NDIS Evidence Advisory Committee Consultations March 2026 - Robot-Assisted Gait Training

Prepared by Cerebral Palsy Alliance

For the NDIA Evidence Advisory Committee

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via email: disabilityevidence@health.gov.au

Contact

Jo Ford
General Manager, Therapy, Cerebral Palsy Alliance

✉ jo.ford@cerebralpalsy.org.au
☎ p: +61299758818
cerebralpalsy.org.au

Cerebral Palsy Alliance Submission to the NDIS Evidence Advisory Committee: Robot-Assisted Gait Training

About Cerebral Palsy Alliance

Cerebral Palsy Alliance (CPA) has evolved to become a global leader in cerebral palsy (CP), bringing together leading services, research, advocacy and technology to improve the lives of people with CP and their families at every stage of life. CPA's dedicated Research Institute is instrumental in privately funding research into CP, leading to reduced rates and severity of the condition in Australia.

Founded in 1945, CPA delivers life-changing services to thousands of children and adults across New South Wales and the Australian Capital Territory, employing more than 225 allied health professionals in a staff cohort of over 2500.

CPA's service model integrates clinical expertise with research translation through the Cerebral Palsy Alliance Research Institute, a global leader in neurorehabilitation and early intervention research. CPA's affiliation with research institutions such as the University of Sydney enables real-world implementation of best practice in exercise, motor learning, and functional outcomes for people with disability.

Under CPA's Strategy 2030 framework, our mission is to maximise functional independence, participation, and lifelong health for people with cerebral palsy and similar conditions. It is also under our framework to share and integrate the evidence base for CP into everyday therapeutic practice.

CPA welcomes the opportunity to respond to the NDIS Evidence Advisory Committee consultation on Robot-Assisted Gait Training (RAGT).

Executive Summary

Robot-Assisted Gait Training (RAGT) uses robotic devices to support walking practice for people with disability, including cerebral palsy. Three broad types of systems are currently used: Treadmill-Paired Exoskeletons; Overground Wearable Exoskeletons; and Foot-guided End-Effector Devices. These systems all aim to provide high-repetition, task-specific walking practice consistent with principles of motor learning and neuroplasticity.

Across systematic reviews, RAGT has been shown to improve standing and walking ability, endurance, and balance when delivered as part of a structured physiotherapy and/or exercise physiology program. The strongest evidence currently supports treadmill-paired systems, particularly when used alongside conventional therapy and delivered at moderate training doses. Wearable overground exoskeletons and end-effector devices systems show emerging promise but have a smaller and more variable evidence base.

Evidence across device types is variable. Improvements in walking speed, cadence, symmetry and spasticity are inconsistent, and RAGT does not consistently outperform intensive conventional physiotherapy alone. In addition, many systematic reviews in this field include early "proof-of-concept" engineering studies, which lowers overall confidence in the strength of the evidence. This submission has therefore prioritised more recent reviews and studies with clearer clinical relevance.

CPA's position is that RAGT can be a valuable adjunct to goal-directed physiotherapy and exercise physiology for some individuals with CP, but it should not be delivered as a stand-alone intervention. Current evidence does not support routine NDIS funding for private home purchase of robotic mobility devices. Structured therapy blocks or time-limited device hire may be appropriate while the evidence base continues to develop.

As robotic mobility devices continue to evolve rapidly, policy settings must balance encouraging innovation with ensuring that funding decisions remain grounded in strong clinical evidence and demonstrable functional benefit.

New robotic mobility devices continue to emerge, including smaller and more targeted devices that may offer broader clinical application than traditional systems. Given the pace of development, CPA recommends that NDIA continue to monitor emerging evidence and consider re-evaluation of funding settings within the next two to three years.

Technology Overview

Robot-Assisted Gait Training (RAGT) uses robotic devices to help people practise walking during therapy. It is most often used for people with neurological conditions that affect movement, such as CP, stroke, spinal cord injury and traumatic brain injury.

These systems are designed to provide a high amount of repeated, structured walking practice. This type of intensive practice is important for helping the brain and body relearn movement skills. RAGT can also reduce the physical strain on therapists, allow more walking practice within a session, and give immediate feedback about how a person is walking.

There are many different types of robotic mobility devices. Some support one joint, others support multiple joints; some assist one leg, others both; some respond to the user's own movement signals (e.g., muscle activity), while others guide movement automatically. Broadly, however, RAGT devices fall into three main categories:

1. Treadmill-Paired Exoskeletons (Treadmill-Paired RAGT)

These systems combine a treadmill with a robotic exoskeleton that attaches to the legs and helps guide hip and knee movement while the person walks.

Key Features:

- The robotic device is secured to the legs and moves them through a programmed walking pattern.
- A harness is usually used to support some of the person's body weight for safety.
- Therapists can adjust walking speed, step length, level of assistance, and how the joints move.
- Many systems can respond to the person's effort and provide feedback about their walking.

Examples:

- Lokomat (Hocoma)
- Walkbot-K
- EXO-GT

Typical Benefits:

- Allows a high amount of repeated walking practice in a controlled way.
- Reduces the physical strain on therapists when delivering intensive training.
- Can be used with people who have moderate to severe mobility limitations.

Evidence:

Treadmill-paired robotic mobility systems have been studied more than other types of RAGT because they have been in use for longer.

A 2024 systematic review (Martino Cinnera et al, 2024) found that Lokomat training can improve walking speed, step length and balance in children with CP, particularly when it is used alongside regular physiotherapy rather than on its own. A 2022 randomised study (Moll et al, 2022) examined the hybrid assistive limb (HAL) in combination with bodyweight support and a treadmill in 30 adolescents with spastic CP during an 11-day inpatient program. Participants received either robotic training plus standard therapy, or standard therapy alone. While there were no clear differences between groups for walking speed or endurance, the group receiving robotic training showed meaningful improvements in overall gross motor function, particularly in standing and walking skills. The results suggest potential benefit, although larger and longer studies are needed. Another randomised cross-over trial (Jin et al, 2020) involving 20 children with moderate to severe CP (GMFCS II–IV) evaluated a six-week Walkbot-K program alongside usual care. Children who received robotic training showed improvements in standing and walking ability, mobility in daily activities, goal performance and satisfaction, and reduced energy cost during walking. Gains were greater in children who were already ambulant (GMFCS II–III). The study did not include a follow-up evaluation, therefore lasting carry-over effects beyond the training period were not tested. As with other trials, improvements may reflect the combined impact of robotic training and ongoing physiotherapy.

Overall, mobility training with treadmill-paired exoskeletons appears to improve standing and walking ability, endurance and functional mobility when delivered as part of a structured therapy program. However, evidence remains mixed for walking speed and muscle tone, and long-term outcomes are not yet well established.

2. Overground Exoskeletons (Wearable / Mobile RAGT)

Wearable robotic exoskeletons are devices that allow a person to walk over ground, rather than on a treadmill. Some are rigid robotic frames, while others are softer, assistive wearable systems. In some cases, bodyweight support systems can be used alongside these devices for safety.

Key Features

- The person walks on flat surfaces, slopes, or in real-world environments.
- The device provides powered assistance at specific joints, most commonly the hips and knees, and sometimes the ankles.
- The level of support can range from full assistance to partial support, depending on the user's needs.
- These systems are increasingly used to practise walking in real-life settings, including community environments.

Examples

- EksoNR; ReWalk; Indego; Atalante X; ExoAtlet II; Bambini; REX; Trexo; Biomotum Spark.
- And other soft exosuits and other emerging research prototypes.

Typical Benefits

- Allows more natural, real-world walking practice compared with treadmill systems.
- Encourages active participation and user-initiated stepping.

- May help bridge the gap between clinic-based therapy and community mobility.

Evidence

A recent systematic review led by the CPA Research Institute (currently under peer review, Postol et al, 2026) examined wearable overground exoskeletons for people with CP. The review included 21 clinical studies involving 241 participants aged 3 to 40 years (median age 9.6 years). Importantly, unlike earlier reviews, this study included only clinical research and excluded early engineering “proof of concept” studies. However, only five of the included studies used controlled designs, and research involving adults remains limited.

The review found statistically significant and clinically meaningful improvements in:

- Walking endurance
- Balance
- Walking speed
- Higher-level mobility skills

However, other outcomes such as step rhythm, step length, walking symmetry, muscle strength, spasticity, body composition, goal attainment, and user experience were reported inconsistently. This makes it difficult to draw firm conclusions about broader benefits. Overall, the review concluded that wearable overground exoskeletons can improve endurance, balance, speed, and higher-level mobility in people with CP. However, evidence for wider outcomes — including quality of life and participation — is still limited. Another recent review (Pacheco-Chérrez, J et al. 2025) highlighted that there is currently little guidance on how best to implement these devices in routine clinical practice, and that clearer clinical guidelines are needed.

A 2025 study by Jeong et al. evaluated a six-week program involving twelve 30-minute sessions using the Bambini overground exoskeleton in 10 children with spastic CP(GMFCS I–IV). The study found increased physical activity levels, including more time spent in light and moderate activity and reduced sedentary time. Children also improved in motor function, with gains in GMFM scores, faster Timed Up and Go (TUG) performance, and longer distances on the 6MWT. Despite these physical and functional improvements, there were no significant changes in quality-of-life scores.

In summary, wearable exoskeleton-assisted gait training appears to increase physical activity and improve mobility in children with spastic CP. It shows promise as a therapy option, but the evidence is still developing, and long-term benefits and broader impacts require further study.

3. Foot-guided End-Effector Devices

End-effector devices are robotic systems that move the user's feet using footplates or pedals that guide stepping movements. Rather than controlling the hip and knee joints directly, the device moves the feet, and the movement of the legs follows naturally.

Key Features

- The person stands on moving footplates that simulate a walking pattern.
- Hip and knee movement happens as a result of the foot movement, rather than being directly controlled.
- These systems are often used with bodyweight support for safety.
- Training can be adjusted to include different walking speeds, patterns, and balance challenges.

Examples

- G-EO System (Reha Technology); LokoHelp; Lyra; Lexo

Typical Benefits

- Allows walking-like movement even for individuals with limited voluntary control.
- May encourage more active trunk and upper body engagement, as the legs are not rigidly fixed in position.

Evidence

There is currently limited research on end-effector devices in people with CP, but two recent studies provide some useful insights.

A randomised trial by Julien et al. (2024) involved 40 children with unilateral CP (aged 4–18). The study compared 10 sessions of robotic training using the G-EO system with intensified conventional physiotherapy. After two weeks, the robotic training group showed greater improvements in walking speed and walking endurance. Brain imaging also showed increased connectivity in areas related to movement in the robotic training group, while the control group showed a decline. However, there were no changes in overall GMFM scores or structural brain measures. Children who received robotic training reported positive changes. Overall, the study showed short-term improvements in walking performance and brain activity following repetitive robotic training.

Another study by Grodon et al. (2023) examined the Innowalk Pro in children functioning at GMFCS IV–V. Participants used the device four times per week for 30 minutes over six weeks. The study found possible improvements in quality of life and functional goals, particularly in adolescents. However, these benefits reduced after a break of 6–12 weeks, suggesting that gains may not be sustained without ongoing use. The authors recommended further research, especially in adolescents and adults, and exploration of broader outcomes such as pain, weight management and gastrointestinal health.

Taken together, these studies suggest that end-effector devices can improve walking ability and perceived function in the short term and may influence brain activity related to movement. However, evidence in more severely affected children remains limited, and long-term benefits are not yet well established.

4. RAGT Overall

Several systematic reviews (Wang et al 2023, Khawaja et al 2025, Cortés-Pérez et al 2022; Vezér et al 2023, Chen et al 2025, Lim et al 2024 and Llama-Ramos et al 2022) have examined different types of robotic mobility training in children with CP. When looking across these reviews, a consistent pattern emerges: RAGT can improve aspects of motor function, walking ability, endurance, and balance. However, results vary depending on the type of device used, how the program is delivered, and whether robotic training is combined with conventional therapy.

Overall, the research base is mixed. Many studies are small, use different training protocols, and have limited long-term follow-up. There are relatively few high-quality controlled trials.

Across seven recent systematic reviews (ibid), the general finding is that RAGT shows potential, but effectiveness differs across devices and programs. Meta-analyses suggest that RAGT can improve standing and walking ability (GMFM-D/E), walking distance, balance, and in some cases walking speed, particularly when it is delivered alongside conventional physiotherapy and provided at moderate intensity. Treadmill-paired devices such as Lokomat and WalkbotK tend to show stronger and more consistent results than wearable devices in current studies. However, some high-quality reviews report no clear advantage of robotic training over intensive treadmill training or high-quality physiotherapy alone. Improvements in specific gait features, such as speed, cadence and step length, remain inconsistent across studies.

CPA's plans to conduct a project in FY27 including clinical implementation and further clinical research with the Biomotum Spark device, a powered ankle orthosis that can assist ankle movement whilst walking and incline and stair climbing. This device has TGA approval for use in Australia as a Class 1 Medical Device (ARTG#493887). Evidence to date has demonstrated potential benefits to clinical outcomes such as endurance (Conner et al., 2021; Orekhov et al., 2020), speed and stride length (Fang et al., 2022), when utilising this device with people with CP, although most studies have very small samples and are undertaken in lab settings rather than clinical settings. Its smaller form factor and potential applicability across the lifespan, and across GMFCS levels I–IV suggest it may complement existing mobility interventions, as it can be used with a treadmill or overground, including outdoors. CPA Therapy Services and Research Institute will work together to evaluate how such devices can be implemented safely and effectively in clinical services, including their impact on functional outcomes, participation, and service delivery models. CPA has chosen to focus on use of this device in clinical services due to the research evidence of benefits for people with CP and expected broader impact than larger, more expensive devices, including possible integration into regional services.

In summary, robot-assisted gait training is a promising intervention for people with CP, although strong clinical reasoning is required to ensure appropriate device choice, dosage and mode of delivery, relevant to the individual, taking into account their individual goals and severity of CP, and how well robotic training can be integrated into their broader therapy program. Further high-quality, standardised trials with longer follow-up are needed to determine which devices work best, for which people, and under what conditions. Robot-assisted gait training is a promising but underexplored area that has huge potential for people with CP and CPA will be continuing to contribute to the evidence base for this population.

Summary

Across systematic reviews, the evidence indicates that:

- RAGT can improve standing and walking ability (GMFM D/E), walking endurance (6MWT), and balance in children with CP.
- RAGT is more effective when delivered alongside conventional physiotherapy rather than as a stand-alone intervention.
- Moderate-dose programs (approximately 1000–4000 minutes delivered over several weeks) are associated with stronger outcomes.

However:

- Effects on gait speed, cadence, step length, and symmetry are inconsistent, with several high-quality reviews reporting no significant advantage over intensive conventional therapy.
- Evidence for wearable exoskeletons is emerging therefore less well established.
- Overall study quality varies considerably, with many small trials, heterogeneous protocols, and limited long-term follow-up.

Taken together, RAGT shows meaningful potential but variable effectiveness, and further high-quality, standardised research is required to clarify optimal device type, dosage, and target populations.

Clinical Recommendations

RAGT should only be delivered within a structured, intensive program aligned with activity-dependent neuroplasticity principles.

RAGT should:

- Be delivered as part of a comprehensive, goal-directed therapy program, not as a stand-alone intervention.
- Be supervised by a trained physiotherapist or exercise physiologist, with appropriate clinical oversight.
- Be provided in defined, intensive blocks, rather than sporadic sessions.
- Include agreed, objective outcome measures at both the body function and participation levels (e.g., GMFM D/E, 6MWT, balance, goal attainment, community mobility).
- Be continued only where measurable gains are demonstrated.

Functional Level Guidance (GMFCS)

- GMFCS I–II: May be appropriate to improve gait speed, endurance and efficiency to support participation goals.
- GMFCS III–IV: May support improved standing tolerance, endurance, or maintenance of mobility.
- GMFCS V: Should only be considered where clearly defined mobility goals exist and benefits outweigh burden.

Risk and Practical Considerations

Clinicians must assess:

- Contraindications and comorbidities
- Skin integrity and joint tolerance
- Cognitive capacity to communicate discomfort
- Travel and logistical burden
- Any adverse events through formal reporting processes

Research Recommendations

There are significant gaps in the current evidence for Robot-Assisted Gait Training in people with CP. In particular, there is limited research on:

- Adults with CP
- Long-term outcomes and durability of gains
- Outcomes beyond gait and balance, including participation and quality of life
- Optimal training dose, frequency and duration
- Cost-effectiveness compared to intensive conventional therapy

Most studies to date focus on children with bilateral spastic CP. There is less clarity about which subgroups benefit most, including those with different CP types or more severe mobility limitations.

Future research should prioritise:

- Larger, multi-centre randomised controlled trials
- Standardised training protocols and outcome measures
- Longer follow-up periods to assess sustained benefit
- Clear reporting of adverse events and implementation burden
- Comparative studies between device types
- Economic evaluations to determine value for money

Further research is also needed to understand the impact of long-term home or community use of robotic mobility devices, particularly for individuals with significant support needs.

Conclusion

Robot-Assisted Gait Training represents a developing area of rehabilitation for people with CP. Current evidence indicates that, when delivered intensively and alongside conventional physiotherapy, RAGT can improve standing and walking ability, endurance, and balance for some individuals. These improvements are most consistent in ambulant children and when moderate training doses are used.

However, the evidence remains variable across device types and outcome measures. Effects on gait speed, symmetry, spasticity, and long-term participation are inconsistent, and sustained benefits beyond the training period are not yet well established. The evidence to date is predominantly lower level (case reports, case series, and observational/cohort studies), with few controlled trials, and there is limited evidence on long-term cost-effectiveness, and how to implement this technology into clinical practice.

RAGT should therefore be viewed as a structured, goal-directed adjunct to therapy rather than a replacement for conventional therapy. It should not be implemented as a stand-alone intervention, and current evidence does not support routine NDIS funding for private purchase of robotic mobility devices for home use. Emerging technologies, including smaller and more targeted wearable devices, may expand the range of applications for robot-assisted mobility, but require more controlled trials to strengthen clinical and implementation evidence.

CPA supports cautious, targeted implementation within defined therapy blocks under trained clinical supervision. Given the pace of technological development in this field, CPA recommends ongoing monitoring of emerging evidence and re-evaluation of funding settings within the next two to three years.

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