ISSN 2664-8075 (Print) & ISSN 2706-5774 (Online)
South Asian Research Journal of Applied Medical Sciences
Abbreviated Key Title: South Asian Res J App Med Sci

| Volume-7 | Issue-5 | Sep-Oct- 2025 | **DOI: https://doi.org/10.36346/sarjams.2025.v07i05.002**

Review Article

A Review of Alterg® Anti-Gravity Treadmill Efficacy in Orthopedic Patients with Lower Limb Conditions

James M. McKivigan[1*], Gina M. Tulimero[1], Katherine Joines[1]

[1]School of Physical Therapy, Touro University Nevada, Henderson, Nevada, USA

***Corresponding Author:** James M. McKivigan
School of Physical Therapy, Touro University Nevada, Henderson, Nevada, USA

Article History
Received: 02.09.2025
Accepted: 21.10.2025
Published: 23.10.2025

Abstract: ***Background:*** Patients with lower extremity injuries or surgeries cannot perform basic everyday activities, such as going outside, walking, or running. Their consequent social isolation can result in various problems, including depression and metabolic syndrome. Anti-gravity treadmill training has been used in these patients, enhancing gait speed and endurance and improving quality of life. The authors performed a literature review to investigate published studies that reported the effectiveness of anti-gravity treadmill training in orthopedic patients with lower limb conditions. ***Methods:*** The following databases were searched until May 10, 2022: Pub Med, The Cochrane Library, Science Direct, PEDro, ClinicalTrials.gov, and Google Scholar. Original articles of any design reporting on AlterG® anti-gravity treadmill in orthopedic patients with lower limb conditions were included. Information related to the study design, sample size, participants, control group, AlterG® therapy, and critical findings of the study were extracted. The appraisal checklist for studies devised by the Joanna Briggs Institute (JBI) was used to assess the quality of the studies. ***Results:*** Fifteen research articles (totaling 201 participants) were retrieved and included for qualitative analysis. The sample size ranged from 1 (case report) to 29, with years of publication from 2011 to 2022. Four of the 15 studies were conducted in the United States, followed by the United Kingdom, Iran, Japan, China, Italy, Germany, Turkey, and Korea. Of the 15 studies included, most had a moderate to low risk of bias. Anti-gravity treadmill training was proven to be safe and beneficial for subjects with lower extremity fractures and those who underwent orthopedic surgery. Compared to those who received standard rehabilitation, these patients had more minor symptoms, a higher quality of life, significantly better gait, and reduced leg muscle atrophy. ***Conclusion:*** Anti-gravity treadmill training can assist patients with lower extremity injuries in walking upright by reducing biomechanical risks during neurological and orthopedic rehabilitation. It will help patients retrain their muscles, increase endurance, relearn how to walk, and improve their overall quality of life.

Keywords: Anti-gravity treadmill, lower limb osteoarthritis, rehabilitation, body weight support.

I. INTRODUCTION

Every year, around 1.35 million people die from traffic accidents, with millions more injured [1]. These patients experience lower extremity injuries or difficulty in performing activities of daily living and benefit from customized postoperative rehabilitation. Gradually returning to weight-bearing activities is essential in rehabilitating many lower extremity injuries. The goal of weight-bearing restriction is to protect the joint from the harmful effects of impact loading while allowing for safe and optimal tissue repair. After surgery, many patients suffer from early mobility and rehabilitation lower pain, fear, anxiety, and the risk of the venous thromboembolic condition. Walking and other progressive weight-bearing exercises are frequently prescribed during rehabilitation to aid in the return to normal function [2].

Anti-gravity training is a novel technique for treating orthopedic problems requiring limited weight-bearing. It has recently been proposed as an appealing approach to speed up functional rehabilitation while protecting healing structures from the detrimental consequences of impact loading.

Lower body positive pressure treadmills (LBPP) or anti-gravity treadmills allow normal treadmill walking and running while significantly lowering body weight. During walking training, these devices use a unique air pressure control

mechanism to change feelings of gravity in the lower extremities. This process decreases the patient's body weight by up to 80%, allowing them to walk and run without carrying all their weight [3]. The therapeutic effects of AlterG® training have been successfully examined in numerous clinical applications, including reducing knee forces following a knee transplant and enhancing gait speed and endurance [4]. It also helps patients with femoral fractures, prevents muscle atrophy, and improves their musculature [5], [6]. A previous study found that changing gravity to 50% of body weight lowered the force transferred to the knee during early recovery [7]. Furthermore, previous studies have found that using an anti-gravity treadmill for muscle strength and aerobic exercise improved walking and dynamic balance [8–10].

To date, there have been few comprehensive assessments of the effectiveness of the AlterG® anti-gravity treadmill in orthopedic patients with lower limb conditions. This study aimed to investigate if AlterG® was effective in patients with lower limb orthopedic conditions and to see if rehabilitation durations were reduced or if any other unanticipated advantages of AlterG® treatment could be found.

II. MATERIALS AND METHODS

Preferred Reporting Items for Systematic Review and Meta-Analyses (PRISMA) checklist guidelines were followed [11].

A. Search Strategy

Six databases (Pub Med, Science Direct, The Cochrane Library, PEDro, ClinicalTrials.gov, and Google Scholar) were used to complete a comprehensive literature search. The country, time, and publication language were not constraints during the literature search. This research did not include conference proceedings, letters to the editor, or practice guidelines.

The broad key terms used for the database searches were (lower limb fracture OR lower limb conditions OR lower extremity condition OR lower limb osteoarthritis) AND (anti-gravity treadmill OR Alter G). Only research articles were retrieved and reviewed.

B. Study Selection

After duplicates were removed, titles and abstracts were reviewed for eligibility. The abstracts and full-text papers of the identified studies were independently reviewed.

C. Inclusion and Exclusion Criteria for Considering Studies

The inclusion criteria included published studies of any design (including case reports) reporting on the efficacy or effectiveness of the anti-gravity treadmill (AlterG®) in orthopedic patients with lower limb conditions (such as bone fracture, acute ankle sprain, and orthopedic trauma of the lower extremities).

The exclusion criteria were [1] studies not related to the study, [2] studies not providing sufficient data or without results, [3] studies published in languages other than English or before 2008, [4] commentaries, guidelines, editorials, book chapters, letters to the editor, reviews, and metanalyses, [5] animal studies, [6] protocols, and [7] studies investigating interventions or involvements other than orthopedic and athletic injuries of the lower extremity.

If there were any, the reference lists of previous systematic reviews or metanalyses were also screened for relevant studies.

D. Data Extraction and Synthesis

The authors extracted data from the selected articles. Any discrepancies were resolved through discussion. The data were removed using a standard Excel spreadsheet. The summary and aspects of the included studies are presented in Table 1. The authors, publication year, study design, participants, control groups, interventions, and significant study findings were collected for each included study. A metanalysis was not performed because of the variability of the interventions, demographics, and outcome measures.

E. Study Quality Assessment

The quality of the selected studies was evaluated using the Joanna Briggs Institute's (JBI) Critical Appraisal Checklists for Research to assess the risk of bias in the included studies. A study's chance of bias was considered high if the "yes" score was less than 49%. Studies with a score of 50%–69% had a moderate risk of bias, while those with a score of 70% or more had a low risk of bias.

Discussion and consensus were used to resolve disagreements between the authors.

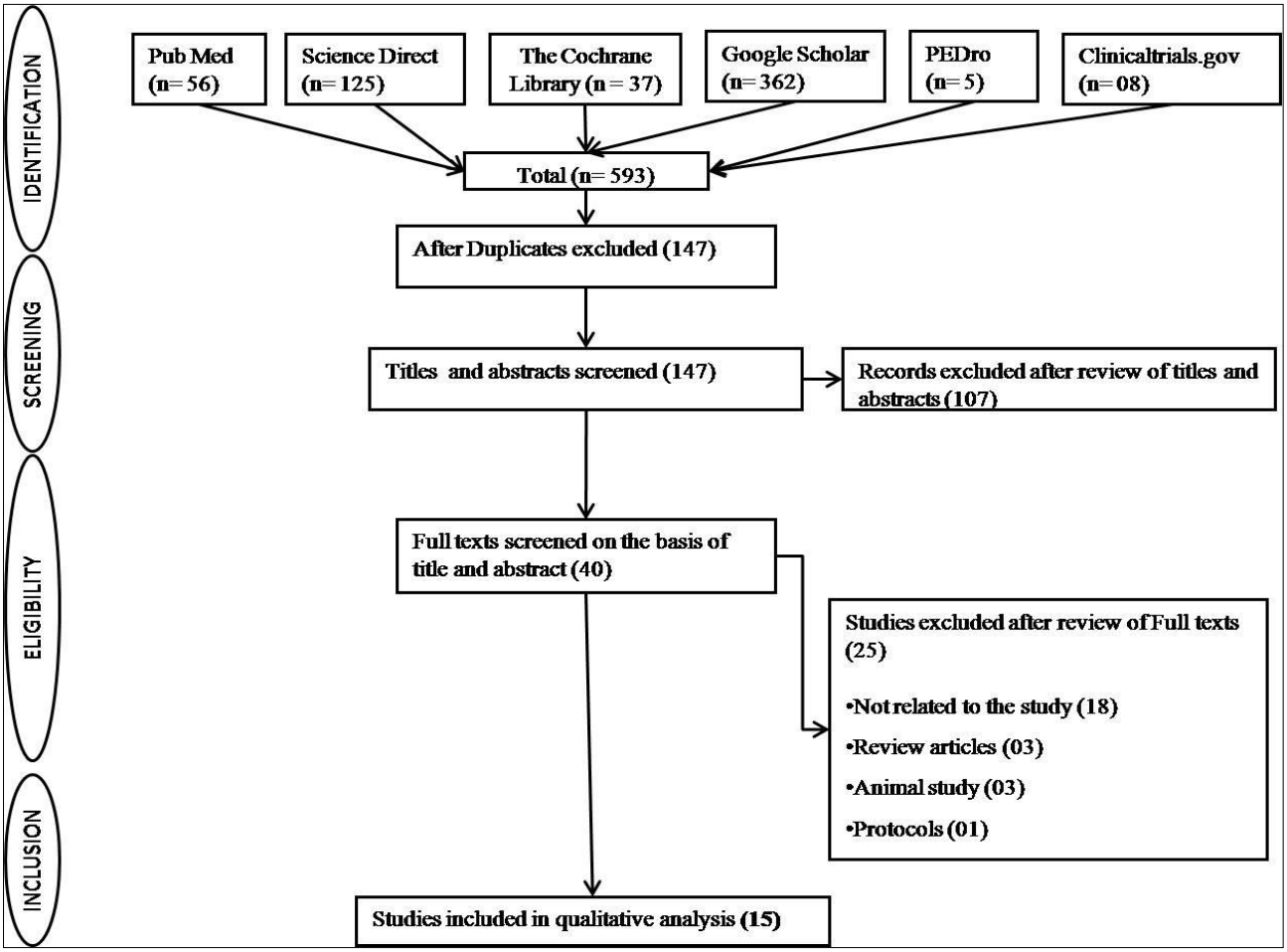

Figure 1: Flow chart showing the process of selecting or rejecting articles for inclusion in the study

III. RESULTS

A. Identification and Description of Included Studies

There were 593 citations, with 56 from PubMed, 362 from Google Scholar, 125 from Science Direct, 37 from The Cochrane Library, 8 from ClinicalTrials.gov, and 5 from PEDro. Among these, 447 duplicate studies were removed. One hundred seven studies were eliminated after the titles and abstracts of 147 articles were evaluated. The remaining 40 articles fulfilled the full-text review criteria. After applying the exclusion criteria, 25 full texts were excluded, and the remaining 15 articles were included in the final qualitative analysis. The study selection process is displayed in the flow diagram (Figure 1). The 15 articles comprised three randomized control trials, six prospective studies, one prospective and one retrospective controlled trial, one non-randomized study, one matched control study, and two case reports.

B. Characteristics of the Included Studies

Each included study's key demographic and clinical features are summarized in Table 1. Two hundred-one patients participated in the studies. The sample size ranged from one to 29 subjects, and the articles were published between 2011 and 2022. Out of 15 studies, four were conducted in the United States, two in the United Kingdom, Iran, and Japan, and one in China, Italy, Germany, Turkey, and Korea.

C. Efficacy of AlterG® in Patients with Lower Limb Orthopedic Conditions

AlterG® anti-gravity treadmill was safe and effective under several conditions. These included patients with [1] complete tendon ruptures and insertional repairs; [2] instrumented knee prosthesis; [3] total knee arthroplasty; [4] lower limb osteoarthritis; [5] cerebral palsy; [6] knee osteochondral surgery; [7] total hip arthroplasty; [8] knee osteoarthritis; [9] femoral fracture; [10] Parkinson disease; [11] post-stroke gait impairment; [12] ankle or tibial plateau fractures; and [13] lower limb burn injury.

According to Saxena and Granot [3], AlterG® anti-gravity treadmill training may be advantageous and desired for athletic patients in terms of a quicker return to exercise. AlterG® patients began their initial treadmill run at 70% of their body weight at 13.9 ± 3.4 weeks, 85% at 17.6 ± 3.9 weeks, and 18.1 ± 3.9 weeks, with no adverse consequences [3].

AlterG® treadmill might be beneficial for people recovering from lower extremity surgery. The maximal axial tibiofemoral force ranged from 5.1 times body weight at a treadmill speed of 4.5 mph (2.01 m/s) and a pressure setting of 100% body weight to 0.8 times body weight at 1.5 mph (0.67 m/s) and a pressure level of 25% body weight, according to Patil *et al.* [7]. Walking speed and treadmill response force were shown to be correlated with peak knee forces. Patients who had received anti-gravity treadmill therapy had a better gait than those in the control group. Those with tibial plateau fractures had less muscle atrophy, according to research by Palke *et al*. [13]. The Foot and Ankle Outcome Score and the Knee Injury and Osteoarthritis Outcome Score showed no significant differences [13]. Patients with tibial plateau fractures in the intervention group had a 3 cm wider thigh circumference than those in the control group ($P = 0.08$) [13]. Between the groups, the change in the Dynamic Gait Index from 12 weeks to 12 months was different ($P = 0.04$) [13].

In the study by Bugbee *et al*. [14], AlterG® anti-gravity treadmill device was found to be safe and feasible in a preliminary trial, during which all total knee arthroplasty patients completed rehabilitation procedures without experiencing any complications. In the AlterG® group, sports or recreation, quality of life, and pain scores improved. Another study by Kawae *et al*. [15] found that exercise treatment on an anti-gravity treadmill improved cardiopulmonary function in individuals with lower limb osteoarthritis. Pain before walking did not differ between level ground and AlterG® walking, but pain after walking was greater on level ground walking than on AlterG® walking, according to the study.

Rasooli *et al*. [4] and Lotfian *et al*. [16] demonstrated that AlterG® training might be a therapeutic intervention for improving postural stability, lower limb performance, and locomotion in children with cerebral palsy. According to these investigations, the major gait, kinematic, and kinetic characteristics improved following AlterG® training, and there was a consistent increase in postural stability.

The potential effect of anti-gravity treadmills in enhancing self-efficacy and subjective knee function in preparation for a return to athletics was emphasized in a case study by Hambly *et al*. [17]. The case was a 39-year-old woman who had undergone osteochondral surgery on her knee. After using an anti-gravity treadmill, the authors noted improvements in the Self-Efficacy for Rehabilitation Outcomes Scale and the Knee Self-Efficacy Scale. In another case report [18], a 65-year-old woman with knee osteoarthritis had 30 minutes of AlterG® training six days a week for two weeks. The 10-m walk test (10MWT) and Timed Up and Go (TUG) tests improved after two weeks of AlterG® intervention, although the Visual Analog Scale (VAS) score declined. The right knee flexion-extension range of motion (ROM) gradually improved. AlterG® improved spatio-temporal parameters, knee flexion or extension gait patterns, and associated muscular strength while relieving pain.

Kim *et al*. [2] found that anti-gravity treadmill exercises enhanced hip extensor and gluteus muscular strength more than traditional treatment in patients with femoral fractures. In both groups, hip flexors and extensors' isokinetic muscular strength and endurance improved significantly ($p < 0.05$). Before and after the intervention and across the groups, statistically significant increases in muscle activity were observed.

Anti-gravity treadmill training reduced gait freezing and mobility in Parkinson's patients, according to Baizabal-Carvallo and colleagues [19]. Patients demonstrated improvements in the Freezing of Gait Questionnaire ($p = 0.001$) and a mean decrease in the Timed Up and Go (TUG) test ($p = 0.004$) when compared to the baseline [19]. Eighty-four percent reported moderate or significant improvement in gait.

Using a lower body positive pressure support system (LBPPSS) in treadmill-based gait training appears to have potential in post-stroke rehabilitation. AlterG® shaped muscle activation phases and gait cycle characteristics in patients, but it enhanced total muscle activity in healthy controls. Calabrò *et al.* [20] found that AlterG® provided patients with higher quantitative but not qualitative gait attributes compared to standard treadmill gait training.

Morley *et al.* [21] found that an anti-gravity treadmill simulated a decrease in BMI of 25 and resulted in a substantial reduction in pain in obese individuals with foot and ankle arthritis. From the baseline to a BMI of 25, the mean pain scores improved by 32% ($p = 0.04$). From a BMI of 25 to 30, the paired analysis revealed a substantial reduction in pain levels ($p = 0.016$). The arthritis symptoms were relieved by a simulated weight decrease from a high to a normal BMI. Özkal *et al*. [22] evaluated treadmill-to-overground gait training in patients with lower limb burn injuries. Both gait training regimens benefited individuals with lower limb burn injury (LLBI) because they increased gait symmetry and functional mobility.

D. Quality Assessment of Included Studies

Two reviewers independently evaluated all the included studies. Most of the studies in this analysis had a low to moderate risk of bias.

Table 1: Characteristics of the included studies

Author	Year	Study design	Condition	Sample size	Age	Intervention	Control	Results	Conclusion
Saxena & Granot[3]	2011	Prospective controlled clinical trial	Complete tendon ruptures and insertional repairs.	3 females 5 males	42.1 ± 10.6	Using AlterG® treadmill	Complete ruptures (n = 2) and insertional repairs (n = 6)	With no adverse effects, AG patients began their first treadmill run at 70% of their body weight at 13.9 ± 3.4 weeks, 85% at 17.6 ± 3.9 weeks, and outside at 18.1 3.9 weeks. The control group took 20.4 ± 4.1 weeks to resume running.	For athletes, a quicker return to action may be helpful and desirable. After Achilles surgery, patients were cleared to run outside if they could run at 85% of their body weight.
Patil *et al.*[7]	2013	Prospective study	Instrumented knee prosthesis	3 males 1 female	77.3 ± 7.04	Using lower body positive pressure (LBPP) treadmills	N/A	At a treadmill speed of 4.5 mph (2.01 m/s) and a pressure setting of % bodyweight, the peak axial tibio-femoral force varied from 5.1 times BW to 0.8 times BW at 1.5 mph (0.67 m/s) and a pressure setting of 25% BW. Walking speed and treadmill reaction force were shown to be substantially correlated with peak knee force.	The LBPP treadmill might be a beneficial tool for individuals recovering from lower-extremity surgery.
Bugbee *et al.*[14]	2016	Randomized controlled trial	Total knee arthroplasty surgeries	7 males 7 females	66.5 ± 7.8	Anti-gravity treadmill device for total knee arthroplasty (TKA) rehabilitation	15 controls	All the patients finished their rehabilitation programs without any complications. Sports or recreation, quality of life, and pain scores all improved in the AlterG® group. Therapists were completely satisfied with AlterG® on a subjective level.	AlterG® anti-gravity treadmill device was shown to be safe and feasible in this pilot study.
Kawae *et al.*[15]	2017	Prospective study	Lower limb osteoarthritis	8 males 12 females	62.8 ± 10.8	Using an anti-gravity treadmill	N/A	Pain levels before and after walking did not differ substantially between level ground and AlterG® walking, but pain levels after walking were considerably higher with level ground walking than with AlterG® walking.	Exercise therapy on an anti-gravity treadmill improved cardiopulmonary function in individuals with lower limb osteoarthritis.
Lotfian *et al.*[16]	2017	Prospective study	Cerebral palsy	2 males 2 females	10.5 ± 1.7	45-minute AG training program, 3 times a week for 8 weeks.	N/A	After AlterG® training, major gait, kinematic, and kinetic metrics improved and remained stable.	AlterG® training can be used as a therapy method to help children, with CP improving their lower limb function and mobility.

Baizabal-Carvallo *et al*.[19]	Kim *et al*.[2]	Liang *et al.*[18]	Mikami *et al.*[10]	Hambly *et al.*[17]	Rasooli *et al.*[4]
2020	2020	2019	2019	2017	2017
Prospective study	Randomized controlled trial	Case report	Retrospective controlled clinical trial	Case report	Prospective study
Parkinson' s disease	Femoral fracture	Knee osteoarthritis	Total hip arthroplasty (THA) surgeries	Knee osteochondral surgery	Cerebral palsy
9 Females 10 Males	4 Females 13 Males	1 Female	7 males 15 females	1 Female	2 males 2 females
72.7 ± 10.1	48.8 ± 5.96	65	67.4 ± 10.5	39	9.13 ± 3.33
Anti-gravity treadmill training twice a week for 4 consecutive weeks	Anti-gravity treadmill training	30 min AG training for 6 days/week for 2 weeks	Using an anti-gravity treadmill	Using an anti-gravity treadmill	45-minute AG training program, 3 times a week for 8 weeks.
N/A	17 controls	N/A	Conventional group (n = 22)	N/A	N/A
Patients demonstrated improvement in the Freezing of Gait Questionnaire (p = 0.001) and a mean decrease of 7 seconds in the Timed Up and Go (TUG) test (p = 0.004) compared to baseline. A moderate or major improvement in gait was reported in 84%.	In both groups, isokinetic muscular strength and endurance of hip flexors and extensors improved significantly ($p < 0.05$). Before and after the intervention, and between the groups, there were statistically significant increases in muscle activity.	The 10-m walk tests (10MWT) and Timed Up and Go (TUG) tests improved considerably after 2 weeks of AlterG® intervention, although the Visual Analog Scale (VAS) score declined. The right knee flexion-extension range of motion (ROM) was gradually raised.	Two weeks following surgery after conducting a devised hybrid physiotherapy, the values of knee extension muscle strength and 6MD were not worse in the hybrid group than conventional group. Only in the conventional group did knee extension muscular strength and 6MD values drop considerably compared to the preoperative values.	Improvements in Self-Efficacy for Rehabilitation Outcome Scale, Knee Self-Efficacy Scale. A rise from 62.1 in week 1 to 86.2 in week 8 is clinically significant (39%).	Following AlterG® training, the average FA (fractional anisotropy) value of the white matter of the cerebellum increased. There was a consistent increase in postural stability.
In patients with Parkinson' s disease, anti-gravity treadmill exercise improved gait freezing and mobility.	Anti-gravity treadmill training enhanced hip extensor and gluteus muscle strength much more than traditional therapy, which may be useful for individuals who have had hip fracture surgery.	AlterG® reduced discomfort and improved spatio-temporal metrics, knee flexion or extension gait patterns, and associated muscular strength.	Lower limb muscular strength and endurance were maintained in the hybrid group, indicating that hybrid physiotherapy might help patients retain physical functions following THA surgery.	The potential effect of anti-gravity treadmills in improving self-efficacy and subjective knee function in preparation for a comeback to athletics is highlighted in this case study.	AlterG® training might be regarded a therapeutic method for improving postural stability in children with cerebral palsy.

Özkal *et al.*[22]	2022	A matched control study	Lower limb burn injury	9 Females 5 Males	33.6 ± 12.4	Treadmill versus overground gait training	Overground group (*n* = 14)	When the differences between the overground and treadmill groups were compared, the treadmill group had considerably larger changes in kinesiophobia and TUG values. In patients with LLBI, both overground and treadmill gait training increased velocity and cadence, as well as gait symmetry for step length, swing, and posture.	Both gait training regimens were beneficial to individuals with LLBI because they increased gait symmetry and functional mobility.
Palke *et al.*[13]	2022	Prospective randomized trial	Ankle or tibial plateau fractures	29 (Intervention group)	41 ± 12	Anti-gravity treadmill rehabilitation	24 patients (standard protocol)	The Foot and Ankle Outcome Score and the Knee Injury and Osteoarthritis Outcome Score showed no significant differences. The difference in the Dynamic Gait Index between the groups from 12 weeks to 12 months was significant (*P* = 0.04). Tibial plateau fracture patients in the intervention group had a 3 cm greater thigh circumference than those in the control group (*P* = 0.08).	Patients who had received anti-gravity treadmill therapy exhibited improved gait and less muscle atrophy than those in the control group.
Morley *et al.*[21]	2021	Non-randomized, prospective trial	Obese patients with foot and ankle arthritis	16 Females 3 Males	64.8 ± 7.9	Anti-gravity treadmill	N/A	Pain was significantly reduced when the BMI was reduced to 25. From baseline to BMI 25, mean pain ratings improved by 32% (*p* = 0.04). From a BMI of 30 to 25, paired analysis revealed a substantial reduction in pain levels (*p* = 0.016).	Arthritic symptoms were eased by simulating a weight decrease from a high to a normal BMI.
Calabrò *et al.*[20]	2020	Randomized controlled trial	Post-stroke gait impairment	15 Females 10 Males	65 ± 6	24 daily sessions of gait training using either AlterG® device or conventional treadmill gait training (TGT)	25 age-matched healthy controls (HC) 25 in TGT group	In patients, AlterG® shaped muscle activation phases and gait cycle aspects, but in HC it just raised total muscle activity. In comparison with TGT, AlterG® presented patients with higher quantitative but not qualitative gait qualities.	Lower body positive pressure support system (LBPPSS) treadmill-based gait training appears to be helpful in post-stroke rehabilitation.

IV. DISCUSSION

Most orthopedic surgeries rely on a speedy return to a full range of motion, normal strength, and function to succeed. When seeking to return to activities after an accident, the anti-gravity treadmill may be a beneficial tool for treatment. AlterG® anti-gravity treadmill provides a unique approach to exercise for those who are obese, have lower extremity injuries, or are recuperating from various conditions. The device reduces stress on the user's joints, ligaments, and tendons when walking and running by lowering ground reaction forces.

AlterG® anti-gravity treadmill's effectiveness in patients with lower-limb problems has received little attention. Treadmill training, like overground training, improved gait parameters and balance in people with various neurological diseases [23]. Individuals suffering from lower extremity injuries have discovered that rehabilitation equipment, such as the anti-gravity treadmill, can help them return to activities after an accident. However, further research is needed to determine its usefulness. The writers conducted an in-depth review of the literature. It has been reported that individuals

with lower limb injuries, Parkinsonism, cerebral palsy, and other disorders that present problems in walking or running might benefit from the anti-gravity treadmill.

In this review, the authors found that AlterG® is safe and effective in various conditions, particularly after surgeries and injuries to the lower extremities. Anti-gravity treadmill training was beneficial in patients with fractures to the lower extremities who received this therapy after surgery. These patients had fewer symptoms, a better quality of life, a much-improved gait, and less leg muscle atrophy than those who received routine rehabilitation.

According to Bello *et al.,* [24], treadmill exercise mainly improves balance and stride length in patients with Parkinson's disease. Anti-gravity treadmill training enhanced gait freezing and mobility in patients with Parkinsonism [19]. In Grecco *et al.*'s [25] study, treadmill training is more successful than overground training in improving functional balance in children with cerebral palsy. In addition, it has been demonstrated to alleviate muscular stiffness, reduce reflex hyperexcitability, and improve corticostriatal tract function in children with cerebral palsy [26]. Furthermore, these individuals improved dynamic balance and postural stability [27].

Bugbee *et al.,* [14] evaluated the safety of AlterG® since patient safety is an essential attribute of any postoperative rehabilitation procedure, especially in an older population after major orthopedic surgery. AlterG® is a postoperative rehabilitation adjunct found to be safe, well-received by patients and therapists, and delivers clinical, functional results comparable to typical postoperative rehabilitation. During the early stages of treatment, rehabilitation is suggested to avoid systemic complications induced by long-term immobilization and bed rest. In a study, anti-gravity treadmill training improved knee muscle function in individuals with meniscus rupture and knee osteoarthritis [10]. In addition, anti-gravity treadmill training has increased spatiotemporal characteristics, knee gait pattern, and muscular strength in individuals with knee osteoarthritis, resulting in improved activities of daily living [2], [10]. AlterG® anti-gravity treadmill is a safe, feasible, and beneficial tool for patients recovering from lower-extremity injuries. Patients who used an anti-gravity treadmill for rehabilitation reported improved gait, reduced muscular atrophy, and a faster return to activity after an injury or surgery.

REFERENCES

1. Road traffic injuries. Accessed May 24, 2022. https://www.who.int/news-room/fact-sheets/detail/road-traffic-injuries
2. Kim BR, Kim SR, Nam KW, Lee SY, Park YG, Suh MJ, *et al*. Effects of body weight support and gait velocity via anti-gravity treadmill on cardiovascular responses early after total knee arthroplasty. *Medicine (Baltimore)*. 2020;99(14):e19586. doi:10.1097/MD.0000000000019586
3. Saxena A, Granot A. Use of an anti-gravity treadmill in the rehabilitation of the operated Achilles tendon: a pilot study. *J Foot Ankle Surg*. 2011;50(5):558–561. doi:10.1053/j.jfas.2011.04.045
4. Rasooli AH, Birgani PM, Azizi S, Shahrokhi A, Mirbagheri MM. Therapeutic effects of an anti-gravity locomotor training (AlterG®) on postural balance and cerebellum structure in children with Cerebral Palsy. *IEEE Int Conf Rehabil Robot*. 2017;2017:101–105. doi:10.1109/ICORR.2017.8009229
5. Lee RYW, Munn J. Passive moment about the hip in straight leg raising. *Clin Biomech*. 2000;15(5):330-334. doi:10.1016/S0268-0033(99)00091-1
6. Oh MK, Yoo JI, Byun H, Chun SW, Lim SK, Jang YJ, *et al*. Efficacy of Combined Anti-gravity Treadmill and Conventional Rehabilitation After Hip Fracture in Patients With Sarcopenia. *J Gerontol A Biol Sci Med Sci*. 2020;75(10):e173–e181. doi:10.1093/gerona/glaa158
7. Patil S, Steklov N, Bugbee WD, Goldberg T, Colwell CW, D'Lima DD. Anti-gravity treadmills are effective in reducing knee forces. *J Orthop Res*. 2013;31(5):672–679. doi:10.1002/jor.22272
8. Grabowski AM. Metabolic and biomechanical effects of velocity and weight support using a lower-body positive pressure device during walking. *Arch Phys Med Rehabil*. 2010;91(6):951–957. doi:10.1016/j.apmr.2010.02.007
9. Berthelsen MP, Husu E, Christensen SB, Prahm KP, Vissing J, Jensen BR. Anti-gravity training improves walking capacity and postural balance in patients with muscular dystrophy. *Neuromuscul Disord*. 2014;24(6):492–498. doi:10.1016/j.nmd.2014.03.001
10. Mikami Y, Orita N, Yamasaki T, Kamijo Y, Kimura H, Adachi N. The Effect of Simultaneous Anti-gravity Treadmill Training and Electrical Muscle Stimulation After Total Hip Arthroplasty: Short Follow-Up Time. *Ann Rehabil Med*. 2019;43(4):474–482. doi:10.5535/arm.2019.43.4.474
11. Knobloch K, Yoon U, Vogt PM. Preferred reporting items for systematic reviews and meta-analyses (PRISMA) statement and publication bias. *J Craniomaxillofac Surg*. 2011;39(2):91–92. doi:10.1016/j.jcms.2010.11.001
12. critical-appraisal-tools - Critical Appraisal Tools | JBI. Accessed April 5, 2022. https://jbi.global/critical-appraisal-tools
13. Palke L, Schneider S, Karich B, Mende M, Josten C, Böhme J, et al. Anti-gravity treadmill rehabilitation improves gait and muscle atrophy in patients with surgically treated ankle and tibial plateau fractures after one year: A randomised clinical trial. *Clin Rehabil*. 2022;36(1):87–98. doi:10.1177/02692155211037148

14. Bugbee WD, Pulido PA, Goldberg T, D'Lima DD. Use of an Anti-Gravity Treadmill for Early Postoperative Rehabilitation After Total Knee Replacement: A Pilot Study to Determine Safety and Feasibility. *Am J Orthop*. 2016;45(4):E167–173.
15. Kawae T, Mikami Y, Fukuhara K, Kimura H, Adachi N. Anti-gravity treadmill can promote aerobic exercise for lower limb osteoarthritis patients. *J Phys Ther Sci*. 2017;29(8):1444–1448. doi:10.1589/jpts.29.1444
16. Lotfian M, Kharazi MR, Mirbagheri A, Dadashi F, Nourian R, Mirbagheri MM. Therapeutic effects of an anti-gravity treadmill (AlterG®) training on gait and lower limbs kinematics and kinetics in children with cerebral palsy. *IEEE Int Conf Rehabil Robot*. 2017;2017:170–174. doi:10.1109/ICORR.2017.8009241
17. Hambly K, Poomsalood S, Mundy E. Return to running following knee osteochondral repair using an anti-gravity treadmill: A case report. *Phys Ther Sport*. 2017;26:35–40. doi:10.1016/j.ptsp.2017.05.004
18. Liang J, Lang S, Zheng Y, Wang Y, Chen H, Yang J, *et al.,* The effect of anti-gravity treadmill training for knee osteoarthritis rehabilitation on joint pain, gait, and EMG: Case report. *Medicine (Baltimore)*. 2019;98(18):e15386. doi:10.1097/MD.0000000000015386
19. Baizabal-Carvallo JF, Alonso-Juarez M, Fekete R. Anti-Gravity Treadmill Training for Freezing of Gait in Parkinson's Disease. *Brain Sci*. 2020;10(10):E739. doi:10.3390/brainsci10100739
20. Calabrò RS, Billeri L, Andronaco VA, Accorinti M, Milardi D, Cannavò A, *et al.,* Walking on the Moon: a randomized clinical trial on the role of lower body positive pressure treadmill training in post-stroke gait impairment. *J. Adv. Res.* 2020;21:15–24. doi:10.1016/j.jare.2019.09.005
21. Morley WJ, Dawe E, Boyd R, Creasy J, Grice J, Marsland D, et al. Simulated weight reduction using an anti-gravity treadmill - A pilot study of the impact of weight loss on foot and ankle arthritis. *Foot Ankle Surg*. 2021;27(7):809–812. doi:10.1016/j.fas.2020.10.009
22. Özkal Ö, Kısmet K, Konan A, Hayran M, Topuz S. Treadmill versus overground gait training in patients with lower limb burn injury: A matched control study. *Burns*. 2022;48(1):51–58. doi:10.1016/j.burns.2021.04.019
23. Lura DJ, Venglar MC, van Duijn AJ, Csavina KR. Body weight supported treadmill vs. overground gait training for acute stroke gait rehabilitation. *Int J Rehabil Res.* 2019;42(3):270–274. doi:10.1097/MRR.0000000000000357
24. Bello O, Sanchez JA, Lopez-Alonso V, Márquez G, Morenilla L, Castro X, et al. The effects of treadmill or overground walking training program on gait in Parkinson's disease. *Gait Posture*. 2013;38(4):590–595. doi:10.1016/j.gaitpost.2013.02.005
25. Grecco LAC, Tomita SM, Christovão TCL, Pasini H, Sampaio LMM, Oliveira CS. Effect of treadmill gait training on static and functional balance in children with cerebral palsy: a randomized controlled trial. *Braz J Phys Ther*. 2013;17:17–23. doi:10.1590/S1413-35552012005000066
26. Parvin S, Taghiloo A, Irani A, Mirbagheri MM. Therapeutic effects of anti-gravity treadmill (AlterG®) training on reflex hyper-excitability, corticospinal tract activities, and muscle stiffness in children with cerebral palsy. *IEEE Int Conf Rehabil Robot*. 2017;2017:485–490. doi:10.1109/ICORR.2017.8009295
27. Dadashi F, Kharazi MR, Lotfian M, Shahroki A, Mirbagheri A, Mirbagheri MM. The Effects of Lower Body Positive Pressure Treadmill Training on Dynamic Balance of Children with Cerebral Palsy. *Annu Int Conf IEEE Eng Med Biol Soc*. 2018;2018:2487–2490. doi:10.1109/EMBC.2018.8512837