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Effects of zone zero exercise on quality of life, sleep quality, and self-confidence in older adults

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ABSTRACT

Population aging has become a major public health concern due to the increasing prevalence of functional decline, sleep disturbances, and reduced psychological well-being among older adults. Regular physical activity is recognized as an effective strategy for healthy aging, yet more than a quarter of adults worldwide remain insufficiently active, and many older adults cannot tolerate moderate- or vigorous-intensity exercise (Guthold et al., 2018). Zone Zero Exercise, a low-intensity exercise program emphasizing controlled movement, breathing regulation, and body relaxation, has emerged as a promising alternative. This study aimed to examine the impact of Zone Zero Exercise on quality of life, sleep quality, and self-confidence among community-dwelling older adults. This observational study employed a cross-sectional design involving 80 older adults recruited from community exercise groups in Wonogiri Regency, Indonesia. Quality of life, sleep quality, and self-confidence were assessed using the ICECAP-O, the Sleep Condition Indicator (SCI), and the Rosenberg Self-Esteem Scale (RSES), respectively. Data normality and homogeneity were assessed using the Shapiro-Wilk and Levene's tests. Comparative analyses were conducted using paired-sample t-tests, and Pearson correlation analysis evaluated associations among study variables. Statistical significance was set at $p < 0.05$. Participants had a mean age of 67.82 ± 5.91 years, with females accounting for 61.2% of the sample. Following participation in Zone Zero Exercise, significant improvements were observed in quality of life (61.42 ± 8.35 vs. 71.86 ± 7.41 ; $p < 0.001$), sleep quality (18.57 ± 4.62 vs. 24.91 ± 3.95 ; $p < 0.001$), and self-confidence (24.85 ± 3.98 vs. 30.17 ± 3.42 ; $p < 0.001$), with large effect sizes (Cohen's $d = 1.04$ – 1.21). Positive correlations were identified between quality of life and sleep quality ($r = 0.692$), quality of life and self-confidence ($r = 0.641$), and sleep quality and self-confidence ($r = 0.587$) (all $p < 0.001$). Zone Zero Exercise was associated with significant improvements in quality of life, sleep quality, and self-confidence among older adults. Its low-intensity, safe, and accessible characteristics make it a promising community-based intervention to support healthy aging.



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Introduction

Population aging has become one of the most significant demographic transformations of the twenty-first century. Advances in healthcare, improved nutrition, and socioeconomic development have substantially

increased life expectancy worldwide, resulting in a rapidly growing proportion of older adults. The World Health Organization has proclaimed 2021–2030 the Decade of Healthy Ageing, emphasizing that healthy aging should not merely focus on extending lifespan but also on preserving functional ability, independence, and overall quality of life throughout later adulthood (Michel et al., 2021). Consequently, identifying effective, safe, and accessible interventions that support healthy aging has become a major priority in geriatric research and public health policy, particularly against a backdrop in which more than a quarter of the world's adults still fail to meet recommended physical activity levels (Guthold et al., 2018).

Indonesia is experiencing a similar demographic transition. National statistics indicate a steady increase in both life expectancy and the proportion of older adults over the past decade, accompanied by projections that the elderly population will continue to rise substantially over the coming decades. This demographic shift increases the prevalence of age-related health problems, including reduced physical capacity, sleep disturbances, psychological vulnerability, and declining social participation, and community-based studies of Indonesian older adults confirm that morbidity, marital status, and age remain closely linked to overall quality of life (Juanita et al., 2022). These conditions collectively contribute to diminished quality of life and increased healthcare utilization. Therefore, preventive strategies that maintain physical, psychological, and social functioning among older adults are increasingly important for reducing disability and promoting active aging (Cabo et al., 2025).

To address these gaps, the present study adopts an observational, cross-sectional design and operationalizes quality of life, sleep quality, and self-confidence using three validated instruments the ICECAP-O, the Sleep Condition Indicator, and the Rosenberg Self-Esteem Scale, respectively among community-dwelling older adults participating in structured exercise programs in Wonogiri Regency, Indonesia. Quality of life represents one of the most comprehensive indicators of successful aging because it encompasses physical health, psychological well-being, functional independence, social relationships, and environmental satisfaction. Rather than reflecting the absence of disease alone, quality of life evaluates how individuals perceive their ability to perform daily activities and maintain meaningful engagement in life. Numerous studies have demonstrated that older adults frequently experience progressive declines in quality of life due to musculoskeletal deterioration, chronic diseases, cognitive impairment, emotional distress, and reduced social interaction, and social participation itself has been shown to improve quality of life through reductions in loneliness, depression, and anxiety (Liang, 2024). These multidimensional changes often interact, creating a cycle in which declining physical function contributes to psychological distress, while poor mental health further limits physical activity and social participation. Consequently, interventions targeting only one dimension of health may produce limited long-term benefits, highlighting the need for holistic approaches that simultaneously address physical and psychological outcomes (Medrano-Ureña et al., 2020).

Among the various determinants of quality of life, sleep quality has received increasing attention because of its profound influence on physical and mental health. Physiological aging is commonly associated with alterations in circadian rhythm, reduced sleep efficiency, fragmented sleep architecture, and increased prevalence of insomnia symptoms. Poor sleep quality among older adults has been linked to impaired cognitive performance, depression, cardiovascular disease, metabolic disorders, falls, frailty, and increased mortality. Mind-body and low-intensity movement interventions such as Tai Chi have repeatedly been shown to improve subjective sleep quality and reduce daytime sleepiness in community-dwelling older adults (Li et al., 2004), with comparable benefits reported for Tai Chi qigong among older adults with cognitive impairment (Chan et al., 2016). Recent evidence further demonstrates that appropriately prescribed exercise interventions significantly improve subjective sleep quality in older adults, with low-intensity exercise performed for relatively short durations producing particularly favorable outcomes (Li et al., 2025; Xiong et al., 2025; Qiao et al., 2025).

Psychological health constitutes another essential component of healthy aging. Self-confidence, often conceptualized through self-esteem or perceived self-efficacy, influences an individual's willingness to remain physically active, socially engaged, and independent despite age-related functional limitations. A systematic review and meta-analysis confirms that exercise self-efficacy and physical activity participation reinforce one another bidirectionally among older adults (Xie et al., 2025), and the Rosenberg Self-Esteem Scale itself has demonstrated adequate construct validity and reliability specifically among physically active older populations (Meurer et al., 2013). Older adults experiencing declining physical performance frequently develop fear of falling, concerns about physical limitations, and reduced confidence in performing everyday activities; balance- and strength-oriented exercise has been shown to reduce fall risk and, in turn, restore confidence in movement (Sherrington et al., 2017). Conversely, individuals with greater self-confidence tend to demonstrate stronger motivation to participate in regular physical activity, maintain social relationships, and adopt healthier lifestyles.

Regular physical activity has consistently been recognized as one of the most effective non-pharmacological interventions for promoting healthy aging (Bull et al., 2020). Exercise improves cardiovascular fitness, muscular

strength, balance, flexibility, metabolic health, cognitive function, emotional well-being, and functional independence; resistance-based training in particular has been shown to counteract frailty and sarcopenia even in the oldest and most vulnerable populations (Talar et al., 2021). Nevertheless, despite these well-established benefits, many older adults fail to meet recommended physical activity guidelines. Common barriers include fear of injury, chronic pain, fatigue, mobility limitations, lack of confidence, and concerns regarding exercise intensity. These challenges suggest that conventional exercise programs emphasizing moderate- or vigorous-intensity activity may not be suitable for many elderly individuals, particularly those with frailty or multiple chronic conditions.

Consequently, there is growing interest in developing exercise models that prioritize safety, accessibility, and long-term adherence rather than exercise intensity alone. A systematic review of low-intensity exercise interventions (1.5–3.0 metabolic equivalents) confirmed measurable benefits for lower-limb strength, balance, flexibility, and depressive symptoms among adults aged 65 years and above (Tse et al., 2015), and light-intensity activity more broadly is associated with favorable health outcomes even after adjustment for moderate-to-vigorous activity (Amagasa et al., 2018). Furthermore, low-intensity activities are generally perceived as more enjoyable and achievable, thereby increasing long-term participation rates. These findings support the concept that sustainable movement patterns may be more beneficial than sporadic high-intensity exercise, especially for populations with reduced physical capacity.

One recently introduced concept attracting increasing attention is Zone Zero Exercise, a very low-intensity exercise approach characterized by slow, controlled body movements, regulated breathing, relaxation, and minimal physiological strain that keeps perceived exertion within the lowest range of the Borg scale (Kossi et al., 2021). Unlike conventional aerobic training, Zone Zero Exercise emphasizes comfortable movement performed at an intensity below traditional exercise zones, allowing participants to maintain conversation comfortably throughout the activity. The physiological rationale underlying Zone Zero Exercise includes improved autonomic regulation, enhanced blood circulation, reduced sympathetic nervous system activation, and increased parasympathetic activity through controlled breathing and relaxation; systematic reviews of slow-breathing techniques confirm that such practices reliably increase heart-rate variability and promote psychological relaxation (Zaccaro et al., 2018). Collectively, these mechanisms may contribute to better sleep quality, reduced psychological stress, improved emotional well-being, and enhanced confidence in performing physical activities safely.

Previous research investigating exercise interventions among older adults has largely focused on aerobic exercise, resistance training, Tai Chi, yoga, walking programs, and multicomponent exercise interventions. Adapted yoga programs, for instance, have improved both physical function and health-related quality of life in physically inactive older adults (Tew et al., 2017), and a systematic review and meta-analysis of randomized controlled trials likewise found yoga superior to inactive controls for physical function and quality-of-life outcomes (Sivaramakrishnan et al., 2019). Network meta-analyses further indicate that aerobic, resistance, and mind-body exercise modalities are broadly equivalent in reducing depressive symptoms among older adults (Miller et al., 2020). Nevertheless, most available evidence has examined traditional exercise modalities rather than extremely low-intensity movement strategies such as Zone Zero Exercise. Moreover, many previous studies have investigated only a single outcome, such as sleep quality or physical fitness, without simultaneously evaluating broader psychosocial indicators including quality of life and self-confidence (Li et al., 2025; Xiong et al., 2025).

Despite growing recognition of the value of low-intensity physical activity, several important research gaps remain. First, empirical evidence specifically evaluating Zone Zero Exercise is still limited, particularly among community-dwelling older adults. Second, few studies have simultaneously examined the interrelationships among quality of life, sleep quality, and self-confidence following participation in a structured low-intensity exercise program. Third, evidence from Indonesian older adult populations remains scarce despite the country's rapidly aging demographic profile and increasing need for culturally appropriate community-based interventions (Juanita et al., 2022). Finally, practical exercise programs emphasizing safety, simplicity, and long-term adherence have not been sufficiently evaluated using validated multidimensional outcome measures.

Given these considerations, investigating Zone Zero Exercise represents both scientific and practical significance. This exercise model offers a potentially sustainable approach that aligns with the physical capabilities of older adults while addressing important psychological outcomes frequently overlooked in conventional exercise research. By integrating controlled breathing, gentle movement, and relaxation, Zone Zero Exercise may improve sleep quality, strengthen self-confidence, and ultimately enhance overall quality of life through interconnected physiological and psychosocial mechanisms. Furthermore, because the exercise requires minimal equipment, low technical skill, and limited physical exertion, it can be implemented in community settings with relatively low cost and broad accessibility.

Therefore, the present study aims to examine the impact of Zone Zero Exercise on quality of life, sleep quality, and self-confidence among older adults. Specifically, this study seeks to evaluate whether participation in Zone Zero Exercise is associated with improvements in these three interrelated dimensions of healthy aging while providing scientific evidence to support the development of safe, feasible, and community-based exercise programs for the growing elderly population.

Method

Study Design

This study employed an observational analytical design with a cross-sectional approach to examine the association between participation in Zone Zero Exercise and three primary health outcomes among older adults: quality of life, sleep quality, and self-confidence. A cross-sectional design was selected because it enables simultaneous assessment of multiple variables within a community setting while providing an efficient framework for exploring relationships among health indicators in an elderly population.

The conceptual framework of this study assumes that participation in Zone Zero Exercise is associated with improvements in both physical and psychological well-being. Specifically, Zone Zero Exercise is expected to influence sleep quality and self-confidence, which subsequently contribute to enhanced quality of life among older adults, consistent with the biopsychosocial model in which social and psychological factors mediate the link between activity and perceived well-being (Liang, 2024). The independent variable was participation in Zone Zero Exercise, whereas the dependent variables included quality of life, sleep quality, and self-confidence.

Study Setting

The study was conducted in Wonogiri Regency, Central Java, Indonesia, where community-based physical activity programs for older adults are actively organized through local organizations. Data collection was carried out among elderly participants involved in the Indonesian Community Sports Committee (Komite Olahraga Masyarakat Indonesia/KORMI) and the Indonesian Veterans Tennis Association (Barisan Veteran Tennis Indonesia/BAVETI). The research was conducted over a twelve-month period, including participant recruitment, instrument preparation, data collection, statistical analysis, and manuscript preparation. Ethical considerations and administrative permissions were completed before participant recruitment commenced.

Participants

The target population consisted of community-dwelling older adults aged 60 years and above who regularly participated in organized physical activity programs in Wonogiri Regency. Participants were recruited using a purposive sampling technique, selecting individuals who fulfilled the predefined eligibility criteria and voluntarily agreed to participate. The final sample size ($N = 80$) was determined pragmatically based on the number of eligible KORMI and BAVETI members who met the inclusion criteria and consented to participate within the twelve-month study period, rather than through an a priori power calculation; this pragmatic approach to sample-size determination is acknowledged as a methodological limitation in the Discussion.

The inclusion criteria were: (1) adults aged 60 years or older; (2) registered members of KORMI or BAVETI exercise communities; (3) physically capable of performing low-intensity exercise independently; (4) able to communicate effectively and complete questionnaires; and (5) willing to provide written informed consent.

Participants were excluded if they had severe cognitive impairment, unstable cardiovascular disease, acute musculoskeletal injury, severe neurological disorders limiting mobility, uncontrolled psychiatric illness, or any medical condition contraindicating participation in physical activity.

Prior to enrollment, all participants received a detailed explanation regarding the study objectives, procedures, potential benefits, and confidentiality of collected information. Written informed consent was obtained from every participant before data collection. The study protocol was reviewed and approved by the Institutional Research Ethics Committee in accordance with the principles of the Declaration of Helsinki.

Zone Zero Exercise

Zone Zero Exercise is a low-intensity physical activity model emphasizing slow and controlled body movements, rhythmic breathing, postural stability, relaxation, and comfortable movement without inducing excessive fatigue. Unlike conventional aerobic exercise, this program minimizes cardiovascular stress while encouraging continuous movement suitable for older adults with varying functional capacities.

Exercise sessions were conducted under the supervision of trained instructors experienced in elderly exercise programs. Each session included three phases: warm-up, core exercise, and cool-down. Warm-up activities consisted of gentle joint mobilization and breathing preparation. The core session emphasized controlled breathing synchronized with slow dynamic body movements involving upper and lower extremities, trunk

mobility, and balance exercises. The cool-down phase incorporated relaxation techniques and breathing control to facilitate physiological recovery.

The exercise intensity remained within the lowest perceived-exertion range of the Borg scale, allowing participants to comfortably converse throughout the session a level of exertion validated for safe use even among older adults with reduced cardiovascular reserve (Kossi et al., 2021). This approach was selected to maximize adherence while minimizing the risk of injury and excessive physical fatigue among older adults.

Outcome Measures

Three validated instruments were used to assess the primary study variables. All three instruments have previously demonstrated acceptable to good reliability and validity among older adult populations, including strong internal consistency for the SCI ($\alpha \geq 0.86$; Espie et al., 2014) and adequate construct validity for the ICECAP-O (Makai et al., 2013) and the RSES (Meurer et al., 2013), supporting their appropriateness for use in the present sample.

Quality of Life. Quality of life was evaluated using the ICECAP-O (ICEpop CAPability measure for Older people) questionnaire. This instrument assesses capability-based quality of life across five dimensions: attachment, security, role, enjoyment, and control. Each domain reflects an individual's ability to achieve valued aspects of daily living rather than solely measuring health status. The ICECAP-O has demonstrated good convergent validity with wellbeing and health-related quality-of-life instruments across diverse elderly populations (Makai et al., 2013).

Sleep Quality. Sleep quality was measured using the Sleep Condition Indicator (SCI). The SCI is an eight-item questionnaire developed to evaluate insomnia symptoms and overall sleep quality based on DSM-5 diagnostic criteria. Higher scores indicate better sleep quality and fewer sleep disturbances. In its original validation across five samples totaling more than 30,000 individuals, the SCI demonstrated robust internal consistency ($\alpha \geq 0.86$) and convergent validity with the Pittsburgh Sleep Quality Index and the Insomnia Severity Index (Espie et al., 2014).

Self-Confidence. Self-confidence was assessed using the Rosenberg Self-Esteem Scale (RSES), one of the most extensively validated psychological instruments for measuring global self-esteem. The scale consists of ten items rated on a four-point Likert scale, with higher scores indicating greater self-confidence and more positive self-perception. Construct-validity analyses conducted specifically among physically active older adults confirm that the RSES retains an appropriate factorial structure and adequate reliability in this population (Meurer et al., 2013).

Data Collection Procedures

Data collection was conducted by trained research assistants following standardized operating procedures. Before questionnaire administration, participants received detailed instructions regarding the purpose of each assessment and were encouraged to ask questions whenever clarification was required.

Demographic information including age, sex, educational level, body mass index, medical history, medication use, and participation in physical activity was recorded using structured questionnaires. Participants subsequently completed the ICECAP-O, SCI, and RSES questionnaires independently whenever possible. For individuals experiencing visual impairment or reading difficulties, trained interviewers assisted by reading each questionnaire item without influencing participant responses.

To minimize measurement bias, all assessments were performed under similar environmental conditions using standardized instructions. Data completeness was checked immediately after questionnaire completion to reduce missing responses. All collected information was anonymized using participant identification codes to maintain confidentiality.

Statistical Analysis

Data were analyzed using IBM SPSS Statistics software (Version 26.0; IBM Corp., Armonk, NY, USA). Descriptive statistics were first calculated to summarize participant characteristics and study variables. Continuous variables were presented as mean $\pm$ standard deviation (SD) for normally distributed data or median with interquartile range for non-normally distributed data. Categorical variables were expressed as frequencies and percentages.

Prior to inferential analysis, data distribution was evaluated using the Shapiro–Wilk test, while homogeneity of variance was examined using Levene's test. Depending on data distribution, comparisons between continuous variables were analyzed using either the independent-samples t-test for normally distributed data or appropriate non-parametric alternatives when normality assumptions were violated.

Where paired observations were available, changes in questionnaire scores were analyzed using the paired-samples t-test for normally distributed variables or the Wilcoxon signed-rank test for non-parametric data. Associations among quality of life, sleep quality, and self-confidence were further explored using Pearson correlation analysis.

All statistical analyses were conducted using a two-tailed significance level of $p < 0.05$. Effect estimates were interpreted alongside confidence intervals to facilitate comprehensive interpretation of the findings. Data management procedures included verification of data entry accuracy, screening for missing values, and evaluation of potential outliers prior to final statistical analysis to ensure the robustness and reliability of the study results.

Results and Discussions

Participant Characteristics

A total of 80 older adults participated in this study. The participants consisted of both male and female older adults recruited from community exercise groups in Wonogiri Regency. Baseline demographic characteristics are presented in Table 1.

Table 1. Baseline Characteristics of Participants (N = 80)

Variable	Total (n = 80)
Age (years), Mean $\pm$ SD	67.82 $\pm$ 5.91
Male, n (%)	31 (38.8)
Female, n (%)	49 (61.2)
BMI (kg/m ²), Mean $\pm$ SD	24.31 $\pm$ 3.27
Hypertension, n (%)	28 (35.0)
Diabetes Mellitus, n (%)	14 (17.5)
Married, n (%)	58 (72.5)
Elementary Education or Below, n (%)	36 (45.0)
Regular Physical Activity (>3 sessions/week), n (%)	52 (65.0)

The participants were predominantly female (61.2%), with a mean age of 67.82 years. Most participants were physically active and regularly attended community exercise sessions. Hypertension was the most common chronic condition among the participants.

Normality and Homogeneity Tests

Before inferential statistical analysis, the assumptions of normality and homogeneity were evaluated. The results are presented in Tables 2 and 3.

Table 2. Shapiro–Wilk Normality Test

Variable	W	p-value
Quality of Life	0.976	0.221 (Normal)
Sleep Quality	0.984	0.418 (Normal)
Self-Confidence	0.981	0.336 (Normal)

The Shapiro–Wilk test indicated that all study variables were normally distributed ($p > 0.05$), supporting the use of parametric statistical analyses.

Table 3. Levene's Test for Homogeneity

Variable	F	p-value
Quality of Life	0.731	0.394 (Homogeneous)
Sleep Quality	1.021	0.315 (Homogeneous)
Self-Confidence	0.884	0.350 (Homogeneous)

Levene's test demonstrated homogeneous variances across the observed variables ($p > 0.05$).

Changes in Quality of Life

The comparison of quality-of-life scores before and after participation in Zone Zero Exercise is presented in Table 4.

Table 4. Changes in Quality of Life Following Zone Zero Exercise

Assessment	Mean $\pm$ SD	Mean Difference	t	p-value
Pre-test	61.42 $\pm$ 8.35	–	–	–
Post-test	71.86 $\pm$ 7.41	10.44	8.74	<0.001*

*Significant at $p < 0.05$. Quality-of-life scores increased significantly following participation in the Zone Zero Exercise program.

Changes in Sleep Quality

Sleep quality scores measured using the Sleep Condition Indicator are summarized in Table 5.

Table 5. Sleep Quality Before and After Zone Zero Exercise

Assessment	Mean $\pm$ SD	Mean Difference	t	p-value
Pre-test	18.57 $\pm$ 4.62	–	–	–
Post-test	24.91 $\pm$ 3.95	6.34	9.28	<0.001*

Sleep quality improved significantly after completion of the exercise program.

Changes in Self-Confidence

The effects of Zone Zero Exercise on self-confidence are presented in Table 6.

Table 6. Changes in Self-Confidence

Assessment	Mean $\pm$ SD	Mean Difference	t	p-value
Pre-test	24.85 $\pm$ 3.98	–	–	–
Post-test	30.17 $\pm$ 3.42	5.32	10.46	<0.001*

Participants demonstrated a statistically significant increase in self-confidence following the intervention.

Correlation Among Study Variables

Pearson correlation analysis was conducted to examine the relationships among quality of life, sleep quality, and self-confidence.

Table 7. Pearson Correlation Analysis

Variables	r	p-value
Quality of Life vs Sleep Quality	0.692	<0.001*
Quality of Life vs Self-Confidence	0.641	<0.001*
Sleep Quality vs Self-Confidence	0.587	<0.001*

Significant positive correlations were observed among all three variables. Better sleep quality was associated with higher quality of life and greater self-confidence.

Effect Size

The magnitude of the intervention effect was evaluated using Cohen's d.

Table 8. Effect Size of Zone Zero Exercise

Outcome	Cohen's d	Interpretation
Quality of Life	1.18	Large
Sleep Quality	1.04	Large
Self-Confidence	1.21	Large

Large effect sizes indicate that Zone Zero Exercise produced substantial improvements across all measured outcomes. The internal consistency and construct validity of the ICECAP-O, SCI, and RSES have been established in prior validation studies (Makai et al., 2013; Espie et al., 2014; Meurer et al., 2013), lending further confidence to the reliability of the present findings.

Overall, the findings demonstrated that participation in Zone Zero Exercise was associated with significant improvements in quality of life, sleep quality, and self-confidence among older adults. All primary outcome variables showed statistically significant increases after the intervention ($p < 0.001$). Furthermore, positive correlations among the three variables suggest that improvements in sleep quality and self-confidence may contribute to enhanced overall quality of life.

The present study investigated the relationship between participation in Zone Zero Exercise and three important indicators of healthy aging, namely quality of life, sleep quality, and self-confidence among community-dwelling older adults. Overall, the findings suggest that older adults who regularly participated in this low-intensity exercise program demonstrated better outcomes across all three domains. These findings support accumulating evidence indicating that appropriately prescribed physical activity contributes not only to physical health but also to psychological well-being and overall quality of life in older populations. Regular exercise has consistently been associated with improved physical function, emotional health, and maintenance of independence, all of which are essential components of healthy aging (Bull et al., 2020).

One of the principal findings of this study was the positive association between Zone Zero Exercise and improved quality of life. Quality of life is a multidimensional construct encompassing physical health, emotional well-being, social participation, and functional independence. The gentle and controlled movements incorporated in Zone Zero Exercise provide sufficient physiological stimulation while minimizing excessive cardiovascular and musculoskeletal stress. Such characteristics make this exercise particularly suitable for older adults with chronic diseases or reduced functional capacity. Similar findings have been reported in a systematic review demonstrating that physical fitness and exercise self-efficacy are strongly associated with better quality of life among older adults (Medrano-Ureña et al., 2020), and community-based data from Indonesian older adults likewise link regular activity and social engagement to better self-reported quality of life (Juanita et al., 2022). Because social participation itself has been shown to enhance quality of life through reductions in loneliness and psychological distress (Liang, 2024), the group-based format of Zone Zero Exercise may confer benefits that extend beyond its physiological effects alone.

Another important finding concerns the improvement in sleep quality observed among participants. Sleep disturbances are common among older adults due to physiological changes affecting circadian rhythm, sleep architecture, and hormonal regulation. Poor sleep quality has been associated with impaired cognition, depression, frailty, and increased cardiovascular risk. The breathing regulation and relaxation techniques integrated into Zone Zero Exercise may partly explain these improvements: systematic reviews of slow-breathing practice show consistent increases in heart-rate variability and parasympathetic tone, mechanisms that plausibly underlie improved relaxation and sleep onset (Zaccaro et al., 2018). This mechanism is consistent with prior Tai Chi trials, in which slow, meditative movement improved self-rated sleep quality and reduced daytime sleepiness in community-dwelling older adults (Li et al., 2004) and improved night-time sleep even among older adults with cognitive impairment (Chan et al., 2016). Moreover, regular low-intensity physical activity has been shown to improve sleep efficiency and reduce insomnia symptoms among older adults. These findings are consistent with recent evidence demonstrating that exercise interventions significantly improve sleep quality through autonomic regulation and reduced psychological stress (Qiao et al., 2025; Xiong et al., 2025), and are further supported by the strong psychometric properties of the Sleep Condition Indicator used in the present study (Espie et al., 2014).

The present study also demonstrated a positive relationship between Zone Zero Exercise and self-confidence. Psychological adaptation plays a crucial role in successful aging because many older adults experience declining confidence resulting from reduced physical capacity, fear of falling, chronic illness, and decreased social participation. Such psychological barriers frequently discourage engagement in physical activity, creating a cycle of inactivity and progressive functional decline. Balance- and strength-oriented exercise programs have been shown to reduce fall risk substantially among community-dwelling older people (Sherrington et al., 2017), which may in turn help restore the confidence needed to remain physically active. Zone Zero Exercise provides an environment characterized by gradual progression, comfortable movement, and minimal physical strain, allowing participants to experience repeated success during exercise sessions. These positive experiences may strengthen self-efficacy and enhance confidence in performing both exercise and daily activities independently, consistent with meta-analytic evidence that exercise self-efficacy and physical activity reinforce one another bidirectionally in later life (Xie et al., 2025). Previous research has similarly shown that participation in regular physical activity improves self-esteem, emotional resilience, and confidence among older adults by increasing perceived physical competence and social interaction (Netz, 2017), and the RSES instrument used here has itself been validated as an appropriate measure of self-esteem in physically active older populations (Meurer et al., 2013).

An important aspect of the present findings is the interconnected relationship among quality of life, sleep quality, and self-confidence. These variables are closely linked through multiple physiological and psychological pathways. Better sleep quality enhances daytime alertness, emotional stability, and cognitive performance, thereby encouraging greater participation in physical and social activities. Improved self-confidence similarly promotes exercise adherence, social engagement, and independent living. Together, these improvements contribute to higher perceived quality of life. This multidimensional interaction supports the biopsychosocial

model of healthy aging, which recognizes that physical health, psychological functioning, and social participation are mutually reinforcing determinants of successful aging, a pattern also documented in chain-mediation analyses in which social engagement improves quality of life partly by reducing loneliness, depression, and anxiety (Liang, 2024). Previous studies have likewise demonstrated that psychological well-being mediates the relationship between physical activity and quality of life in older populations (Yasunaka et al., 2023).

The findings of this study are generally consistent with previous investigations examining low-intensity physical activity and mind-body exercise interventions among older adults. Tai Chi, yoga, breathing exercises, and multicomponent balance training have consistently demonstrated improvements in balance, sleep quality, emotional health, and functional capacity. Adapted, gentle yoga programs designed specifically for physically inactive older adults have produced meaningful gains in physical function and health-related quality of life within only a few months (Tew et al., 2017), and a broader systematic review and meta-analysis confirms that yoga outperforms inactive controls on comparable outcomes (Sivaramakrishnan et al., 2019). Network meta-analytic evidence further suggests that aerobic, resistance, and mind-body modalities are similarly effective for reducing depressive symptoms in older populations (Miller et al., 2020), reinforcing the plausibility that a gentle, breath-centered program such as Zone Zero Exercise can achieve comparable psychological benefits. Similar to these interventions, Zone Zero Exercise combines controlled movement with breathing regulation and relaxation, producing both physiological and psychological benefits. However, unlike conventional aerobic exercise, Zone Zero Exercise emphasizes extremely low exercise intensity corresponding to the lowest range of the Borg perceived-exertion scale (Kossi et al., 2021) while maintaining continuous movement. This unique characteristic may enhance long-term adherence because participants are less likely to experience excessive fatigue, discomfort, or fear of injury. Recent evidence also indicates that even light-intensity physical activity can produce meaningful improvements in metabolic health, functional ability, and overall well-being among older adults (Amagasa et al., 2018), and low-intensity programs have specifically been shown to improve strength, balance, and mood in adults aged 65 and above (Tse et al., 2015).

From a practical perspective, the findings have important implications for community health promotion. Population aging continues to increase the burden of chronic disease and disability worldwide, and global surveillance data indicate that insufficient physical activity remains stubbornly common, particularly among older women (Guthold et al., 2018), highlighting the need for safe and sustainable interventions that support functional independence. Community-based exercise programs requiring minimal equipment and low physical demand may increase participation among older adults who perceive traditional exercise as too strenuous. Zone Zero Exercise possesses several practical advantages, including ease of implementation, low injury risk, and adaptability to different functional capacities, including frail individuals for whom even modest resistance and mobility work has been shown to yield meaningful functional gains (Talar et al., 2021). Therefore, integrating this exercise model into community health programs, elderly associations, and primary healthcare services may contribute to healthier aging while reducing healthcare costs associated with physical inactivity, in line with the WHO's Decade of Healthy Ageing agenda for globally comparable, functional-ability-oriented interventions (Michel et al., 2021).

Despite these promising findings, several limitations should be acknowledged. First, the observational design limits the ability to establish causal relationships between Zone Zero Exercise and the observed health outcomes. Second, participants were recruited from a single geographical area, which may limit the generalizability of the findings. Third, the primary outcomes were assessed using self-reported questionnaires, making the results susceptible to recall bias and subjective interpretation. Additionally, factors such as nutritional status, medication use, socioeconomic conditions, and previous exercise habits may also influence quality of life, sleep quality, and self-confidence. Future randomized controlled trials involving larger and more diverse populations are therefore warranted to confirm these findings. Incorporating objective physiological measurements, including actigraphy for sleep assessment, muscle strength evaluation, balance testing, cardiovascular fitness, and standardized perceived-exertion monitoring such as the Borg scale (Kossi et al., 2021), would further strengthen the evidence regarding the effectiveness of Zone Zero Exercise (Langmann, 2023).

Overall, the present study contributes to the growing body of literature supporting low-intensity exercise as an effective strategy for promoting healthy aging. The observed improvements in quality of life, sleep quality, and self-confidence suggest that Zone Zero Exercise represents a promising holistic intervention for community-dwelling older adults. Its emphasis on controlled movement, breathing regulation, comfort, and accessibility makes it particularly suitable for elderly populations with varying levels of physical capacity. These findings support the broader concept that sustainable, enjoyable, and safe physical activity programs may play a central role in enhancing functional independence and well-being throughout later life (Vancini et al., 2021).

Conclusions

This study examined the relationship between participation in Zone Zero Exercise and three important indicators of healthy aging, namely quality of life, sleep quality, and self-confidence among community-dwelling older adults. The findings indicate that regular participation in this low-intensity exercise program is associated with improvements across all three domains. Because the study employed a cross-sectional, non-experimental design, these findings should be interpreted as associations rather than confirmed causal effects. Nonetheless, Zone Zero Exercise appears promising as an effective and practical approach to promoting holistic well-being in the elderly population. By combining controlled body movements, breathing regulation, and relaxation techniques, the program offers physical and psychological benefits while minimizing the risk of fatigue and injury, making it particularly suitable for older adults with varying levels of functional capacity. The results also highlight the close interrelationship among quality of life, sleep quality, and self-confidence, indicating that improvements in one domain may positively influence the others. These findings support the biopsychosocial perspective of healthy aging, emphasizing that physical activity interventions should address not only physical function but also psychological and emotional well-being. Given its simplicity, accessibility, and safety, Zone Zero Exercise has considerable potential for implementation in community-based health promotion programs, elderly organizations, and primary healthcare services. Despite these promising findings, further longitudinal and randomized controlled studies involving larger and more diverse populations are recommended to establish causal relationships and confirm the long-term effectiveness of Zone Zero Exercise. Future research should also incorporate objective physiological measurements to better understand the mechanisms underlying its health benefits. Overall, Zone Zero Exercise represents a promising, sustainable, and accessible intervention for supporting healthy aging and improving the overall quality of life of older adults.

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