

Review Article

Diaphragmatic breathing exercise to eliminate fear of falling in older adults: A literature review

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Abstract

Background: Fear of falling is a psychological problem frequently experienced by older adults and can lead to reduced physical activity, restricted mobility, loss of independence, and diminished quality of life. Various nonpharmacological interventions have been developed to address this condition, including Diaphragmatic Breathing Exercise (DBE), which focuses on controlled breathing to promote relaxation and reduce anxiety.

Aim: To review and analyze scientific evidence on the effectiveness of Diaphragmatic Breathing Exercise in reducing fear of falling among older adults.

Methods: This study employed a literature review method. Scientific articles were identified through searches of databases including PubMed and ScienceDirect using the keywords "diaphragmatic breathing exercise," "fear of falling," "elderly," "older adults," "anxiety," and "balance confidence." Eligible articles were relevant full-text publications in Indonesian or English, published within the last five years (2023–2026), using experimental designs (randomized controlled trials or quasi-experimental studies) or case reports, and focusing on the effects of diaphragmatic breathing exercises on physical function or mobility parameters. Data were analyzed descriptively to identify the principal findings of each study.

Results: The review findings indicate that Diaphragmatic Breathing Exercise has positive effects on reducing anxiety, promoting relaxation, and improving emotional regulation in older adults. Reduced anxiety contributes to greater confidence in moving and engaging in activities, which may help alleviate fear of falling. In addition, several studies reported that regular diaphragmatic breathing exercises improved psychological comfort and supported older adults' participation in daily physical activities.

Conclusion: Based on this literature review, Diaphragmatic Breathing Exercise is a simple, safe, nonpharmacological intervention with the potential to reduce fear of falling among older adults through anxiety reduction and enhanced relaxation. This exercise may be considered as part of health promotion and preventive programs aimed at improving the psychological well-being of older adults.

Background

Older adults are susceptible to falls because of changes in physical function, impaired balance, reduced mobility, and health conditions associated with aging. Falls among older adults represent a public health concern because they may cause injuries, activity limitations, loss of independence, and the need for long-term care. The World Health Organization (WHO, 2021) estimates that approximately 684,000 fall-related deaths occur worldwide each year, with people older than 60 years accounting for a high number of these deaths. Fall risk is associated not only with physical condition but also with an older person's ability to maintain balance and perform daily activities safely.

One psychological concern that requires attention in older adults is fear of falling (FoF), defined as the fear of experiencing a fall during everyday

activities. Such fear may occur both in individuals who have previously fallen and in those with no history of falls. A meta-analysis by Xiong et al. (2024), encompassing 153 studies and 200,033 participants from 38 countries, reported a global prevalence of FoF of 49.60%. Factors associated with FoF include demographic characteristics, physical function, chronic diseases, and psychological problems. These findings demonstrate that FoF is a widespread concern requiring management approaches that address both the physical and psychological dimensions of aging.

Fear of falling may affect older adults' behavior and ability to perform activities. Older adults who fear falling may restrict activities such as walking, changing positions, performing household tasks, or participating in social activities. Such restrictions may reduce opportunities to preserve muscle strength, balance, and independence. A

systematic review by Vo et al. (2023) found that the prevalence of FoF in Southeast Asian studies ranged from 21.6% to 88.2%. The most frequently reported associated factors were female sex, advanced age, balance impairment, and a history of falls. This variation in prevalence highlights the importance of considering population and environmental characteristics when examining FoF among older adults.

Management of FoF should aim to improve perceived safety during movement, maintain physical function, and reduce psychological barriers to activity. Through a systematic review and meta-analysis, Han et al. (2024) examined the effects of Otago exercises on FoF in older adults. Their findings indicate that exercise-based interventions are among the approaches worth investigating for managing fear of falling. Meanwhile, Kruisbrink et al. (2022) examined intervention components intended to reduce FoF and found that several approaches, including holistic exercises and exercises that enhance body awareness, demonstrated potential benefits. This evidence supports the development of interventions that help older adults improve movement control and confidence during activities, although the benefits of each exercise modality must be evaluated on the basis of intervention-specific research findings.

One complementary intervention worth investigating is diaphragmatic breathing exercise (DBE), a breathing technique that emphasizes diaphragm activation through controlled inspiration and expiration. This exercise may help regulate breathing patterns and enhance awareness of bodily movement. Conceptually, breathing regulation may form part of an approach to improving comfort during activities or physical exercise. However, the benefits of DBE for balance, mobility, and FoF reduction in older adults should not be assumed without evidence from intervention studies that specifically measure these outcomes. Accordingly, DBE should be regarded as a potentially useful intervention for further investigation rather than an established treatment for reducing fear of falling.

In view of the foregoing, fear of falling is a multidimensional problem among older adults associated with physical function, health conditions, and psychological factors. Its management should involve efforts to maintain mobility while improving older adults' confidence in performing daily activities. Although various exercise interventions have been investigated for FoF reduction, evidence specifically evaluating

DBE remains in need of review, particularly when outcomes include fear of falling and mobility. Therefore, this review aims to examine scientific evidence on the use of diaphragmatic breathing exercise for fear of falling and mobility among older adults and to identify limitations and research gaps that can inform the development of gerontological nursing interventions.

Methods

Study Design

This study employed a critical review design to identify, critically evaluate, and synthesize scientific evidence concerning the effects of Diaphragmatic Breathing Exercise (DBE) on physical function and functional mobility among older adults with mobility limitations. The literature search was conducted in two electronic databases, PubMed and ScienceDirect. Review stages included identifying articles, screening for relevance, assessing eligibility according to inclusion and exclusion criteria, extracting data, and synthesizing research findings. The review was used to identify potential benefits of DBE, the characteristics of the interventions applied, and limitations of the available scientific evidence.

Research Question

The research question was developed using the PICO framework (Population, Intervention, Comparison, and Outcome). The population of interest consisted of older adults experiencing immobility, mobility limitations, or frailty. Interventions included diaphragmatic breathing exercises and relevant abdominal and deep-breathing exercises. No specific comparison group was defined, while outcomes included physical performance, physical endurance, and functional mobility.

The research question was formulated as follows: *"What scientific evidence is available regarding the effects of Diaphragmatic Breathing Exercise on physical function and functional mobility in older adults with mobility limitations?"* The PICO components used are presented in the following table 1.

Search Strategy

The literature search was conducted in PubMed and ScienceDirect using keywords developed on the basis of the PICO framework. The keywords covered concepts related to older populations,

breathing exercise interventions, and physical function outcomes. Boolean operators AND and OR were used to combine the main concepts and their synonyms.

Table 1. PICO Framework and Search Terms Used in the Literature Review

PICO	Main term	Synonym 1	Synonym 2
P	Older Adults with Immobilization	Older Adults with Mobility Limitations	Frail Older Adults
I	Diaphragmatic Breathing Exercise	Abdominal Breathing Exercise	Deep Breathing Exercise
C	—	—	—
O	Physical Functional Performance	Physical Performance	Physical Endurance

The principal search terms were elderly with immobilization, elderly with mobility limitation, frail elderly, diaphragmatic breathing exercise, abdominal breathing exercise, deep breathing exercise, physical functional performance, physical performance, and physical endurance.

The search strategy was formulated as follows:

("elderly with immobilization" OR "elderly with mobility limitation" OR "frail elderly") AND ("diaphragmatic breathing exercise" OR "abdominal breathing exercise" OR "deep breathing exercise") AND ("physical functional performance" OR "physical performance" OR "physical endurance") (See Table 2).

The search strategy was adapted to the characteristics of each database. In PubMed, search terms may be combined with relevant Medical Subject Headings (MeSH) after verification. According to the search records, eight articles were initially retrieved: two from PubMed and six from ScienceDirect. The articles were then screened against the inclusion and exclusion criteria to determine their eligibility for review.

Study Selection Process

Article selection involved several stages: identification of search results, title and abstract screening, eligibility assessment according to the inclusion and exclusion criteria, and full-text evaluation of relevant articles. Articles meeting the criteria were selected for further analysis.

According to the initial search records, eight articles were identified, comprising two from PubMed and six from ScienceDirect. Four articles were reported to meet the eligibility criteria for review. However, the final number of articles from each database needs to be verified to ensure consistency with the overall number of studies included. Duplicate articles, if present, should be identified and removed before the final count is established. Reasons for exclusion at each stage should also be documented to improve the transparency of the selection process.

Table 2. Search databases

Search keywords	Database	Number of search results	Number finally included
((Elderly with Immobilization) OR (Elderly with Mobility Limitation)) AND ((Diaphragmatic Breathing Exercise) OR (Abdominal Breathing Exercise)) AND ((Physical Functional Performance) OR (Physical Performance)))	PubMed	2	2
((Elderly with Immobilization) OR (Elderly with Mobility Limitation)) AND ((Diaphragmatic Breathing Exercise) OR (Abdominal Breathing Exercise)) AND ((Physical Functional Performance) OR (Physical Performance)))	ScienceDirect	6	2

Data Extraction and Synthesis

Data from the articles meeting the inclusion criteria were extracted using a structured recording form. Information collected included author names and publication year, study country, research design, sample size and participant characteristics, intervention type, exercise frequency and duration, measurement instruments, principal findings, and study limitations.

The extracted data were then organized in a study-characteristics table to facilitate comparisons across articles. The analysis focused on the effects of diaphragmatic breathing exercises on physical function and functional mobility in older adults, the characteristics of the intervention protocols, consistency of study findings, and their relevance to gerontological nursing practice.

A narrative synthesis was conducted by comparing similarities and differences among the findings, considering the methodological quality and limitations of each study, and identifying gaps in scientific evidence. Narrative synthesis was selected because the study designs, participant characteristics, intervention protocols, and measurement instruments varied across articles.

Conclusions were drawn from the available findings while considering the strengths and limitations of the reviewed evidence.

Results

This section presents a synthesis of four publications examining diaphragmatic breathing exercises in different populations and for different outcomes. To facilitate comparison, intervention procedures are summarized by intervention type and implementation duration, while the instruments column lists only the measurement tools. Findings are compared according to the main outcomes to highlight similarities, differences, and consistency across publications.

Table 3. Characteristics and Main Findings of the Included Studies on Diaphragmatic Breathing Exercise

Author(s) and year	Study design	Study setting	Population and sample	Instruments	Intervention (summary)	Main findings
Abdullahi, Wong, & Ng (2024)	Systematic review and meta-analysis	Department of Rehabilitation Sciences, The Hong Kong Polytechnic University; the review searched international databases.	6 studies; 151 post-stroke patients aged ≥18 years.	Spirometry; pulse oximetry; Trunk Impairment Scale (TIS); surface electromyography (sEMG); ultrasonography; Berg Balance Scale (BBS); measuring tape; Korean Mini-Mental State Examination (K-MMSE).	Diaphragmatic breathing exercises, generally performed supine or in crook-lying position; some studies combined them with conventional therapy/chest mobilization. Average duration: 15–30 minutes/session, 3–5 times/week for approximately 4 weeks.	Respiratory function improved significantly, particularly FVC, FEV1, and PEF. No significant superiority over controls was found for FEV1/FVC or certain trunk motor function/muscle activation outcomes.
Nazir, Mathiakom, Tassawar, & Tantisuwat (2026)	Single-blind randomized controlled trial	Older adult communities and physiotherapy clinics in Pakistan; researchers' main affiliation was Chulalongkorn University, Thailand.	54 older adults aged 65–75 years; 3 groups with 18 participants each.	Mini-BESTest; Timed Up and Go (TUG); gait velocity (GV); Five-Times Sit to Stand Test (5xSTS); Activities-specific Balance Confidence (ABC) Scale; Fatigue Severity Scale (FSS); Short Form-36 (SF-36).	Comparison of diaphragmatic breathing (DB), DB combined with diaphragmatic mobilization (DB+DM), and control. The intervention lasted 20 minutes/session, twice weekly for 8 weeks.	DB and DB+DM increased walking speed, shortened TUG time, improved balance confidence, and improved fatigue and quality of life. Immediate changes in Mini-BESTest and 5xSTS scores were not significant; balance improvement

Author(s) and year	Study design	Study setting	Population and sample	Instruments	Intervention (summary)	Main findings
Herdayanti & Rosa (2024)	Quasi-experimental; one-group pretest-posttest	"Cahaya" Physiotherapy Clinic, Palembang, Indonesia.	15 patients with nonspecific low back pain; purposive sampling.	Oswestry Disability Index (ODI).	Regular diaphragmatic breathing exercises, 3 times/week for 4 weeks.	was observed at the 10-week follow-up. Mean ODI score decreased from 34.00 at pretest to 16.13 at posttest ($p < 0.05$), indicating reduced disability and improved function in patients with nonspecific low back pain.
Nagaraj, Kumar, & Aaron (2023)	Case report	Nitte Institute of Physiotherapy, Mangalore, Karnataka, India.	One 55-year-old male patient with recurrent chronic low back pain and an abnormal breathing pattern.	Visual Analogue Scale (VAS); Oswestry Disability Index (ODI); measuring tape; spirometry (FVC and FEV1).	Diaphragmatic breathing exercises for 4 weeks as part of rehabilitation, combined with core stability exercises.	VAS score decreased from 7/10 to 2/10; ODI from 46% to 14%; diaphragm excursion increased from 2 to 4 cm; FVC increased from 2.4 to 3.1 L; FEV1 increased from 1.9 to 2.5 L. As this is a single case report, the findings cannot be generalized.

Similarities and consistency of findings. All four publications reported results supporting the benefits of diaphragmatic breathing exercises for at least some of the outcomes assessed. Two publications focused on low back pain (Herdayanti & Rosa, 2024; Nagaraj et al., 2023) reported improvements in function/disability; the case report also documented reduced pain and improved respiratory parameters. The review by Abdullahi et al. (2024) supported benefits for respiratory function, whereas the randomized trial by Nazir et al. (2026) showed improvements in walking performance, fatigue, balance confidence, and quality of life.

Differences in outcomes and populations. The findings were not entirely consistent because the populations, study designs, instruments, comparators, and outcomes differed. Abdullahi et al. reviewed post-stroke patients and primarily identified respiratory benefits. Nazir et al. studied older adults and found improvements in walking

performance, but not immediate significant improvements in postural balance or lower-limb strength. Two low-back-pain studies used the ODI and reported reductions in disability, although one involved only a single patient.

Strength of evidence and interpretation. Findings from a systematic review/meta-analysis and a randomized controlled trial provide a stronger basis for comparison than findings from an uncontrolled single-group study or a case report. However, the available summaries are insufficient to conclude that this exercise produces the same benefits in every population or across all outcomes. Differences in the findings should be interpreted in light of the study designs, sample sizes, intervention durations, and measurement instruments used.

Discussion

It is commonly assumed that breathing exercises affect only the respiratory system and have no

direct relationship with lower-limb motor performance or walking agility in older adults. However, from a pathophysiological perspective, ventilation patterns, optimization of abdominal muscle strength, and maintenance of central postural stability are closely integrated.

The diaphragm is a dome-shaped musculotendinous structure that separates the thoracic and abdominal cavities. When older adults perform deep diaphragmatic inspiration, the diaphragm contracts caudally and compresses the abdominal viscera. This contraction increases intra-abdominal pressure (IAP), which acts as an internal hydrostatic stabilizer supporting the vertebral column anteriorly. This process produces abdominal bracing, or the formation of a “natural corset.”

Older adults experiencing immobility often limit their movements because of postural instability or the perception that their spine is weak. Abdominal bracing provides greater firmness to the core region. Once proximal trunk stability has been achieved, the mechanical load on distal components (the upper and lower extremities) decreases, allowing the arms and legs to move with greater ease, precision, and stability.

A major determinant of immobility (such as prolonged bed rest or a sedentary lifestyle) among older adults is pain during movement, particularly nonspecific low back pain (LBP). As synthesized from the findings of Herdayanti (2024) and Nagaraj (2023), diaphragmatic breathing exercises significantly reduce pain intensity and lumbar functional disability. Repetitive mechanical stimulation of the diaphragm induces relaxation of the paravertebral muscles affected by spasms, hypertonicity, and inflammation associated with chronic fatigue.

A reduction in pain intensity will correspondingly improve functional range of motion. As pain in the lower back subsides, physical barriers to function are removed, increasing older adults' confidence and independence in performing basic activities such as standing, axial trunk rotation, and independently transferring from a bed to a chair.

Reluctance to walk among older adults is often triggered by age-related reductions in lung vital capacity, manifested as easy fatigability, weakness, or dyspnea even during light physical activity. DBE works by encouraging maximal circumferential

expansion of the lower lung lobes. The biological effect of this expansion is an improvement in spirometric parameters, particularly forced vital capacity (FVC) and forced expiratory volume in one second (FEV1), which automatically increases oxygen saturation and oxygen delivery into the circulation.

Oxygen is an essential substrate in aerobic metabolism, enabling the production of adenosine triphosphate (ATP) as an energy source for the skeletal muscles of the lower extremities. Adequate oxygen availability in muscle tissue minimizes lactic acid accumulation, reduces fatigue severity, and preserves sufficient energy for older adults to walk longer distances and at a faster pace (increased gait velocity).

The factors complicating immobility in older adults extend beyond organic or physical impairments to include psychological factors such as fear of falling. According to empirical data from Nazir (2026), this anxiety is a primary reason why older adults restrict their movements (sedentary behavior). Slow, deep diaphragmatic breathing can stimulate parasympathetic tone through vagus nerve activation, leading to reductions in stress hormones and anxiety. Together with the greater internal support associated with IAP, proprioceptive input to the brain signals that the body's posture is stable and safe.

When balance confidence improves and anxiety about the risk of falling is eliminated, older adults become psychologically motivated to discontinue prolonged bed rest. They become more independently active in everyday activities, such as morning mobilization, and no longer confine themselves to bed (KK et al., 2024; Yun & Ji, 2025; Cristina & Santos, 2025; Deswani et al., 2025)..

Although not all participants in the reviewed literature were in the geriatric age group, DBE is nevertheless considered highly relevant, appropriate, and sufficiently valid to be recommended for older adults with immobility. According to evidence-based nursing practice, nursing interventions are selected on the basis of similarities in the clinical presentation and pathophysiological pathways of a condition, rather than solely on patients' chronological age. In the article by Abdullahi (2024), older adults are identified as the population most vulnerable to stroke, which may manifest as hemiparesis,

impaired trunk motor control, and severe immobility.

The finding that DBE can optimize respiratory function is particularly important in gerontological nursing. Older adults experiencing prolonged immobility are highly vulnerable to potentially fatal secondary complications, such as orthostatic pneumonia resulting from the stasis and accumulation of airway secretions. The studies by Herdayanti (2024) and Nagaraj (2023) focused on individuals with sedentary lifestyles associated with mechanical fatigue of the paravertebral muscles and impaired postural stability. Sedentary behavior is a major clinical characteristic observed among older adults with immobility (Effendi et al., 2024; Akbar et al., 2024; Kurniawan, 2024). When dysfunction or pain occurs in the lumbar region, individuals of any age, whether young or old, tend to consciously restrict their physical mobility. DBE has been shown to rehabilitate the deep core muscles and restore lumbar movement capacity (Annisa et al., 2024; Rumatrai et al., 2024; Rekawati et al., 2025; Rekawati et al., 2026).

The mechanical function of the diaphragm as a major postural stabilizer remains constant and does not undergo structural changes with increasing age. Whether in young adults (30 years), middle-aged adults (55 years), or older adults (70 years), diaphragmatic inspiration consistently stimulates an increase in intra-abdominal pressure (IAP). This internal pressure supports the vertebral column from within and produces an abdominal-bracing effect that stabilizes posture during movement. If the intervention has been shown to improve postural stability and reduce movement-related disability in adults, then, according to the same physiological principles, similar protective and therapeutic effects should also occur in older populations.

The rationale for applying this intervention is reinforced by the article by Nazir et al. (2026), which used a randomized controlled trial (RCT) design, considered the highest tier in the hierarchy of experimental research designs. The study specifically involved an older adult population aged 65–75 years. This article serves as the principal clinical bridge between the other findings and older adults. The empirical results of this RCT confirm that the physiological mechanisms of the diaphragm identified in studies

involving adults can produce clinically demonstrable improvements in gait velocity and reductions in fear of falling among community-dwelling older adults.

Conclusion and Recommendation

Based on the critical review of recent literature, it can be concluded that Diaphragmatic Breathing Exercise (DBE) has considerable potential and is highly suitable as a nursing intervention for older adults experiencing immobility. This intervention has been comprehensively demonstrated to improve core muscle stability through intra-abdominal pressure, reduce low-back-pain-related disability, optimize oxygen circulation to the muscles, and strengthen older adults' confidence in resuming physical activity.

Therefore, the findings of this review are expected to provide a strong theoretical basis for recommending DBE in the development of gerontological nursing care plans and future rehabilitation programs for older adults with immobility.

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Declaration of conflict of interest

The authors declare no competing interests.

Declaration on the Use of AI

No AI tools were used in the preparation of this manuscript.

Data Availability Statement

Data sharing is not applicable to this article.

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