

Effectiveness of Gait Interventions in Improving Gait in Adults with Ataxia: A Systematic Review



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Overview

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Background

Ataxia:

- Lack of coordination characterized by progressive disturbances related to balance and gait
- Often caused by acquired brain injury (TBI, CVA or infection) or degenerative cerebellar changes^{1,2}

Symptoms Of **Ataxic Gait**

- Lack of proper coordination
- Unsteady gait with a potential to stumble and fall
- Frequent falling episode
- Lack of muscle coordination in the legs
- Ambulation difficulties



Kerker P. Symptoms of Ataxic Gait. <https://www.epainassist.com/brain/ataxic-gait>. Reviewed February 15th, 2018. Accessed October 5th, 2018.



Background

- **Traditionally, patients with ataxic gait have been treated using compensatory strategies such as ankle weights/weighted vests, or using assistive devices³**
 - Although widely used in everyday practice, there is no significant research on the efficacy of these strategies⁴
- **There has been no consensus on the best intervention to improve ataxic gait⁴**



Purpose

- The purpose of this study was to determine the most effective gait intervention in improving gait in patients with ataxia.



Methods

Databases

- CINAHL
- Health Source: Nursing/Academic Edition
- MEDLINE/PubMed
- Proquest
- Hand search

Search Limits

- Last 10 years 2008-2018
- English
- Human subjects
- Scholarly (Peer-Reviewed) articles

Search Terms



(ataxia) AND (“gait training” or “locomotion training” or “gait rehabilitation”)



Selection Criteria

- **Diagnosis:** ataxia
- **Age:** adult (18 or older)
- **Gender:** male or female
- **Outcomes:** objective gait measurements
 - Having an outcome measure with a gait component
- **Intervention:** any *gait* intervention
 - A gait rehabilitation strategy that directly involves ambulation or pre-ambulation
 - Balance training alone was not considered a gait intervention



Identification

Records identified through database searching (n=55)

Additional records identified through other sources (n=1)

Screening

Records identified after duplicates removed (n=48)

Eligibility

Records screened (n=48)

Records excluded (n=35):

- Not gait/lack of gait outcome measure (n=8)
- Not ataxia (n=13)
- No intervention/wrong design (n=12)
- Not adult (n=1), not humans (n=1)

Included

Full text articles assessed for eligibility (n=13)

Full text articles excluded (n=4):

- Not ataxia (n=1)
- Lack of objective gait outcome measure (n=3)

Studies included in qualitative synthesis (n=9)

PRISMA

Article Title	Sackett Level
A Comparative Study of Conventional Physiotherapy versus Robot-Assisted Gait Training Associated to Physiotherapy in Individuals with Ataxia after Stroke.⁵	1B
The effect of a task-specific locomotor training strategy on gait stability in patients with cerebellar disease: a feasibility study.⁶	4
Partial Body Weight-Supported Treadmill Training in Spinocerebellar Ataxia.⁴	4
Gait adaptability training improves obstacle avoidance and dynamic stability in patients with cerebellar degeneration.¹	4
Use of trunk stabilization and locomotor training in an adult with cerebellar ataxia: A single system design.³	5
Challenge-oriented gait and balance training in sporadic olivopontocerebellar atrophy: a case study.⁷	5
Delayed regaining of gait ability in a patient with brain injury: A case report.⁸	5
Metronome Cueing of Walking Reduces Gait Variability after a Cerebellar Stroke.⁹	5
Treadmill training for ataxic patients: A single-subject experimental design.²	5



Results¹⁻⁹

- **Samples Ranged:** 1-19 participants (58 total)
- **Intervention parameters:** 1-60 sessions lasting 10-240 minutes
- **Duration of the interventions:** 1 day-20 weeks

Results

Interventions included:

- Treadmill training^{1,2}
- Partial body weight support³⁻⁵
- Dynamic gait training⁷
- Auditory cueing⁹
- Conventional gait training^{6,8}



Lokomat®. Optimal Patient Challenge. <https://www.hocoma.com/solutions/lokomat/>. Accessed October 25, 2018.

Results



All 9 studies found statistical and/or clinical improvements in gait outcomes such as:

- **Spatio-temporal gait parameters** (cadence, step length/width, gait speed, etc.)^{2,3,6,7,9}
- **Complex gait** (Timed Up and Go test, Dynamic Gait Index)^{2,4,5,7}
- **Ataxia** (Scale for Assessment and Rating of Ataxia)^{1,5,8}
- **Independence** (Functional Ambulation Category)^{3,8}
- **Gait quality** (Rivermead Visual Gait Assessment)²

Results

Intervention	Sample Size	Intervention Parameters	Duration	Outcomes Improved
Robot assisted gait training vs. therapist assisted gait training ⁵	N=15	60 min 3x per week	5 months	Complex gait (TUG), Ataxia (SARA)
Conventional gait training (with weight shifts, verbal cuing, etc.) ⁶	N=19	1.5 hrs 2x per week	12 weeks	Spatio-temporal gait parameters (COM displacement, gait speed, step length/width, stance time)
Partial Body Weight Support ⁴	N=8	50 min 2x per week	18 weeks	Complex gait (DGI)
Treadmill training (with visual cues) ¹	N=10	1 hrs 10 sessions	5 weeks	Ataxia (SARA)
Conventional gait training (with trunk stabilization) ³	N=1	60-90 min 28 sessions	22 weeks	Spatio-temporal gait parameters (10 MWT) , Independence (FAC)

Results

Intervention	Sample Size	Intervention Parameters	Duration	Outcomes Improved
Dynamic Gait (obstacle course, gait with head turns, stop and goes)⁷	N =1	1.5-2 hrs 5x per week	12 weeks	Complex gait (DGI), Spatio-temporal gait parameters (gait velocity)
Conventional gait training (trunk stabilization, physical conditioning)⁸	N=1	30 min 5x per week	2 months	Ataxia (SARA), Independence (FAC)
Auditory cueing (metronome)⁹	N=1	1 session non-specified	1 day	Spatio-temporal gait parameters (Step time, stance time, double support time, step length)
Treadmill training (with visual cues)²	N=2	30 min 3x per week	7 weeks	Spatio-temporal gait parameters (Step length, cadence, speed), Complex gait (TUG), Gait quality (RVGA)



Conclusions

There is a mixed level of evidence to support task-specific gait interventions for patients with ataxia.

- **High quality evidence:**

- Both over ground gait training with therapist assistance and robotic assisted gait training were found to be equally as effective in improving gait in adults with ataxia.
- Evident by improved complex gait with reduced ataxia⁵



Conclusions

There is a mixed level of evidence to support task-specific gait interventions for patients with ataxia.

- **Low quality evidence:**

- Treadmill training (with and without obstacles), body weight support, auditory cueing, and dynamic gait training can improve ataxic gait as evident by improvements in:
 - Spatio-temporal parameters^{2,3,6,7,9}
 - Complex gait^{2,4,5,7}
 - Ataxia^{1,5,8}
 - Independence^{3,8}
 - Gait quality²



Limitations

- Small samples
- Vague gait interventions
- Lack of uniform outcome measures
- Lack of control groups
- Long-term follow up



Future Research

- **In order to determine the optimal gait intervention for patients with ataxia, future research is needed to:**
 - Develop specific ataxic gait outcome measures
 - Implement specific gait interventions for patients with ataxic gait
 - Include higher quality randomized control trials



Clinical Relevance

- **Historically, ataxic gait has been treated by weighting the patient's trunk and lower limbs and through symptom management.³**
 - Recent research has shown that this is not the most effective rehabilitation for these patients.
- **In order to move away from symptom management, clinicians should consider task-specific gait training to meet the individual needs of each patient with ataxia.**



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Questions?