

# A Review Article on Assistive and Rehabilitation Technology in Cerebellar Ataxia

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## Abstract

Cerebellar ataxia can be induced by a variety of factors, and symptoms include a lack of coordination in one's balance and cadence, extremities, as well as eye movements. Cerebellar ataxia leads to cerebellar dysfunction with impaired balance and shows Romberg's sign positive as assisted by the therapist. Suspension therapy is given to bear patients' weight and improve their gait by supporting their bodies. Treadmill training to assist gait speed, gait endurance, and step length of the patient. Rehabilitation techniques are used to control balance and coordination. As a result Gait variability is common and can be caused by a union of equilibrium issues, a lack of synchronization between the limbs, postural activity, and leg movement facilitation. The unprejudiced study is to ascertain the potential of assistive and rehabilitative technology in cerebellar ataxia. This study was taken from different data sources here four databases were used for searching the last fifteen years of research articles. Here articles for cerebellar ataxia on assistive and rehabilitation were chosen for study. Assistive techniques like bruce protocol, treadmill, and suspension therapy are useful in various cerebral dysfunctional conditions, but this study focuses on cerebellar ataxia.

**Keywords:** cerebellar ataxia, Romberg's sign, suspension, treadmill, Bruce protocol, suspension therapy.

## INTRODUCTION

(1) The term "ataxia" was first used to describe a variety of uncoordinated symptoms associated with multiple disorders, such as gait, movement, and heartbeat. Romberg's sign was positive in Cerebellar Ataxia individuals; common symptoms include walking slowly, rolling, and so on. When the eyes were open, the symptoms were minor, but when the eyes were closed, they became far more severe. (2) In neurological practice, cerebellar ataxia is a common occurrence, with various reasons Acute cerebellar lesions generated by infarction, in a genuine neurological emergency spectrum from constantly recurring and step-by-step degenerations to acute cerebellar lesions caused by infarction, effusion, and bloody-flux. (3) Cerebellar ataxias are a diverse collection of conditions characterized by slurred speech, uncoordinated limb movements, and poor balance, which frequently lead to wheelchair confinement.

Assistive devices

Treadmill:

(4) Gait lasting power, gait tempo, limb support time, rise and fall, and step length have all been impacted via treadmill training in a cerebellar ataxia patient. Wend one's way on a treadmill and doing muscle-strengthening exercises are common elements of gait training. Twelve sessions of Treadmill course will enable older folks improve cognitive balance and gait speed.

(5) The experimental group's gait tempo (mean 0.15 m/s, 95% confidence interval 0.04–0.26) and stride length (mean 0.16 m, 95% confidence interval 0.02–0.30) skyrocketed more than the control gathered together.

### Suspension therapy:

Suspended gait training is used to train patients with the help of suspension attached to the patient, which supports their lumbar region and spine to avoid deviation and sway of the body. The Suspension Walker allows a person to walk in either a somewhat weight-bearing or fully weight-bearing position.

The patient's body is suspended in a standing position by the automatic suspension system (REHABOT), allowing them to walk around the circular railing without having to push themselves forward. The patient's weight loss is accurately managed as he or she is supported safely.

### Etiology :

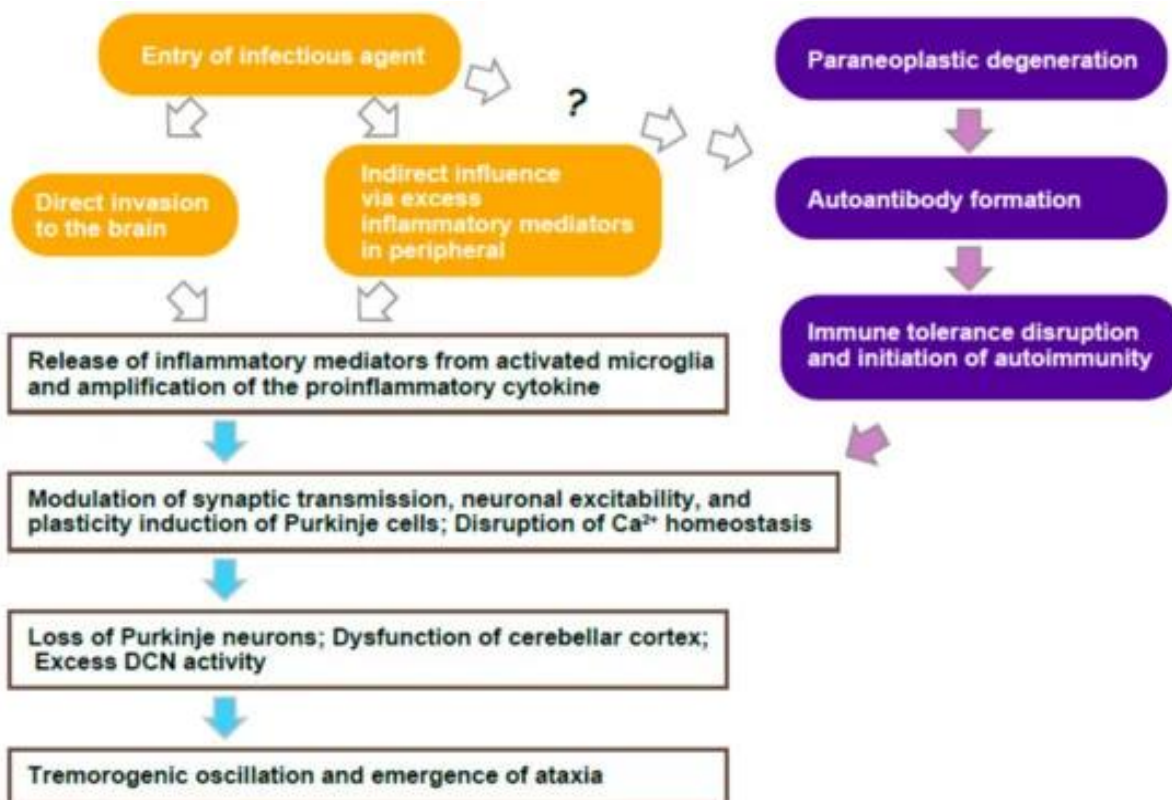
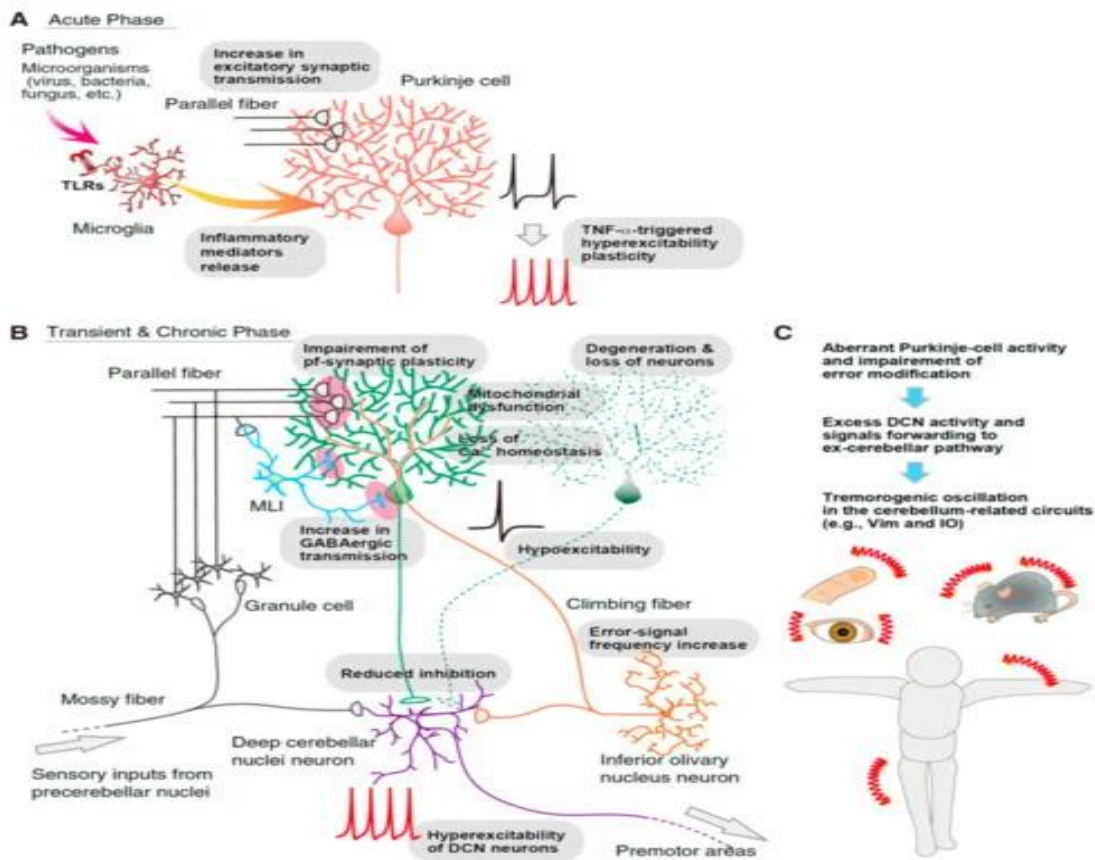
When the cerebellum is affected, ataxia develops (the segment of the brain in charge of movement coordination). Ataxia can be driven by a range of circumstances, including an acute injury or infection, as well as a chronic degenerative process. Ataxia is associated with injury to the cerebellum (the prefrontal cortex that controls muscle coordination) or its connections.

### Possible causes of cerebellar ataxia:

- viruses like chickenpox, epestein-barr, coxsackie viruses.
- bacterial infection: lyme disease
- alchol misuse
- brain tumors
- head trauma
- bleeding in the cerebellum
- inherited or congenital
- Exposure to mercury, lead & other toxins
- brain degeneration

### Pathogenesis :

(6) The cerebellum is in command of motor coordination and education. Exterior disease causing agents, such as viruses, bacteria, and fungi, trigger inflammatory mediators to be released and produced, resulting in acute cerebellar inflammation. The onset of cerebellar ataxia is linked to the clinical finding of acute cerebellitis.



## Rehabilitation Technology in Cerebellar Ataxia :

### Balance and co-ordination:

(7) Balance training, come into being postural control, determined gait training, The use of compensatory orthotics and aids, as well as the theoretical understanding of cerebellar functioning, are also explored. The awkwardness of utilize trial-and-error-based learning are taken into account, which will have an footprint on the teaching expertise and grand design used in the course of gait rehabilitation.(8) Walking, a edgewise weight-shifting piece of work to assess steadiness, a visually conduct stepping task to assess leg coordination, and a sideway weight-shifting exercise to assess equilibrium. Balance and gait control in the cerebellum are linked but distinct via cerebellar regulation of discretionary, visually guided limb motions.

### Bruce protocol exercise treadmill test:

Robert A. Bruce developed the Bruce protocol, which is a diagnostic test for assessing cardiac function. It's a multistage treadmill test that's used to assess cardiovascular health.(9) A standardized and validated stress protocol for monitoring cardiovascular hemodynamic changes in exercising patients has been developed.(10-25) The protocol of the test had no effect on VO<sub>2</sub>max assessed during treadmill exercise, and utilising a brief running protocol (i.e. roughly 5 minutes) could be a quick way to determine VO<sub>2</sub>max in healthy, untrained adults. Running with tiny gradient increments, on the other hand, is a good way to start is successful in eliciting a greater V O<sub>2</sub>max in trained subjects (27-38).

## Conclusion:

Gait variability is common and can be caused by a union of equilibrium issues, interlimb harmonize , and postural pursuit and leg manoeuvre incoordination. The high occurrence of injurious falls is due to inherent balance issues. This review empathises the essential components to be explored in thesis on the cerebellar ataxia in assistive and rehabilitation in patients. Cerebellar ataxia diagnosis is surged in high demand over the past decades, with implicants in both the biomedicine and lifestyle.(11) The commonly held belief so as cerebellar ataxia of stance does not exceed with visual report is only true for vestibulocerebellar lesions, not for ataxia caused by cerebellar atrophy. As per the study of J Dichgans and B Guschlbauer et al (1992) The patients who were the most badly afflicted (n = 2) exhibited no preparatory activity at all and were thus unable to complete the task. By using these assistive devices and rehabilitation techniques provides a significant improvement in patients with cerebellar ataxia. Review lacks data about the sensibility accuracy and specificity of the approaches for different assistive devices and rehabilitation techniques occurs after cerebellar ataxia between technical capabilities in terms of precision, performance efficiency and modalities and human requirements for convenience durability and often aesthetics evolves with time and can be researched further.

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