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Feature Article

Tai Chi with music improves quality of life among community-dwelling older persons with mild to moderate depressive symptoms: A cluster randomized controlled trial

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ABSTRACT

Depression leads to a poorer quality of life (QOL) which is a determinant of healthy ageing. Cost-effective solutions for enhancing QOL in the older population are much needed in China, with its rapidly ageing population. We conducted a randomized controlled trial involving 112 community-dwelling older participants with mild to moderate depression, to evaluate the effect of Tai Chi with music on QOL (57 in intervention group, 55 in control group). WHO Quality of Life-BREF was used to measure QOL at baseline and at every month for three months. Following the adjustments for sociodemographic data, the effect of intervention on QOL was assured ($F = 25.145$, $P < 0.001$, $\eta_p^2 = 0.435$, $F = 18.696$, $P < 0.001$, $\eta_p^2 = 0.364$, $F = 17.473$, $P < 0.001$, $\eta_p^2 = 0.348$, and $F = 29.576$, $P < 0.001$, $\eta_p^2 = 0.475$ for physical, psychological, social, and environment domains respectively). This intervention represents an economically viable solution to better QOL and healthy ageing in a highly populous developing nation.

Introduction

Depression contributes to 10% of the total non-fatal disease burden worldwide[1]. Depression is reported to be present in 27.5% of the community-dwelling older persons[2] and 65% of the institutionalized older persons worldwide[3]. In Southwest China, the prevalence rate of depression among community-dwelling older persons has been reported at 24.3%[4].

Quality of life (QOL) plays a dominant role in defining healthy aging[5]; depression evidently having a deleterious effect on QOL[6]. A strong emphasis is now placed on healthy ageing globally, with it being considered the ultimate preventive medicine[7].

China, as the most populous nation in the world, is experiencing rapid population ageing[8], contributed by the increasing life expectancy, fueled by an unprecedented increase in economic wealth[8]; and its' one child policy which has only recently been abolished. Furthermore, large discrepancies exist in the rate of development in this geographically vast nation. Cost-effective and achievable solutions to healthy ageing are much needed by the older population of China in order to ensure a continued economic growth through a reduction in the healthcare burden attributed to population ageing. It is likely that interventions that improve QOL in older persons will contribute to healthy ageing [9].

Tai Chi is a traditional Chinese mind-body exercise which combines physical activity, breath inspiration and expiration, and mind regulation altogether[10], which is often performed with soft relaxing Chinese folk music played in the background. Tai Chi is popular among older persons in China as it is culturally embedded, safe, easy to learn, and enjoyable[10]. While the beneficial effects of Tai Chi on QOL have previously been demonstrated[11–13], its true effect on QOL remains controversial[14,15]. Furthermore, previous studies had been conducted in general populations rather than in disease-specific populations. Hence, the effect of Tai Chi on QOL among older persons with depressive symptoms has yet to be established. Thus, we evaluated the QOL among community-dwelling older persons with mild to moderate depressive symptoms in Southwest China in a randomized controlled trial involving a 3-month Tai Chi program with music as background.

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Methods

Study population

Study participants consisted of 112 older persons with mild to moderate depressive symptoms, who were recruited from eight communities in Ya'an City, Sichuan Province, China. The eight communities involved in the study were cluster-randomized using computer-generated, random number sequences. This study is part of a larger trial which measured both depressive symptoms and QOL, a detailed description of the recruitment and selection process have been published elsewhere with the outcome for depressive symptoms[16]. The Consort flow diagram depicting the study process is included in Fig. 1.

Selection criteria

Participants recruited for the study needed to fulfil the following criteria: aged 60 years or above, residing in the targeted communities for at least one year, adequately mentally alert to complete the intervention as judged by trained researchers, with mild to moderate depressive symptoms, and agreeable to take part in the entire intervention process. The presence of mild to moderate depressive symptoms was defined by a 30-item Geriatric Depression Scale (GDS) with scores of 11 to 25 (inclusive of both).

Individuals who had physical impediments, severe hearing loss or visual impairment leading to difficulty in completing the intervention, as well as those with stroke or cardiovascular event within the

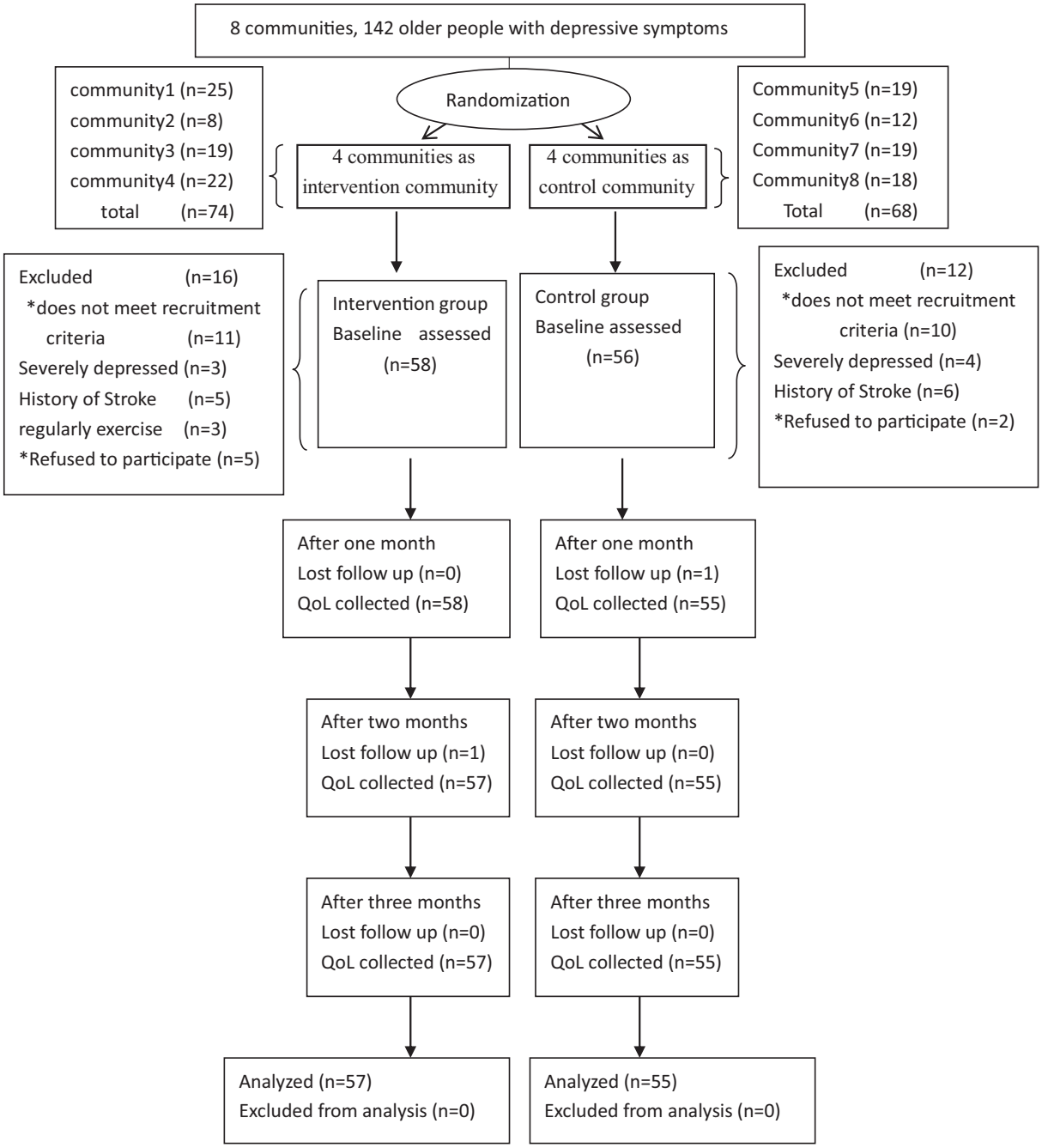

Fig. 1. Subjects progress through the trail.

past 6 months, and the presence of other conditions which require medical assessments prior to physical exercise, were excluded. In addition, those who exercised more than 3 times per week, were also excluded from the study.

Intervention

Individuals who were randomly allocated to the intervention group performed the 24-movement Yang's Tai Chi exercise delivered within their cluster as group therapy. All Tai Chi sessions was accompanied by recorded traditional Chinese folk music. Each intervention session lasted a total of 50 minutes: 5-minute warm-up, 40-minute Tai Chi exercise, and 5-minute cooldown. The length and intensity of the intervention met the requirements of the World Health Organization's recommendation of at least 150 minutes of moderate-intensity aerobic physical activity each week or 75 minutes of vigorous-intensity aerobic physical activity each week, or an equivalent combination of the above[17]. The intervention was delivered 3 times per week for 3 consecutive months. Participants assigned to the control group received routine health education monthly, delivered by a community nurse.

Data collection

Data were collected from May to July 2016. Written informed consent was obtained from all participants prior to recruitment. To assure authenticity, all individuals completed the questionnaires independently. For those with low levels of literacy, the researchers read out the items verbatim and recorded the answers on their behalf.

Socio-demographic data, including age, gender, marital status, living arrangements, monthly income, negative life events, educational background, and exercise habit were collected at the beginning of the study. Marital status was classified into two categories: “married” and “single, widow, or divorced”; living arrangements referred to whether participants were living with their families or lived alone; negative life events referred to experiences that had a potential of significantly altering one's social world, such as the death of a spouse or family member, divorce, serious illness, and other sudden dramatic events; educational background was grouped into two categories: “secondary and below” and “college and above”; exercise habit was classified into two categories: “once a week or less” and “more than twice a week”.

QOL was assessed using WHOQOL-BREF on four occasions throughout the duration of the three-month study: at baseline and at the end of the first, second, and third month after commencement. The attendance of the participants at each exercise session was recorded by trainers at the beginning of each session.

Measurement instruments

Quality of life was measured using the Chinese version of the WHOQOL-BREF questionnaire. The WHOQOL-BREF consists of 26 items, scored on a five-point Likert scale of 1-5, with an item score of 1 indicating ‘not at all’ or ‘very poor/dissatisfied’ and an item score of 5 indicating ‘very good’, ‘completely’ or ‘extremely’. There are two general items regarding health conditions which would be analyzed independently. The other items evaluated QOL in four main domains: physical health (seven items), psychological (six items), social relationships (three items), and environment (eight items). Three items are phased negatively and hence, scored in reverse. The domain scores were computed separately and the raw score of each domain was converted into a 0 to 100 transformed score, according to the WHOQOL user manual. After conversion, the maximal scores for the physical health, psychological, social relationships, and environment domains were 100 respectively, with a higher score indicating a better QOL[18]. Satisfactory reliability and validity of WHOQOL-BREF have been demonstrated in the Chinese population with a Cronbach's-α coefficient of 0.892 [18].

Blinding

This study is a single-blinded trial. Since the study was conducted within the communities in which the participants lived, it was not possible to conceal the group allocations. Therefore, only the researchers were blinded to the treatment allocation during data collection, to avoid subjective bias.

Data analysis

Data were analyzed using the SPSS software, version 24.0. Mean and standard deviation (SD), and proportion with percentages in parentheses were used to summarize the socio-demographic data and WHOQOL-BREF scores. The Chi-squared and independent t-tests were used to conduct a baseline comparison. Split-Plot ANOVA was used to identify potential differences between the two groups. Split-Plot ANCOVA was used to control the socio-demographic variables as covariates in this study. All statistical tests used were two-sided, had a p-value of less than 0.05, and was considered statistically significant.

Ethical consideration

This study had been registered as a clinical trial on 30 November 2014 (clinical trial registration number: ChiCTR-IPR-15006300). Participation in the study was entirely voluntary, and participants were informed of their rights to withdraw at any point without any influence on their subsequent medical treatment. Written informed consent was obtained from all participants prior to recruitment. An incentive in the form of a gift token of supermarket vouchers worth a total of RMB 50 (USD 8) was given to each participant who had completed the entire study.

Results

Sociodemographic data

One hundred and forty-two older individuals from eight communities were screened for eligibility. One hundred and fourteen fulfilled the study criteria and all individuals agreed to participate. Fifty-eight participants from Huaxinjie, Tuqiao, Qiangjiang, and Shangba were allocated to the intervention group, while the other fifty-six participants from Hanbei, Yaoqiao, Yucai, and Weijiagang were allocated to the control group, through cluster randomization. In the intervention group, fifty-seven participants completed the whole study by attending all sessions, only one participant was lost to follow up during the second month. Hence, the attendance was 98.30%. Meanwhile, in the control group, one participant was lost to follow up during the first month, and thus the responding rate was 98.20%. One hundred and twelve cases were included in the final data analysis, of which fifty-seven were from the intervention group and fifty-five from the control group (Fig. 1). The ages of participants ranged from 62 to 90 years old, with 69 female participants (61.6%). The basic characteristics of both groups are summarized in Table 1.

Changes in quality of life

Split-plot ANOVA was used to identify the changes in QOL between the intervention and the control groups based on repeated measurements, which indicated that the group to receive Tai Chi

Table 1
Baseline characteristics of participants.

Characteristics	Overall N=112	Intervention n=57	Control n=55	P-value
Age, mean±SD	71.79±7.634	71.72±7.331	71.87±8.002	0.916
Gender, n (%)				0.262
Male	43 (38.4%)	19 (33.34%)	24 (43.64%)	
Female	69 (61.6%)	38 (66.66%)	31 (56.36%)	
Monthly income(USD), mean±SD	179.10±54.762	180.45±58.568	177.71±51.020	0.792
Marital status, n (%)				0.884
Married	42 (37.5%)	21 (36.84%)	21 (38.18%)	
Single, widow, and divorced	70 (62.5%)	36 (63.16%)	34 (61.82%)	
Living arrangements, n (%)				0.131
Living with family	55 (49.1%)	24 (42.11%)	31 (56.36%)	
Living alone	57 (50.9%)	33 (57.89%)	24 (43.64%)	
Negative life events (past three years), n(%)				0.462
Yes	65 (58.0%)	35 (61.40%)	30 (54.55%)	
No	47 (42.0%)	22 (38.60%)	25 (45.45%)	
Educational background, n (%)				0.369
Secondary and below	92 (82.1%)	45 (78.95%)	47 (85.45%)	
College and above	20 (17.9%)	12 (21.05%)	8 (14.55%)	
Exercise habit, n (%)				0.318
Once a week or less	85 (75.9%)	41 (71.93%)	44 (80.00%)	
More than twice a week	27 (24.1%)	16 (28.07%)	11 (20.00%)	
Physical domain of QOL, mean±SD	41.13±10.188	40.40±12.365	41.89±7.325	0.442
Psychological domain of QOL, mean±SD	42.96±11.723	44.72±14.331	41.15±7.929	0.107
Social domain of QOL, mean±SD	46.20±13.955	46.39±16.460	46.00±10.922	0.884
Environment domain of QOL, mean±SD	43.35±10.672	45.02±13.513	41.62±6.226	0.092

SD = standard deviation; QOL = Quality of life

Table 2
Each domain of QOL for Intervention and Control Participants.

QOL domain	Time point	Interventionn=57 Mean ±SD	ControlN=55 Mean ±SD	F-statistic (df =3,330)	P-value
	Baseline	40.40±12.365	41.89±7.325		
	1 month	41.35±11.815	42.44±7.418		
Physical domain	2 month	46.63±10.722	42.53±7.688	50.664	<0.001
	3 month	52.89±9.892	42.80±7.103		
	Baseline	44.72±14.331	41.15±7.929		
	1 month	45.51±14.017	42.53±7.688		
Psychological domain	2 month	45.51±14.017	42.98±7.407	32.970	<0.001
	3 month	54.05±11.914	42.75±7.641		
	Baseline	46.39±16.460	46.00±10.922		
	1 month	57.40±10.432	45.87±10.562		
Social domain	2 month	57.40±10.432	46.09±10.111	56.853	<0.001
	3 month	57.40±10.432	45.87±10.562		
	Baseline	45.02±13.513	41.62±6.226		
	1 month	46.18±12.689	42.40±6.593		
Environment domain	2 month	47.61±13.150	42.29±6.411	27.752	<0.001
	3 month	52.67±10.360	42.29±6.411		

SD = standard deviation; QOL = Quality of life

with music intervention had significantly improved in physical ($F(3,330) = 50.664$, $p < 0.001$), psychological ($F(3,330) = 32.970$, $p < 0.001$), social ($F(3,330) = 56.853$, $p < 0.001$), and environment ($F(3,330) = 27.752$, $p < 0.001$) domains of QOL (Table 2). With controlled socio-demographic variables, including age, gender, marital status, living arrangements, monthly income, negative life events, educational background, and exercise habit, the true effect of group Tai Chi exercise with music in enhancing QOL was assured ($F = 25.145$, $p < 0.001$, $\eta_p^2 = 0.435$, $F = 18.696$, $p < 0.001$, $\eta_p^2 = 0.364$, $F = 17.473$, $p < 0.001$, $\eta_p^2 = 0.348$, and $F = 29.576$, $p < 0.001$, $\eta_p^2 = 0.475$ for physical, psychological, social, and environment domain respectively) (Table 3).

Discussion

A 12-week Yang's style Tai Chi exercise with background music enhanced all QOL domains, as measured using the WHOQOL-BREF among community-dwelling older people with mild to moderate depressive symptoms (identified using GDS). The widespread introduction of this intervention may contribute towards the Chinese government initiatives to promote "Healthy Ageing"[7]. With the increasing health burden associated with population ageing and the high prevalence of depression within older Chinese communities, such measures show promise as potential strategies to reduce visits to hospitals and other healthcare settings.

Tai Chi is a traditional moderate-intensity aerobic exercise which originated in China. It was first developed by a famous martial arts master, Wang-Ting Chen at the end of Ming Dynasty (17th Century AD)[19]. Later in the early 18th Century, Yang's Tai Chi was developed and it gained popularity[19]. Tai Chi comprehensively incorporates the essence of Chinese culture and martial arts, breathing and meditative techniques, the Chinese philosophy of "yin" and "yang", and traditional Chinese medicinal theories[20]. This traditional martial art is beneficial to the physiological function, including blood pressure and the lowering of blood lipids, cardiovascular risk[21], cellular immune function[22], cardiopulmonary function[23], and bone strength[24]. Tai Chi emphasizes the philosophy of "letting go" of interpersonal conflicts and stress, instead maintains a peace of mind and a sense of harmony,

Table 3
True effect of Tai Chi on each domain of QOL after controlling sociodemographic variables.

Effect	Physical domain (df=3,98)			Psychological domain (df=3,98)			Social domain (df=3,98)			Environment domain (df=3,98)		
	F	P	η_p^2	F	P	η_p^2	F	P	η_p^2	F	P	η_p^2
Treatment*age	0.665	0.582	0.020	0.144	0.933	0.004	0.245	0.865	0.007	0.629	0.598	0.019
Treatment*gender	0.214	0.886	0.007	0.716	0.545	0.021	1.389	0.251	0.041	0.535	0.660	0.016
Treatment*monthly income	0.646	0.588	0.019	2.263	0.086	0.065	0.766	0.516	0.023	2.160	0.098	0.062
Treatment*marital status	0.659	0.579	0.020	0.138	0.937	0.004	1.084	0.359	0.032	1.609	0.192	0.047
Treatment*living arrangements	0.128	0.943	0.004	0.363	0.780	0.011	0.118	0.949	0.004	4.027	0.010	0.110
Treatment*negative life events	1.162	0.328	0.034	0.715	0.545	0.021	1.377	0.254	0.040	0.870	0.459	0.026
Treatment*educational background	1.150	0.333	0.034	1.742	0.163	0.051	0.992	0.400	0.029	0.181	0.909	0.006
Treatment*exercise habit	1.898	0.135	0.055	3.188	0.027	0.089	0.224	0.880	0.007	0.948	0.421	0.028
Treatment*group	25.145	<0.001	0.435	18.696	<0.001	0.364	17.473	<0.001	0.348	29.576	<0.001	0.475

Effect size based on Partial Eta Squared η_p^2: Small = 0.01; Moderate = 0.06; Large = 0.14

which are congruent with the aspiration of life fulfillment[25]. This is likely to have contributed to the improvement of the psychological domain of QOL. Tai Chi performed as a group leads to increased social contact, and is known to enhance social participation[26], corresponding to the observed improvements in the environment and social domains of QOL. A previous analysis on the effects of Tai Chi on depressive symptoms among community-dwelling older people[16] revealed improvements in depressive symptoms within this present study, of which are likely to have contributed to the overall improvements in QOL.

This study differed from previous studies which had reported the benefits of Tai Chi on QOL in its inclusion of only older persons with mild to moderate depressive symptoms[10–15]. In addition, Tai Chi interventions have yet to be tested in its current setting in which variations of economic and cultural backgrounds exist. Previous studies had also reported different lengths of intervention which could lead to differences in outcome[27]. The dose-dependent response in QOL revealed in this study further supports the latter statement.

Individual randomization could not be achieved in this study due to the grouped nature of the intervention, with only single-blinding of the researcher during outcome assessments possible. The overall representativeness of the current study may also be limited by its unique location in rural China. As a result, a larger, multi-centre, randomized controlled trial is now indicated to determine the likely benefits of Tai Chi on QOL among those with mild-moderate depressive symptoms. Future studies should also evaluate effective doses of Tai Chi in terms of length and intensity, as well as to determine the sustainability of such an intervention with previous studies on exercise interventions highlighting challenges in long-term compliance with exercise interventions [28,29]. However, some sociodemographic factors were controlled to analyze the true treatment effect of Tai Chi, of which included age, gender, monthly income, marital status, living arrangements, negative life events, and educational background. Other factors such as social support and comorbidities will also be considered in further studies[30]. Except for attendance, more robust records of fidelity, such as peak heart rate, should be attempted in future studies. The intervention of this study was Tai Chi combined with Chinese folk music. Further detailed studies are required to compare the relative contributions of Tai Chi and music on QOL.

Conclusion

Group-based combined Tai Chi with background Chinese folk music improves QOL among community-dwelling older persons with mild to moderate depression. The potentially economically viable and the “natural” image associated with this intervention makes it an attractive solution to enhancing QOL in the largest older population in the world. Future studies on the relative contributions of Tai Chi and music should be considered.

Conflict of interest

None.

Declarations of interest

none.

Clinical trial registration number

ChiCTR-IPR-15006300

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