



October 2021

Enriched Tai Chi (ETC) Program Enhances Quality of Life for Older Adults in Assisted Living Facility: Feasibility Study

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Recommended Citation

Ghai, P., Mohler, A. J., & Morrison, M. T. (2021). Enriched Tai Chi (ETC) Program Enhances Quality of Life for Older Adults in Assisted Living Facility: Feasibility Study. *The Open Journal of Occupational Therapy*, 9(4), 1-11. <https://doi.org/10.15453/2168-6408.1789>

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Enriched Tai Chi (ETC) Program Enhances Quality of Life for Older Adults in Assisted Living Facility: Feasibility Study

Abstract

Background: Older adults living in assisted living facilities (ALFs) are at risk for physical and mental health decline that precipitates nursing home placement. There is a need for an exercise program that improves the quality of life (QOL) for older adults living in the ALFs. This study's primary purpose was to investigate the feasibility of an Enriched tai chi (ETC) intervention program on improving the QOL of older adults living in an ALF.

Method: A convenience sample of six older adults living in the same ALF attended the ETC program for 16 consecutive sessions two times per week for 8 weeks. A pre-test and post-test one-group design was used. The 36-Item Short Form Survey and the Beck depression inventory were used to measure QOL and mood at baseline, the 4th week, and the 8th week of the study.

Results: Wilcoxon sign rank test on pre and postintervention SF-36 scores were significant ($p < .05$). Pre-test and post-test intervention changes in mood were significantly improved (BDI; $p < .05$).

Conclusion: These findings suggest the ETC program may be a feasible intervention to improve the QOL of older adults in ALFs, warranting the need for further research.

Comments

The authors declare that they have no competing financial, professional, or personal interest that might have influenced the performance or presentation of the work described in this manuscript.

Keywords

quality of life, assisted living, tai chi

Cover Page Footnote

The authors would like to thank Christine Wright, Phd, OTR/L, for valuable guidance on drafts of this manuscript. The authors would also like to thank Mohamed Milad, Phd, for validating the data. The authors would also like to acknowledge Debbie Farrell (RN, administrator) and Katy Gifford (activities director) at the assisted living facility for their support during the study.

Credentials Display

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DOI: 10.15453/2168-6408.1789

In the US, the number of individuals 65 years of age and older is growing rapidly because of improving medical care and increased life expectancy. Many older adults move from their home environments into assisted living facilities (ALFs) (Williams, 2008). Approximately one million Americans currently are residing in ALFs with exponential growth anticipated by 2030 (American Senior Communities, 2016; Knickman & Snell, 2002; Mather, 2016).

ALFs are designed to facilitate the residents in maintaining their function while preserving personal autonomy. Residents have private living quarters, and they may receive assistance with meals, housekeeping, transportation, physical fitness, socialization, recreation, and medication management (Williams, 2008). Despite these services, many residents experience a progressive decline, particularly in cognitive and physical functioning because of progression of chronic disease or lack of an exercise program or scheduled physical activity as a part of their daily routine (De Rezende et al., 2014; Resnick et al., 2018; Williams, 2008). Evidence suggests that the social and physical activities offered to residents fail to encourage participation because residents perceive the activities as demeaning or because the activities are too challenging for residents because of their physical or cognitive abilities (Chen et al., 2007; Resnick et al., 2018; Williams 2008). Instead, residents spend their time completing sedentary activities, such as watching television, which is associated with increased odds of metabolic syndrome, high blood pressure, high cholesterol, and obesity (De Rezende et al., 2014; Rosenberg et al., 2015). A sedentary lifestyle can lead to a progressive decline in physical and psychological health. Progressive health decline leads to the transition from ALFs to nursing homes. Such transitions lead to not only increased health care costs (Luppa et al., 2010) but also continued progressive functional and physical health decline. There is a need for sophisticated age-appropriate activities in the ALFs, which may improve older adults' health and prevent the need to transition to a nursing home.

Tai chi is a sophisticated peaceful activity that promotes a mind-body connection (Kim et al., 2014; Zheng et al., 2015). Tai chi is an Eastern martial art that involves slow continuous dance-like movements and is often referred to as "meditation in motion" (Posadzki & Jacques, 2009, p. 108). Tai chi is a popular activity for many community-dwelling older adults because of the focus on relaxation through slow and fluid movements that require mental attentiveness, controlled breathing, and mind and body integration (Zheng et al., 2015). There are different tai chi styles: Yang style, Sun style, Wu style, Hao style, and Chen style. Each style has individual features (movements); however, the basic principles are the same (Tong et al., 2018). Sun style is the most common style and a popular training course worldwide. In comparison to some other styles, it involves the easiest movements. It is a modified short program with 21 forms, and each form is further broken down into easy to learn movements. All these features make it more suitable for older adults (Leung et al., 2013).

Evidence suggests that tai chi has significant health benefits and is associated with improving physical strength, balance, flexibility, cardiovascular and respiratory functions, and sleep in older adults (Du et al., 2015; Kim et al., 2014; Sun et al., 2015). Studies demonstrated that tai chi exercise improved physiological health and functional abilities in older adults (Ho et al., 2017; Lin et al., 2017). Moreover, tai chi is associated with improved psychological health of older adults (Siu et al., 2015; Wang et al., 2014). Tai chi has a positive impact on mental health by improving mood and self-esteem and alleviating many psychological symptoms, including anxiety, depression, stress, and fear of falling (Wang et al., 2014). Given the physical and psychological benefits, tai chi exercise could be an appropriate intervention.

There is a paradigm shift in occupational therapy academic institutions and in practice to carry forward the vision of promoting health, well-being, and quality of life (QOL) (Pizzi & Richards, 2017). Tai chi could be used by occupational therapists to prevent further deterioration of function in older adults and could be included as an intervention for health promotion and wellness. Improving the QOL, including the psychological and functional well-being of elders, directly relates to the quality of their engagement in occupations and their ability to participate in meaningful occupations.

Occupational therapists are skilled in selecting age-appropriate activities and meeting the client's physical, cognitive, and emotional needs. Occupational therapists perform activity analysis to adapt and modify the environment and the activity to support the person's engagement and participation to promote the well-being of the individual (Law, 1991; Lim et al., 2020). Environmental enrichment (also known as enriched environment) is a method first explored for positive neurological effects in animal models (Krech et al., 1960; Rosenzweig et al., 1962). It was later established as beneficial to both neurological and socioemotional development in early childhood (Reynolds et al., 2010). It involves changes in the environment and activities to provide enhanced sensory, cognitive, motor, and social opportunities. Occupational therapists are skilled in integrating environmental enrichment in otherwise normal activities to enhance or promote the health of the population served (Law, 1991; Lim et al., 2020). When environmental enrichment is used for therapeutic activities, for example, tai chi, the occupational therapist considers the individual needs first and then modifies and adapts the activity to promote engagement and performance.

The primary purpose of this study is to investigate the feasibility of an enriched tai chi (ETC) intervention program, which is designed to mentally stimulate and physically engage a cohort of older adults living in an ALF. Group attendance, qualitative feedback, and QOL outcomes were selected as the focus of this intervention. The research question was, "Is an ETC program feasible for improving the QOL of older adults in an ALF?"

Method

Research Design

A quasi-experimental pretest/posttest design was used to test the feasibility of the ETC intervention for older adults living in one ALF. After receiving approval from the institutional review board at the author's institution of record, subjects who met study criteria in the initial screening were recruited sequentially. After verbal and written consents were obtained, baseline information was gathered 5 days prior to the first ETC session by administering the following assessments: the 36-Item Short Form Survey (SF-36) and the Beck Depression Inventory (BDI). Resident volunteers participated in the ETC sessions with the principal investigator. Sessions were provided twice weekly for 8 weeks, each session lasted 60 min. A total of 16 hrs and 16 sessions were provided to the volunteer participants.

Participant Selection

Six participants were recruited from an ALF. A small sample size was chosen to provide individual attention and enrich the activity based on individual needs. Written and verbal consent were obtained from the participants, and facility authorities granted permission to conduct the study in the facility. Convenience sampling was used. Nursing staff assisted by providing the medical history, which helped the researcher find the individuals who met the inclusion criteria. Participants were recruited using face-to-face methods. The purpose and expectations of the study were explained to the participants. If the participants agreed, verbal consent was obtained, and the participants were informed of the activity schedules. Written consent was obtained when baseline data were collected.

Inclusion Criterion

The participants were recruited for the study using the following inclusion criteria: (a) between 70–95 years of age; (b) a resident of the ALF; (c) able to comprehend simple commands; (d) does not currently participate in an instructor-led program; (e) does not have a diagnosis of cognitive impairment, such as dementia or Alzheimer's; (f) able to provide both written and verbal informed consent; and (g) able to make their own medical decisions.

ETC

ETC expands on a current tai chi method called Sun style tai chi. The enrichment of Sun style tai chi took place through a client-centered activity analysis across contextual factors, client factors, and performance skills. Modifying the tai chi movements to accommodate it for individual abilities and make it attainable for individuals with different health conditions promotes social participation and physical and psychological health.

In the ETC intervention, researchers considered contextual factors, such as seating and positional changes, to facilitate engagement. The environment was designed to encourage social participation by providing seating in a circle. Different environmental modifications were done based on informal debriefing interviews across sessions of the ETC program.

- The volume of the music was adjusted so that it would be calming and the participants could hear the instructor's instructions.
- Voice amplifier: a microphone with a headset was used to provide the instructions in a clear and audible manner.
- Feedback indicated strong lighting from the windows was bothering some of the participants; windows were covered to make it more comfortable for the participants.
- For some of the participants, it was hard to get up from low chairs. High height chairs were used for some of the participants, which helped them to get up from the chair. A walker was placed in a reachable distance but out of the way to be easier for the participants to access it when needed.
- Positioning was changed from a horizontal line seating arrangement into a circular seating arrangement.
- Based on the participants' feedback, some of the tai chi exercise movements were broken down into small parts, and the participants mastered those small parts before they tried each tai chi exercise.
- Tai chi exercises were modified to make it more feasible for the participants with different conditions; for example, the participant with shoulder pain was asked to do the arm movements during exercises in a pain-free range.
- The room's size was another essential environmental modification because tai chi exercises involve big arm movements; so, the room should be big enough to accommodate an appropriate distance between the participants.

Table 1*Different Components Modified in ETC Program*

Component (American Occupational Therapy Association, 2014)	Enriched Tai Chi
Client Factors 1) Cognition 2) Sensory 3) Pain 4) Neuromusculoskeletal 5) Cardiovascular and respiratory system functions	<ol style="list-style-type: none"> 1) Breaking the movements into small parts and repeating the movements several times. Introducing one tai chi movement at each session and working on the movements from previous sessions before introducing the new one. 2) Volume of the music, voice amplifier, appropriate lightening to reduce glare. 3) Modified the movements based on upper extremity or lower extremity pain level. 4) Based on neuromusculoskeletal movement abilities, modified the movements to make it more feasible. 5) Frequent rest breaks.
Performance Skills 1) Motor skills 2) Process skills 3) Social interaction skills	Based on the motor skills and process skills of the participants, some movements were modified. Movements are broken down into small parts. The participants mastered each movement before a new movement was introduced. Each participant is encouraged to provide their feedback and ask questions at the end of the session. Frequent rest breaks were provided, and participants were encouraged to hydrate themselves during the session.
Context and environment	Height of the chairs, music volume, music, voice amplifier, appropriate lightening to reduce glare, placing water source in the participants' reach, size of the room, the distance between participants, seating the participants in a circle to encourage social participation.

Instruments

QOL was measured using the SF-36, and depression was measured using the BDI. The demographic information collected included age, gender, race and ethnicity, education level, socioeconomic status, and comorbid conditions. The SF-36 is a QOL measure that assesses the following sub-scales: the participant's physical functioning, social functioning, role restrictions because of physical health difficulties, role limitations because of emotional issues, general mental health, general health perceptions, bodily pain, and vitality (Gill et al., 2015; Hayes et al., 1995; Jenkinson et al., 1994). Total scores on each of the SF-36 subscales ranges between 0 and 100. Zero indicates the worst QOL, and 100 indicates a better QOL. The SF-36 is reliable, valid, and the most widely used measure of older adults' QOL (Gill et al., 2015; Hayes et al., 1995; Jenkinson et al., 1994). Studies have shown the SF-36 had adequate internal consistency, good test-retest reliability (Cronbach's alpha = 0.84–0.94), and good construct validity (Bunevicius, 2017; Pinar, 2005).

The BDI assesses the level of depression using 21 items, including sadness, pessimism, sense of failure, suicidal wishes, punishment feelings, crying, and sleep disturbance (Gallagher et al., 1983). It has been found to have good reliability and validity and is an appropriate tool to measure depression levels in older adults. The Cronbach's alpha for reliability ranged from 0.75 to 0.92, and inter-item correlations ranged from 0.53 to 0.78 (Khan et al., 2015). Both the outcome measures used for the study are self-report measures. Therefore, the data collected is based on the participants' perspectives.

Procedures

Six participants attended the ETC intervention sessions two times per week for 8 weeks, totaling 16 hr of ETC intervention. Each session lasted for 60 min. Two times per week were chosen for the

program based on the participants' availability. The ETC sessions were conducted by the principal investigator, who is a certified tai chi instructor. Each session consisted of a 15 min warm-up that involved gentle stretching exercises of upper and lower extremities while in a seated position. Basic Sun style tai chi movements (e.g., commencing form, hold the ball, wave hands like cloud, etc.) were performed for 35 min. Cooldown exercises and feedback from the participants occurred during the last 10 min of class. Following each session, field notes were taken by the principal investigator. Six out of the six participants completed the intervention and attended all the sessions, indicating the adherence to the program by the participants.

Data Collection

Assessments were administered at three different times throughout the study: (a) pre-study participation to get baseline data, (b) 4 weeks into the study to collect information about changes in QOL, and (c) post study to collect information regarding the level of psychological well-being and overall QOL. Data were collected by the principal investigator. The independent variable for the study was the ETC intervention program. The dependent variables were mood and overall QOL after completion of the program.

Data Analysis

The principal investigator performed statistical analysis with the Statistical Package for the Social Sciences (IBM SPSS) and Microsoft Excel. Significance for all statistical tests was set at the $p = 0.05$ level. Because of the small sample size and lack of normalization of data, non-parametric analysis method was conducted. The Wilcoxon sign rank test was used for analysis because it is a non-parametric test that is used to compare repeated sample measurements to assess whether their population mean ranks differ. Demographic data were analyzed using descriptive statistics. A non-parametric effect size $r^2 = z^2/N$ (Fritz et al., 2012).

Results

Participant Demographics

The participants were screened for eligibility following the inclusion and exclusion criterion. Table 2 displays the demographic information of the six participants, which was analyzed using descriptive statistics. Six Caucasian participants, two males and four females with an average age of 84.2 years, agreed to participate in the study. Half of the participants had a high school education ($n = 3$), 1 had an undergraduate degree, and 2 of the participants had a post graduate degree. The most common comorbid conditions included hypertension ($n = 5$), hyperlipidemia ($n = 3$), heart disease ($n = 2$), osteoarthritis ($n = 2$), renal disease ($n = 2$), and spinal conditions ($n = 2$).

QOL

Table 3 displays the mean, standard deviation, and effect size for the subscales of the SF-36, overall QOL, and the BDI at baseline and 4 weeks. The QOL dimensions, such as vitality ($p < .05$), emotional well-being ($p < .05$), overall QOL ($p < .05$), physical component scores ($p < .05$), and mental component scores ($p < .05$), improved significantly as measured by Wilcoxon sign rank test at 4 weeks. However, no significant differences were found in physical functioning, role limitations because of physical and emotional health, social functioning, bodily pain, and general health perceptions at 4 weeks of the ETC intervention programs. The BDI scores were significantly reduced at 4 weeks ($p < .05$).

Table 2
Descriptive Analysis of Demographic Data

Variables	ETC
Number of participants (n)	6
Male (n)	2
Female (n)	4
Ethnicity/Race	White/Caucasian
Age (mean \pm SD)	84.2 \pm 5.9
Education	n
1. High school	3
2. College	1
3. Post graduate	2
Socioeconomic status	Middle class
Comorbid conditions	n (%)
HTN	5
GERD	1
OA	2
COPD	1
Parkinson's	1
Hyperlipidemia	3
Heart disease	2
Hypothyroidism	1
Renal disease/renal stones	2

Note. ETC = Enriched tai chi; SD = Standard deviation; COPD = Chronic obstructive pulmonary disease; OA= Osteoarthritis; HTN = Hypertension; GERD = Gastroesophageal reflux disease.

Table 3
Wilcoxon Sign Rank Test to Analyze the QOL at 4 Weeks of ETC Intervention

SF-36	Baseline (mean \pm SD)	4 weeks (mean \pm SD)	Z value	r^a	p-value
PF	23.3 \pm 22.3	29.2 \pm 18.3	-.850	0.35	.395
RP	16.7 \pm 30.3	54.2 \pm 33.2	-1.841	0.75	.066
RE	55.6 \pm 34.4	83.3 \pm 27.9	-1.890	0.77	.059
VT	37.5 \pm 20.9	62.5 \pm 22.1	-2.226	0.91	.026
EWB	65.3 \pm 17.3	84.0 \pm 18.9	-2.207	0.90	.027
SF	66.7 \pm 21.9	87.5 \pm 13.7	-1.857	0.76	.063
BP	47.9 \pm 12.2	67.5 \pm 24.4	-1.787	0.73	.074
GH	57.5 \pm 16.4	60.0 \pm 23.0	-.680	0.28	.496
PCS	87.9 \pm 38.9	150.8 \pm 59.7	-2.201	0.90	.028
MCS	187.6 \pm 40.6	254.8 \pm 52.1	-2.201	0.90	.028
Overall QOL	1501.7 \pm 300.0	2092.5 \pm 429.9	-2.201	0.90	.028
BDI	10.3 \pm 6.2	6.3 \pm 7.1	-2.214	0.90	.027

Note. PF = Physical functioning; RP = Role limitations because of physical health; RE = Role limitations because of emotional health; VT = Vitality; EWB = Emotional well-being; SF = Social functioning; BP = Bodily pain; GH = General health perceptions; PCS = Physical component summary; MHC = Mental component summary; QOL = Quality of life; BDI = Beck Depression Inventory; SD = Standard deviation.

^aEffect size: 0.1 = small effect, 0.3 = medium effect, 0.5 = large effect.

After 8 weeks, the researchers found significant improvement in the following QOL dimensions: role limitations because of physical health and emotional health ($p < .05$), bodily pain ($p < .05$), vitality ($p < .05$), emotional well-being ($p < .05$), overall QOL ($p < .05$), and physical and mental component scores ($p < .05$). No significant differences were found in physical functioning, social functioning, and general health perceptions at the end of 8 weeks in the treatment group. The BDI scores reduced significantly after 8 weeks (see Table 4).

Table 4*Wilcoxon Sign Rank Test Analysis to Compare Baseline and Posttest Data*

SF-36	Baseline (mean ± SD)	8 weeks (mean ± SD)	Z value	r^a	p-value
PF	23.3 ± 22.3	28.3 ± 25.4	-1.656	0.68	.098
RP	16.7 ± 30.3	79.2 ± 24.6	-2.041	0.83	.041
RE	55.6 ± 34.4	88.9 ± 27.2	-2.121	0.87	.034
VT	37.5 ± 20.9	57.5 ± 20.2	-2.214	0.90	.027
EWB	65.3 ± 17.3	85.3 ± 17.6	-2.201	0.90	.028
SF	66.7 ± 21.9	91.7 ± 12.9	-1.826	0.75	.068
BP	47.9 ± 12.2	65.0 ± 8.8	-2.214	0.90	.027
GH	57.5 ± 16.4	53.3 ± 23.4	-.406	0.17	.684
PCS	87.9 ± 38.9	172.5 ± 29.9	-2.201	0.90	.028
MCS	187.6 ± 40.6	265.8 ± 52.3	-2.201	0.90	.028
Overall QOL	1501.7 ± 300.0	2161.6 ± 354.3	-2.201	0.90	.028
BDI	10.3 ± 6.2	5.8 ± 6.5	-2.201	0.90	.028

Note. PF = Physical Functioning; RP = Role limitations because of physical health; RE = Role limitations because of emotional health; VT = Vitality; EWB = Emotional well-being; SF = Social Functioning; BP = Bodily pain; GH = General health perceptions; PCS = Physical component summary; MHC = Mental component summary; QOL = Quality of life; BDI = Beck Depression Inventory; SD = Standard deviation; Significance level $p \leq 0.05$.

^aEffect size: 0.1 = small effect, 0.3 = medium effect, 0.5 = large effect.

Effect Size

The non-parametric effect size r ($r^2 = z^2/N$) between the pretest and at 4 weeks was tested. Fritz et al. (2012) reported that effect size r can be interpreted as follows: 0.1 = small effect, 0.3 = medium effect, and 0.5 = large effect. At 4 and 8 weeks, vitality, emotional well-being, physical component scores, mental component scores, overall QOL, and BDI scores showed a large effect of the ETC program. In addition to the subscales mentioned above, researchers found a large effect of the ETC program on role limitations because of physical and emotional health and bodily pain after 8 weeks.

Subjective Comments of Participants in the Debriefing Meeting

Subjective comments of the participants during the debriefing meeting indicated that the participants enjoyed each session. They attended the session with enthusiasm and liked the exercise being slow and relaxing. All of the participants attended every session. Subjective comments aid in evaluating and modifying the ETC program, such as one of the participants expressed difficulty getting up from the chair and would like to have a tall chair to get up. Similarly, some of the participants had shoulder pain because of arthritis. Movements were modified to make those feasible for all of the

participants. Some of the participants became passive to active learners, and they started providing more feedback and started asking more questions during sessions.

- Participant 1, 2, 3: “Love the debriefing meeting after the ETC session.”
- Participant 5, 6: “I like the exercise being slow.”
- Participant 1: “It is a very relaxing exercise, makes me calm.”
- Participant 1: “I had back pain when we started today’s session. I do not have any back pain after doing tai chi exercise.”
- Participant 4: “I had neck issues. Tai chi is helping me, and my neck is far better. I think my range of motion is also better.”
- Participant 3: “This exercise makes me so relaxed that I want to go to sleep. I am sleeping better nowadays.”
- Participant 2: “This is easy exercise; does not exasperate my breathing issue, and I enjoy every session.”

Adverse Events

The participants reported no adverse reactions to the intervention.

Discussion

Interpretation

This study’s objective was to assess the feasibility of an ETC intervention program on the QOL of older adults residing in an ALF. This study’s findings demonstrated the resident’s QOL scores improved after participating for 8 weeks in the ETC intervention. A significant increase was found in physical and mental component scores after 4 weeks and 8 weeks ($p < .05$). After 8 weeks of the ETC intervention, the scores of vitality, role limitations, emotional well-being, and bodily pain significantly improved. The abovementioned findings are consistent with the previous research findings on tai chi’s effect on the older adult population. The studies have found the benefits of tai chi participation in relieving age-related fatigue and improvement in vitality (Xiang et al., 2017). Studies have also found improvement in older adults’ physical and psychological health after participating in a tai chi exercise program (Kim et al., 2014; Lin et al., 2017; Wang et al., 2014). Improvement in the scores of role limitations could be because of improved emotional well-being, decreased fatigue, and decreased pain scores. At 4 weeks, the researchers found significant improvement in the vitality and emotional well-being scores of the participants. In another 4 weeks, the researchers found improvement in other subscales and to the subscales mentioned above: role limitations because of physical health and emotional health and bodily pain.

This pilot study was a preliminary feasibility study that demonstrated that ETC could be provided to ALF residents at a minimal cost. The gains noted by comparing pretest and posttest data are encouraging but must be interpreted with caution. Because of the small sample size, the paired t-test assumption of normally distributed data could not be assured. Replication of this research with a larger sample and a control group is needed to assess the intervention’s effectiveness. Future research should also evaluate the potential effects on maintaining instrumental activities of daily living and activities of daily living performance and delaying nursing home placement. There is a need to explore further the

culture of social activity participation and the difference between groups who are more active and less active in ALFs.

Bias and Other Threats

The potential threat was maturation to internal validity, so the researchers used the repeated measurements to reduce that bias. The intervention was provided by the same tai chi instructor and followed the standard protocol for every session to maintain intervention fidelity. One new tai chi movement was added to the protocol each week.

Effect Size

The ETC intervention was found to significantly affect vitality, emotional well-being, role limitations because of physical and emotional health, bodily pain, physical component scores, mental component scores, overall QOL, and BDI scores. Effect size measures the strength of the relationship between variables (Sullivan & Feinn, 2012). A large effect size indicates a stronger relationship between different variables, such as social role limitation, emotional health, and bodily pain. The large effect size on decreased social role limitation subscale secondary to improvement in emotional health and bodily pain scores suggests improvement in emotional health and pain reduction may be associated with decreased social role limitations.

Implications for Occupational Therapy Practice

The primary purpose of the study was to assess the feasibility of the ETC intervention program on the QOL of older adults residing in an ALF.

Findings from this study have the following implications for occupational therapy practice:

- Feasibility studies are typically an essential step in refining study design and intervention protocols before large-scale implementation.
- The ETC intervention program may have a positive effect on the QOL of older adults; however, future studies are warranted to confirm these findings.
- The generalizability of these findings is currently limited, and future research is necessary to confirm them.
- Conducting an ETC intervention to improve QOL in an ALF is feasible.

Limitations and Future Research

Although the findings of this study are promising, some limitations of the study should be mentioned. Because the present study involves short-term ETC training, the lasting positive effects of ETC on health-related outcomes remains unclear. Therefore, a long-term ETC intervention with a follow-up assessment should be designed. For future investigations, extended studies are required to establish more significant results. A larger, more diverse sample is needed to increase the strength of the studies. The randomized control design could be used in the future to investigate the effectiveness of the ETC intervention program further. The ETC intervention program could be further evaluated for effectiveness for improving individuals' QOL with specific disorders. Another limitation of the study is the lack of blindness during data collection and data analysis. However, steps are taken to decrease the bias by involving the expert biostatistician to reanalyze the data and using different statistical methods to reinforce the results further. A follow-up qualitative study is underway to explore the discrepancy between the feedback received and quantitative data.

Conclusion

This study suggests that the ETC intervention program was feasible in an ALF, and preliminary results revealed benefits by improving the QOL of ALF residents. The 100% retention rate may reflect

participant satisfaction with the intervention. However, we cannot generalize these findings as this study took place in one ALF, and the sample size was small. Larger sample size randomized control trials are warranted to confirm our findings and to demonstrate further the efficacy of ETC intervention for improving QOL.

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