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Efficacy of Dance Intervention for Improving Frailty Among Chinese Older Adults Living in the Community: A Randomized Controlled Trial

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Although dance interventions may have lots of advantages in improving frailty, there are few papers focusing on the effects such interventions have on frail older adults living in the community setting. This study investigates whether a dance intervention can improve the level of frailty among Chinese older adults living in the community setting. The dance intervention was done five times a week for 16 weeks. Participants in the control group maintained their normal daily activities. Assessments were conducted at baseline, 8 weeks, and 16 weeks. Mixed models were used to test for the effects on frailty, depression, short physical performance battery, and grip strength between the groups over time. The level of frailty ($p < .05$) and depression ($p < .001$) decreased, and short physical performance battery ($p < .001$) increased over time in the dance group compared with the control group. A dance intervention lasting 16 weeks showed improved frailty, depression, and physical performance among Chinese older adults living in the community setting.

***Keywords*:** exercise, depression, balance, walking speed, grip strength

With the rapid development of the economy and improvement of medical and health services, people's life expectancy is increasing, and the older segment of the population is growing relative to the global population (Liu et al., 2020). The World Health Organization (2018) reported that the proportion of the population aged over 60 years will nearly double to 22% of total world population between 2015 and 2050. With the acceleration of the aging population, frailty is becoming an issue of medical and societal importance.

Frailty is a multidimensional concept generally described by the loss of physiological reserves with the increase in age, and includes a reduction of energy, physical ability, cognition, and health (Collard et al., 2012). Frailty is related to the interaction with the individual physical, psychological, and social environment, and it is typically characterized by exhaustion and a loss or lack of physical activity (Hou et al., 2019; Kasim et al., 2020). Previous research found that frailty is a good predictor of adverse health consequences in older adults, such as falls, hospitalization, disability, and death (Pérez-Ros et al., 2020). The prevalence of frailty among community-dwelling individuals in China ranges from 7.4% to 14.2% (Liao et al., 2017). Therefore, reducing frailty in older adults through effective interventions has become a major priority in clinical practice.

Frailty is a dynamic process and is characterized by several transitional stages that can be treated and reversed (Freiberger et al., 2016). It is important to maintain functional status through active aging in order to facilitate independent living, improve the quality of life, reduce age-related morbidity, and reduce healthcare costs (Santos-Rocha et al., 2019).

There is evidence that exercise is an effective strategy for the prevention of frailty. A randomized clinical trial revealed that individualized multicomponent exercise training improved the functional capacity, muscle strength, and cognitive function of older adults (Sáez de Asteasu et al., 2019). Based on the frailty state of older adults, exercise guidance can not only promote physical function but also improve psychological complaints (Fan, 2019). Skeletal muscle mass, strength, physical performance, cognitive performance, and psychological well-being can be significantly improved through an increase in physical activity or exercise training, and these have also been shown to be promising interventions for frailty (Catalan-Matamoros et al., 2016). Several authors suggest that exercise not only reverses frailty, but that it ameliorates physical and mental health in frail older adults.

At present, there are many exercise interventions for improving frailty; however, the types of exercises vary worldwide, such as resistance training, balance training, aerobic training, and multicomponent exercises (Chiu & Yu, 2022; Liu et al., 2022). Although regular exercise may maintain health in older adults, not enough older adults maintain regular exercise (Osho et al., 2018). A systematic review showed that exercise improves frail and physical functioning among older adults, but it was not clear which exercise programs were the most beneficial (de Labra et al., 2015). Moreover, interventions in research are often not successfully applied in practice because of poor external validity (Glasgow et al., 2003), as specialized facilities are limited in community settings, which also limits interventions of resistance training exercise (Cadore et al., 2014). In addition, recent research has focused on interventions that involve a single type of exercise, and if participants find this experience boring, they will be less motivated to continue with

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it (Viña et al., 2016). Thus, a more motivating intervention is required to attract more older adults and encourage them to continue to participate in the exercise. Dancing may provide such an option, as shown in recent research (Jeoung, 2014).

Dance intervention is a relatively novel approach that has sparked increasing interest among older adults, especially if they have previous dancing experience (Kraft et al., 2015). Regardless of each style, dance can improve muscular strength, balance, and cognitive function among older adults (Hwang & Braun, 2015; Meng et al., 2020). Meta-analysis research strengthens the evidence that dance intervention was effective to improve the performance of physical function, decreasing the rate of falling, increased balance, and mobility among older adults (Liu et al., 2021; Mattle et al., 2020). In a word, appropriately organized dance intervention would be an effective exercise to incorporate into daily life and it may be useful to prevent falls. Dancing is a multicomponent intervention method used to relieve stress, anxiety, and depression, which also integrates multiple physical, cognitive, and social elements. Social interaction and enjoyment are improved by dancing, and it may prevent and decrease frailty in the older population. Research (Chang et al., 2015; Li, et al., 2019; Ray & Mittelman, 2017) showed that frail people had the ability to move with the rhythm, which could help them to improve cognitive function and reduce anxiety and depressive symptoms. Music-based dancing may help frail older adults enjoy exercising and sustain it for longer periods of time.

Furthermore, only a few investigations have analyzed the effects of dancing on frail older adults who live in the community setting. The main purpose of this study was to identify whether square dancing is a promoting intervention to improve the four different domains (physical, psychological, social, and environmental domains) of frailty among older adults living in communities in China.

Materials and Methods

The trial was approved by the Ethics Committee of Tianjin University of Traditional Chinese Medicine as a randomized controlled trial of dance interventions to be conducted and registered at Chinese Trials Registry (ChiCTR2100044354) among older adults.

Participants and Sample Size

According to the protocol after trial commencement, we recruited older adults through posters in a local community center from May to June 2020 in Zhangjiakou, China, and provided eligible older adults with information about the study. This research was a randomized, parallel controlled trial with computer-generated concealed allocation.

Participants provided signed informed consent for participation prior to the study. The inclusion criteria were that participants (a) were aged 60 years or above, (b) obtained a score of at least 0.23 on the Chinese frailty index (FI-35), (c) had no current plans to move out of the community before the end of the study, (d) did not participate in square dance or any other physical exercise, and (e) were able to walk without any auxiliary equipment. Exclusion criteria were as follows: (a) any illness that contraindicates exercise (musculoskeletal system disorders, cancer, and severe cardiovascular, lung, liver, and kidney disease), (b) severe audiovisual or communication impairment, (c) neurological impairment (stroke and paresis), and (d) participation in other training projects.

Our study consisted of a sample of community-dwelling older persons aged 60 years and over. Participants were randomly allocated to a dance group or a control group with a 1:1 ratio. Convenience sampling was used to collect data in the community, 72 older adults: 36 in the dance group and 36 in the control group were included. Compared with sample size of other comparable studies, the sample in this study fit for the intervention (Beigienė et al., 2021; Sadjapong et al., 2020).

Interventions

The participants were randomly assigned to the intervention or control group using the simple randomization method (using http://www.randomizer.org/form.htm). In order to make the activity enjoyable rather than a form of exercise, a dance program was designed and performed in the intervention group. The program spanned 16 weeks and consisted of 1 hr of dance exercise, five times per week. The investigator made a phone call to the participants to remind them to take part in the dance training before the intervention began. In China, square dancing was first launched by the State Sports Administration in 2015 (Zhao et al., 2021). Each dance intervention process included 10-min warm-up exercises, 40-min square dancing, and 10-min relaxation training. The warm-up exercises consisted of simple stretching, joint movement activities, and finger gymnastics. The participants were arranged in four rows and performed simple body movements (head rotation, swing upper limb/shoulder movement, chest expansion and lower limb movement, walking forward/backward, turns, and side-to-side movements) with specific emphasis on rhythm. Rather than a single movement of body, dance combined the multiple body parts with rhythms to mobilize attention of individuals. The dance teacher was located at the front and explained the essentials of the dance to the participants and led them throughout the session. After the square dance activity, the relaxation training included deep breathing and stretching the major muscle groups. Suitable music was used throughout the intervention. The participants were arranged in four rows and performed simple body movements with specific emphasis on rhythm. In order to prevent adverse events (like falls), trained staff paid attention to the physical condition of the older adults at all times. They would immediately stop dancing and rest if the older adults were found to have unstable gait or tilt. In the control group, participants maintained their normal daily activities and did not interact with the intervention group for the duration of the experiment. In order to improve compliance, attendance was recorded at each intervention session and older adults were rewarded with small gifts.

In addition, because of the risk management for the prevention of COVID-19 in China when implementing the intervention programs, participants were required to wear face masks.

Measurements

Data were collected at three points during the intervention (baseline, after 8 weeks, and after 16 weeks) by a researcher who was blinded to the allocation. The following parameters were recorded: gender, age, height, weight, body mass index, education level, marital status, income, number of chronic conditions, grip strength, frailty, depression, and short physical performance battery (SPPB).

Frailty was measured based on the FI-35. The FI-35 consisted of 35 items placed in four domains (physical, psychological, social, and environmental domains) and 11 subdomains: nutrition, motion, strength, vigor, sleep quality, emotion, cognition, role, social contact, environment, and adaptability (Zhang et al., 2017). The answer categories “no,” “sometimes,” and “yes” were scored as 0, 0.5, and 1, respectively. The overall score of the FI-35 is calculated by adding the item scores and dividing by 35, the total number of items, resulting in a score between 0 and 1, which is called the frailty index.

The closer the final score is to 1, the frailer the person (Zhang et al., 2020). According to previous research, an index larger than 0.23 indicates frailty and smaller than 0.23 nonfrailty. The FI-35 scale has good reliability and validity (Zhang et al., 2020).

Depression was measured using the Geriatric Depression Scale, 15-item version, which is composed of 15 items and has been widely used to screen for depression in older adults (Sheikh &Yesavage, 1986). This scale is an assessment that ranges from 0 to 15. A score above 6 is considered to be indicative of depression, and higher scores indicate the person has a greater number of symptoms of depression. The Chinese version of Geriatric Depression Scale, 15-item version, which has Cronbach's alpha coefficient of .793, was used in this study.

Physical function was measured by the SPPB, which is an objective tool for measuring physical performance status and is mainly used for older adults or people with a poor physical condition (Ramírez-Vélez et al., 2020). The SPPB was calculated from three components: (a) standing balance performance—the ability to stand for up to 10 s with feet in a side-by-side position, a semitandem position, and a tandem position; (b) walking speed test—the time taken to complete a 4-m walk at the participant's usual pace; and (c) five times sit-to-stand test—the time taken to rise from a seated position five times (Thaweewannakij et al., 2013). Each test was scored from 1 to 4, with a score of zero indicating participants were "unable to perform." The score of SPPB ranges from 0 to 12, with higher scores indicating a higher level of physical function, and a total score ≤9 points can distinguish between vigorous and frail persons (da Câmara et al., 2013). A score of 0–6 indicates that the physical function is low, while 7–9 indicates medium, and 10–12 indicates good (Zhang, 2020).

An electronic grip strength meter (Model: EH-101, Zhongshan Camry Electronic Co, Ltd) was used to measure grip strength. To use this, participants stand with their arms down naturally with their palms facing inward avoiding contact with the body and clothes, with the display screen facing outward (Li et al., 2020). Researchers guided the participants to hold the strength meter for 3 s and then recorded the result. After 30 s of rest, the measurement is repeated, and the maximum value is recorded. Hand grip strength measurements were taken for each hand, and the maximum value was taken as the final value included in the analysis.

Statistical Analysis

Statistical analysis was done using SPSS (version 21.0). In order to facilitate comparison, continuous variables were presented as mean (*SD*), and categorical variables were presented as counts and percentages. In order to compare the baseline results of the dance group with the control group, *t* tests and chi-square tests were used.

Due to the longitudinal design of the experiment, mixed-effects models were used to analyze the measurements in time, specifically the intervention-by-time interaction effect. Thus, the estimation of the frailty, depression, physical function, and grip strength between the training and control groups over time was calculated using mixed-effects models. All tests were two-sided considering $p < .05$ as statistically significant.

Results

Participants

A total of 116 participants were recruited for this study: 66 women and 50 men. Thirty-one older adults (26.7%) did not fulfill the inclusion criteria and thus were excluded, and 13 declined to participate. Reasons for declining to participate were lack of time ($n = 8$), dislike of dancing ($n = 4$), and illness ($n = 1$). Finally, 72 eligible individuals were enrolled in the study, and each one completed the experiment. The process of study is shown in Figure 1. The adherence rate of the intervention was 100%.

Baseline Characteristics

The respondents consisted of 39 women (54.2%) and 33 men (45.8%), aged 60–75 years old with a mean (*SD*) age of 64.85 (4.29). A total of 26 (36.1%) participants had the highest education level of junior school. The largest number of people was in the middle-income group of "2,000–3,999 yuan" (28, 38.8%). Twenty-seven (37.5%) of older adults had no chronic conditions. The majority of participants rarely took medicine (42, 58.3%), and 26 (36.1%) older adults took one to three types of medicines. Other main baseline characteristics of the study sample are presented in Table 1. No significant differences in frailty or other characteristics between the groups were found.

Outcomes

Mixed-effects models with a random effect for each participant were used to analyze differences between the groups in time. The results in Table 2 show that almost all the subdomains of frailty have a significant group-by-time interaction effect, with the subdomain "adaptability" ($p = .231$) as the only exception. In the dance group, the mean frailty decreased by 0.13 after 8 weeks and by 0.24 after 16 weeks. Compared with the control group, the mean frailty score in the dance group decreased significantly in time. Notably, there were significant differences in the subdomains of exercise, sleep, emotion, and cognition ($p < .05$), as shown in Table 2.

Furthermore, mixed-effects models were also used to estimate the effect of dance over time on depression, physical performance (SPPB), and grip strength. Comparing the two groups, there were significant improvements in depression and SPPB over time ($p < .001$) in the intervention group. The mean score of depression decreased by 0.61 after 8 weeks and 1.14 after 16 weeks, and the mean score of SPPB increased by 1.91 after 16 weeks. Looking at the three elements in the SPPB, standing balance performance showed no significant difference ($p = .087$). Although the score of grip strength increased with time, there was no significant difference between the intervention and the control group ($p = .500$). The results are detailed in Table 3.

Adverse Events

There were no reported adverse events related to square dance training among the participants during the 16-week intervention period.

Discussion

This study aimed to evaluate the effectiveness of a dance intervention in improving frailty among older adults. In this study, the level of frailty among the participants was high compared with the critical FI-35 value of 0.23 (Zhang et al., 2017). Recent research has revealed that frailty is prevalent among older adults who live in community settings (Zhang et al., 2020). This may be due to a lack of regular exercise among older adults. A thematic analysis showed that dancing was an engaging, beneficial, feasible, and enjoyable form of exercise among older adults (Gomaa et al., 2020). Dancing

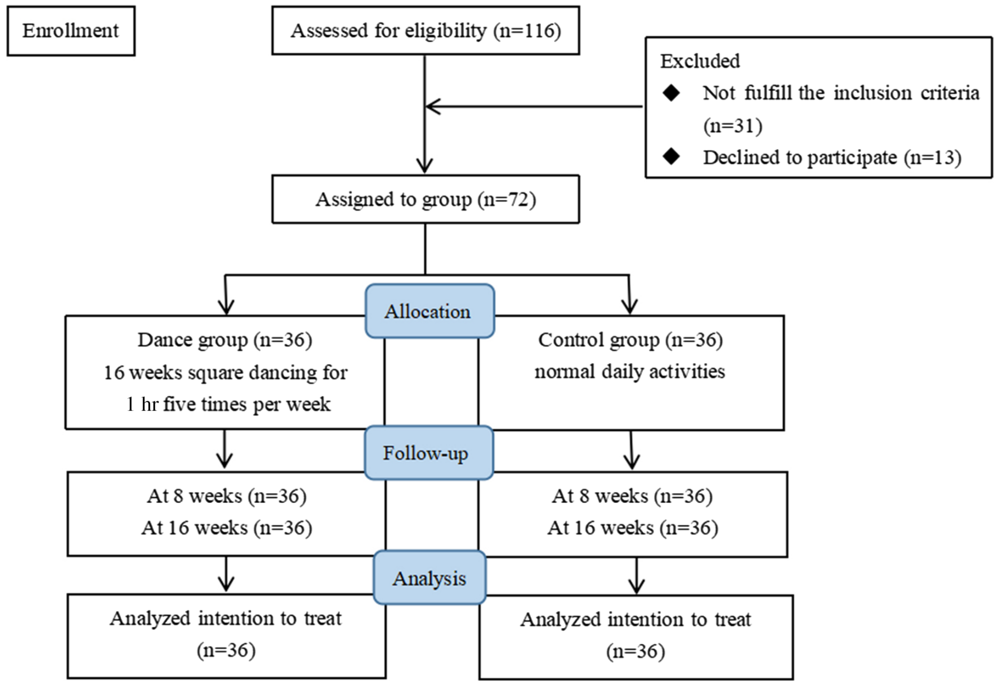

Figure 1 — Flowchart of the selection criteria.

may also motivate older adults to enjoy and maintain exercising (Gomaa et al., 2018). In our study, we confirmed that dancing is an easy and effective method to combat frailty, with a high compliance over a 16-week intervention. Attendance was recorded before the intervention, and older adults were rewarded with small gifts, which were effective at improving compliance.

The findings of the research confirmed that dance interventions significantly reduced the level of frailty among older adults living in the community. In particular, frailty was found to be reduced in the subdomains of exercise, vigor, sleep, emotion, and cognition after 16 weeks of intervention. Dance intervention had a positive effect on performance of physical function, decreased the rate of falling, and increased the balance among older adults (Liu et al., 2021; Mattle et al., 2020; Zhao et al., 2021). Previous studies also showed that regular exercise can relieve negative emotions, improve sleep quality, and lead to significant improvements in cognitive function (Cezar et al., 2021; Cheng et al., 2021). Furthermore, despite the proximity of families, loneliness and social isolation negatively affect the quality of life among older adults living in communities. The finding of this study was similar to other studies,at dance was the most enjoyable for older adults (Freed et al., 2021). Dance could be effective for older adults who are at risk in social isolation and loneliness. Dance groups provided positive emotional support among older adults who live alone and decreased the high risk of not being socially connected.

As we know, these improving performances were component to evaluate frailty. However, the research studies were only conducted from a single level of frailty. Thus, it is the basis for our study on the intervention of dance that may reduce frailty related to four different domains. A growing amount of research shows that regular exercise can benefit frail older adults (Livingston et al., 2017). Regardless of style, dance can improve muscular strength, balance, and cognitive function among older adults (Hwang & Braun, 2015; Meng et al., 2020). However, no relationship between the dance program and the improvement in muscle strength subdomain was observed in this study. Compared with other exercises, the intensity of muscle training of square dancing in this study may have been too low, or the improvement of muscle strength in the lower body muscles may have not been detected by handgrip strength assessment. In future studies, other assessments, like the five times sit-to-stand test, should be incorporated in the assessment battery. Square dance is simple, and it is not limited by equipment or a dancing partner when compared with other dance interventions reported in previous studies, which makes it an appropriate intervention for older adults, especially those do not often engage in physical exercise.

This study also found a significant mean decrease in depression among participants. Moreover, the SPPB showed improved physical performance after the 16-week dance intervention ($p < .001$). In terms of the subdomains of SPPB, walking speed ($p < .001$) and five times sit-to-stand test ($p = .034$) were significantly different between the two groups, while the standing balance performance showed no significant difference ($p = .087$). In the literature, a meta-analysis concluded that cognitive function and memory were improved by aerobic dance in older adults with mild cognitive impairment (Zhu et al., 2020). Hofgaard et al. (2019) demonstrated that a 6-week Faroese chain dance program improved postural balance and physical function. Dancing is an effective form of cognitive training that can improve the cognitive function of older adults. It has been found that cognitive training can significantly improve gait speed; therefore, dancing can improve walking speed (Smith-Ray et al., 2015). However, in this study, there was no significant effect on standing balance performance. The reason for this may be that the average age of the older adults was 64.85 ± 4.29 years, and they had a good balance ability compared with people in an older age range.

No significant difference in grip strength was found between the dance group and control group ($p = .500$), but it increased in the dance group and decreased in the control group over time. As age increases, the grip strength of older adults declines (Li, 2018). This study revealed that square dancing does not provide exercise for the

Table 1 Baseline Characteristics of the Participants

Characteristics	Project	Dance group Mean ± *SD* or *n* (%)	Control group Mean ± *SD* or *n* (%)
Gender	Male	13	20
	Female	23	16
Age		64.75 ± 4.35	64.94 ± 4.29
Height		163.25 ± 7.50	164.97 ± 6.95
Weight		66.25 ± 9.67	66.62 ± 9.47
BMI		24.82 ± 3.14	24.45 ± 2.94
Education	Primary or below	3 (8.3)	9 (25.0)
	Junior school	14 (38.9)	12 (33.3)
	High school	14 (38.9)	11 (30.6)
	College degree or above	5 (13.9)	4 (11.1)
Income	<1,000	2 (5.6)	6 (16.7)
	1,000–1,999	13 (36.1)	11 (30.6)
	2,000–3,999	15 (41.7)	13 (36.1)
	≥4,000	6 (16.7)	6 (16.7)
Number of offspring	0	0 (0)	1 (2.8)
	1	12 (33.3)	12 (33.3)
	2	23 (63.9)	18 (50)
	3	1 (2.8)	4 (11.2)
	≥4	0 (0)	1 (2.7)
Marital status	Married	33 (91.7)	33 (91.7)
	Divorced	0 (0)	1 (2.8)
	Widowed	3 (8.3)	2 (5.5)
Number of chronic conditions	0	13 (36.1)	14 (38.9)
	1	11 (30.6)	13 (36.1)
	2	8 (22.2)	9 (25)
	3	1 (2.8)	0 (0)
	≥4	3 (8.3)	0 (0)
Types of medicines	0	17 (47.2)	25 (69.4)
	1–3	16 (44.4)	10 (27.8)
	≥4	3 (8.3)	1 (2.7)
Frailty	—	0.56 ± 0.16	0.51 ± 0.09
Nutrition	—	0.45 ± 0.30	0.43 ± 0.17
Exercise	—	0.79 ± 0.28	0.71 ± 0.21
Muscle strength	—	0.29 ± 0.20	0.23 ± 0.20
Vigor	—	0.80 ± 0.30	0.68 ± 0.32
Sleep	—	0.58 ± 0.28	0.56 ± 0.24
Emotion	—	0.67 ± 0.28	0.63 ± 0.24
Cognition	—	0.63 ± 0.25	0.58 ± 0.18
Role	—	0.29 ± 0.18	0.23 ± 0.20
Social contact	—	0.48 ± 0.28	0.45 ± 0.29
Environment	—	0.42 ± 0.29	0.37 ± 0.25
Adaptability	—	0.65 ± 0.32	0.60 ± 0.29
Depression	—	4.83 ± 1.50	5.14 ± 1.99
SPPB	—	9.47 ± 1.77	9.55 ± 1.93
Grip strength	—	23.00 ± 7.35	26.26 ± 8.59

Note. BMI = body mass index; SPPB = short physical performance battery.

Table 2 Means and *F* Values From Analysis of Variance Tables From Mixed-Effects Model of Frailty and Its Subdomains With *F* Testing on Main Time and Group Effects and Their Interaction and Their *p* Values (Mean ± *SD*)

Project	Time	Dance group	Control group	*F* (*p*) Time	Group	Time × Group
Frailty	Baseline	0.56 ± 0.16	0.51 ± 0.09	61.820 (<.001)	11.968 (.001)	114.491 (<.001)
	8 weeks	0.43 ± 0.13	0.53 ± 0.09			
	16 weeks	0.32 ± 0.08	0.54 ± 0.08			
Nutrition	Baseline	0.45 ± 0.30	0.43 ± 0.17	1.199 (.307)	0.489 (.487)	8.093 (.001)
	8 weeks	0.42 ± 0.28	0.45 ± 0.18			
	16 weeks	0.37 ± 0.27	0.47 ± 0.18			
Exercise	Baseline	0.79 ± 0.28	0.71 ± 0.21	39.179 (<.001)	11.773 (.001)	54.587 (<.001)
	8 weeks	0.60 ± 0.22	0.73 ± 0.19			
	16 weeks	0.39 ± 0.21	0.75 ± 0.19			
Muscle strength	Baseline	0.29 ± 0.20	0.23 ± 0.20	4.227 (.017)	0.154 (.696)	9.421 (<.001)
	8 weeks	0.21 ± 0.20	0.24 ± 0.24			
	16 weeks	0.21 ± 0.18	0.26 ± 0.24			
Vigor	Baseline	0.80 ± 0.30	0.68 ± 0.32	25.854 (<.001)	2.714 (.104)	37.425 (<.001)
	8 weeks	0.61 ± 0.30	0.70 ± 0.30			
	16 weeks	0.40 ± 0.23	0.72 ± 0.26			
Sleep	Baseline	0.58 ± 0.28	0.56 ± 0.24	19.701 (<.001)	13.360 (<.001)	35.108 (<.001)
	8 weeks	0.38 ± 0.24	0.58 ± 0.20			
	16 weeks	0.27 ± 0.13	0.60 ± 0.19			
Emotion	Baseline	0.67 ± 0.28	0.63 ± 0.24	18.405 (<.001)	9.459 (.003)	28.685 (<.001)
	8 weeks	0.47 ± 0.26	0.65 ± 0.23			
	16 weeks	0.33 ± 0.21	0.67 ± 0.21			
Cognition	Baseline	0.63 ± 0.25	0.58 ± 0.18	31.682 (<.001)	4.190 (.044)	47.168 (<.001)
	8 weeks	0.53 ± 0.19	0.59 ± 0.17			
	16 weeks	0.36 ± 0.13	0.60 ± 0.17			
Role	Baseline	0.29 ± 0.18	0.23 ± 0.20	0.928 (.397)	0.008 (.928)	9.374 (<.001)
	8 weeks	0.25 ± 0.18	0.25 ± 0.22			
	16 weeks	0.22 ± 0.17	0.27 ± 0.23			
Social contact	Baseline	0.48 ± 0.28	0.45 ± 0.29	7.963 (.001)	3.828 (.054)	18.636 (<.001)
	8 weeks	0.36 ± 0.21	0.48 ± 0.29			
	16 weeks	0.25 ± 0.17	0.49 ± 0.27			
Environment	Baseline	0.42 ± 0.29	0.37 ± 0.25	8.844 (<.001)	3.626 (.061)	18.976 (<.001)
	8 weeks	0.30 ± 0.24	0.40 ± 0.25			
	16 weeks	0.18 ± 0.10	0.43 ± 0.20			
Adaptability	Baseline	0.65 ± 0.32	0.60 ± 0.29	3.176 (.065)	0.003 (.918)	1.384 (.231)
	8 weeks	0.59 ± 0.28	0.61 ± 0.28			
	16 weeks	0.56 ± 0.28	0.61 ± 0.27			

upper limbs; therefore, researchers should pay attention to upper limb training in subsequent studies.

It is important to make the implications of this study explicit and highlight the role of dance in preventing frailty among older adults. Dance is an easy and effective strategy to prevent or reduce frailty. This study pinpointed an effective exercise program that attracts older adults with high compliance even under the conditions of COVID-19. However, some limitations should be noted. Although there were significant positive effects on frailty, depression, and physical performance during the 16-week intervention period, there was no change in grip strength. For this reason, we suggest that future studies include exercises to specifically train upper arm strength.

Limitations

There are the following limitations in the present research. Incentive activities were used to increase the rate of attendance in this study, such as giving gifts. Although the results showed that attendance was high during the intervention, the participants' rate reduced when the research finished. However, the influencing factors remain uncertain, which needs further qualitative research to investigate the concerning of frailty from older adults. Second, to avoiding the risk of a bad event, we excluded participants with any illness that contraindicates exercise and audiovisual or communication impairment, and the intervention of special older adults should be considered in further research studies. Furthermore, in

Table 3 Means and Analysis of Variance Table for the Mixed-Effects Model of the Outcomes for Depression, SPPB, and Grip Strength at Three Time Points (Mean ± *SD*)

				F (*p*)		
Outcome	**Time**	**Dance group**	**Control group**	**Time**	**Group**	**Time × Group**
Depression	Baseline	4.83 ± 1.50	5.14 ± 1.19	8.813 (<.001)	17.383 (<.001)	29.634 (<.001)
	8 weeks	4.22 ± 1.02	5.33 ± 1.07			
	16 weeks	3.69 ± 0.86	5.47 ± 0.99			
Standing balance performance[a]	Baseline	3.92 ± 0.28	3.86 ± 0.35	0.204 (.816)	3.008 (.087)	2.853 (.061)
	8 weeks	3.94 ± 0.23	3.83 ± 0.37			
	16 weeks	3.97 ± 0.16	3.78 ± 0.42			
Walking speed[a]	Baseline	3.08 ± 0.87	2.89 ± 1.00	3.468 (.034)	16.827 (<.001)	27.724 (<.001)
	8 weeks	3.44 ± 0.81	2.75 ± 0.96			
	16 weeks	3.80 ± 0.46	2.53 ± 0.77			
Five times sit-to-stand[a]	Baseline	2.47 ± 0.99	2.81 ± 0.85	16.257 (<.001)	4.254 (.034)	41.678 (<.001)
	8 weeks	3.02 ± 0.84	2.67 ± 0.86			
	16 weeks	3.61 ± 0.55	2.50 ± 0.65			
SPPB (total)	Baseline	9.47 ± 1.77	9.55 ± 1.93	13.371 (<.001)	11.261 (<.001)	62.988 (<.001)
	8 weeks	10.44 ± 1.46	9.25 ± 1.88			
	16 weeks	11.38 ± 0.90	8.81 ± 1.58			
Grip strength	Baseline	23.00 ± 7.35	26.26 ± 8.59	1.466 (.232)	0.460 (.500)	58.957 (<.001)
	8 weeks	23.97 ± 7.20	25.29 ± 8.28			
	16 weeks	25.38 ± 7.29	24.49 ± 7.81			

Note. Standing balance scores between 0 and 4 (0 = unable to perform and 4 = balance is good). Walking speed is the score to perform a 4-m walk. Five times sit-to-stand is the score to perform sit-to-stand five times. The SPPB total ranges from 0 to 12 (0–6 indicates that the physical function is low, 7–9 indicates medium, and 10–12 indicates good). Depression score is from 0 to 15. Normal grip strengths are 30.2–48.0 kg (men) and 17.2–31.0 kg (women) in 60- to 64-year-olds, 28.2–44.0 kg (men) and 15.4–27.2 kg (women) in 65- to 69-year-olds, and 21.3–35.1 kg (men) and 14.7–24.5 kg (women) in 70- to 99-year-olds. SPPB = short physical performance battery.
[a]Part of the SPPB.

order to be generalizable, it is important to enlarge the sample in further investigation.

Conclusions

Dance reduces frailty and depression and improves physical performance among older adults. Dance, as an interesting exercise, helps engage or motivate the older population to take part in the exercise. In future studies, it would be useful to further explore the benefits of dancing on frailty. According to the result, targeted benefits should be explored to improve frailty from upper body strength among older adults in intervention.

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