



Evaluating the Benefits of a Tele-Exercise Program on Quality of Life and Body Composition Among Female Older Adults

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Abstract

Objectives. This study aimed to assess the impact of an 8-week tele-exercise program on the quality of life (QoL) and body composition among female older adults.

Materials and methods. This study involved female participants aged 60 and older, using a quasi-experimental research design. The tele-exercise regimen comprised a multimodal approach, with sessions lasting 30 minutes, conducted three times a week over an 8-week period. The program included breathing exercises, cognitive training, balance exercises, strength training, stretching, aerobic dance and karaoke singing. The sessions were conducted via streaming studio facilities at the Computer Center of Ubon Ratchathani Rajabhat University (Thailand). The tele-exercise equipment was represented by the following technical means: a 50-inch LED TV, OBS (Open Broadcaster Software) version 30.1.2 for live broadcasting and video recording, Google Meet for virtual interaction, wireless portable microphones, a desktop computer, and two 19-inch computer monitors. Pre- and post-intervention data were collected, including assessments of QoL using the Thai abbreviated version of the World Health Organization QoL questionnaire and body composition measurements (waist circumference and bioelectrical impedance analysis; BIA).

Results. Statistically significant improvements were observed in both QoL and body composition following the tele-exercise intervention. QoL scores demonstrated significant enhancements in overall QoL ($p = 0.004$), as well as in the social relationship ($p = 0.002$) and environmental ($p = 0.001$) domains. Regarding body composition, reductions in waist circumference and visceral adipose tissue were statistically significant ($p < 0.05$), while muscle mass and body fat mass showed trends toward improvement, though not statistically significant.

Conclusions. The findings suggest that tele-exercise training holds promise for enhancing QoL and positively influencing body composition among female older adults. This underscores the potential of tele-exercise as a viable option for older adults, offering cost and time-saving benefits, particularly in situations where transportation may pose challenges.

Keywords: body composition, older adults, quality of life, tele-exercise.

Introduction

Individuals at any stage of life are now required to be proficient in digital technologies. This topic has garnered significant attention from researchers (Oh et al., 2021). Particularly in countries like Japan, South Korea, Singapore, and Thailand, the importance of digital technology for

maintaining the health of older adults is increasingly recognized (Aung et al., 2022). Additionally, the concept of digital literacy has expanded to include eHealth literacy, which refers to the ability to effectively locate, understand, and evaluate health-related information from electronic sources and apply it to address health concerns (Norman & Skinner, 2006). This comprehensive understanding of digital literacy highlights the necessity for older adults to adeptly navigate digital platforms to access vital health information (Chanyawudhiwan & Mingsiritham, 2022).

Recent years have seen a notable surge in the development of technological innovations tailored to

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meet the specific needs of older adult populations. These innovations encompass a wide range of systems designed to provide assistance across various contexts (Liu et al., 2023), especially in addressing challenges exacerbated by the COVID-19 pandemic (Haase et al., 2021).

Home tele-exercise offers numerous advantages, including a reduced risk of infection transmission due to decreased interpersonal contact. Empirical evidence suggests that it fosters increased independence among older adults and yields positive outcomes for their physical and mental well-being (Ghram et al., 2021). Moreover, the convenience of home tele-exercise is enhanced by eliminating the need for travel, resulting in both time and cost savings in healthcare expenditures (Noel et al., 2004).

From a healthcare perspective, telemedicine emerges as a viable solution for managing healthcare during the COVID-19 pandemic (Latifi & Doarn, 2020). Despite experiencing a decline in quality of life compared to previous years, over 80% of older adults utilized technology to maintain social connections, thereby mitigating the impact of social distancing measures on their social networks (Siette et al., 2021). Previous systematic reviews have reported small improvements in balance and moderate improvements in mobility and strength among older adults with frailty (Dawson et al., 2024), while older adults with sarcopenia have shown improved functional fitness and body composition (Hong et al., 2017). In dementia patients, telemedicine has proven valuable for assessment and intervention approaches during periods of social distancing (Elbaz et al., 2021; Sari et al., 2023). Furthermore, prior research on tele-exercise has demonstrated enhancements in both physical and mental health outcomes (Sangprapai et al., 2023). Consequently, the aim of this study was to investigate the quality of life (QoL) and body composition of healthy older adults.

Materials and Methods

Study Participants

Older adults affiliated with the senior club of the Ubon Ratchathani Provincial Administrative Organization were recruited during the social distancing period in September and October 2021. The sample size was determined using the G*power 3.1.4.9 program, with an effect size of 0.95, a significance level (α) of 0.05, and a statistical power ($1-\beta$) of 0.95, resulting in a total sample size of 15 participants. The inclusion and exclusion criteria are outlined in Table 1.

Human Research Ethics

The study was approved by the Ubon Ratchathani Rajabhat University Ethics Committee for Human

Research (Approval No.641008), ensuring adherence to ethical standards. The research protocol was conducted in accordance with the principles outlined in the Declaration of Helsinki. Additionally, the study was registered in the Thai Clinical Trials Database (TCTR 20221103001).

Experimental Design

During the period of COVID-19 social distancing measures, participants were offered an eight-week tele-exercise training program comprising sessions lasting 30 minutes, conducted three times weekly. Prior to the pre-test day, participants received a handbook detailing the training program. The study methodology adhered to the approach outlined in a previous study (Sangprapai et al., 2023). Assessments at the pre- and post-intervention stages were conducted at the UBRU Fitness Center, Ubon Ratchathani Rajabhat University.

The exercise program, conducted in the Streaming Studio room at the Computer Center, Ubon Ratchathani Rajabhat University (see Fig. 1), included a variety of activities: breathing exercises, cognitive training, balance exercises, strengthening exercises, stretching, aerobic dance and karaoke singing. Each session lasted 30 minutes and comprised at least two types of exercises. The aerobic dance routines developed for this study incorporated movements relevant to self-care during the COVID-19 pandemic, such as hand washing and mask-wearing.



Fig. 1. Tele-exercise training protocol at Streaming Studio room

Table 1. Participant criterion

Inclusion criteria	Exclusion criteria
<ul style="list-style-type: none"> - Age \geq 60 years - Barthel Index score $>$ 11 - Capacity for auditory, visual, cognitive and verbal communication including proficiency in the Thai language - Ubon Ratchathani Province residency required - Access to smartphone or computer with internet at home 	<ul style="list-style-type: none"> - Severe medical conditions (e.g., cancer, bloodstream infections and tuberculosis) - High risk of COVID-19 transmission - Presence of unstable congenital diseases - Blood pressure exceeding 160/90 mmHg - Pre-existing cardiac conditions - Presence of joint, bone or muscle disorders exacerbated by physical exertion

Telehealth Equipment

1. TV LED: two screens, one sized 50 inches and the other 45 inches.
2. Google Meet: video conferencing platform.
3. Open Broadcaster Software (OBS) 30.1.2: Software for live broadcasting and video recording.
4. Windows 10: Operating System.
5. Wireless Portable Microphone: Utilized to capture the instructor's voice.
6. Camcorder: Used for recording trainers.
7. Desktop Computer: One set.
8. Computer Monitors: Two 19-inch monitors for image display and graphic work (operator).
9. Green Screen: Employed for background alteration in videos.
10. Illumination: Lighting setup to enhance video brightness.

Study Measurements

1. QoL Assessment

In the Thai abbreviated version of the World Health Organization Quality of Life (WHOQOL-BREF-THAI), a total of 26 questions were included. Responses were recorded on a 5-point Likert scale, ranging from “none” to “very much”, across four distinct domains: physical health, psychological, social relationships, and environmental factors. The scoring of the WHOQOL-BREF-THAI was standardized, yielding a total score range of 26 to 130 points and divided into categories of low (26-60 scores), average (61-95 scores), and good (96-130 scores) for overall QoL (Mahatnirunkul et al., 1998). These encompassed 7 questionnaires for physical health (7-16 scores = low, 17-26 scores = average, 27-35 scores = good), 6 focusing on mental health (6-14 scores = low, 15-22 scores = average, 23-30 scores = good), 3 examining social relationships (3-7 scores = low, 8-11 scores = average, 12-15 scores = good), and 8 addressing environmental domains (8-18 scores = low, 19-29 scores = average, 30-40 scores = good). Data collection procedures involved the utilization of online information forms administered *via* Google Forms, completed by self-evaluation *via* a LINE group.

2. Body composition measurement

2.1. Waist circumference (WC); WC measurement was conducted at the level of the navel while participants maintained a standing position (Yamamoto et al., 2024). The measuring tape was positioned horizontally on the floor and perpendicular to the body's long axis. It was taut but did not press against the abdominal wall.

2.2. Bioelectrical impedance analysis (BIA); BIA equipment (SecamBCA, Hamburg, Germany) was used for five minutes to evaluate body composition (Namboonlue et al., 2021). This instrument analyzes body weight, body fat mass, muscle mass and visceral adipose tissue.

Statistical Analysis

IBM SPSS Statistics version 19.0 was employed for the statistical analyses (IBM Corp., NY). The Shapiro-Wilk test was utilized to assess a normal distribution by examining the mean and standard deviation. The Wilcoxon Signed Rank Test was employed to compare mean variables within the group between pre- and post-tests. A significance level of $p < 0.05$ was established.

Results

Table 2 displays the baseline characteristics of the participants. The majority of participants were aged between 60 and 69 years, reported having chronic diseases necessitating regular medication and exhibited a normal body mass index (BMI).

Table 2. Baseline characteristics of the participants

Parameters	Number	%	
Age (y)	60-69	9	60.00
	≥70	6	40.00
Chronic disease	Yes	9	60.00
	No	6	40.00
Regular medicine	Yes	10	66.67
	No	5	3.33
BMI (kg/m ²)	18.50-22.90	3	20.00
	23.00-24.90	7	46.67
	25.00-29.90	5	33.33
	≥30	0	0.00

Description: BMI; body mass index

Figure 2 depicts the QoL at the PRE-POST assessment stages. In the physical health domain, the intervention yielded average pre- and post-scores of 27.80 ± 3.69 and 29.40 ± 2.23 , respectively, with a p-value of 0.130. These findings suggest a favorable QoL both before and after the intervention. Similarly, in the psychological domain, the average pre- and post-scores were 26.60 ± 2.95 and 27.67 ± 2.44 , respectively, with a p-value of 0.269, indicating a consistent good QoL across assessments. Notably, the social relationships domain exhibited average pre- and post-scores of 10.47 ± 2.36 and 13.33 ± 1.63 , respectively, with a significant p-value of 0.002, signifying an improvement from average to good QoL. In the environmental domain, the average pre- and post-scores were 31.60 ± 3.94 and 38.00 ± 2.10 , respectively, with a significant p-value of 0.001, indicating good QoL levels both pre- and post-intervention. Additionally, a statistically significant improvement in overall QoL was observed with a p-value of 0.004. The average scores for pre- and post-

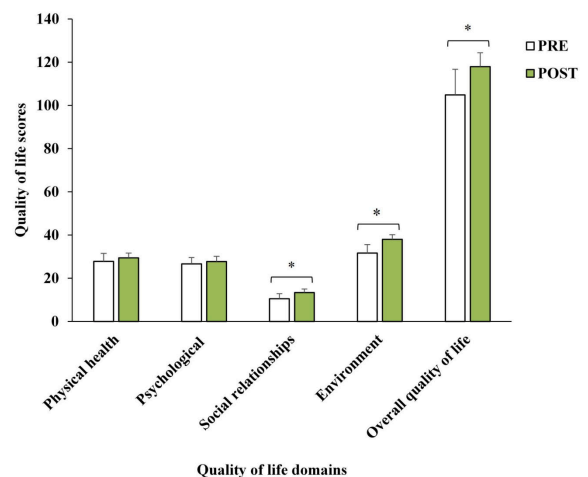


Fig. 2. Comparison of pre- and post-quality of life scores. *Significant $p < 0.05$ (pre vs post)

Table 3. The body composition of the participants

Parameters	Pre-test	Post-test	Z	p-value
Waist circumference (cm)	88.20±5.89	83.00±6.71	-3.088	0.002*
Muscle mass (kg)	13.67±2.36	15.18±5.32	-1.886	0.059
Body fat mass (%)	43.02±3.14	42.67±3.27	-0.966	0.334
visceral adipose tissue (L)	2.62±0.42	2.26±0.51	-3.118	0.002*

*Significant $p < 0.05$ (pre vs post)

assessments were classified as indicative of good QoL at 104.80 ± 11.92 and 117.93 ± 6.42 , respectively.

Table 3 presents the body composition data derived from WC measurement and BIA. A significant decrease in WC was observed with a p-value of 0.002. Regarding BIA results, there was a significant reduction in visceral adipose tissue with a p-value of 0.002. Furthermore, there was an increasing trend noted in muscle mass and body fat mass, although these changes were not statistically significant, with p-values of 0.059 and 0.334, respectively.

Discussion

The 8-week tele-exercise program resulted in significant improvements in both QoL and body composition among participants, particularly female older adults and during the COVID-19 pandemic. The effectiveness of multimodal exercise in female older adults has been corroborated by studies indicating an elevation in brain-derived neurotrophic factor (Vaughan et al., 2014), a biomarker of neurogenesis induced by physical exercise (Titus et al., 2021). Under the COVID-19 epidemic, mobile and online communication emerged as popular alternatives for older individuals to retain social contacts, engage in community events, relieve stress and loneliness (Greenwood-Hickman et al., 2021). Additionally, beyond the distancing period, tele-exercise programs have the potential to enhance physical activity levels in older adults (Chan et al., 2023). Moreover, a systematic review and meta-analysis have shown no significant difference between face-to-face and tele-exercise programs (Wicks et al., 2023). However, challenges such as effort and performance expectations, as well as underlying health conditions, remain prominent concerns (Turcotte et al., 2023).

According to the findings, it appears that the COVID-19 epidemic and the ensuing social distancing measures may have influenced the social factors. This is illustrated by the baseline categorization, which primarily identified the social relationships domain as having an average QoL, while the other domains were classified as having a good QoL (Fig. 2). These results are consistent with previous studies that have demonstrated improvements in QoL among older adults experiencing social isolation due to the COVID-19 pandemic (Solis-Navarro et al., 2022; Zengin Alpozgen et al., 2022). Moreover, significant differences in QoL have been observed among non-hospitalized post-COVID-19 individuals (Poon et al., 2024). However, a systematic review and meta-analysis investigating QoL prior to the COVID-19 pandemic did not identify significant differences in health-related QoL (Chan et al., 2021). This suggests that crises or vulnerable situations among older adults could potentially be mitigated by tele-exercise programs, thereby enhancing QoL.

Regarding body composition, the WC exhibited statistically significant improvements in this study, aligning

with previous findings in older adults (Kuhle et al., 2014) and individuals residing in long-term nursing homes (Arrieta et al., 2018). Furthermore, a systematic review and meta-analysis revealed that regular aerobic exercise led to a decrease in WC of approximately 3 cm among overweight or obese individuals (Armstrong et al., 2022). Comparatively, the WC reduction observed in this study was approximately 5 cm, despite only one-third of the participants being overweight and no cases of obesity present. In the context of BIA, this study revealed statistically significant enhancements in visceral adipose tissue and observed trends suggestive of potential increases in muscle mass and body fat mass over the 8-week intervention period (Table 3). According to Silva et al. (2022), their study juxtaposing tele-exercise alone and tele-exercise supplemented with nutritional coaching demonstrated that an 8-week tele-exercise regimen led to enhancements in exercise capacity. However, the intervention did not yield statistically significant changes in anthropometric or body composition-related parameters (Silva et al., 2022). This finding aligns with a previous systematic review and meta-analysis, which indicated improvements in muscle strength and performance, although not specifically in muscle mass (Escriche-Escuder et al., 2021). Additionally, a study investigating tele-exercise at home in older adults reported improvements in muscle mass after 12 weeks (Hong et al., 2017). Furthermore, various additional factors are associated with enhancing their overall state of well-being and aspects of QoL (Amorese & Ryan, 2022; Najafi et al., 2023). Moreover, a previous study demonstrated statistically significant enhancements in body composition after 15 weeks (Blasco-Lafarga et al., 2020), suggesting that extended or long-term tele-exercise interventions may yield distinct effects on body composition. Notably, low muscle mass has been linked to mortality in older adults, underscoring the potential benefit of tele-exercise in increasing muscle mass and attenuating mortality (de Santana et al., 2021).

The main limitations of this study include a small sample size, a lack of a control group, a short duration of the exercise intervention, and a focus exclusively on female older adults. Additionally, there may be concerns regarding the accuracy of the measurement tools utilized. Future research should aim to address these limitations by implementing randomized controlled trials with predefined protocols, longer intervention durations, inclusion of both genders, and the utilization of high-accuracy instruments for body composition assessment, such as dual-energy X-ray absorptiometry.

Conclusions

The 8-week tele-exercise program significantly improved QoL and body composition among female older adults. This intervention, particularly valuable during the COVID-19

pandemic, offers a practical solution for maintaining well-being while adhering to social distancing measures. Significant QoL enhancements, especially in social relationships and environmental domains, were observed, along with notable reductions in WC and visceral adipose tissue.

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Conflict of interest

The authors guarantee that no conflicts of interest exist.

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Оцінка ефективності програми дистанційних фізичних тренувань на показники якості життя та композиції тіла серед жінок похилого віку

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Авторський вклад: А – дизайн дослідження; В – збір даних; С – статаналіз; D – підготовка рукопису; Е – збір коштів

Реферат. Стаття: 7 с., 3 табл., 2 рис., 37 джерела.

Мета дослідження. Дослідження спрямовано на оцінку впливу 8-тижневої програми дистанційних фізичних тренувань на якість життя (ЯЖ) та композицію тіла серед жінок похилого віку.

Матеріали та методи. У дослідженні з застосуванням квазі-експериментального дизайну взяли участь жінки віком 60 років і старше. Режим дистанційних фізичних тренувань складався з мультимодального підходу, сеанси тривалистю 30 хвилин проводилися тричі на тиждень протягом 8 тижнів. Програма охоплювала дихальні вправи, когнітивне тренування, вправи на рівновагу, силові тренування, розтяжку, аеробні танці та спів у караоке. Заняття проводилися за допомогою студії потокового мовлення в комп'ютерному центрі Убонратчатханського університету Раджабхат (Таїланд). Обладнання для проведення дистанційних фізичних тренувань було представлено наступними технічними засобами: 50-дюймовий LED-телевізор, програмне забезпечення OBS (Open Broadcaster Software) версії 30.1.2 для прямої трансляції та відеозапису, Google Meet для віртуальної взаємодії, бездротові портативні мікрофони, настільний комп'ютер і два 19-дюймові комп'ютерні монітори. Збір даних до та після інтервенції включав оцінку ЯЖ з використанням тайської скороченої версії опитувальника якості життя Всесвітньої організації охорони здоров'я та вимірювання показників композиції тіла (окружність талії та біоімпедансний аналіз; БІА).

Результати. Після впровадження інтервенції у формі дистанційних фізичних тренувань спостерігалось статистично значуще покращення як показників ЯЖ, так і композиції тіла. Показники ЯЖ продемонстрували значне поліпшення загального рівня ЯЖ ($p = 0,004$), а також сфери соціальних відносин ($p = 0,002$) та навколишнього середовища ($p = 0,001$). Що стосується показників композиції тіла, зменшення окружності талії та вісцеральної жирової тканини було статистично значущим ($p < 0,05$), тоді як м'язова маса та жирова маса тіла показали тенденцію до покращення, проте не були статистично значущими.

Висновки. Результати дослідження свідчать про перспективність проведення дистанційних тренувань з метою покращення якості життя та позитивного впливу на показники композиції тіла серед жінок похилого віку. Це підкреслює потенціал дистанційних тренувань як дієвого методу активності для осіб похилого віку, що дозволяє заощадити кошти та час, особливо в ситуаціях, коли транспортування може бути проблематичним.

Ключові слова: композиція тіла, особи похилого віку, якість життя, дистанційне фізичне тренування.

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