Effects of an Active Music Therapy Program on Functional Fitness in Community Older Adults

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ABSTRACT

Background: Health problems common among older adults living in community settings include a lack of functional fitness. Many studies have confirmed that exercises and static music therapy improve physical and psychological health problems. Exercise programs involving music have a higher frequency of attendance and motivation than other exercise programs. Active participation in active group music therapy results in better therapeutic effects.

Purpose: This study was designed to test the effectiveness of a 3-month active group music therapy program on the functional fitness of community older adults in Taiwan.

Methods: A quasi-experimental design with repeated measures was applied. A convenience cluster sample of older adults was drawn from seven senior-citizen activity centers in southern Taiwan. All participants were assigned to either an experimental group (n = 77) or a comparison group (n = 69) based on the requests of each senior center. The experimental group participated in the active group music therapy program for 3 months (twice per week and 60 minutes per session). The comparison group maintained their daily activities. Each participant’s level of functional fitness was measured at baseline and at 1 and 3 months after the start of the intervention.

Results: Seventy-one participants in the experimental group and 62 participants in the comparison group completed the 3-month study. At the 1-month measurement, the experimental group had greater improvements in cardiopulmonary fitness, upper body flexibility, lower body flexibility, upper limb muscle power, lower limb muscle endurance, and balance than the comparison group (all p's < .05). These significant improvements persisted through the 3-month intervention (all p's < .05).

Conclusions/Implications for Practice: Active group music therapy is an effective complementary and alternative therapy for improving six items of functional fitness in community-dwelling older adults. Healthcare professionals may incorporate this active group music therapy program as a health promotion activity for older adults living in community settings.

KEY WORDS:
active group music therapy, community older adults, functional fitness.

Introduction

The issue of population aging has long attracted the attention of the World Health Organization. The global population aged 60 years or older is increasing at an unprecedented rate and is projected to rise from 12% in 2015 to 22% in 2050 (World Health Organization, 2018). In Taiwan, adults aged 65 years or older composed 15% of the population in January 2020, and the aging index was 121% (Department of Statistics, Ministry of Interior, Taiwan, ROC, 2020). Among adults aged 65 years or older, 65% had a chronic illness (Ministry of Health and Welfare, Taiwan, ROC, 2019), 86% regularly sought healthcare, and 22% had been hospitalized within the past year (Ministry of Health and Welfare, Taiwan, ROC, 2017). Researchers worldwide have found that older adults in general experience poor physical health (Li & Lu, 2014). Studies of health problems faced by community-dwelling older adults have found decreases with age in the following areas: body mass index, lower body flexibility, and static balance (H. T. Chen et al., 2009); upper limb strength, lower limb endurance, and cardiopulmonary fitness (H. T. Chen et al., 2009; Langhammer & Stanghelle, 2011; Lee & Cheng, 2010); and agility and dynamic balance (Langhammer & Stanghelle, 2011; Lee & Cheng, 2010).

These issues affect the ability of older adults to perform activities of daily living as well as personal quality of life. Among Taiwanese adults aged 65 years or older, 16% believe that their health and physical and mental functioning are poor (Ministry of Health and Welfare, Taiwan, ROC, 2019). Thus, physical and functional fitness represent critical health issues for community-dwelling older adults in Taiwan and other countries with rapidly aging populations. There is a pressing need for healthcare professionals to design systematic interventions that address these health issues in community-dwelling older adults.

Music therapy is a type of complementary or alternative therapy. Music is viewed as a therapeutic measure that has preventive and therapeutic effects on a person’s body, mind, and soul (Mahon & Mahon, 2011). Music therapy may be passive or active. In passive music therapy, individuals listen...
to recorded music or live performance. Active music therapy involves listening to live music, singing along, using percussion instruments (e.g., tabor, castanets, naruko, drums, triangle, cymbals), and performing physical activities (Mahon & Mahon, 2011). Japan’s Kagayashiki music therapy is an active style of music therapy that was developed by Tetsuro Kagaya in 1967. Shimizu et al. (2013) asserted that active participation in music therapy enhances the therapeutic value of music therapy.

Altschuler (cited in Lai & Good, 2002) proposed sound identity theory to address the mechanism underlying music therapy, proposing that everyone has a unique sound identity. Entrainment theory builds on sound identity theory and postulates that the internal rhythms within a patient’s body may be altered by the vibrations of music, producing resonance and harmony between internal bodily rhythms and musical rhythms (Lai & Good, 2002). According to the entrainment theory, the sound waves of music have energy. When an individual listens to music, internal rhythms synchronize with the musical rhythm (e.g., fast, slow, strong, or weak). The musical rhythm affects and alters the individual’s physical and psychological functioning, decreasing health indicators such as anxiety, heart rate, and breathing (Wu & Chou, 2008).

Cervellin and Lippi (2011) proposed that listening to music could affect the autonomic nerves by suppressing the sympathetic system or activating the parasympathetic system and thereby change physical and psychological responses. Gerra et al. (1998) found that different types of music stimulate the secretion of different types of neuroendocrine substances. For example, allegro music stimulates secretion of beta-endorphins, adrenocorticotropic hormones, norepinephrine, and cortisol, thus increasing heart rate and systolic pressure, enhancing emotional stability, and regulating nervous system and physiological responses by increasing dopamine secretion and stimulating emotions. Music reduces cortisol secretions in response to stress and reduces the stress response (Suda et al., 2008). Music may also reduce the secretion of catecholamines and plasma cytokines, thereby reducing congestive heart failure (Okada et al., 2009). Although Dunbar et al. (2012) found that active music therapy stimulates endorphin secretion, they posited that the increase in endorphins was caused by activity and not the music itself. Therefore, they suggested that therapy designs should combine both activity and music.

Kagayashiki music therapy combines activity and music to promote health among older adults and the general public, enhance growth in special populations, and delay aging among older adults (Taiwan Kagayashiki Miyamoto Music Care Association, 2019). It combines music with dynamic elements such as instruments and movements. Active music therapy increases motivation and helps participants achieve harmony that is physical, psychological, spiritual, and social. The potential effects include improved interpersonal relationships, stabilized emotions, improved relaxation and relief, reduced anxiety, reduced need for healthcare interventions, improved physical function, and increased participation in group activities (Taiwan Kagayashiki Miyamoto Music Care Association, 2019). In addition, perhaps because of cultural similarities between Japan and Taiwan, older adults in Taiwan involved in Kagayashiki music therapy have expressed great satisfaction with it.

Notably, Kagayashiki music therapy differs from other approaches in three respects: the selection of musical tracks, the design of movements with therapeutic goals, and the use of guided-group modality. Activities are led by one teacher who helps guide the group’s movements. Kagayashiki music therapy uses the concepts of entrainment, balances between activity and inactivity, balances between self-release and self-restraint, and balances between sympathetic and parasympathetic nerves. Movements are adapted to the unique characteristics of participants. It can incorporate original songs (e.g., Jang Jang and Gili Gili), other songs (e.g., classical and pop music), and basic movements (e.g., patting body parts and hand movements). Set poses and movements are used to express body language, with movements correlated to emotions and music rhythms to promote mind–body connection. Kagayashiki music therapy applies the power of the group and the attributes of the music to elicit spontaneous expression of internal emotions and values the starts and finishes, interludes, and pauses in music and the natural reactions to music, emphasizing the need for transitional movements at the end of songs, to achieve the goal of communicating with individuals. Individual wishes regarding participation are respected; participants develop a desire to participate. Active music therapy elicits α waves in the brain and thus relaxation through the satisfaction of musical esthetics and 1/f movements. Movement is viewed as the interval between static and dynamic rhythms as well as the expression of emotions (Taiwan Kagayashiki Miyamoto Music Care Association, 2019).

Previous studies have confirmed that exercise improves physical health, mental health, and functional fitness in older adults (Chan & Chen, 2017; Chan et al., 2016). Moreover, many studies have established that listening passively to music improves perceived physical and mental health in older adults (Innes et al., 2018; Wang et al., 2016; Xu et al., 2017). However, passive music therapy cannot improve functional fitness. Shimizu et al. (2013) found that older adults preferred continuous exercise classes with added music. The addition of music improved attendance and motivation for learning and was quite beneficial in improving physical and mental health. Cheng (2007) found that, after listening to classical music, older adults expressed a preference for instrumental music, with this preference increasing with repeated listening. Moreover, Cheng found that older adults prefer forceful and lively music with powerful melodies, strong rhythms, and fast tempos. Empirical studies have shown that providing older adults with active music therapy featuring percussive instruments and strong rhythms improves their perceived physical and mental health (Jeon et al., 2009), systolic blood pressure and pulmonary functioning (Shimizu et al., 2013), cardiopulmonary fitness (Lin, 2016), lower limb flexibility (Sung,
The results revealed that the cardiopulmonary fitness of the older adults living in community settings. Therapy (modified Kagayashiki music therapy) on the functional fitness of older adults was significantly improved after group music therapy activities but that lower limb endurance, agility, and coordination were not significantly improved (Lin, 2016), whereas the others focused on either institutionalized older adults (Chang, 2007; S. L. Chen et al., 2009; Tung & Chen, 2007) or patients with cancer in hospice care (one study; Kao et al., 2007). These studies indicate that Kagayashiki music therapy improves cardiopulmonary fitness (Lin, 2016), depression (Chang, 2007; Tung & Chen, 2007), and cognitive and behavioral problems (Tung & Chen, 2007); participants' perceptions of Kagayashiki music therapy in terms of strength were derived from the group dynamic and enhanced quality of life (S. L. Chen et al., 2009) and the physical and psychological participation and quality of life of the patient (Kao et al., 2007). Only Lin (2016) addressed the effects of Kagayashiki music therapy on community-dwelling older adults' functional fitness, using a two-group, quasi-experimental, pretest and posttest study involving small sample sizes. The experimental group participated in group music therapy activities for 8 weeks (once per week for 60–90 minutes). The results revealed that the cardiopulmonary fitness of the participants was significantly improved after group music therapy activities but that lower limb endurance, agility, and coordination were not significantly improved (Lin, 2016). Consequently, the objectives of this study were to investigate the effects of a longer, 3-month active group music therapy (modified Kagayashiki music therapy) on the functional fitness of older adults living in community settings.

Methods

Study Design
This study used a quasi-experimental design with repeated measures. The intervention comprised 3 months of active music therapy. The participants were assigned to either the experimental group or the comparison group based on the preferences of each senior center. The functional fitness of the participants was assessed before the intervention, at 1 month after the start of the intervention, and at 3 months after the start of the intervention.

Setting and Participants
The research sites were senior centers in Kaohsiung City in southern Taiwan. We contacted administrators at the 59 centers located in the city, and seven agreed to allow us to conduct this study. Senior centers in Taiwan generally provide both active and passive learning classes for community-dwelling older adults. In active learning classes, individuals participate in physical activities such as elastic band exercise and yoga. In passive learning classes, individuals listen to music or participate in other activities that do not involve active, physical movements of the body. From these seven senior centers, we invited older adults who met the following study criteria to participate: (a) community-dwelling adults aged 65 years or older, (b) ability to communicate in Mandarin or Taiwanese (Hoklo) and to complete the questionnaire by themselves or during an interview, (c) no visual or hearing impairment, (d) normal cognitive functioning without dementia as defined by a score of 8 or higher on the Short Portable Mental State Questionnaire (SPMSQ; Pfeiffer, 1975), and (e) mild or moderate dependence or complete independence as defined by a score of 61 or higher on the Barthel Index (Mahoney & Barthel, 1965). Exclusion criteria were (a) participation in active music therapy within the past 6 months, (b) severe musculoskeletal disease (e.g., upper or lower limb amputation or fracture) or severe cardiovascular disease (e.g., congestive heart failure or acute myocardial infarction), and (c) mental illness. In this study, the SPMSQ showed a Cronbach alpha value of .66. The intraclass correlation coefficient (ICC) was applied to five participants by the first author and the research assistant to assess the Barthel Index test interobserver consistency. The ICC value on the Barthel Index test was 1.00 (95% CI [1.00, 1.00], p < .001). The sample size was estimated using G*Power 3.1.5 software (Heinrich Heine Universitat, Dusseldorf, Germany). The power was set to .80, and the α level for the two-tailed test was set to .05. The effect sizes ranged from 0.19 to 1.66 in previous studies (Shimizu et al., 2013; Sung, 2007), and we used a small effect size of 0.25 in our sample size calculation (Burns & Grove, 2005). We estimated that a total sample size of 86 participants would be required; in anticipation of a 20% dropout rate, the desired sample size was set at 104 participants. We recruited 146 community-dwelling older adults. All of the participants were assigned either to the active music therapy intervention group (three senior centers, n = 77) or to the comparison group (four senior centers, n = 69) based on the expressed desire of each center. The data were collected during 2016. One hundred thirty-three participants (experimental group, n = 71; comparison group, n = 62) completed the 3-month study, a retention rate of 92% (Figure 1).

Ethical Considerations
This study received prior approval from the Kaohsiung Medical University Hospital’s institutional review board and was assigned the code KMUH-IRB-F(II)-20150068. We explained the study objectives and process to all of the prospective participants. Individuals who agreed to participate were asked to sign a consent form. Participants were free to terminate participation at any point during the study with no repercussions. To protect participant confidentiality,
all of the data were anonymized using serial numbers. All personal information was secured and kept safe.

**Intervention**

The theoretical framework of the intervention used in this study was based on the entrainment theory (Lai & Good, 2002) and psychophysiological theory (Cervellin & Lippi, 2011). We designed the intervention based on the musical framework of Kagayashiki music therapy while taking into account local cultural differences. Music therapy intervention research supports the view that folk and popular songs in Taiwanese (Hoklo) and Mandarin Chinese improve diastolic blood pressure, mean arterial pressure, respiration, blood oxygen concentration, and anxiety (Wu & Chou, 2008). Therefore, we modified the active music therapy intervention by using these kinds of music to enhance the functional fitness of the participants. Applying the principle that sound waves are a type of energy, we chose music with varying sound waves to elicit different feelings among the participants. All of the movements in the active music therapy were designed with the “introduction, explanation, transition, and conclusion” of the activities in mind, comprising a continuous and unified course of movements that started slowly, intensified in the middle, and ended slowly. The progression of the active music therapy activities included seven steps and a 10-minute break midsession; each session lasted approximately 60 minutes (Table 1).

Hour-long, active music therapy group activities were performed at the three community senior centers participating in the experimental group twice weekly for a period of 3 months. The entire therapy comprised 24 sessions. One teacher (certified to teach intermediate classes in the Kagayashiki music therapy method) guided all movements of the active music therapy to ensure the uniformity of the intervention. Two researchers (both registered nurses) acted as the supervisors for the active music therapy group to ensure the safety of the participants. The average attendance rate in the experimental group was 86%. If the attendance rate in an intervention is less than 50%, research results may be affected because of insufficient intervention intensity (Chan & Chen, 2016). However, because the individual attendance rates were all above 50% in this study, all of the data were included in the sample and analyzed.

**Measurements**

In 2016, functional fitness and other data were collected by the first author and one research assistant (both hold registered...
Six areas of functional fitness (cardiopulmonary fitness, body flexibilities, muscle power and endurance, and balance) were measured using the instruments described below. Specialists regularly calibrated these measuring instruments.

1. **Cardiopulmonary fitness**: 2-minute step test: In the 2-minute step test, participants were asked to raise their knees above the midpoint between the patella and the pelvic bone. The number of times their right leg was raised above the necessary height was counted and recorded as the number of steps in 2 minutes (Rikli & Jones, 2012). Before the study, we asked 10 participants to perform the cardiopulmonary fitness test twice at 30-minute intervals. The ICC was used to assess the test-retest reliability of the cardiopulmonary fitness test; the ICC value was .99 (95% CI [0.98–1.00], \( p < .001 \)).

2. **Body flexibilities**: back-scratch test and chair sit-and-reach test: The back-scratch test was used to assess shoulder flexibility. Participants were asked to reach behind their shoulder with their dominant hand and place it against their back. They were then asked to reach for the middle of their back with their non-dominant hand. The distance between the middle fingers on both hands was recorded. If the middle fingers touched and overlapped, this distance was recorded as a positive value in centimeters. If the middle fingers touched and overlapped, this distance was recorded as a positive value in centimeters.

| Table 1 |
The Content of the Active Music Therapy Program

| Seven Steps                                                                 | Duration and Purpose of the Active Music Therapy |
|----------------------------------------------------------------------------|--------------------------------------------------|
| 1. Welcome song (slow tempo, 60 bpm)                                        | 1. Approximately 1 minute 24 seconds.            |
| 2. Purpose: Participants perform slow physical activity, similar to         | 2. Purpose: A slower song is selected to          |
| warm-up exercises.                                                         | to accompany slow physical                      |
| 2. Warm-up song (slow tempo, 60–80 bpm)                                      | activity that relaxes the muscles and flexes the |
| 1. Approximately 5 minutes 19 seconds.                                       | joints. The goal of this activity is stretching  |
| 2. Purpose: A slower song is selected to accompanying slow physical         | and warming up.                                  |
| activity that relaxes the muscles and flexes the joints. The goal of this   |                                                  |
| activity is stretching and warming up.                                       |                                                  |
| 3. Rhythmic song (slow and faster tempo, 78–168 bpm)                         | 1. Approximately 9 minutes 09 seconds to 14      |
| 1. Approximately 9 minutes 09 seconds to 14 minutes 04 seconds.             | minutes 04 seconds.                              |
| 2. Purpose: A faster, happier song is selected to evoke a sense of          |                                                  |
| happiness, boost vigor, and lift spirits. Participants perform physical      |                                                  |
| activity that improves muscle strength, muscle endurance, balance, body    |                                                  |
| extension, flexibility, and cardiopulmonary functioning. The goal of this   |                                                  |
| activity is aerobic movement.                                                |                                                  |
| 4. Rhythmic song, singing an older Taiwanese song or Mandarin pop song (fast | 1. Approximately 2 minutes 12 seconds to 4      |
| or slow tempo, 103–132 bpm)                                                 | minutes 28 seconds.                              |
| 2. Purpose: A popular lively or romantic song from the participants’ past   |                                                  |
| is selected to provide a connection to their experiences or background.     |                                                  |
| The goal of this song selection is emotional release and happiness.         |                                                  |
| Participants perform physical activity that improves muscle strength,       |                                                  |
| muscle endurance, balance, body extension, flexibility, and cardiopulmonary |
| functioning. The goal of this activity is aerobic movement.                  |                                                  |
| 5. Rhythmic song (fast tempo, 100–162 bpm)                                   | 1. Approximately 8 minutes 49 seconds to 11      |
| 1. Approximately 8 minutes 49 seconds to 11 minutes 06 seconds.             | minutes 06 seconds.                              |
| 2. Purpose: A faster, happier song is selected to elicit a sense of         |                                                  |
| happiness, boost vigor, and lift spirits. Participants perform physical      |                                                  |
| activity that improves muscle strength, body extension, flexibility, and    |                                                  |
| cardiopulmonary functioning. The goal of this activity is aerobic movement. |                                                  |
| 6. Slower song (slow tempo, 60–80 bpm) or singing an older Taiwanese or     | 1. Approximately 2 minutes 49 seconds to 4      |
| Mandarin song (slow or lively tempo song, 72–120 bpm)                       | minutes 26 seconds.                              |
| 2. Purpose: A slower song or a popular lively or romantic song from the     |                                                  |
| participants’ past is selected to provide a connection to their experiences  |                                                  |
| or background. Participants perform slower physical activity to evoke a     |                                                  |
| sense of warmth and happiness, to stimulate emotional release, and provide  |                                                  |
| peace of mind. This allows breathing, heart rate, circulation, muscles, and  |                                                  |
| joints to relax and slowly return to a resting state.                       |                                                  |
| 7. Silent retrospection or experience sharing                                | 1. Approximately 10 minutes.                     |
| 1. Approximately 10 minutes.                                                 | 2. Purpose: The goal of this activity is to      |
| 2. Purpose: The goal of this activity is to share emotions and stimulate    | share emotions and stimulate emotional release.   |
| emotional release.                                                           |                                                  |

nurse licenses). The latter was trained by the first author before conducting this study to ensure data collection consistency.

Six areas of functional fitness (cardiopulmonary fitness, body flexibilities, muscle power and endurance, and balance) were measured using the instruments described below. Specialists regularly calibrated these measuring instruments.
(+), and the ICC value of the upper body endurance test was .98 (95% CI [0.93, 1.00], p < .001). The ICC value of the lower body endurance test was .88 (95% CI [0.92, 1.00], p < .001).

4. Balance: open-eye single-leg stand test: The open-eye, single-leg stand test was used to assess static balance. Without wearing socks or shoes, participants were asked to stand on a flat surface behind a chair. They were asked to stand on their nondominant leg 2–5 cm off the ground. The amount of time participants were able to stand continuously on one leg was recorded in seconds (Sung, 2007). Before this study, we asked 10 participants to perform the static balance test twice at 30-minute intervals. The ICC value was .98 (95% CI [0.93, 1.00], p < .001).

Results

Demographic Profiles of Participants

Data on the 133 participants (experimental group [n = 71]; comparison group [n = 62]) who completed all of the measurements were analyzed. Participant ages ranged from 65 to 91 years, and the mean age was 72.93 years (SD = 5.54). Most of the participants were female (79.7%); most were married (54.9%); most had an educational level below junior high school (66.2%); and 88 (66.2%) had a chronic disease, including hypertension (40.6%), arthritis (22.6%), and heart disease (13.5%). Most of the participants reported enjoying soft music (99.3%), including Taiwanese folk songs (75.9%), Mandarin folk songs (60.2%), Taiwanese pop songs (40.6%), and Mandarin pop songs (33.8%; Table 2).

Baseline Comparisons Between the Two Groups

In the demographic profiles, there were no significant differences between the experimental group and the comparison group (all ps ≥ .05), except that singing frequency per week in the experimental group was lower (t = −3.41, p = .001) than that in the comparison group (Table 2). Participants’ outcome variables at baseline showed no significant differences between the two groups (all ps ≥ .05), with the exception that lower limb muscle endurance (t = 2.81, p = .006) in the experimental group was higher.

Effectiveness of the Music Therapy Intervention on Functional Fitness

The mean scores of six functional fitness measures (cardiopulmonary fitness, upper body flexibility, lower body flexibility, upper limb muscle power, balance, and lower limb muscle endurance) of the two groups at baseline and at 1 and 3 months after the start of the intervention are shown in Table 3. The generalized estimating equation analysis, adjusted for the baseline variable and singing frequency per week, showed that the changes in the six functional fitness measures from baseline to the first month and third month of the intervention were significantly higher in the experimental group than in the comparison group (all ps < .05; Table 4).

Data Analysis

IBM SPSS Statistics for Windows 20.0 (IBM, Inc., Armonk, NY, USA) was used for data analysis. The independent t test and the chi-square test were used to examine differences in demographic profiles and outcome variables between the experimental and comparison groups. Subsequently, generalized estimating equation analysis, adjusted for the baseline variable and singing frequency per week, was used to analyze the differences in the outcome variables between the two groups from baseline to the first month and from baseline to the third month.

Discussion

Regarding the effectiveness of active music therapy on functional fitness among older adults (aged 65 years or older), we
found greater improvements in cardiopulmonary fitness in the experimental group than in the comparison group after 1 and 3 months of active music therapy. This finding is consistent with the findings of Lin (2016). Because the active music therapy program included stretching and warming up exercises as well as aerobic and extension exercises paired

| Variable                                      | Exp. (n = 71) | Com. (n = 62) | Total (N = 133) | t/χ² | p   |
|-----------------------------------------------|---------------|---------------|-----------------|------|-----|
| Age (years; M and SD)                         | 72.35         | 73.60         | 72.93           | 1.30 | .198|
| Gender                                        |               |               |                 |      |     |
| Male                                          | 13 (18.3)     | 14 (22.6)     | 27 (20.3)       | 0.37 | .541|
| Female                                        | 58 (81.7)     | 48 (77.4)     | 106 (79.7)      |      |     |
| Marital status                                |               |               |                 |      |     |
| Married                                       | 40 (56.3)     | 33 (53.2)     | 73 (54.9)       | 0.13 | .719|
| Single/divorced/widowed/separated             | 31 (43.7)     | 29 (46.8)     | 60 (45.1)       |      |     |
| Educational level                             |               |               |                 | 3.34 | .067|
| Below junior high school                      | 42 (59.2)     | 46 (74.2)     | 88 (66.2)       |      |     |
| Above senior high school                      | 29 (40.9)     | 16 (25.8)     | 45 (33.8)       |      |     |
| Living status                                 |               |               |                 | 0.17 | .682|
| Live alone                                    | 17 (24.9)     | 13 (21.0)     | 30 (22.6)       |      |     |
| Live with family                              | 54 (76.1)     | 49 (79.0)     | 103 (77.4)      |      |     |
| Chronic diseases                              |               |               |                 | 1.20 | .274|
| No                                            | 27 (38.0)     | 18 (29.0)     | 45 (33.8)       |      |     |
| Yes                                           | 44 (62.0)     | 44 (71.0)     | 88 (66.2)       |      |     |
| Chronic diseases (number; M and SD)           | 0.94          | 1.03          | 1.01            | 0.77 | .441|
| Exercise habit                                |               |               |                 | 0.05 | .824|
| No                                            | 5 (7.0)       | 5 (8.1)       | 10 (7.5)        |      |     |
| Yes                                           | 66 (93.0)     | 57 (91.9)     | 123 (92.5)      |      |     |
| Frequency (times/week; M and SD)              | 4.73          | 2.23          | 2.35            | 0.27 | .789|
| Duration (minutes/time; M and SD)             | 51.90         | 28.01         | 45.11           | 0.81 | .419|
| Music-listening habit                         |               |               |                 | 0.92 | .337|
| No                                            | 20 (28.2)     | 13 (21.0)     | 33 (24.8)       |      |     |
| Yes                                           | 51 (71.8)     | 49 (79.0)     | 100 (75.2)      |      |     |
| Frequency (times/week; M and SD)              | 3.20          | 2.78          | 3.40            | 0.89 | .373|
| Duration (minutes/time; M and SD)             | 35.70         | 36.61         | 36.13           | 0.14 | .890|
| Music preference                              |               |               |                 | 1.00 | .534^a|
| Soft music                                    | 70 (98.6)     | 62 (100.0)    | 132 (99.3)      |      |     |
| Rock music                                    | 1 (1.4)       | 0 (0.0)       | 1 (0.8)         |      |     |
| Singing habit                                 |               |               |                 | 5.46 | .065|
| No                                            | 36 (50.7)     | 20 (32.3)     | 56 (42.1)       |      |     |
| Yes                                           | 35 (49.3)     | 42 (67.7)     | 77 (57.9)       |      |     |
| Frequency (times/week; M and SD)              | 1.10          | 2.41          | 2.68            | 3.41 | .001**|
| Duration (minutes/time; M and SD)             | 23.20         | 28.90         | 25.86           | 0.88 | .380|
| SPMSQ (M and SD)                              | 9.97          | 9.90          | 9.94            | 1.11 | .269|
| Barthel Index                                 |               |               |                 | 1.15 | .466^a|
| Mild dependence to complete independence      | 71 (100.0)    | 61 (98.4)     | 132 (99.3)      |      |     |
| Moderate dependence                           | 0 (0.0)       | 1 (1.6)       | 1 (0.8)         |      |     |
| Barthel Index (M and SD)                      | 99.93         | 99.76         | 99.85           | 0.72 | .473|

Note. Exp. = experimental group; Com. = comparison group; SPMSQ = Short Portable Mental Status Questionnaire.

^p Value in the Fisher’s exact test.

**p < .01.
with slow and fast rhythmic music, this diverse exercise regimen increased physical activity throughout the body. As a result, circulation was stimulated, and cardiopulmonary functioning was strengthened. This, in turn, led to the significant improvement in cardiopulmonary fitness.

With regard to flexibility, a significant improvement was found in upper body flexibility in the experimental group after 1 and 3 months of active music therapy. This finding contradicts the findings of Sung (2007), which may be explained by the fact that the participants in this study were drawn from senior-citizen activity centers and that those in the Sung study participants were drawn from older adults living in nursing homes. Moreover, the sample size in this study was larger than that in the study of Sung, which included only 20 older adults in each group.

A greater improvement in lower body flexibility in the experimental group after 1 and 3 months of active music therapy was also found in this study. This finding is consistent with the findings of Sung (2007). With regard to muscle strength and muscle endurance, a significant improvement in upper limb strength in the experimental group was found in this study, which is consistent with previous studies (Grau-Sanchez et al., 2018; Jeon et al., 2009) but contradicts the findings of Shimizu et al. (2013). Shimizu et al. included only women in their final analysis because the available sample of 12 men was overly small, with the experimental group performing an 8-week movement music therapy involving the Naruko clapper (once per week; 60 minutes per session) and the control group participating in the same exercise program as the experimental group but without music or the Naruko clapper. It is these differences that may have led to the difference in findings between Shimizu et al. and this study.

In addition, the experimental group experienced more significant improvements in lower limb endurance than the comparison group after 1 and 3 months. This finding is consistent with previous studies (Hars et al., 2014; Sung, 2007) but contradicts the findings of Lin (2016), which may be because of the differences in research design. This study used a quasi-experimental design with two groups and repeated measures, whereas Lin used a quasi-experimental design with two groups and pretest and posttest measures. Moreover, the sample size in this study was larger than that in Lin, which included 33 older adults in the experimental group and 14 older adults in the comparison group. In addition, the intervention intensity in this study was greater than that of Lin, with the experimental group receiving an 8-week program of group music therapy activities (once per week for 60–90 minutes). Because the active music therapy in this study included stretching and warm-up exercises as well as passive extension and active aerobic exercises paired with slow and fast rhythmic music, and because the exercises emphasized stretching and extension of the core, upper limbs, and lower limbs, these areas of the body were extended at maximal angles to train joint flexibility and muscle extension, strength, and endurance. This activates joints and muscles throughout the body. As a result, it is surmised that the therapy in this study produced significant improvements in flexibility, muscle strength, and muscle endurance.

Regarding static balance, a more significant improvement in static balance was found in the experimental group after 1 and 3 months of the active music therapy program. This finding is consistent with previous studies (Hars et al., 2014; Shimizu et al., 2013; Trombetti et al., 2011). The active music therapy includes aerobic exercises paired with slow and fast rhythmic music, notably, squats, leg lifts, walking heel to toe, and punching exercises during which participants' full body weight is supported on both legs. These exercises strengthened lower limb endurance and flexibility in all joints, bones, and muscles. In turn, this improved coordination and balance. Thus, the therapy produced significant improvements in static balance.

The active music therapy program emphasized the power of a social group to inspire individuals to participate in activities. The high attendance in the experimental group (86.21%) indicated that participants liked the group activities involved in the Kagayashiki music therapy-based program. The participants in

Table 3
Functional Fitness of Participants at Baseline, 1 Month, and 3 Months (N = 133)

| Variable                        | Baseline          | 1 Month          | 3 Months         |
|---------------------------------|-------------------|------------------|------------------|
|                                 | Exp (n = 71) | Com (n = 62) | Exp (n = 71) | Com (n = 62) | Exp (n = 71) | Com (n = 62) |
| M SD                            | M SD              | M SD                  | M SD              | M SD                  | M SD                  | M SD                  |
| Cardiopulmonary fitness (times) | 82.94 21.42      | 78.89 31.58        | 90.90 20.45      | 77.16 32.04          | 97.61 20.07          | 75.13 29.04          |
| Upper body flexibility (cm)     | −3.89 10.91      | −7.35 13.42        | −2.38 10.84      | −7.54 13.43          | −1.03 10.80          | −7.50 12.71          |
| Lower body flexibility (cm)     | 9.70 7.84        | 7.96 11.39         | 11.73 8.09       | 6.94 11.22           | 13.74 8.04           | 5.34 10.05           |
| Upper limb muscle power (kg)    | 22.29 5.70       | 23.29 7.48         | 23.96 6.20       | 23.48 7.76           | 24.48 6.32           | 23.00 7.68           |
| Balance (second)                | 32.30 36.59      | 21.50 31.18        | 42.97 38.17      | 21.08 25.63          | 52.01 43.66          | 18.71 27.00          |
| Lower limb muscle endurance (times) | 29.35 8.63 | 24.79 10.10        | 32.44 8.89       | 24.10 9.81           | 34.52 9.38           | 23.18 9.51           |

Note. Exp = experimental group; Com = comparison group.
the experimental group heard different types of music and used props such as instruments, towels, and newspapers to activate limbs and joints. These participants listened to slow music or Taiwanese, oldies or current hits, helped participants relax. As a result, their vitality, vigor, and spirits were lifted. Therefore, the active music therapy had a significant effect on the functional fitness of these older adult participants.

To summarize, the active music therapy intervention in this study improved six items of functional fitness in community-dwelling older adults. These findings support both the entrainment theory (Lai & Good, 2002) and the psychophysiological theory (Cervellin & Lippi, 2011). The results of this study also support the idea that listening to appropriate music creates resonance between internal bodily rhythms and music rhythms and produces equilibrium between body and mind (Lai & Good, 2002). Moreover, the findings confirm that active Kagayashiki music therapy achieves the objectives of training physical function and improving bodily functions (Taiwan Kagayashiki Miyamoto Music Care Association, 2019).

### Study Limitations and Recommendations

In this study, a convenience cluster sample was used to recruit older adults from seven community senior centers in southern Taiwan. As the sampling method may have affected the external validity of the findings, future researchers should use cluster random sampling to recruit research subjects or expand the study to include community-dwelling older adults from other areas to improve the external validity of the research findings. In addition, a quasi-experimental design was used in which all participants from a senior center were assigned to the experimental group or comparison group based on the preferences of each center. The advantage of this method was that potential interference with results because of information sharing between members of the two groups was avoided. However, this study design may have created differences between the two groups that decreased the power of the statistical analysis and reduced the reliability of the findings. Before the study, the ICC was used to assess the test–retest reliability of six items of the cardiopulmonary fitness test and was also used to assess the first author and the research assistant on the Barthel Index interobserver consistency, and the SPMSQ had Cronbach alpha values of .66. Furthermore, in terms of most of the variables, no statistical differences were found between the two groups during baseline assessments. This indicates that participants in both groups were largely homogeneous, which showed that every effort had been made to avoid recruitment biases and to ensure homogeneity between the two groups. Furthermore, the sample in this study was large enough to show statistically significant results. During baseline assessments, significant differences were found between the two groups in weekly frequency of singing and lower limb endurance. To ensure these variables did not interfere with the findings, these two
variables were adjusted during data analyses. Further suggestions are provided for future research in these areas: (a) Static balance and lower limb endurance are both related to the risk and incidence of falls. Therefore, future researchers should design a long-term intervention and track the risk and incidence of falls among community-dwelling older adults. (b) Agility, coordination, and gait speed are related to lower limb strength. Therefore, future researchers should assess agility, coordination, and gait speed among community-dwelling older adults.

At present, this active music therapy has not been promoted in senior-citizen activity centers and community care stations in Taiwan. One possible reason is that musical instruments are expensive and there are few certified instructors. Therefore, it is recommended that city-government social bureaus provide funds to encourage staff to participate in active music therapy training courses and that musical instruments be made available at no cost to older adults so that they may participate in active music therapy. In addition, self-made musical instruments and daily-use utensils or materials may be adopted and used. Future research should seek to clarify whether the effects of active music therapy are caused mainly by activity or music or by both. Would group physical activity alone produce the same effects, or are the musical components essential? In this study, most participants had an educational level below junior high school (66.2%). Future research should work to include and compare people of different educational levels and different socioeconomic statuses.

Conclusions and Implications for Practice
Active group music therapy involves mild body movements, is easy to perform, and is very safe. Thus, it is an effective complementary and alternative therapy suitable to improving older adults’ physical and psychological health under the guidance of certified instructors. Older adults living in community settings have expressed high degrees of satisfaction with the active group music therapy program. At present, senior-citizen activity centers and community care stations lack active group music therapy programs, and staff lack related knowledge and skills. The active group music therapy program introduced here is easy for staff to learn to implement with older adults living in community settings. We recommend that staff be cultivated as active music care instructors. Moreover, healthcare professionals should incorporate active music therapy programs into their health promotion activities for older adults living in community settings.

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