



Effect of backward walking: A review article

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Abstract

The study looked into the physical and mental effects of backward walking (BW) in both clinical and healthy groups. A systematic review was conducted following PRISMA guidelines. This review included 20 peer-reviewed studies published between 2019 and 2025 that focused on human BW interventions assessing functional outcomes. Data were extracted and analyzed descriptively to find common trends in physical, biomechanical, and cognitive changes. The findings showed that BW significantly improved gait, balance, strength, and proprioception in clinical populations. It also helped boost neuromuscular control and prevent injuries in healthy people. Additionally, cognitive improvements were noted in neurological cases. The reviewed studies had limitations, including differences in participant characteristics, varying training methods, and inconsistencies in outcome measures. These issues made it difficult to compare studies directly and perform meta-analyses. Based on these findings, it is suggested that BW should be included as a safe, low-cost, and effective rehabilitation method. Future research should use standardized protocols, long-term designs, and larger sample sizes to strengthen the evidence and improve clinical use.

Keywords: Backward walking, physiotherapy rehabilitation, gait and balance improvement, knee osteoarthritis therapy, cognitive and motor function

Introduction

Backward walking (BW), also called retro walking, is a special way of moving where the usual movement of the arms and legs, as well as the direction the body faces, are reversed compared to normal walking [1]. Because there's less visual input and the steps are done in a different order, backward walking requires more coordination between the nerves and muscles, better balance, and increased body awareness [2, 3]. Hence, it's becoming more popular in physical therapy as a helpful method to improve gait, muscle strength, and posture in people who have difficulties in movement [4-6].

The lower body parts like the hips, thighs, knees, legs, ankles, and feet work together during normal walking.

While in backward walking, these parts move in the opposite order, which means the Quadriceps and the muscles that lift the toes (Dorsiflexors) need to be more active to keep the movement under control and maintain balance [7].

In musculoskeletal rehab, especially for Knee Osteoarthritis, backward walking has proven to be helpful.

It lowers the stress on the knee joint, reduces pain in the front of the knee, and strengthens the Quadriceps [1, 4]. Research by Alghadir *et al.* and Nisamudeen *et al.* found that people who did backwards walking programs experienced less pain, better body awareness, and improved function [1, 4]. Newer approaches, like walking on slopes or using support devices, have made this method more adaptable for different patients [9, 10].

In neurological conditions such as Stroke, Parkinson's disease, Multiple Sclerosis, and Cerebral Palsy, backwards walking has shown benefits.

It helps improve walking speed, balance, motor skills, and the connection between movement and thinking [5, 6, 11-17]. Studies using muscle activity sensors (EMG) show that

more of certain muscles like the Tibialis Anterior, Quadriceps, and Glutes are used during backwards walking. This increased activity helps improve the senses related to balance and body position [2, 3, 19]. Overall, the available evidence shows that backwards walking is a promising therapy that can help with both physical and mental recovery, and it also makes movement more efficient and improves the quality of life.

Materials & Methods

This review followed the PRISMA 2020 guidelines to make sure the process was thorough and open. We included 20 research papers published from 2019 onwards. These papers had to meet certain rules about what counted as a good study. They had to be in English, published in respected journals, and talk about backward walking with clear results. We didn't include studies that used animals, case reports, editorials, or papers that didn't have real data from research.

We looked for studies in three main databases: PubMed, Google Scholar, and Semantic Scholar. We focused on areas like medicine and physical therapy. We used specific words to find the right papers, like "backward walking," "retro-walking," "stroke rehabilitation," "knee osteoarthritis and backward walking," "cognitive effects of backward walking," and "backward walking in sports performance." This helped us find both studies about health and those about performance in sports.

We first found 40 studies and checked their titles and summaries. Then we read the full texts to decide which ones to include. If there were disagreements, we talked it over, and sometimes a third person helped to make a decision. We used a standard form to collect information from each study.

We wrote down things like when the study was published, what kind of study it was, who was involved, how long the walking intervention lasted, what was measured, and what the main findings were. Two people checked all the data to make sure it was correct and consistent.

This detailed method helped us gather a wide range of studies about backward walking in different groups of people and for various purposes, which made the overall findings more reliable.

Result

This review looks at 20 studies that looked at how backwards walking (BW) affects different groups of people and their outcomes. The studies show that BW works well in helping improve balance, walking, movement, and how well people can do daily tasks. This is especially true for people with medical conditions like stroke, Parkinson's disease, knee osteoarthritis, and cerebral palsy [1, 2-6, 11, 13-15, 17].

Most of the studies were high quality and used a method called randomized controlled trials [1, 2, 5, 6, 8, 9, 11-13, 17, 18, 20].

These studies found that BW led to important improvements in key tests like the Timed Up and Go Test (TUG), the Berg Balance Scale (BBS), and the 10-meter walk test (10MWT). The results back up earlier findings that BW helps with body mechanics and muscle function.

It activates leg muscles, improves awareness of the body, and strengthens the core [18, 20]. For people with stroke or Parkinson's, BW helps with both movement and thinking, leading to better balance, smoother walking, and fewer falls [5, 6, 11, 12, 14, 15, 20]. For people with knee osteoarthritis, BW reduces pain and improves muscle strength and movement [1, 4, 9, 21].

Some studies also checked how BW affects thinking, especially in people with Parkinson's and multiple sclerosis [14, 16].

These studies showed that doing tasks while walking backwards can help with multitasking, probably because the activity requires more mental effort. More research is needed to understand the link between walking backwards and brain function.

Discussion

Backward walking is becoming a versatile tool in rehabilitation, offering benefits to people with neurological issues, musculoskeletal injuries, older adults, and athletes. This type of movement requires more mental focus, muscle control, and balance than walking forward, which makes it especially helpful for those who have trouble with balance, uneven walking, or leg problems.

There is strong support for backward walking from many studies, including randomized controlled trials, systematic reviews, and meta-analyses.

These studies often include a fair number of participants, though the groups studied can be quite different from one another.

In Neurorehabilitation, backward walking helps stroke survivors walk better, improve their gait, and increase their balance.

It also helps people with Parkinson's disease and multiple sclerosis by lowering their risk of falling and improving their stability. Children with cerebral palsy also benefit from backward walking programs, gaining better mobility and balance.

For those with musculoskeletal issues, backward walking can reduce pain and improve function, while also building muscle strength and body awareness.

It's been used in treating knee osteoarthritis and helping people recover from injuries. Newer tools, like pressure-controlled treadmills, are being used to make this treatment more effective, though more long-term research is needed.

In older adults, backward walking can help identify those at risk of falling and is a useful part of fall prevention efforts.

Its ease of use makes it a good option for home-based therapy and virtual health services. Even in athletics, backward walking can help improve performance, trunk control, balance, and quickness.

However, more studies are needed to examine these benefits across different types of athletes over longer periods of time. Current research strengths include studying a variety of people, using reliable assessments, and following strict scientific methods. New technologies, such as virtual reality and smart devices, are also being used to make backward walking more adaptable and personalized.

There are some challenges too. Many studies involve only small groups, which can make it hard to apply the results to a wider population. The length and type of backward walking sessions can vary a lot, making it hard to compare results.

Some studies are not designed to prove cause and effect clearly, and not all report on how well participants and researchers were blinded. Access to advanced equipment can also be a barrier to wider use.

Looking ahead, there is potential to create standardized backward walking programs that are tailored to individual needs and conditions.

Integrating technology like virtual reality and wearable devices could help make interventions more personalized. Expanding tele-rehabilitation options could make backward walking more accessible.

Future research should also explore the mental, brain, and physical mechanisms behind backward walking's effects, as well as how different amounts of training affect outcomes. Long-term studies are needed to understand how backward walking benefits people of all ages and how to make it more widely available.

Conclusion

A review of 20 studies shows that walking backward is a safe and effective way to improve balance, walking, body awareness, strength, and reduce pain. It uses special pathways in the nervous and muscular systems, making it especially helpful for people with brain or muscle-related conditions.

Walking backward helped people with knee osteoarthritis feel less pain, move better, and improve their strength and how well they sense their joints.

Stroke survivors saw better walking, balance, and mental improvements when using virtual reality. It also helped those with Parkinson's, multiple sclerosis, cerebral palsy, and posture issues, showing it can be used in many situations.

For healthy and fit people, backward walking improves balance, quickness, and control of muscles and nerves, which can help prevent injuries and improve performance.

Even though some studies had small groups or different methods, the evidence shows backward walking is a low-cost and flexible tool for therapy and training.

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