

Author Year Country Research Design Score Total Sample Size	Methods	Outcome
Midik et al. 2020 Turkey RCT PEDro = 4 Level 2 N = 30	Population: 30 males with traumatic incomplete SCI and a LEMS of ≥ 10; mean (range) age 36.6 (19-53) years; AIS C (n = 16) and AIS D (n = 14); injury level T12 (n = 7) and L1-L3 (n = 23); median time since injury for the RAGT and control groups was 5 and 24 months, respectively. Treatment: All patients received regular physiotherapy (consisting of ROM exercises, strengthening exercises, body stabilization, self-care ability, and ground walking training) for 5 times a week for a total of 5 weeks. Participants were randomized into two groups: • RAGT group (n = 15): Received additional RAGT (using Lokomat) for 3 times a week (each session lasted 30 min) for a total of 5 weeks. Treadmill speed and BWS was increased individually. • Control group (n = 15). Nothing additional – regular PT only. Outcome Measures: LEMS and WISCI II were assessed at baseline (t1), at the end of the treatment (t2), and at three months after the treatment (t3).	1. Both groups improved in LEMS and WISCI II (within group changes between T2-T1 and T3-T1 [but not between T3-T2] were statistically significant in both groups). Only the improvement between T3-T1 was significantly (p = 0.049) higher in RAGT group (2.1 ± 0.5) than in control group (0.6 ± 0.2) for LEMS. 2. The improvement in the LEMS scores and the SCIM-III scores was significantly higher in the RAGT group at the end of the fifth week and at three months (p=0.017; p=0.038).
Piira et al. 2019a Norway RCT PEDro = 7 Level 1 N = 20	Population: Participants with chronic and motor incomplete SCI; 15 males and 5 females; mean age 50 years; level of injury cervical (n = 8), thoracic (n = 8) and lumbar (n = 4); AIS C (n = 6) and AIS D (n = 14); and median time since injury 4 years. Treatment: Participants were randomly divided in two groups: • Control group (n = 10): Participants received usual care (which might include overground walking).	1. The training intervention was well tolerated with no AEs, and there were only minor side-effects, such as superficial abrasions, which did not interfere with the regular training program. 2. In each group, 2 participants with AIS grade C were unable to walk at baseline and did not gain independent walking post-intervention. Thus, only 7 participants in each group were

	Intervention group (n = 10): A treadmill with BWS system was used for 60 days training, with 2 daily sessions of BWSTT with manual assistance for a total of 90 min per day, 5 days per week for 3 4-weeks periods; with the aim of reducing the BWS to <40% and/or increase walking speed towards normal (3–5 km/h). BWSTT also included overground training. The participants performed home exercises between the training periods. Outcome Measures: 10MWT, distance walked with use of necessary walking aids (6MWT), LEMS, BBS, and mFRT were assessed at baseline and 2–4 weeks after program.	available for post-intervention walking testing: - Both groups walked faster at post-test; however, the difference between the groups was small (0.1 m/s [95% CI –0.2, 0.4], $p > 0.05$). - Distance walked improved approximately the same amount in both groups. - There was no significant difference in change between the groups for BBS, –1.2 points 95% CI (–4.3, 1.9), $p = 0.42$. 3. In the intervention group, LEMS increased by a mean of 2.1 points (± 2.8, $p = 0.05$), whereas there was little change in the control group (mean change –0.6 (± 5.1), $p = 0.75$). The difference in mean changes between the groups was 2.7 (95% CI –1.4, 6.8, $p = 0.19$).
Piira et al. 2019b Norway RCT <u>PEDro = 7</u> Level 1 N = 24	Population: 24 participants wheelchair-dependents with or without some walking function and with chronic incomplete SCI; 9 males and 15 females; mean age 50.5 years; level of injury cervical (n = 10), thoracic (n = 9); and mean time since injury 18 years. Treatment: Participants were randomized to either intervention (n = 7) or control group (n = 12). - Intervention participants received 60 days of RALT (with the use of Lokomat®), with 3 training sessions per week over a period of 6 months. Each session included preparation (≈ 20–30 min), stepping on a treadmill (20–60 min) with BWS <40% of the participants' initial weight, and a few minutes of overground walking and/or exercises on the treadmill. - Control participants received low-intensity usual care, usually 1–5 times per week.	- The intervention was well tolerated with no AEs, except for minor issues such as small leg abrasions. - The recovery of walking function was not achieved in any participant. - Walking speed and endurance: Despite randomization, the groups differed in several aspects: All participants in the intervention group had some walking function, whereas 3 in the control group were unable to walk. Also, the controls with some baseline walking function had twice the walking speed and endurance compared with the intervention group. - Both groups improved or maintained their walking speed (10MWT) at post-test. However, the group difference in improvement was small and not statistically significant. - Mean endurance (6MWT), improved more in the control group (23.1 vs. 6.6 m, $p > 0.05$) than the intervention group.

	Outcome Measures: Full or partial recovery of walking function, walking speed and endurance (10MWT and 6MWT); LEMS; BBS; and mFRT were assessed within 30 days before randomization, and post-evaluation within 14–30 days after completion of the trial.	4. In the intervention group, LEMS increased by 5.4 points, vs. 0.2 in controls.
Wu et al. 2018 USA RCT PEDro = 6 Level 1 N = 14	Population: 14 participants with incomplete SCI; 10 males, 4 females. • Robotic group: Mean age: 48.4 years; level of injury C2-T7; ASIA C (n=2) and ASIA D (n=5); and mean time since injury: 5.8 years • Treadmill only: Mean age: 48.1 years; level of injury C3-T10; ASIA C (n=0) and ASIA D (n=7); and mean time since injury: 9.4 years Treatment: Participants were randomly assigned to one of two groups: • Robotic treadmill training (n=7): A custom-designed cable-driven robotic gait training system (3DCaLT) was used to provide controlled forces to the pelvis and legs during treadmill walking. A bilateral pelvis assistance load was applied to the pelvis from heel strike to mid-stance on the ipsilateral leg for facilitating weight shifting. The peak force was set at approximately 9% of body weight (a constant magnitude force was applied during the loading period), although adjusted based on the tolerance of participants. In addition, an assistance load was applied to both legs from toe off to mid-swing to facilitate leg swing with magnitude of the force was determined using an adaptive control algorithm. • Treadmill only training (n=7): No assistance force was applied during treadmill training. Participants were fitted with an overhead harness that attached to a counterweight support system. BWS	1. Between-group comparisons indicated that gains in 6MWT distance were greater for the robotic training group than that for treadmill-only training group ($P = 0.03$), although gains in self-selected and fast walking speeds were not significantly different between the two groups ($P = 0.06$ and $P = 0.12$ for self-selected walking speed and fast walking speed, respectively). 2. 6MWT significantly increased after robotic treadmill training ($P = 0.02$) (from 120 ± 37 m to 157 ± 59 m) after robotic training ($P = 0.04$) and remained to be significantly greater than baseline levels at the follow-up test, that is, 151 ± 60 m. The gain in 6MWT was greater than the MCID of adults with pathology (i.e., >14.0–30.5 m and is unknown for patients with SCI [Bohannon & Crouch 2017]). a. Self-selected walking speed tended to increase after robotic treadmill training, that is, from 0.33 ± 0.15 m/sec to 0.39 ± 0.20 m/sec after training, although this was not significant ($P = 0.07$) and was 0.38 ± 0.19 m/sec at the follow-up test. The gain in self-selected walking speed exceeded the MCID of patients with SCI, that is, ≥ 0.05 m/sec (Musselman et al. 2009). b. There were no significant changes in fast walking speed ($P = 0.16$) after robotic treadmill training and at follow-up tests. 3. Treadmill only training group:

	was provided as necessary for both groups to prohibit knee buckling or toe dragging during treadmill walking. Treadmill training speed was set at the participant's comfortable walking speed. Training was conducted 3 times/week for 6 weeks with the training time for each visit set to 45 minutes (i.e., 35 minutes of treadmill training and followed by 10 minutes of overground walking practice), excluding set up time. The targeted RPE was 12 to 16 (somewhat hard to hard levels). Outcome Measures: Self-selected and fast walking speeds (using a 10-m instrumented mat) and 6MWT were assessed before, after 6 weeks of treadmill training, and 8 weeks after the end of training.	c. 6MWT, self-selected walking speed, and fast walking speed had no significant change after treadmill-only training and at follow-up test.
Tarnacka et al. 2023 Poland RCT PEDro = 5 Level 2 N = 105	Population: 105 participants with SCI - Control group (n = 33): 28 males, 5 females Median age: 36.5 years AIS A (n = 14), AIS B (n = 4), AIS C (n = 11), AIS D (n = 4) Level of injury: Cervical (n = 7), thoracic (n = 17), and lumbar (n = 9) Median time since injury: 13 months - Experimental group (n = 72): 58 males, 14 females Median age: 36.5 years AIS A (n = 27), AIS B (n = 7), AIS C (n = 13), AIS D (n = 25) Level of injury: Cervical (n = 17), thoracic (n = 32), and lumbar (n = 23) Median time since injury: 13 months Treatment: The therapeutic program consisted of two phases: first, 3 weeks, then, after a 1-week break, 3 weeks in the second phase. The program was conducted six days per week. Participants were allocated into two groups: - The control group received conventional physiotherapy and	- Patients with incomplete SCI assigned to the rehabilitation group achieved significantly more improvement in motor score [2.58 (SE 1.21, p < 0.05)] and WISCI II [3.07 (SE 1.02, p < 0.01)] scores in comparison with patients assigned to the control group. - A nonsignificant improvement between the groups for SCIM-III was found.

	30 min dynamic parapodium training. The experimental group received 30 min sessions of RAGT with exoskeleton EKSO-GT or Lokomat Pro with the general exercise program and ground gait training. *The dynamic parapodium is a piece of individualized uprighting equipment (a combination of thoracolumbosacral orthosis and hip-knee-ankle-foot orthosis (HKAFO) device of the dynamic type) that allows the patient to stand and walk by swinging the trunk. All participants from the Lokomat group with incomplete SCI started with 60% BWS and an initial treadmill speed of 1.5 km/h; patients with complete SCI started with 100-90% BWS. Patients with a thoracic level of injury were mostly enrolled in the EKSO-GT group, and with a cervical level, in the Lokomat group. Outcome Measures: The American Spinal Cord Injury Association Impairment Scale Motor Score (LEMS), SCIM-III, WISCI II, and Barthel Index were conducted before the start of the therapy and after 7 weeks of therapy.	
El Semaary & Daker 2019 Egypt RCT PEDro = 3 Level 2 N = 20	Population: 20 males with traumatic motor-incomplete SCI and paraplegia; mean ($\pm$ SD) 32.53 ($\pm$ 1.80) years; level of injury T9-T12; AIS B, C or D (n = N/A); and time since injury > 1 year. Treatment: The participants performed BWSTT (divided into a 15-min warm-up on a stationary bicycle, 45-min BWSTT, and a 10-min cool down) for 1h every session, twice a week, for 6 weeks. The participants were assigned randomly into two groups: - Group A (n = 10) performed BWSTT with a 30% of BWS. - Group B (n = 10) performed BWSTT with a 40% of BWS.	- Between-groups (40% vs. 30% of BWS) analyses revealed that there were significant distinctions among groups, with the 40% group experiencing superior improvements in: walking speed (89.36% vs. 23.84%, $p = 0.001$), step length (17.23% vs. 0.89%, $p = 0.001$), stride length (51.81% vs. 13.66% $p = 0.001$), and in cadence (16.07% vs. 4.69%, $p = 0.009$). - Within groups analysis showed that all the parameters (walking speed, step length, stride length and cadence width) except step width were improved in both groups.

	Outcome Measures: 2MWT and 6MWT were performed prior to and following the training intervention and were assessed using the force platform or video camera optional including walking speed, step length, stride length, cadence, and step width.	
Malik et al. 2019 Canada Case control Level 3 N = 13	Population: 8 participants with motor-incomplete and chronic SCI and able to walk on a treadmill with BWS but without manual assistance; 5 males and 3 females; AIS C (n = 1) and AIS D (n = 7); level of injury C1/2 (n = 1), C4/C5 (n = 1), C4-C5 (n = 1), C4 (n = 1), C5 (n = 1), T3 (n = 1), T4 (n = 1), and T10 (n = 1); and median time since injury 3.5 (range: 2-15) years. 5 non-SCI controls (median age 26 [range: 22-29] years) were recruited to provide normative kinematic data. Treatment: Kinematic data from participants who participated in the previous RCT by Lam et al. (2015) were included. Participants underwent 45min of Lokomat-based training 3 times per week for 3 months. Outcome Measures: Kinematic data from the lower limbs were recorded during treadmill walking before and after a 3-month training program. It was assessed: • The change in skilled walking and walking speed (based on the percent change of SCI-FAP and 10MWT, respectively). • ROM (sagittal plane hip, knee, and ankle joint angles). • Inter-joint (of hip-knee, hip-ankle and knee-ankle) coordination. Normative data from the non-SCI control participants were collected during a single session of treadmill walking.	1. Following training, improvements in skilled walking (SCI-FAP score) were significantly related to changes in hip-ankle coordination ($\rho = -.833$, $p = 0.010$) and knee ROM ($\rho = .833$, $p = 0.010$) of the weaker limb. 2. Inter-joint coordination tended to revert towards normative patterns, but not completely. 3. No relationships were observed with walking speed.
Sawada et al. 2021 Japan	Population: 19 participants with chronic SCI; 14 males and 5 females; mean ($\pm$ SD) age 42.9 ($\pm$ 17.0) years; AIS A (n = 2), AIS B (n = 4), AIS C (n = 8) and	1. There were no serious AEs. 2. WSCI II and FIM motor score did not show significant differences

Prospective controlled trial Level 2 N = 19	AIS D (n = 5); level of injury cervical (n = 10), thoracic (n = 8), and lumbar (n = 1); and mean ($\pm$ SD) time since injury 6.8 ($\pm$ 11.0) years. Participants were divided into two groups according to their walking ability: • Low group; WISCI II scores 0–5 (n = 8). • High group; WISCI II scores 6–20 (n = 11). Treatment: All participants underwent BWSTT with voluntary driven exoskeleton (using the HAL) for 20 sessions (60 min, 2–5 times/week). During the training, the velocity of the treadmill was individually set to a comfortable and maximum tolerated speed with approximately 50% of each BWS; and the training intensity was progressively increased by changing the walking speed (from 0.5 to 2.5k/m), time, and amount of assist torque by voluntary driven exoskeleton, depending on each participant's ability. In persons unable to walk, only weight shifting or stepping training was performed on the treadmill with voluntary driven exoskeleton. Outcome Measures: WISCI II and FIM motor subscore were evaluated at baseline and post-intervention.	after the voluntary driven exoskeleton-BWSTT program. 3. Furthermore, there was no significant improvement in any of the outcomes between pre-intervention and post-intervention in both low and high group. 4. In terms of individual data, WISCI II improved in four persons, while FIM motor score did not change in any participants.
Okawara et al. 2020 Japan Prospective controlled trial Level 2 N = 20	Population: 20 participants with chronic SCI who had reached a plateau in recovery from paralysis symptoms; 15 males and 5 females; mean ($\pm$ SD) age 43.3 ($\pm$ 16.6) years; level of injury cervical (n = 10), thoracic (n = 9) and lumbar (n = 1); AIS A (n = 2), AIS B (n = 4), AIS C (n = 8) and AIS D (n = 6); and mean ($\pm$ SD) time since injury 80.4 ($\pm$ 128.8) months. Based on baseline WISCI II score, 8 participants were categorized into the low walking ability group (n = 8) and into the high walking ability group (n = 12).	1. There were no AEs. 2. Gait performance on the treadmill with voluntary driven exoskeleton: a. The speed, distance, and total duration of walking in one training session increased significantly from the first to the last training session in all participants. b. Five participants who initially had difficulty walking with voluntary driven exoskeleton were analyzed afterwards, when they were able to walk with voluntary driven exoskeleton for the first time.

	Treatment: Participants underwent 20 sessions of BWSTT with voluntary driven exoskeleton (using the HAL) (2–5 sessions per week [mean frequency 2.6 ± 1.1 sessions] with 60 min of duration) on a treadmill with 50% BWS. The velocity of the treadmill was individually set to the participant's comfortable walking speed, and there was no inclination. Outcomes Measures: The speed, distance, and duration walked, and RPE were recorded in each session. WISCI II, 10MWT*, 2MWT), and LEMS were evaluated at pre and post intervention.	3. Overground walking ability without voluntary driven exoskeleton: a. In the high group, there was a significant improvement in 10MWT time (134.0 to 88.3 s, $p = 0.01$), and speed (0.26 to 0.34 s/m, $p < 0.01$) and number of steps (44.8 to 36.5 steps, $p = 0.05$) (this decrease in number of steps indicates an extension of step length); but not in the WISCI score (10.5 to 11.5, $p = 0.11$). b. There were significant differences between participants in the high/low groups at enrollment; there were more people with cervical level injuries and people classified as AIS B in the 'low' group. In addition, no participants in the low group were able to complete the 10MWT at any time point. 4. Compared to baseline, LEMS did not change after training neither in the whole group nor in the low and high walking ability groups.
Jansen et al. 2017b Germany and USA Pre-post N = 21	Population: 21 participants with chronic SCI and some residual motor function of hip and knee extensor and flexor muscle groups; 15 males and 6 females; mean ($\pm$ SD) age 44.8 ($\pm$ 13.8) years; neurologic lesion level between C4 and L3 (paraplegia, $n = 18$; tetraplegia, $n = 3$); AIS A ($n = 10$), AIS B ($n = 1$), AIS C ($n = 7$) and AIS D ($n = 3$); and mean ($\pm$ SD) time since injury 6.5 ($\pm$ 5.8) years. Treatment: All participants underwent BWSTT 5 times per week using the HAL robot suit exoskeleton for a 12-week period (5 sessions per week). Overall, each training session lasted approximately 90 min, divided into 30 min for preparation, 30 min of functional testing, and 30 min of HAL-BWSTT. During the intervention, training intensity was increased progressively by changing walking speed, time, and level of BWS, depending on each patient's abilities.	1. There was only temporary skin reddening at the site of the skin electrodes, leg cuffs, and shoes in four patients, but without causing an interruption of the training. 2. Treadmill training performance parameters were significantly improved from at baseline to at 6 weeks and at 12 weeks. 3. A significant reduction of the time needed for 10MWT and in the number of steps in 10MWT from baseline (61.17 ± 44.27 sec and 30.90 ± 8.71 steps, respectively) to 6 weeks (43 ± 31.99 sec and 24.45 ± 6.47 steps, respectively; $P < 0.001$), from baseline to 12 weeks (32.18 ± 25.53 sec and 20.70 ± 5.51 steps, respectively; $P < 0.001$), and from 6 weeks to 12 weeks ($P = 0.001$) was shown.

	Additionally, the training was supplemented by specific task exercises such as downhill/uphill/backwards walking and climbing stairs, using a mobile BWS system. Outcome Measures: LEMS was assessed biweekly. 10MWT (gait speed, total time, and number of steps), 6MWT, and WISCI II were assessed without the exoskeleton at baseline, 6 weeks midtraining, and 12 weeks after training. The treadmill training performance parameters (walking distance, speed, and walking time) were recorded continuously.	- The WISCI II score increased from 10.7 ± 4.95 at baseline to 11.7 ± 4.5 after the intervention (ns). - Before the training, the average walking distance covered in the 6MWT was 90.81 ± 110.18 min. All patients improved their walking distance significantly to 118.71 ± 134.89 m (6 weeks, $P = 0.001$) and 149.76 ± 144.28 m (12 weeks, $P < 0.001$). - LEMS showed a statistically significant improvement ($P < 0.001$) from 22.38 ± 10.7 to 25.71 ± 10.21.
Grasmücke et al. 2017 Germany and USA Prospective controlled trial Level 2 N = 55	Population: 55 participants with chronic SCI and some residual motor function of hip and knee extensor and flexor muscle groups; 43 males and 12 females; mean ($\pm$ SD) age $44.3 (\pm 13.9)$ years; and mean ($\pm$ SD) time since injury $6.85 (\pm 5.12)$ years. Participants were divided by age (< 50 or ≥ 50 years), independent of lesion level, and into 4 homogeneous groups according to lesion level: - Subgroup 1, participants with incomplete SCI and tetraplegia ($n = 13$) (C2–8, AIS C [$n = 8$] and AIS D [$n = 5$]). - Subgroup 2, participants with incomplete SCI, with paraplegia, and with spastic motor behavior ($n = 15$) (T2–12, AIS C [$n = 8$] and AIS D [$n = 7$]). - Subgroup 3, participants with SCI, complete motor paraplegia and absence of spastic motor behavior ($n = 18$) (T11–L4 [AIS A], and ZPP from L-3 to S-1). - Subgroup 4, participants with incomplete SCI, with paraplegia, and with absence of spastic motor behavior ($n = 9$) (T12–L3, AIS C [$n = 8$] and AIS D [$n = 1$]). Treatment: All participants underwent BWSTT 5 times per week	- Participants demonstrated an overall significant increase ($p \leq 0.001$) in mean walking speed and cumulative walking time from at baseline to at 12 weeks of training; without significant differences between subgroups. - An increase in the mean ambulated distance ($p \leq 0.001$) on the treadmill while using the HAL suit was observed across all groups. The mean ambulated distance in Subgroups 1, 3, and 4 showed relatively greater improvement than that in Subgroup 2. - The mean time for the 10MWT significantly decreased ($p \leq 0.001$) from baseline (70.45 ± 61.50 s) to 12 weeks (35.22 ± 30.80 s). There were no significant differences between subgroups. - A significant increase ($p \leq 0.001$) in the mean ambulated distance in the 6MWT from 97.81 ± 95.80 m to 146.34 ± 118.13 m was observed. There were no significant differences between subgroups. - The WISCI II scores improved significantly across all participants (baseline mean score, 9.35 ± 5.12; 12-week mean score, 11.04 ± 4.52; $p \leq 0.001$). A significant improvement in the WISCI II score was detected in Subgroups 1 and 3 ($p \leq 0.001$).

	using the HAL robot suit exoskeleton for a 12-week period. Overall, each training session lasted approximately 90 min. Additionally to the exoskeleton's weight, up to 30% of the participants bodyweight was neutralized during the initial training sessions. A 10MWT without the HAL was performed before and after each session in addition to regular physiotherapy. Outcome Measures: Gait speed, number of steps, and required assistance to walk were assessed using the 10MWT in self-selected speed (10MWTsss); 6MWT; and WISCI II were evaluated without the exoskeleton at baseline, at 6 weeks, and at 12 weeks of training. Treadmill-associated data (walking distance, speed, and time) acquired while using the HAL exoskeleton were recorded continuously.	Subgroups 2 and 4 presented no significant differences in pre- and postintervention assessments.
Wu et al. 2016 USA RCT PEDro = 6 Level 1 N = 14	Population: 14 participants with incomplete SCI; the ability to ambulate overground with/without assistive device as necessary, and with orthotics that do not cross the knee; walking with impaired walking function (self-selected walking speed < 1.0 m/s); mean age: 51.9 years; 10 males, 4 females; level of injury C1-T10; ASIA C (n=1) and ASIA D (n=13); and time since injury: more than one year. Treatment: Participants were blocked by gait speed into slow (<0.5 m/s) or fast (>0.5 m/s) and randomly assigned to 1 of 2 groups of robotic treadmill training with resistance (n=7) or assistance (n=7) training. Training was performed 3 times per week for 6 weeks, with the training time for each visit set to 45 minutes (35 minutes of treadmill followed by 10 minutes of overground walking practice) as tolerated. For each training session, participants were fitted with an overhead harness attached to a counterweight support system. BWS was only provided in the	1. Six participants in the resistance training group and six in the assistance training group completed all the 18 training sessions and three evaluation sessions. 2. A significant increase in step length was observed after resistance training (P = 0.04), but not after assistance training (P = 0.18). 3. The changes in self-selected walking speed were not significantly different between the 2 groups after resistance and assistance training (P = 0.37), and at the 8-week follow-up (P = 0.90). The gain in self-selected walking speed exceeded the MCID (i.e., > 0.05 m/s) of patients with SCI (Musselman et al. 2009). 4. The changes in fast walking speed were not significantly different between the two groups after resistance and assistance training (P = 0.61) and at the 8-week follow-up (P = 0.43).

	instance that a counterweight was necessary to prohibit knee buckling or toe dragging during stepping. Treadmill speed was consistent with the participant's maximum comfortable walking speed, determined on the treadmill at the beginning of each training session. The RPE was monitored during the course of training and was 12 to 16. * A custom-designed cable-driven robotic gait training system (CaLT) was used to provide controlled bilateral resistance or assistance load to the leg at the ankle of participants during treadmill training. Outcome Measures: Step length (using the GaitMat recording system, gait speed (self-selected and fast walking speeds, assessed using a 10-m instrumented walkway), walking endurance (6MWT), LEMS, and maximum voluntary isometric joint torques of the hip, knee, and ankle joints were assessed before, after 6 weeks of treadmill training, and 8 weeks after the cessation of treadmill training.	5. The changes in 6-MWT were not significantly different between the two groups after resistance and assistance training ($P = 0.78$) and at the 8-week follow-up ($P = 0.84$). 6. Muscle strength, including peak torque, rate of torque development, and torque impulse, had no significant changes ($P > 0.05$) after treadmill training for both the resistance and assistance training group.
Labruyère & van Hedel 2014 Switzerland RCT cross-over PEDro = 6 Level 1 N = 9	Population: 9 participants- 5 males and 4 females; SCI ranging from C4 to T11; mean age= 59 ± 11y; months post injury= 50 ± 56m. Treatment: Participants with a chronic incomplete SCI were randomized to group 1 or 2. Group 1 received 16 sessions of RAGT with Lokomat (45 min each) within 4 weeks followed by 16 sessions of strength training (45 min each) within 4 weeks. Group 2 received the same interventions in reversed order. Data were collected at baseline, between interventions after 4 weeks, directly after the interventions and at follow-up 6 months after the interventions. Pain was assessed repeatedly throughout the study. Outcome Measures: 10MWT at preferred and maximal speed, walking speed under different	1. There were no significant differences in changes in scores between the 2 interventions, except for maximal walking speed (10MWT), which improved significantly more after strength training than after RAGT.

	conditions, gait symmetry, WISCI, LEMS, and SCIM.									
Lucareli et al. 2011 Brazil RCT PEDro = 7 Level 1 N = 30	Population: 14 males and 10 females with incomplete SCI; mean age 31.5; mean YPI 9.8. Treatment: Group A – treadmill gait training with BWS + conventional physiotherapy; Group B – conventional physiotherapy; both groups underwent 30 semi-weekly sessions lasting 30 min each. Outcome Measures: Spatial temporal gait variables and angular gait variables.	- Group B showed no within group differences for spatial-temporal gait measures. Group A showed within group improvements ($p < 0.05$) in gait speed (47%), step length (17%), and cadence (16%). - There were no statistically significant improvements for Group B for any angular measure. However, group A showed a significantly greater ROM after intervention compared to Group B for maximum hip extension during stance and maximum plantar flexion during pre-swing. There were no significant group differences after treatment in other angular gait variables.								
Effect Sizes: Forest plot of standardized mean differences (SMD $\pm$ 95%C.I.) as calculated from pre- and post-intervention data. <table><caption>Forest Plot Data</caption><thead><tr><th>Measure</th><th>Std Mean Difference (95% C.I.)</th></tr></thead><tbody><tr><td>Gait velocity</td><td>0.75 (-0.08, 1.59)</td></tr><tr><td>Cadence</td><td>1.28 (0.39, 2.18)</td></tr><tr><td>Distance</td><td>1.09 (0.22, 1.96)</td></tr></tbody></table>			Measure	Std Mean Difference (95% C.I.)	Gait velocity	0.75 (-0.08, 1.59)	Cadence	1.28 (0.39, 2.18)	Distance	1.09 (0.22, 1.96)
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Yang et al. 2014 Canada RCT PEDro = 6 Level 1 N = 22	Population: 22 participants; 16 males and 6 females; Level of injury between C2 and T12; mean age= 48 $\pm$ 13y; years post injury= 5.7 $\pm$ 10.5y. Treatment: Twenty-two participants, ≥ 7 months post injury, were randomly allocated to start with Precision or Endurance Training. Each phase of training was 5 times per week for 2 months, followed by a 2-month rest. - Precision Training: Participants had to step over obstacles of different heights and onto targets of different sizes. - Endurance Training: Participants walked on the treadmill, with BWS and manual assistance if needed. Outcome Measures: Walking speed- 10MWT, distance- 6MWT, skill,	- Both forms of training led to significant improvements in walking, with Endurance Training inducing bigger improvements in walking distance than Precision Training, especially for high-functioning walkers who had initial walking speeds > 0.5 m/s. - The largest improvements in walking speed and distance occurred in the first month of Endurance Training, with minimal changes in the second month of training. - In contrast, improvements in walking skill occurred over both months during both types of training. Retention of over ground walking speed, distance, and skill								

	confidence- Activities specific, depression- Centre for Epidemiologic Studies- Depression Scale (before training and monthly afterwards), WISCI II, SCI-FAP.	was excellent for both types of training.
Wu et al. 2012 USA RCT crossover PEDro = 5 Level 2 N = 10	Population: 10 participants with chronic SCI (8M 2F); mean (SD) age: 47(7); mean (SD) DOI: 5.8(3.8) yrs; level of injury: C2-T10. Treatment: Group 1: BWSTT with 4 wks assistance training, then 4 weeks RT. Group 2: BWSTT with 4 wks RT, then 4 wks assistance training. Resistance provided by a cable-driven robotic LT system. Sessions were 45 min, 3x/wk x 8 weeks. Outcome Measures: Self-selected and fast walking speed, 6MWT, BBS, muscle strength tests, WISCI II, and Physical SF-36.	1. A significant improvement in both walking speed (increased from 0.67(0.20) at baseline to 0.76(0.23) m/s post-intervention) was observed after robotic treadmill training. 2. Following robotic training, stride length, step length, and cadence during self-selected walking significantly improved. 3. There was no significant difference in walking functional gains after resistance vs. assistance training, although RT was more effective for higher functioning patients.
Lam et al. 2015 Canada RCT PEDro = 8 Level 1 N = 15	Population: 15 participants - 9 males and 6 females; chronic motor incomplete SCI; 5 AIS C and 10 AIS D; age range= 26-63y; years post injury> 1y. Treatment: Participants were randomly allocated to BWSTT with Lokomat resistance (Loko-R group) or conventional Lokomat-assisted BWSTT (controls). Training sessions were 45 min, 3 times/wk for 3 months. Outcome Measures: Skilled walking capacity (SCI-FAP), 10MWT, 6MWT, were measured at baseline, post-training, and 1 and 6 months follow up.	1. Training was well tolerated by both groups, although participants in Loko-R tended to report higher levels of perceived exertion during training. 2. The Loko-R group showed a significantly greater improvement in the SCI-FAP at posttraining than the control. Compared with baseline, posttraining SCI-FAP scores decreased by 204 points (SD: 207, 95% CI: -348 to -61) in the Loko-R group but only by 18 points (SD: 36, 95% CI: -50 to 14) in the control group. Improvements were retained at 1 and 6 months follow-up. In the Loko-R group, SCI-FAP scores at 1 and 6 months follow-up were 217 (SD: 213, 95% CI: -364 to -69) and 220 (SD: 249, 95% CI: -404 to -36) points less than baseline, respectively. In the control group, the SCI-FAP scores at 1 and 6 month follow-up were 36 (SD: 70, 95% CI: -97 to 25) and 50 (SD: 131, 95% CI: -165 to 65) points less than baseline, respectively.

		3. Both groups showed improvements in walking speed (10MWT) and distance (6MWT) with training, but there were no between-group differences.
Field-Fote & Roach 2011 USA RCT PEDro = 8 Level 1 N = 64	Population: Patients with chronic SCI at least 1-year post-injury, mean ages between 38 and 45; TM group (14 males, 3 females), TS group (14 males, 4 females), OG group (11 males, 4 females), LR group (12 males, 2 females). Treatment: Training 5 days/week for 12 weeks with: treadmill-based training with manual assistance (TM), treadmill-based training with stimulation (TS), overground training with stimulation (OG), or treadmill-based training with robotic assistance (LR). Outcome Measures: 10MWT, 2MWT, LEMS.	1. Walking speed: There were no significant between-group differences; however, the improvement in walking speed was statistically significant for the OG (moderate effect size, $d=0.43$), TS (small effect size, $d=0.28$), and TM (small effect size, $d=0.28$) groups but not for the LR group. 2. Walking distance: There were significant between-group differences ($P < 0.01$) as the increase in the OG group was significantly greater than that in any treadmill-based training group. The increase in walking distance was statistically significant for the OG (moderate effect size, $d=0.40$) and TS (small effect size, $d=0.16$) groups but not for the TM and LR groups. 3. LEMS: LEMS scores of all participants significantly increased 8-13%, with no significant between-group differences.
Alexeeva et al. 2011 USA RCT PEDro = 7 Level 1 N = 35	Population: 35 participants; 30 males and 5 females; chronic SCI; 8 AIS C and 27 AIS D; level of injury: C2-T10. mean age= 38.5y; median years post injury= 4y. Treatment: Patients participated in a 13-week training program, with three 1-hour sessions per week. The physiotherapy group is a structured rehab program individualized for each participant. The TRK group consisted of body weight supported ambulation on a fixed track. The TM group involved body weight supported ambulation on a treadmill. Outcome Measures: 10MWT, LEMS and total MMT score (sum of UEMS and LEMS), and the motor domain component of the FIM measure.	1. All three training groups showed significant improvements in maximal walking speed, muscle strength, and psychological well-being, with no between group differences.

Niu et al. 2014 USA RCT PEDro = 5 Level 2 N = 40	Population: 40 participants - 27 males and 13 females; spastic hypertonia in lower extremities. All participants were injured within their cervical or upper thoracic (above T10) vertebrae. *Growth Mixture Modeling was used to subdivide participants into multiple latent classes based on the recovery patterns (i.e., the change over time) of their walking measures, and subsequently inspect gait improvement within each class: • Class 1, low walking capacity class: Participants with longer 10MWT and TUG times and shorter 6MWT distances at baseline. • Class 2, high walking capacity class: Participants with shorter 10MWT and TUG times and a longer 6MWT distance at baseline. Treatment: Each participant was assigned either to the control (no intervention) or intervention (Lokomat training) group. Each participant received a one-hour training session three times per week for four consecutive weeks; as it took 15-20 mins to set up the participant, the gait training lasted up to 45 mins per session. Outcome Measures: 10MWT, 6MWT, isometric torque resulting from MVC, Modified Ashworth Score, EMG, WISCI II.	1. The baseline (i.e., pre-training) measures of MVC torque (dorsiflexion torque and plantarflexion torque) could predict the differential treatment response, i.e., participants with high plantarflexion and dorsiflexion torques were more likely to have both high walking capacity and receive significant benefit from Lokomat training. 2. Lokomat training in participants with low walking capacity did not show significant improvements. By contrast, participants with a high walking capacity at baseline presented a consistent linear trend in time for speed over the 4-week training period.
Gorassini et al. 2009 Canada Prospective Controlled Trial Level 2 N = 23	Population: 17 participants with incomplete SCI, mean (SD) age 43.8(16.5), injury level C3-L1, and 6 participants without SCI. Participants were divided into 2 groups: those who improved in walking ability (responders, n=9, 4 AIS-C, 5 AIS-D) and those who did not (non-responders, n=8, 7 AIS-C, 1 AIS-D). Treatment: BWSTT, on average for mean (SD) 3.3(1.3) days/week for 14(6) weeks. Outcome Measures: EMG; WISCI II.	1. Responders had an average WISCI II increase of 4.6pts, compared to no increase in the non-responders. 2. The amount of EMG activity increased significantly after training in responders, whereas no change was observed in non-responders.

Behrman et al. 2012 USA Cohort Level 2 N = 95	Population: 95 participants with SCI (75M, 20F); <1 yr (n=47), 1-3 yrs (n=24), ≥3 yrs (n=24) since injury; level of injury: T11 or above; Mean (SD) age: 43(17); median time since injury: 1 year; 31 AIS C, 64 AIS D. Treatment: At least 20 sessions of the NRN Locomotor Training Program consisting of manual-facilitated BWS standing and stepping on a treadmill and overground. Training consisted of 1hr of treadmill training, 30 min overground assessment, and 15-30 min of community reintegration. Frequency: 5 days/wk for non-ambulators, 4 days/wk for ambulators with pronounced assistance, 3 days/wk for independent walkers. Participants split into phases 1-3 depending on level of ability to perform task-specific movements relative to the preinjury capability (higher ability = larger numerical phase). Outcome Measures: ISNCSCI AIS, BBS, 6MWT, 10MWT.	1. For those were classified phase 1 at enrollment and were still classified phase 1 after NRN training, no change was seen in BBS, 6MWT or 10MWT scores. 2. For those who enrolled in phase 1 and were classified phase 2 after NRN training, mean change scores were 1 for BBS, 10 for 6MWT and 0 for 10MWT. 3. For those enrolled at Phase 1 and classified as Phase 3 after NRN training, mean change scores were 38.5 for BBS, 265.5 for 6MWT and 0.7 for 10MWT. 4. For those enrolled in Phase 2 and classified as Phase 2 after training, mean change scores were 7 for BBS, 46 for 6MWT and 0.1 for 10MWT. 5. For those enrolled in Phase 2 and classified as Phase 3 after training, mean change scores were 15 for BBS, 82.3 for 6MWT and 0.3 for 10MWT.
Buehner et al. 2012 USA Prospective cohort Level 2 N = 225	Population: 225 participants with chronic incomplete SCI (167M, 58F); mean (SD) age=42.5 (15.9); Median DOI=2.45; 57 AIS C, 167 AIS D. Treatment: NRN Locomotor Training Program. Training consisted of 1 hr of treadmill training, 30 min overground assessment, and 15-30 min of community reintegration. Frequency: 5 days/wk for non-ambulators, 4 days/wk for ambulators with pronounced assistance, 3 days/wk for independent walkers. Outcome Measures: LEMS, 10MWT, 6MWT, BBS.	1. Significant gains occurred in LEMS scores (Pretraining: 31.85 (13.98); Post-training: 38.61 (12.29)). 2. Although 70% of participants showed significantly improved gait speed after LT, only 8% showed AIS category conversion. 3. Significant gains in gait speed (72%) and ambulation distance (74%) after NRN training regardless of initial AIS classification.
Lorenz et al. 2012 USA Longitudinal Level 2 N = 337	Population: 337 participants with SCI (255M, 82F); mean (SD) age: 40 (17); 99 AIS C, 238 AIS D. Treatment: At least 20 sessions of the NRN Locomotor Training Program. Training consisted of 1hr of treadmill training, 30 min overground assessment, and 15-30 min of	1. Participants varied significantly across groups defined by recovery status and AIS grade at enrollment with respect to baseline performance and rates of change over time. 2. Distances for the 6MWT significantly improved from

	community reintegration. Frequency: 5 days/wk for non-ambulators, 4 days/wk for ambulators with pronounced assistance, 3 days/wk for independent walkers. Outcome Measures: BBS; 6MWT; 10MWT.	enrollment at an attenuated rate ($p < 0.001$). - Speeds for the 10MWT significantly improved from enrollment at an attenuated rate $p < 0.001$. - BBS scores significantly improved from enrollment at an attenuated rate $p < 0.001$. - Time since SCI was a significant determinant of the rate of recovery for all measures.
Varoqui et al. 2014 USA RCT PEDro = 3 Level 2 N = 30	Population: 30 participants; ambulatory chronic incomplete SCI; mean age= 50.80 ± 2.12y; years post injury= 11.80 ± 2.54y. Treatment: 15 participants with incomplete SCI performed twelve 1-hour sessions of Lokomat training over the course of a month. The voluntary movement was qualified by measuring active ROM, maximal velocity peak and trajectory smoothness for the spastic ankle during a movement from full plantar-flexion to full dorsi-flexion at the patient's maximum speed. 15 participants with incomplete SCI were included in a control group. Outcome Measures: Active ROM, maximal velocity peak and trajectory smoothness from full plantar-flexion to full dorsi-flexion at patient's maximum speed, isometric MVC (dorsi- and plantar-flexor muscle strength), 10MWT, 6MWT, and Modified Ashworth Scale were assessed before and after the training.	- For the training group, the 10MWT resulted in a significant increase in mean gait speed of $13.4 \pm 2.8\%$ after training ($P < 0.05$); however, the control group did not show significant improvement ($P = 0.36$). - No significant improvements were found for the 6MWT in either group. - Results of MVC tests showed an improvement in the strength of dorsi- and plantar-flexor muscles during isometric voluntary contraction after the experimental training. On the other hand, for the control group, no change was observed between the two tests in MVCPF ($P = 0.09$) and MVCDF ($P = 0.81$).
Harkema et al. 2012 USA Pre-post (subacute and chronic) Level 4	Population: 196 participants (148 male, 48 female) with incomplete SCI (AIS C, $n = 66$; AIS D, $n = 130$); mean age 41 ± 15 yrs; YPI- < 1 yrs ($n=101$), 1-3 yrs ($n=43$), > 3 yrs ($n=52$). Treatment: At least, 20 training treatment sessions of LT with three components: (1) 1 hour of step training	6MWT distances and 10MWT speeds of all patients significantly improved by an average of 63m and 0.20m/s, respectively. - Significant increases also occurred in the AIS grade C and AIS grade D groups ($P < .001$) and were significantly different from each

N = 196	in the body-weight support on a treadmill environment, followed by 30 min of (2) overground assessment and (3) community integration. Outcome Measures: BBS, 6MWT, and 10MWT.	other ($P < .001$). Patients with AIS grade D had a greater magnitude of increase than those with AIS grade C. However, those with AIS grade C and already ambulatory improved their walking distances to a greater extent than the AIS grade D group, indicating potential for recovery.
Winchester et al. 2009 USA Pre-post Level 4 N = 30	Population: Mean (SD) age = 38.3(13.6); 22 males; 23 participants with tetraplegia, 7 with paraplegia; mean (SD) time since injury = 16.3(14.8) months. Treatment: LT, including: robotic assisted BWSTT (with Lokomat), manually assisted BWSTT, and over ground walking. 3 times per week for 3 months. Outcome Measures: WISCI II and 10MWT.	1. 22 participants showed improvement in walking speed; 8 showed no change post-training. 2. Pre-training, 16 participants could not walk. Post-training, 5 remained unable to ambulate, 7 recovered ambulation but needed assistance, and 4 recovered independent ambulation. 3. Step-wise regression analysis showed that time post-injury, voluntary bowel and bladder voiding, functional spasticity, and walking speed before training were the strongest predictors of post-training overground walking speed.