect the client's emotions, thoughts, behaviors, and senses. The music therapist is a guide or facilitator with the music in therapeutic situations (Bruscia, 1987). Music as therapy, moreover, considers that music itself may overall help

the development of children in various areas, such as self-esteem and emotional, social, cognitive and motor abilities, while performing and listening to music. It means that "music-making" is an integrational behavior and activity (Ruud, 1998). This form of music therapy was developed within various improvisational models.

The examples of music as therapy

The representative style for music as therapy is Creative Music Therapy by Nordoff and Robbins. Nordoff and Robbins (1977) published "Creative Music Therapy" and included three case studies based on improvisational sessions. They used the piano, drum, and cymbal for the therapeutic direction of the sessions. This approach was a seminal model of improvisational music therapy. The model is characterized by techniques that have three characteristics: exploration, consistency, and flexibility. "Exploration" means to search what the child can do, what the present limitations are, and what kinds of sensitivities the child has. "Consistency" is to maintain the level and intensity of the contact in both mood and type of activity established by the client. This helps the client feel supported and promotes development through coherence of approach and direction. "Flexibility" allows the child to apply the improvements in their abilities to deal with new clinical problems (Nordoff & Robbins, 1977, p. 91). In addition to Creative Music Therapy, there are other types of improvisational models, such as "The Alvin Improvisational Music Therapy," "The Priestley Analytical Music Therapy," "The Riordan-Bruscia Model," and "The Heimlich Model" (Bruscia, 1987). From these models and practices in improvisation, the concept of "Music-Centered Music Therapy" was finally founded and organized by Aigen (2005). Music-Centered Music Therapy

encourages using the music itself as the agency of therapy to achieve the therapeutic goals in the music therapy process.

A new approach for research

Music as therapy is one of the approaches used as a foundation for this research. The other is a new research model, Evidence-Based Medicine, emerging from medical practice. The paradigm from the medical area is "Evidence-Based Medicine." Evidence-Based Medicine demands physicians to follow new patterns that are "… efficient literature searching and the application of formal rules of evidence evaluating the clinical literature" (Evidence Based Medicine Working Group, 1992, p. 2420). The paradigm requires the physicians to accurately define the problems of a patient. They also find the data needed to resolve the problem, search effective methods in the literature, choose the best method, and apply the method in the situation to evaluate the suitability of the method. All of this process is called "Critical Appraisal Exercise" (Evidence Based Medicine Working Group, 1992).

This approach was first used in training doctors for medical practice. The approach, however, became widespread in many research areas. The various terminologies used in a variety of study areas, such as "Evidence-Based Practices," "Evidence-Based Management," "Evidence-Based Public Health," "Evidence-Based Radiology" and "Evidence-Based Design" etc., are proof of the growing interest in this new approach.

The pervasiveness of the evidence-based form of research encouraged the music therapy area to follow this approach in their therapeutic process, as well. In response to

this trend, AMTA (2005) showed the movement toward evidence-based form that "… addresses the direction of research in support of evidence-based music therapy practice and improved workforce demand (http://www.musictherapy.org/research/strategic_priority_on_research/overview/)." Moreover, they found five goals and objectives, including "professional education," "dissemination," "future research agenda guidance," "evidence-based practice," and "workforce implications," as the strategic priorities in music therapy research.

The needs of quantitative study in music as therapy

For evidence-based practice, the importance of quantitative research is emphasized to help the effects of music therapy be generalized in a variety of situations. Each result from quantitative research projects is accumulated into a general repository about music therapy practice (Bruscia, 1998). It is not easy to combine the music as therapy form and the evidence-based form. Proving the effectiveness of music therapy in the music as therapy approach is a difficult process, because this style has strong artistic properties, which are difficult to quantify (Abrams, 2010). Even though all effects of music and all situations in music therapy could never be generalized and understood (Crowe, 2004), nevertheless, the endeavor and attempt to prove the effectiveness of music therapy with various objective data from quantitative research must be continued (Dileo & Bradt, 2005).

The purpose and hypothesis of thesis project

"What kinds of experience will most effectively stimulate and engage him" (Nordoff & Robbins, 1977, p. 91). This sentence is from Nordoff and Robbins's ideas.

The researcher was wondering “What kinds of musical factor will most effectively stimulate and engage children with Asperger’s syndrome?” Furthermore, Crowe (2004) implies the importance of research about all musical elements in both qualitative and quantitative method. This research project started from these ideas.

> More attention will be paid to the elements and qualities of the music used. The importance of certain intervals, melodic contours, and rhythm patterns will be considered as important elements of music therapy interventions. . . . Other musical elements will also need to be considered, including timbre, dynamics, and duration of exposure to the music. Both quantitative and qualitative research needs to be done to provide information on these effects (Crowe, 2004, pp. 351-352).

This research project tries to show which musical mode, major or minor, is more effective in engaging children with Asperger’s syndrome in active participation in the music therapy session. In addition, the research endeavors to combine the music as therapy form and the evidence-based form of practice. Therefore, the hypothesis was set as: there will be different responses of children with Asperger’s syndrome between major mode and minor mode while participating in a dance activity to music.

To get responses from the music itself, which musical factors are more effective in musical situations like an improvisation? This was the original question for this thesis project. The use of musical modes of major and minor was selected, because there are relatively fewer studies than rhythm for motivated participation. Children with Asperger’s syndrome, who are highest functioning in the autism disorders, were chosen to carry out a movement task that was copying a dance in the experiment. A simple dance was chosen as a task to show the change of their level of motivation and response to each different musical mode, major and minor, in each dance, because the prime type of observable

reaction of interest is behavior (Abrams, 2010). The music for the experiment was composed by the researcher himself with assistance by a professor from the composition faculty at Arizona State University.

CHAPTER II: LITERATURE REVIEW

This research investigated the influence of musical mode, major or minor, on motivating participation in individual with Asperger's syndrome. The research reviewed the origin, the characteristics, and the criteria of Asperger's syndrome, the comparison between DSM-IV-TR (2000) and Gillberg's (2002) criteria, and the possibility of them as a good candidate for music therapy about Asperger's syndrome. There are literature reviews about music therapy interventions for autism spectrum disorder to display general interventions for individuals with autism type's disorder. The literature review about the music area is presented after sharing about the diagnosis of Asperger's syndromes and music therapy interventions. The literature domains about music as a medium and musical mode, major and minor, are explored.

The origin of Asperger's syndrome

Asperger's syndrome was identified by Hans Asperger, who was a pediatrician in Austria. In 1944, Asperger (1944) discovered a group of male children who appeared to be clumsy with awkward motor skills. Furthermore, they showed a lack of empathy with their peers and difficulties with intuition. The children's symptoms were named "autistic psychopathy" by Hans Asperger. Asperger's autistic psychopathy was presented by Lorna Wing, a psychiatrist and physician who translated and introduced Asperger's syndrome English, in 1981, and she renamed the group of characteristics as Asperger's syndrome (Schnur, 2005). Asperger's syndrome was included in the American Psychiatric Association's official diagnostic manual in 1994 (Harvard Medical School, 2005).

The characteristics of Asperger's syndrome

Although Asperger's syndrome belongs to a pervasive developmental disorder as part of autistic spectrum disorder, autism or high-functioning autism and Asperger's syndrome are not clinically the same (Rinehart, Bradshaw, Brereton, & Tonge, 2002). The predominant difference is excellent intelligence in a topic of special and narrow interest. People with Asperger's syndrome sometimes show normal or outstanding knowledge in a realm in which they are interested. In addition, they often talk about their interest to others in the form of a deep monologue, whether they receive a reply or not (Woodbury-Smith & Volkmar, 2009).

The other characteristics are generally communication problems, social interaction deficits, and restricted stereotyped behaviors. In communication with others, people with Asperger's syndrome are sometimes unable to catch the meaning of facial expressions, gestures, and voice tones. They also express their opinions in their own unique ways. The interlocutor may have problem understanding the exact meaning. During talking, there may be a situation where the individual with Asperger's syndrome stands too close or dose not make eye contact (Harvard Medical School, 2005). In restricted behaviors, people with Asperger's syndrome reveal the abnormal preoccupation with stereotyped patterns of interest and strict adherence to nonfunctional routines (Schnur, 2005).

The criteria of Asperger's syndrome

Table 1:

The criteria of Asperger's syndrome by DSM-IV-TR (American Psychiatric Association, 2000, p. 84)

Diagnostic criteria for Asperger's Disorder
A. Qualitative impairment in social interaction, as manifested by at least two of the following (1) marked impairment in the use of multiple nonverbal behaviors such as eye-to-eye gaze, facial expression, body postures, and gestures to regulate social interaction
(2) failure to develop peer relationships appropriate to developmental level
(3) a lack of spontaneous seeking to share enjoyment, interests, or achievements with other people (e.g., by a lack of showing, bringing, or pointing out objects of interest to other people)
(4) lack of social or emotional reciprocity
B. Restricted repetitive and stereotyped patterns of behavior, interests, and activities, as manifested by at least one of the following (1) encompassing preoccupation with one or more stereotyped and restricted patterns of interest that is abnormal either in intensity or focus
(2) apparently inflexible adherence to specific, nonfunctional routines or rituals
(3) stereotyped and repetitive motor mannerisms (e.g., hand or finger flapping or twisting, or complex whole-body movements)
(4) persistent preoccupation with parts of objects
C. The disturbance causes clinically significant impairment in social, occupational, or other important areas of functioning.
D. There is no clinically significant general delay in language (e.g., single words used by 2 years, communicative phrases used by age 3 years).
E. There is no clinically significant delay in cognitive development or in the development of age-appropriate self-help skills, adaptive behavior (other than in social interaction), and curiosity about the environment in childhood.
F. Criteria are not met for another specific Pervasive Developmental Disorder or Schizophrenia.

Table 2:

The criteria of Asperger's syndrome by Christopher Gillberg (Harpur, Lawlor, & Fitzgerald, 2003, p. 260-261)

Diagnostic criteria for Asperger's Disorder
A. Social impairment (extreme egocentricity), at least two of the following
(1) Difficulties interacting with peers
(2) Indifference to peer contacts
(3) Difficulties interpreting social cues
(4) Socially and emotionally inappropriate behavior
B. Narrow interest, at least one of the following
(1) Exclusion of other activities
(2) Repetitive adherence
(3) More rote than meaning
C. Compulsive need for introducing routines and interests, at least one of the following
(1) Which affect every aspect of the individual's everyday life
(2) Which affect others
D. Speech and language peculiarities, at least three of the following
(1) Delayed speech development
(2) Superficially perfect expressive language
(3) Formal pedantic language
(4) Odd prosody, peculiar voice characteristics
(5) Impairment of comprehension, including misinterpretation of literal/ implied meanings
E. Nonverbal communication problems, at least one of the following
(1) Limited use of gestures
(2) Clumsy/ gauche body language
(3) Limited facial expression
(4) Inappropriate facial expression
(5) Peculiar, stiff gaze

F. Motor clumsiness
Poor performance in neurodevelopmental test

Comparison of criteria between DSM-IV-TR and Gillberg

There are a couple of differences between the criteria of DSM-IV-TR (2000) and Gillberg's (2002) criteria for Asperger's syndrome. Overall, both of them have the same views about the qualitative impairment in social interaction, restricted repetitive behavior, and narrow interests. DSM-IV-TR mentions no clinically significant delay in cognitive development, age-appropriate self-help skills, or adaptive behavior. DSM-IV-TR also speaks that criteria do not corresponded with another specific Pervasive Developmental Disorder or Schizophrenia as a criterion of Asperger's Syndrome. However, there is no mention about the criteria in Gillberg. On the other hand, Gillberg concretely insists that the compulsive need for introducing routines and interests either affect everything in the individual's whole life or affects other individuals.

In addition, DSM-IV-TR and Gillberg's criteria are opposite in the language domain. DSM-IV-TR indicates no clinically significant general delay in language. "Asperger's Disorder can be distinguished from Autistic Disorder by the lack of delay or deviance in early language development. Asperger's Disorder is not diagnosed if criteria are met for Autistic Disorder (p. 74). The Gillberg suggests lack of language development and a couple of characteristics of speech as criteria such as delayed speech development, superficially perfect expressive language, formal pedantic language, odd melody, peculiar

voice characteristics, and impairment of comprehension, including misinterpretation of literal or implied meanings about the language domain.

Individual with Asperger's syndrome as a good candidate for music therapy

Children with Asperger's syndrome potentially are good candidates for music therapy. The characteristics of the music and the therapeutic interventions help children with Asperger's syndrome to focus on and follow various activities in the music therapy session. These musical characteristics include the time elements based on rhythm, the full sensory experience, and wide-spread brain stimulation (Radocy & Boyle, 2003). Typical traits of individuals with Asperger's syndrome that promotes their response to music or music therapy include good intelligence, perseverance, drive for perfection, being unconcerned about other's opinions and ability to disregard social conventions (James, 2006). Even though they show immature personalities and appear child-like in nature (Fitzgerald, 2004), these characteristics may help them be enthusiastic about participating in music.

When their characteristics are concentrated on an interest, they sometimes display amazing ability or creativity in music. James (2006) shows the relationship between music and individuals with Asperger's syndrome in the work of composer Bela Bartok and pianist Glenn Gould, who may have had Asperger's syndrome. Fung (2009) also has studied the personality traits and exceptional talent of the composer Erik Satie, who has the characteristics generally of Asperger's syndrome.

Music therapy interventions for children with autism spectrum disorder in the behavioral area

There are many approaches to changing the behaviors of children with autism using various music therapy methods done since the 1960s. Brownell (2002) used an original song composed using the text of the social story as lyrics. The research was to read or sing the social story. Through the interventions, the researcher found which type of intervention was more effective in achieving their behavioral goal. The results were that the reading condition and singing condition were more effective than the no-contact control condition. Also, the singing condition was more effective than reading the story.

There was another research done with original songs. Kern and Aldridge (2006) used original songs to help children with autism improve social interaction on the playground with toys such as plastic building blocks, wagons, sand toys, tricycles, ball, and hoops. Even though the results showed that the musical intervention was not significantly effective in improving their social interaction, it helped their play and engagement with peers on the playground.

Boso, et al. (2007) explored the effect of long-term, 52-week, music therapy program on behavior profile and musical skills. They used activities such as singing a short and long melody, playing the keyboard, and playing rhythmic patterns on the drum to investigate how much these activities affected the young adult subjects with severe autism in behavior and musical skills. The Clinical Global Impression (CGI) scale and the Brief Psychiatric Rating Scale (BPRS) were used for evaluation. The results suggested that the behavior and musical skills were significantly improved on both the

CGI and BPRS scores. Also, the musical interventions were effective for musical skill and behavioral development.

Kim, et al. (2008) examined which stimulus was more effective between improvisational music therapy and play session with toys on joint attention behaviors. The research was a comparison design study of the different two conditions. The outcomes indicated that the improvisational music therapy had significantly more and lengthier events of eye contact and turn-taking in the play session. The outcomes may mean that using music is more effective than no music in a therapeutic condition.

There was a research project about Applied Behavior Analysis and Verbal Behavior (ABA and VB) approach with music (Lim & Draper, 2011). Lim and Draper (2011) investigated which method was more effective in improving the verbal behavior of children with autism. The conditions for the experiment were music involved ABA VB, speech (ABA VB), and no-training condition. The findings discovered that music involving ABA VB training and speech training were significantly more effective than no-training. Also, the mean of test scores for music involved training was slightly higher than speech training. However, the difference between music involved training and speech training condition was not significant.

Through many research projects, music was discovered to be a good medium to help the clients with autism spectrum disorder improve various behaviors and skills by using various music therapy interventions such as diverse activities with the client's family, activities using embedded song, and activities for eye contact (Allgood, 2005; Kern, Wakeford, & Aldridge, 2007; Starr & Zenker, 1998; and Woodward, 2004 etc.). In

addition, researchers from various study fields - music therapy, psychology, special education and medicine - use music to discover solutions to issues in the brain of importance in the treatment of individuals with autism, because autism comes from functional disability on the brain. Their research is explored below.

Music as a medium of change

Some studies focused on the association between musical stimuli and emotional responses. Juslin and Laukka (2004) provided that emotion definitely influenced people's chief motives for listening to music through an experiment that studied changing emotions depending on listening to music and using a questionnaire. Another research project showed musical activities, such as creating melody or listening to music, elicited emotional response (Sousou, 1997). Also, a research project suggested musical influences on mood change by measuring physiological responses with a computer and polygraph machine and sampled responses from cardiac, vascular, electrodermal, and respiratory systems (Krumhansl, 1997).

Blood, et al. (1999) observed the subjects' brain with positron emission tomography to explore cerebral blood flow (CBF) changes to musical stimulus. They used a new melody with more or less consonant or dissonant harmony accompaniment such as major triads, dominant 7ths, 9ths, 11ths, 13ths, or flatted 13ths. The researchers discovered that there is a neural network related specifically with emotional response to music. Music may also elicit neural mechanisms connected with pleasant and unpleasant mood states.

Research about musical mode

Research projects about musical mode are based on the western tonal system. On the tonal scale system, the major mode and minor mode are formed. Pittenger (2003) investigated the relation between the musical stimuli, major and minor mode, and affective and perceptual judgment, happy or sad and like or dislike. Through the first study, the researcher discovered stability in response and that mode affected the decision about happy or sad and like or dislike. Both major and minor stimuli sounds were more minor and sadder when the participants are unstable that when they are stable. Part 2 of the study suggested that major chords are more prototypical than minor chords. Chords with missing thirds, which decide whether a chord is major or minor, are used to examine musical tendency between major and minor. The findings display that participants recognize a major chord when they hear the incomplete chord with no third note. Also, another experiment that had subjects complete the end of a melody, exhibited that the ending supplied by the subjects depended on the beginning mode, major or minor. When the start is major, the major and ambiguous endings were preferred to the minor ending. If the beginning is minor, the minor and ambiguous endings were selected more than the major ending.

DiGiacomo and Kirby (2006) studied whether musical mode influences emotional response. They used two sample groups and four original instrumental works - major, minor, mixed modes, and instrumental noise. The participants for the first sample group were 108 undergraduate students, 88 females and 22 males. Also, sample 2 consisted of 36 undergraduate students, 33 females and 3 males. The mood categories were anger,

confusion, depression, fatigue, tension, and vigor. The results displayed that the major mode condition induces a positive response, the minor mode condition elicits a negative answer, the mixed mode condition made a moderate combination of emotional feedback, and the noise condition induced different extreme emotional responses.

Khalfa, et al. (2003) did research about the effect of music in stressful situations to decrease stress hormone levels. Based on the research, Suda, et al. (2008) studied which musical mode, major or minor, was more effective on stress reduction by measuring with optical topography and endocrinological stress makers. The researchers believed that neurocognitive research had the potential to verify and exhibit the effectiveness of music therapy using neurophysiological investigation methods and experimental research models.

Suda, et al. (2008) examined how much music influences the reduction of mental fatigue with major piece, Allegro con spirit of Mozart's *Sonata for Two Piano* in D Major, minor piece, Beethoven's *Fur Elise* in A minor, in addition, a silent control condition. The participants were 10 healthy subjects, five men and five women, who were university graduates or postgraduates of normal intelligence. The measuring method was to take cortisol sampling and to measure by using optical topography. The results of the research suggested that major mode music decreased stress more effectively than a minor mode piece and silent control condition as indicated by the cortisol level. Moreover, minor mode music helped to reduce stress more than silent condition. They found that stressful conditions such as mental fatigue were diminished more by major mode music than by minor mode music.

No research was found specifically on the mode of music to engage participation of individual with Asperger's syndrome. However, the reviewed research on the influences of major and minor mode and the research on the effects of music and music therapy on the functioning of individual with Asperger's syndrome support the research questions for this experiment.

CHAPTER III: METHOD

Design

The experiment was designed to discover which musical mode, major or minor, is more motivating for children with Asperger's syndrome, as conveyed through movement. The experimenter modeled simple dance movements with music or without music, in one on one setting with seven participants. There were seven students used for this research. Each of the seven students was tested in three conditions in one day. The first condition was imitating dance movements without music in the same tempo as was used in the music-based dances. The second condition, the dance, was done to music using the major piece or minor piece. The last dance condition used the other mode of the piece. The order of major or minor piece used was chosen randomly. After putting seven balls of two colors, red for major and blue for minor, the balls were drawn by the experimenter. To give the participants directions for the experiment, a script that consisted of introduction, explanation, and direction paragraphs was read (See Appendix A for the direction script for the experiment). Each of the three dances for each subject was video-taped.

Subjects

All seven participants were students at a specialized school for children with Asperger's syndrome in a large metropolitan city in the southeast United States. These subjects were selected based on Schnur (2005) information that ". . . Asperger syndrome is more often diagnosed in school-aged children and less frequently in infancy" (p. 308).

The participants' age range was from six-years-old to twelve-years-old. There were two female and five males used as the research subjects.

The school was chosen in collaboration with the board certified music therapist who works for the school, with permission granted by the principal. A recruitment notice for participating in an experiment was asked of eleven students' parents through the school's principal, using documents, such as the notice about the experiment and the rights of participant (See Appendix B for parental consent form), IRB approval document, and recommendation letter from the professor. Seven parents of the students gave permission to conduct the experiment with their children. Prior to the experiment, all student participants read the consent form (See Appendix C for consent form for the subjects) and signed or wrote their names, by themselves, giving their consent to participate in the research.

Setting

A room at the school designated "Therapy Room" was used for the experiment. The size of room was big enough to accommodate the experiment. There were no chairs or desks, except for a big desk for a teacher. The room contained a set of Bose speakers (Bose Companion 2 Series II Multimedia Speaker System) for music positioned behind the experimenter and a Samsung camcorder (SMX-F33 Digital Memory camcorder) on the left side behind the experimenter for video recording, and a Lenovo laptop computer (Lenovo G570) to play the music. For each experiment, there were three people present; a subject, the experimenter, and a technician to control the devices in the room.

Material

The music for the experiment was composed by the researcher himself with the assistance of a member of the composition faculty at Arizona State University. The music was piano pieces in simple ABA structure and 6/8 time signature. One piece was composed in C major and the same music was used for second piece but in C minor (See Appendix D & E for the music piece both major and minor mode). After composing the pieces, the MP3 music files for both of the pieces were produced by the researcher by using Cubase 5 software program to exactly control all of the conditions and to make both pieces sound the same.

The dance movement for the experiment was devised by the researcher himself. The movements consisted of motions by using head, arms, and feet as recorded in Table 3.

Table 3:

The dance movements for the experiment

Each movement of the dance	
The movements in A part of music	Nodding head right side and center
	Nodding head left side and center
	Lifting up right and left stretched arm until chest height toward front side
	Falling down arms
	Lifting up right stretched arm until chest height toward right side, and then left stretched arm until chest height toward left side
	Lifting up right stretched arm as high as you can go, and left stretched arm as high as you can go
	Falling down arms
	Stomping each foot
The movements in B part of music	Right step forward and back and left step forward and back
	Step sideways right and back, and then left and back
	Stomping each foot
	Step right with right foot and step left with left foot
The movements in A' part of music	Lifting up right stretched arm toward front as high as you can go, and left stretched arm toward front as high as you can go
	Falling down arms until chest height
	Spreading both arms toward right and left side at the same time
	Falling down both arms at the same time
	Lifting up right stretched arm toward front as high as you can go, and left stretched arm toward front as high as you can go
	Falling down arms until chest height
	Spreading both arms toward right and left side at the same time
	Falling down both arms at the same time

Procedures

The experiment was conducted in the afternoon around 12 pm in the therapy room. The setting was prepared by the researcher and technician. A video camera, a speaker system, and a computer were set up for the experiment. After finishing all preparations, the first participant was escorted from the classroom. The experiment was conducted with the researcher standing face to face in front of the participant at a distance of about 6.5 feet (2 meters). The experiment began with the researcher introducing himself and explaining about the experiment and what they needed to do. After the introduction, the participants followed the researcher's movements and directions to the dance three times: once with no music, once with selected major or minor music, and once with the other music. Directions and procedures were identical for the three dances. Each participant was then escorted back to his/her classroom after the experiment.

Independent and dependent variables

The independent variable was the musical mode, major or minor. The dependent variables were the behaviors of the children with Asperger's syndrome. Except for the musical modes, the other environments were controlled by the researcher and these belong to control variables.

Measurements

A seven-point Likert-Type scales were used to measure the effect of the experimental conditions (See Appendix F for the seven-point Likert-Type scales). To determine subjects' motivation on each part of the dependent variable with major or

minor music, three areas were evaluated - competency of movements, facial expression, and concentration on the dance. Three different evaluators viewed the videotapes in order to evaluate responses in the three areas. They were a music therapist, MT-BC, a music therapy student in the undergraduate program at ASU, and a music education student in the master's program at ASU. The three evaluators were chosen to get more exact results of the experiment then could be obtained by using only one (See Appendix G for the evaluation by the three evaluators). Before evaluating, the guidelines and criteria of measurement were explained by the researcher.

The criteria for competency of movements was that no mistakes equaled seven points, one or two mistakes equaled six points, three or four mistakes equaled five points, five or six mistakes equaled four points, seven or eight mistakes equaled three points, nine or ten mistakes equaled two points, and over 11 mistakes equaled one point. The criteria for facial expression were to assign a four to each child and add one for each smile and subtract a one for each frown. The criteria for concentration on the dance were scored by assigning a 7 to each child and subtracting one point for each districted action (See Appendix F).

Statistics

Data from the three evaluators was collated for each of the three areas; the competency of movements, facial expression, and the concentration on the dance. A paired-samples t-test was used to determine if the results were significant at the point 05 level of certainty. The results of this analysis are reported in chapter 4.

CHAPTER IV: RESULTS

The research question for this study was, which musical mode, major or minor, is better to motivate the children with Asperger's syndrome? Simple dance movements were selected as a tool to measure their responses to musical modes. The method of the experiment was for the students to follow the experimenter's movements without music and with music composed of both major and minor mode. The seven subjects were recruited from a school for children with Asperger's syndrome. The dance experiment was presented individually to them three times - without music, with major, and then minor music. There were three parts to the evaluation - competency of movements, facial expression, and concentration on the dance to measure engagement. A seven point Likert scale was used to evaluate their responses. Two of the three presentations, the second and third dances with music, were used to qualitatively evaluate the students' motivation for participation. Three evaluators judged the students' behaviors by watching video recordings of each session.

Data analysis

A paired-sample t-test was used to analyze the data. The date analysis was conducted for each of the areas: students' motivation for participation, competency of movements, facial expression, and concentration on the dance. Also, the mean of the ratings of the three evaluators were calculated for each area and the mean and standard deviation of the responses to the major and minor music were determined.

Competency of movements

There was no significant association between major and minor mode in competency of movements. The mean score of major mode's condition was slightly higher than the mean score of minor mode's condition. The difference of the mean score was 0.1. Descriptive statistics for competency of movements are depicted in Table 4.

Table 4:

Competency of movements

	Major			Minor			Statistic
	M	SD	N	M	SD	N	P
Competency of movements	6.1	0.53	7	6	0.72	7	0.63

The results about the competency of movements were measured by SPSS software program. The p value was 0.63. This was higher than 0.05. Therefore, the outcome was not significant.

Facial expression

There was no significant outcome between major mode and minor mode in facial expression area. The mean of minor music's condition was slightly lower, indicating less smiles, than the mean of major music's condition. The difference of the mean score was 0.14. Descriptive statistics for facial expression are depicted in Table 5.

Table 5:

Facial expression

	Major			Minor			Statistic
	M	SD	N	M	SD	N	P
Facial expression	4.14	0.33	7	4	0.38	7	0.41

The outcome about the facial expression was measured by SPSS software program. The p value was 0.41. This was higher than 0.05. Therefore, the outcome was not significant.

Concentration on the dance

The results for relationship between major mode and minor mode in concentration on the dance were not significant. The mean of the score for major mode's condition was slightly higher than the mean for that of minor mode's condition. The difference of the mean score was 0.38. Descriptive statistics for concentration on the dance are depicted in Table 6.

Table 6:

Concentration on the dance

	Major			Minor			Statistic
	M	SD	N	M	SD	N	P
Concentration on the dance	6.71	0.49	7	6.33	0.58	7	0.14

The results about concentration on the dance were measured by SPSS software program. The p value was 0.14. This was higher than 0.05. Therefore, the outcome was not significant.

Overall, all mean scores were slightly higher using major music condition rather than minor music condition. One of the mean score of three areas - competency of movements, facial expression, and concentration on the dance - had the biggest difference between major and minor mode on concentration on the dance, 0.38, even though the difference was not significant.

Review of hypothesis

The hypothesis was that there will be different responses by the student with Asperger's syndrome between major and minor music. The means of the major condition were higher than the mean of minor condition in all three domains - competency of movement, facial expression, and concentration of the dance. However, the statistical results were not significant. Therefore, the hypothesis could not be verified.

CHAPTER V: DISCUSSION

Summary

The purpose of this research project was to explore which musical mode, major or minor, was effective to motivate movement in children with Asperger's syndrome. The hypothesis was that there will be a difference in the results of experiments using major and minor mode to promote participation in a dance. The seven subjects, between six-years-old and twelve-years-old, were recruited from a school for children with Asperger's syndrome. The researcher designed the experiment and composed the music to measure the subjects' motivation for participation. A t-test was conducted on the data but no significant results were found.

Conclusion

The researcher tried to verify the difference between major and minor music for the motivation of children with Asperger's syndrome through the experiment. There was a slight difference between major and minor condition as evaluated by three evaluators. The major condition produced higher score than the minor condition scores in all of three areas evaluations - competency of movements, facial expression, and concentration on the dance.

In competency of movement, the difference of the mean between major and minor was 0.1. This was the smallest difference of the three areas. Secondly, the difference of the mean between major and minor was for facial expression 0.14. This difference was slightly higher than the competency of movement difference. Lastly, the difference of the

mean between major and minor in concentration on the dance was 0.38. This difference between major and minor was the biggest of all three areas' scores.

However, there were no statistically significant differences in the results of the experiment. Therefore, the verification of the difference between major and minor music in competency of movement, facial expression, and concentration on the dance was not achieved for the motivation of student with Asperger's syndrome.

Limitations

There were limitations that contributed to the results of this research. These included the design of the experiment, recruitment of the subjects, and procedure for gathering data in this research project. First, research projects about Asperger's syndrome are very rare, although there is much research about music therapy and autism. There is some qualitative-style research about Asperger's syndrome in medical, psychology, or nursing area. However, there is no quantitative-style research for Asperger's syndrome in music therapy. In addition, the research projects or experiments about the effects of rhythm are many in music therapy, but the research about the effects of musical mode is non-existent. Therefore, no models were available for designing this type of research, making it difficult to create the design for this research.

Another limitation was low number of subjects for the experiment since this was quantitative research. It was hard to recruit students with Asperger's syndrome to match the researcher's experimental question. Except for the school used, there are few schools for students with Asperger's syndrome in the immediate area. This seriously limited the

potential subject pool. Making the general conclusion about motivation on musical mode, major and minor, was difficult because of the limited number of subjects.

Finally, the procedure for gathering data used in this research was a limiting factor because all three experimental conditions were presented to each subject within an eight minute time period. Because of the closeness of these trials, subjects were likely to have difficulty in perceiving differences in the stimuli. This also did not allow enough time for the subjects to become familiar and comfortable with the researcher and with the task. This factor is particularly important because of the characteristics of individuals with Asperger's syndrome.

Recommendations for future research

For the future research projects, finding a well-designed method will be needed to get significant results. The researchers who will follow up from this research will have to study and consider the association between the responses and the interests of the children with Asperger's syndrome to seek a better experimental design. For example, popular music of interest to the age of the subjects might be chosen over composed music to increase general interest for the activity. Also, building rapport with the subjects with Asperger' syndrome may affect their responses in the experiments. For example, before conducting the experiment, spending time with the subjects, such as attending their classes or playing games together, will help the students respond naturally and comfortably in the experiments.

Another idea might be to use advanced technology. If future researchers use contemporary diagnostic equipment such as MRI to check up the subjects' brain waves,

this will generate more exact results about subjects' motivation on musical mode. Moreover, recruiting a lot of participants is important to get the general outcome for children with Asperger's syndrome on response on musical mode.

Other research needed

The need for study about the effects of elements of music is suggested to accumulate the data about the effects of each musical element and instrument type on client response. Crowe (2004) mentions that the music therapist's knowledge about musical elements is important for effective music therapy sessions. For other types of research projects, comparison studies between two different musical elements and possibly instruments, such as string instrument vs. woodwind instrument, woodwind instrument vs. brass instrument, orchestra sound vs. piano sound, or melody vs. harmony etc., should be explored.

Research on various musical elements to promote response is needed for other kinds of populations. There are many types of populations for music therapy such as general autism spectrum disorder, cognitive impairment (CI), cerebral palsy (CP), and dementia, etc. Because all of the populations have different characteristics and needs, additional research projects are needed to find various populations' response to musical elements. This will help diverse clients improve necessary skills for their daily life. For instance, clients may be training for grabbing skills and controlling hand movement through playing instruments, such as drumming with a mallet or playing guitar with a pick. Research on the influence of various musical elements would also be important in these cases.

Finally, research projects to find the association between music and various clients' motivation and response should be continued. This will help develop effective music therapy techniques to address the clinical needs of a wide variety of disabilities and needs for independent client functioning.

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APPENDIX A

THE DIRECTION SCRIPT

The Direction Script for the Experiment

Hello, nice to meet you.
I am Yeo Kwang Yun and a student at ASU.
Today, I'm going to teach you simple Korean folk dance.
It is not difficult and we will have a good time.
We are going to do the dance three times. You will just copy and follow my movements.
Is it ok? Are you ready? Ok, let's dance.

< The first dance >

Ok, very nice job.
Now, we are going to do the dance with a music..
Are you ready? Ok, let's dance with the music.

< The second dance>

Ok, very nice job.
Now, we are going to do the dance just one more time with different music.
You did a good job so far. This is the last time.
Are you ready? Ok, let's dance with the music.

< The third dance>

Thank you very much. It was awesome. Very nice job.
How was the dance?
Which time is the best for you?
Ok, thank you. Goodbye.

APPENDIX B

PARENTAL CONSENT FORM

Which Musical Mode is More Effective in Motivating Client's Interest in a Task: Major or Minor?

PARENTAL INFORMATION LETTER AND LETTER OF PERMISSION

Dear Parent:

I am a graduate student under the direction of Professor Crowe in the School of Music at Arizona State University. I am conducting a research study on "Which Musical Mode is More Effective in Motivating Client's Interest in a Task: Major or Minor?" This study will compare typical students and those students with autism spectrum disorders on the same dance to music task. I am recruiting for both groups. Because this is a music therapy study, it is necessary to have both groups to compare similarities and differences in responses. This will enable me to draw conclusions about the most effective music therapy strategies to employ in music therapy sessions for children with autism.

I am inviting your child's participation, which will involve copying my simple dance three times. The first dance is without music. The second dance and the third dance are with music. The total length time of the dances takes about eight minutes. I will work with your child in a classroom at his/her school as assigned by the principal during the school day. Teachers will be asked to excuse your child for this short period of time. Your child will be picked up at his/her classroom and escorted to the room where the dancing will occur. Once the research protocol is completed, they will be escorted back to their classroom.

Your child's participation in this study is voluntary. If your child chooses not to participate, this will be indicated by them saying 'No', shaking their head in a no gesture, trying to leave the room or withdrawing from the activities or the researcher. If they indicate their desire to not participate, either initially or anytime during the research protocol, they will be considered in noncompliance, their participation will be stopped and there will be no penalty to you or them. Also, you may observe the process of the experiment if you wish. The results of the research study may be published, but your child's name will not be used. For the purpose of analyzing the research results, each session will be recorded using a digital device. You child will not be identified on this recording by name. Only the two researchers will review these recordings. Once the research is concluded, they will be erased.

Although there may be no direct benefit to your child, the possible benefit of your child's participation is for future clients who have music therapy sessions. They may benefit because of the use of the most effective mode of music being in music therapy sessions to increase client participation in various activities during the sessions. There are no foreseeable risks or discomforts from your child's participation.

Responses will be confidential. The results of this study may be used in reports, presentations, or publications but neither you nor your child's name will be used. All digital recordings may be used in reports, presentations, or publications but neither you nor your child's name will be used. All digital recordings will be destroyed at the completion of the thesis.

If you have any questions concerning the research study or your child's participation in this study, either Professor Crowe or I are available to contact at 480-965-7413

Sincerely,

Yeo Kwang Yun

About your presence (please just check it up)

_____ _____

Yes No

By signing below, you are giving consent for your child _____ (Child's name) to participate in the above study.

_____ _____ _____

Signature Printed Name Date

By signing below, you are giving consent for have your child's dance to be recorded.

_____ _____ _____

Signature Printed Name Date

If you have any questions about you or your child's rights as a subject/participant in this research, or if you feel you or your child have been placed at risk, you can contact the Chair of the Human Subjects Institutional Review Board, through the Office of Research Integrity and Assurance, at (480) 965-6788.

APPENDIX C

CONSENTFORM FOR THE SUBJECTS

Dance without Music and with Music

I have been told that my parents (mom or dad) have given permission (said it's okay) for me to take part in a project about dance without music and with music.

I will be asked to dance.

I am taking part because I want to. I know that I can stop at any time if I want to and it will be okay if I want to stop.

_____	_____	_____
Sign Your Name Here	Print Your Name Here	Date

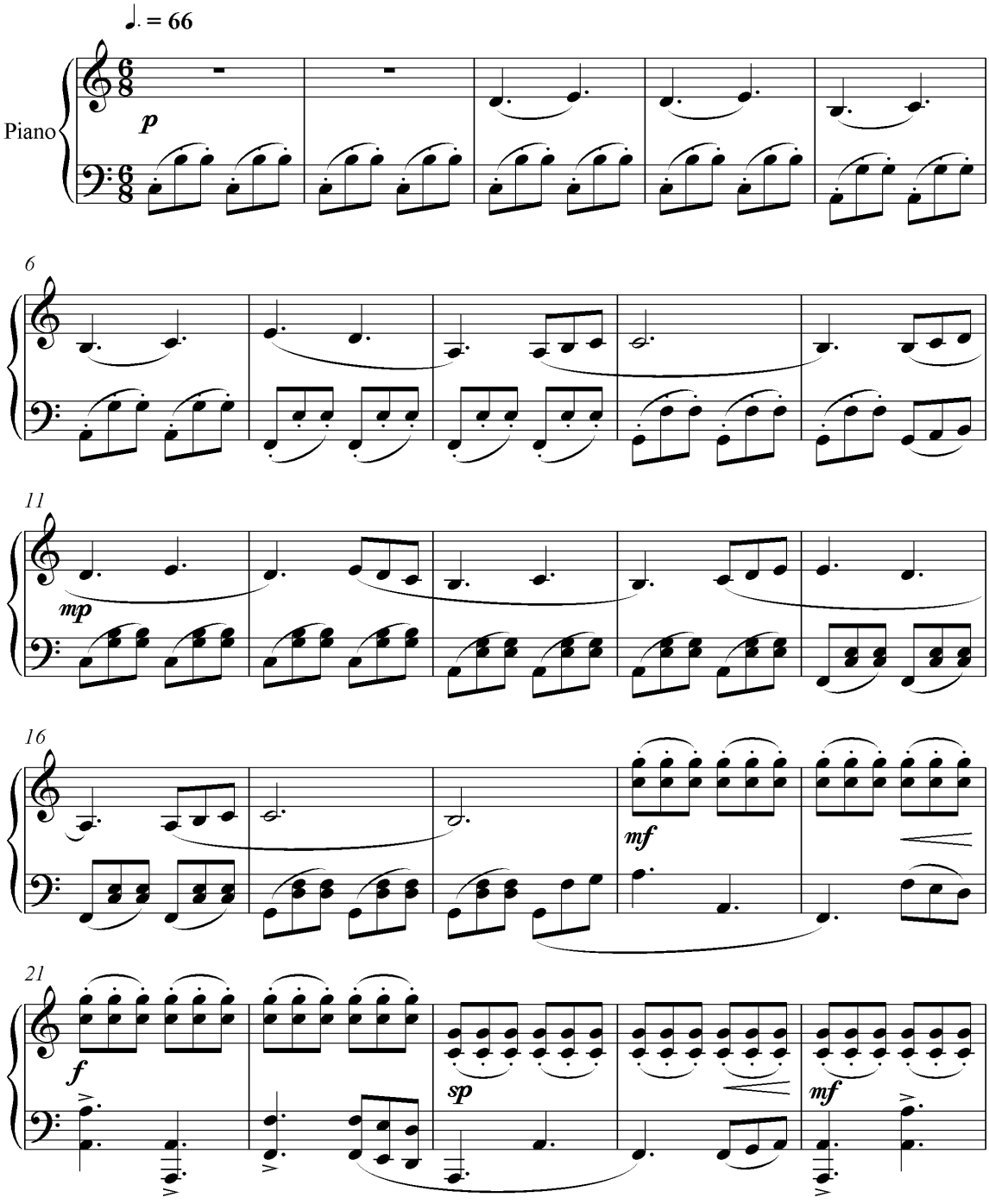
NOTE: For assent for the youngest children, under 7-years-old, and for the children with autism, the researcher will secure their assent by reading above the script. Their permission (either verbal assent or physical like a head nod) will be recorded on the digital recording.

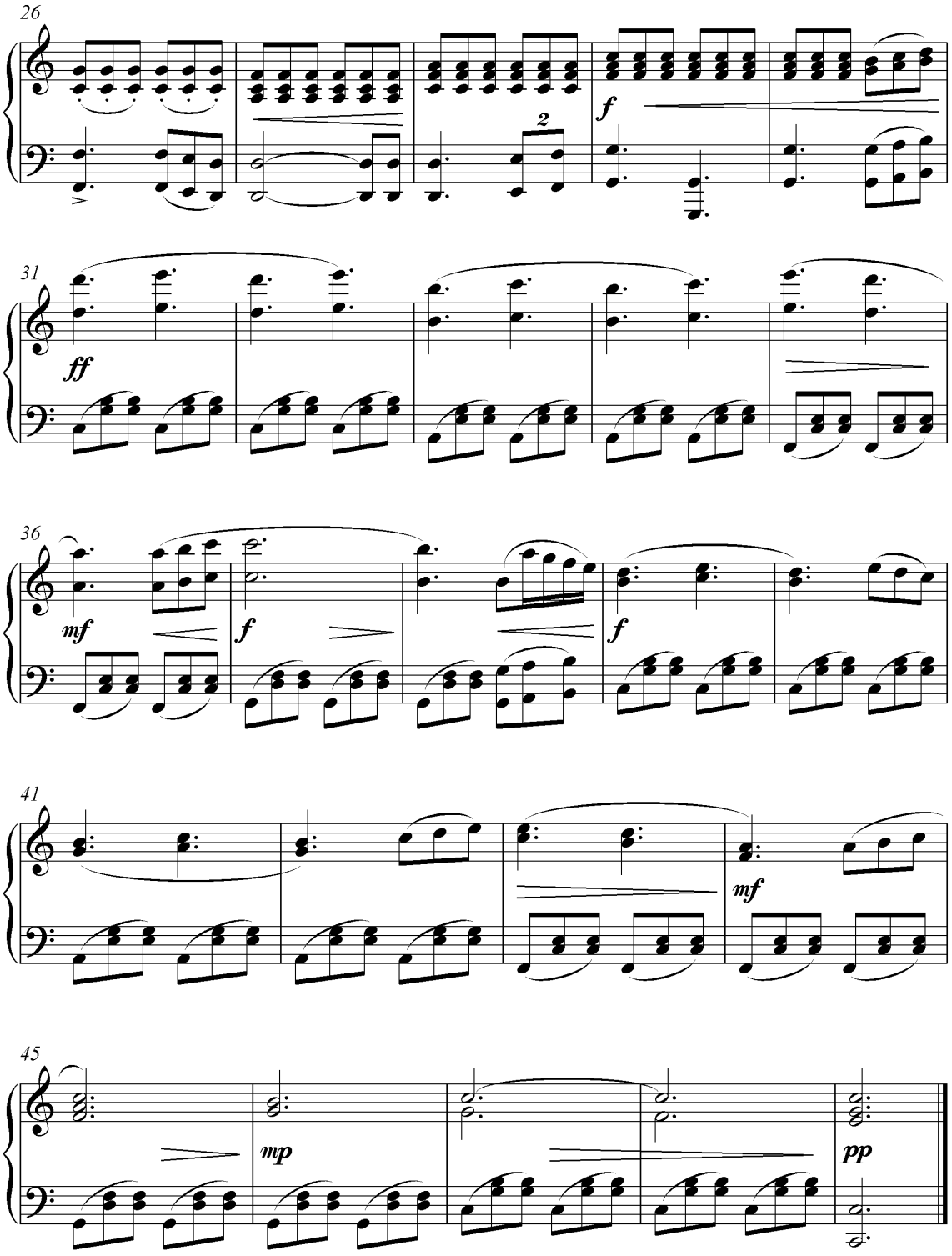
APPENDIX D

THE MUSIC PIECE IN MAJOR MODE

The Piece in Major Mode

Yeo Kwang Yun

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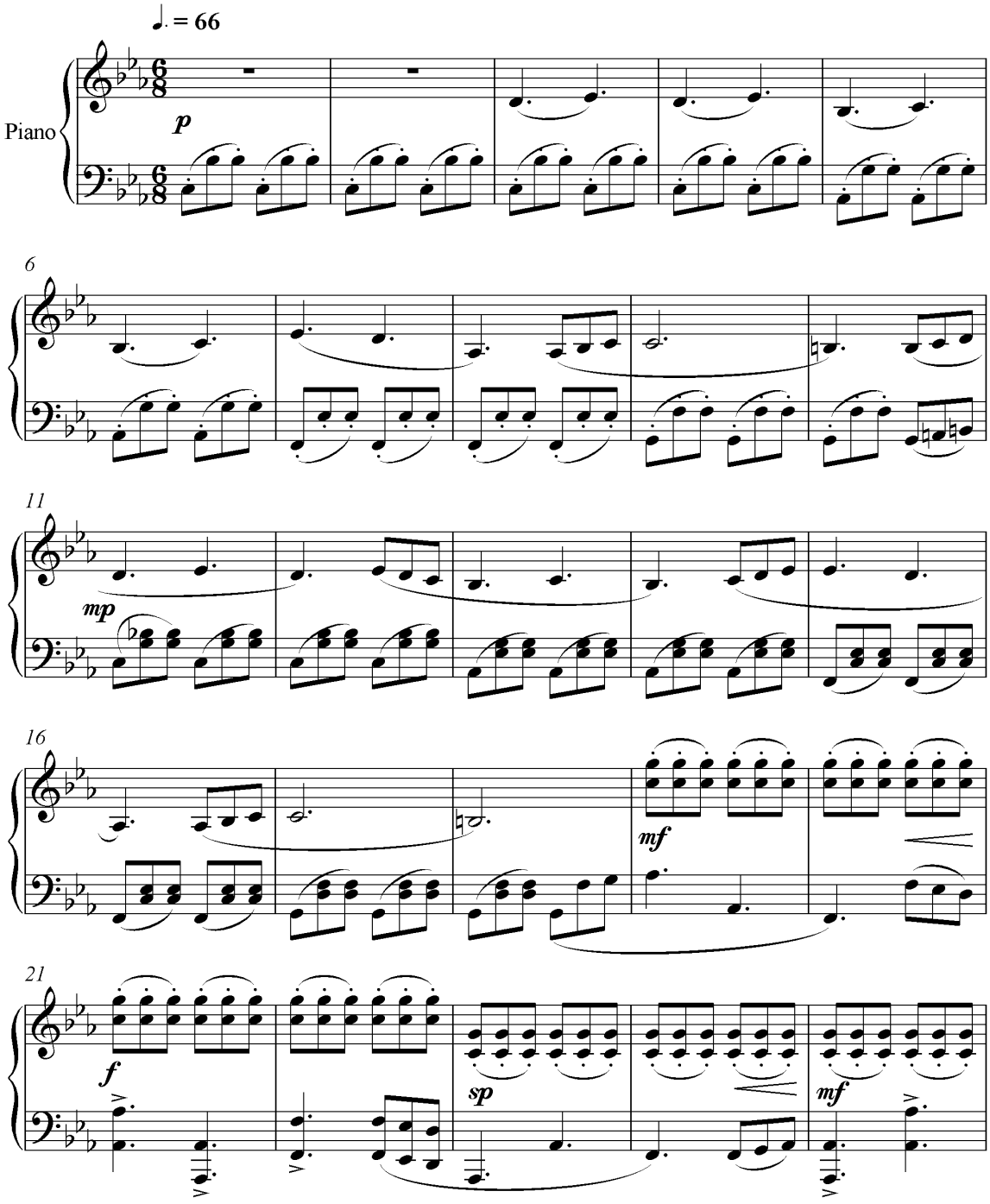
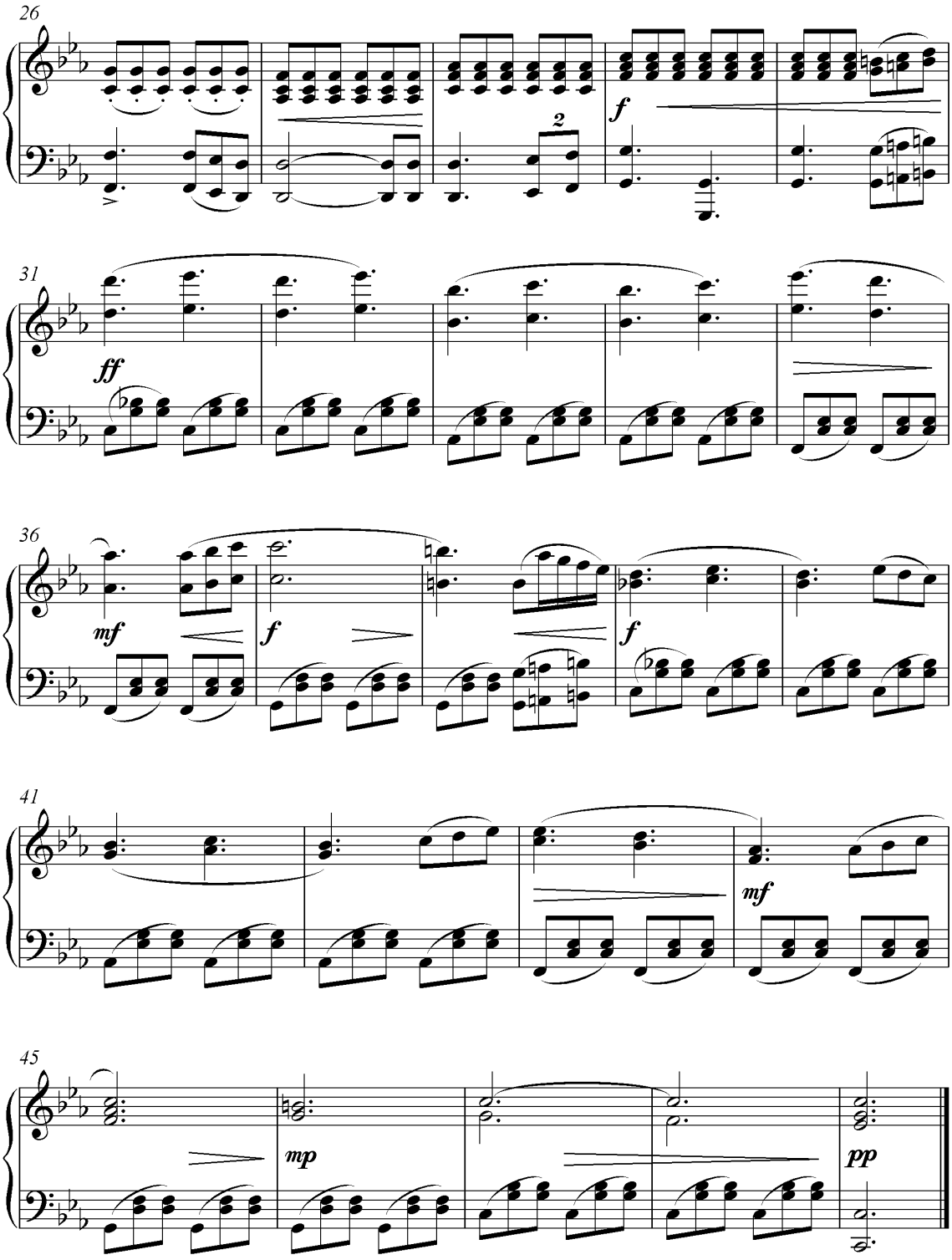
APPENDIX E

THE MUSIC PIECE IN MINOR MODE

The Piece in Minor Mode

Yeo Kwang Yun

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APPENDIX F

THE SEVEN-POINT LIKERT-TYPE SCALES

7-Point Likert-Type Scale for the Evaluation

	Low						High
Competency of movements	1	2	3	4	5	6	7
Facial expression	1	2	3	4	5	6	7
Concentration on dance	1	2	3	4	5	6	7

Criteria of competency of movements

7: no mistake, 6: a mistake or 2 mistakes, 5: 3 or 4 mistakes, 4: 5 or 6 mistakes, 3: 7 or 8 mistakes, 2: 9 or 10 mistakes, and 1: over 11 mistakes

(Mistake is not exactly copying or completing a motion. There are totally 32 motions.)

Criteria of facial expression

Starting on 4, per smile: + 1, per frown: - 1

Criteria of concentration on dance

Starting on 7, per distracted action: - 1

(Districted action is like looking at other objects over 2 seconds. Also, each evaluator measures the districted action in the flow of movements.)

Date:

Evaluator:

APPENDIX G

THE EVALUATION BY THE THREE EVALUATORS

Three Evaluations

	1st Evaluator		2nd Evaluator		3rd Evaluator	
C. of M.	A student 1st trial	7	A student 1st trial	7	A student 1st trial	6
F. E.	minor	4	minor	4	minor	4
C. on D.		7		7		7
C. of M.	A student 2nd trial	6	A student 2nd trial	7	A student 2nd trial	6
F. E.	Major	4	Major	4	Major	5
C. on D.		7		7		7
C. of M.	B student 1st trial	6	B student 1st trial	7	B student 1st trial	6
F. E.	Major	4	Major	4	Major	4
C. on D.		7		7		7
C. of M.	B student 2nd trial	6	B student 2nd trial	7	B student 2nd trial	6
F. E.	minor	4	minor	4	minor	4
C. on D.		7		7		6
C. of M.	C student 1st trial	6	C student 1st trial	7	C student 1st trial	7
F. E.	Major	5	Major	5	Major	4
C. on D.		7		7		7
C. of M.	C student 2nd trial	6	C student 2nd trial	6	C student 2nd trial	6
F. E.	minor	4	minor	4	minor	4
C. on D.		7		7		7
C. of M.	D student 1st trial	6	D student 1st trial	6	D student 1st trial	6
F. E.	Major	4	Major	4	Major	4
C. on D.		7		7		7
C. of M.	D student 2nd trial	5	D student 2nd trial	6	D student 2nd trial	5
F. E.	minor	4	minor	4	minor	4
C. on D.		6		4		7
C. of M.	E student 1st trial	5	E student 1st trial	5	E student 1st trial	5
F. E.	minor	4	minor	4	minor	4
C. on D.		5		6		6
C. of M.	E student 2nd trial	5	E student 2nd trial	5	E student 2nd trial	5
F. E.	Major	4	Major	4	Major	3
C. on D.		6		6		6
C. of M.	F student 1st trial	5	F student 1st trial	6	F student 1st trial	6
F. E.	minor	4	minor	4	minor	6
C. on D.		6		5		7
C. of M.	F student 2nd trial	6	F student 2nd trial	5	F student 2nd trial	7
F. E.	Major	4	Major	4	Major	5
C. on D.		7		7		7
C. of M.	G student 1st trial	7	G student 1st trial	7	G student 1st trial	7
F. E.	minor	4	minor	3	minor	3
C. on D.		7		5		7
C. of M.	G student 2nd trial	7	G student 2nd trial	7	G student 2nd trial	5
F. E.	Major	4	Major	5	Major	3
C. on D.		6		6		6

* Abbreviation C. of M. : Competency of movement
F. E. : Facial expression
C. on D. : Concentration on the dance