

# Neurological Music Therapy and Parkinson's Disease

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## Introduction

- Neurological music therapy utilizes music to treat neurologically-based diseases or impairments.<sup>4</sup>
- Movement Based Music therapy is a type of neurological music therapy which uses rhythmic auditory cueing to treat diseases resulting in motor control impairments specifically.<sup>7</sup>
- Therapy consists of patients synchronizing motor movements which they find difficult to an externally cued musical beat.<sup>1</sup>
- Treatment is non-intrusive and has no addictive properties unlike surgery or pharmaceuticals.<sup>2,7</sup>

## Therapy Applications – Parkinson's Disease

- Parkinson's Disease is a neurodegenerative disease affecting the basal ganglia causing imprecise movements, and tremor among other symptoms.<sup>6</sup>
- Neurological music therapy can be used to treat irregular gait pattern by improving the regularity of stride length and step velocity.<sup>5</sup>
- Therapy involves patients walking in time with an isochronous musical beat adjusted for normative gait pace.<sup>6</sup>
- Over time music is reduced and patients learn to walk unassisted by quietly singing the song to themselves or replaying the song in their head.<sup>4</sup>
- Treatment benefits have shown to carry on one month post treatment.<sup>2</sup>

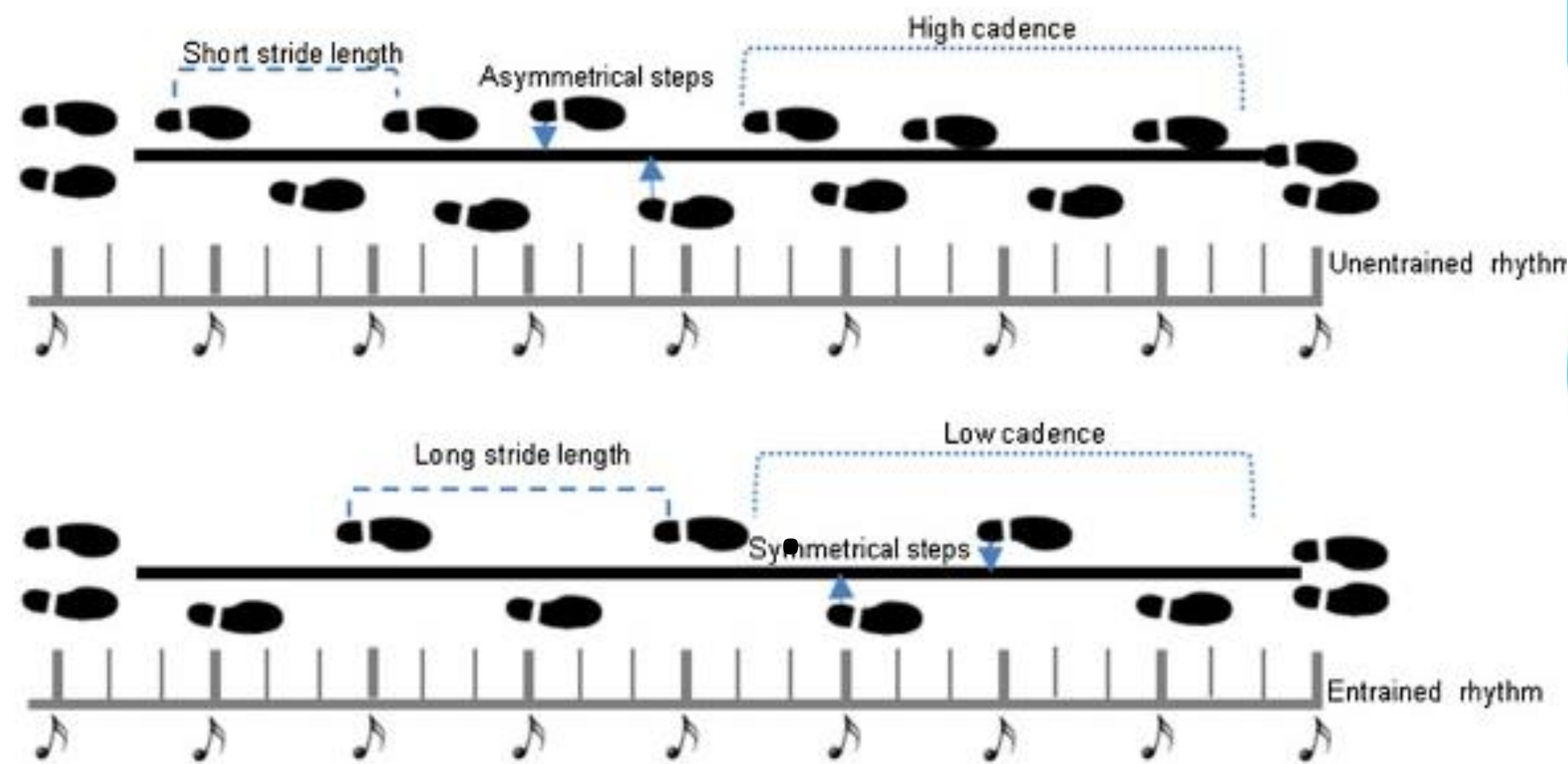


Figure 1: Gait parameters of patient with Parkinson's disease before and after music-based movement therapy. Notice the improvement in stride length and regularity of cadence after entrainment.<sup>7</sup>

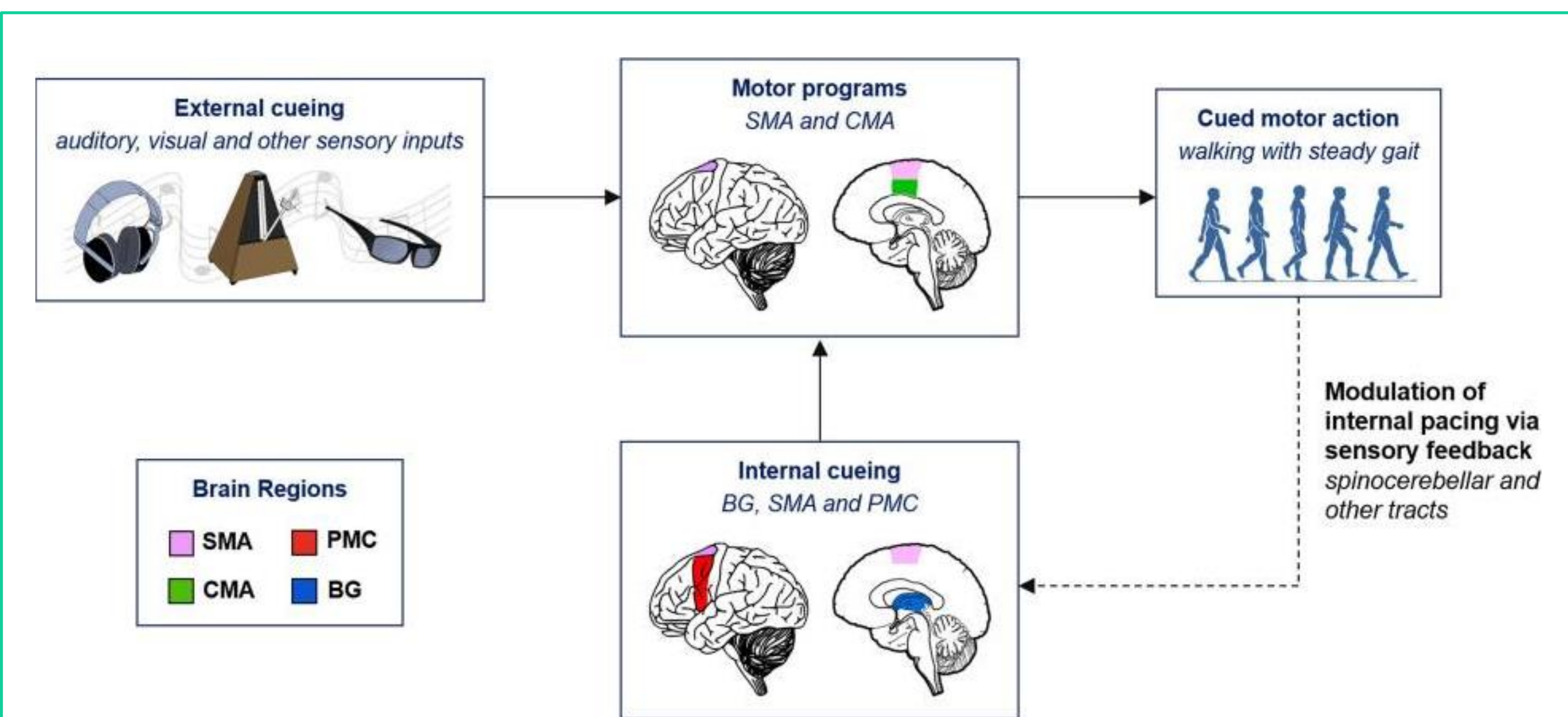


Figure 2: Proposed neurological schema for externally cued gait training and major brain areas involved.<sup>1</sup>

## Neurological Mechanism

- Movement is motivated by response to an external cue instead of being generated internally.<sup>1</sup>
- The pathway responsible for internally generated movements involves the basal ganglia and is impaired in those with Parkinson's Disease.<sup>6</sup>
- Externally cued movements are carried out through a different neurological pathway than internally generated movements.<sup>7</sup>
- It is predicted that a cerebello-thalamo-cortical pathway of communication is what mediates entrainment of externally cued movements.<sup>7</sup>
- fMRI and PET scans have shown high neural activity between the cerebellum and supplementary motor area during externally cued movement.<sup>8</sup>
- Increased neural recruitment in cerebello-thalamo-cortical pathways are found in participants with Parkinson's Disease post therapy

Figure 3: Auditory-motor schema for how external cueing may be used to activate cerebellum-thalamic-cortical circuitry and ultimately target the same key areas as the internal path.<sup>7</sup>

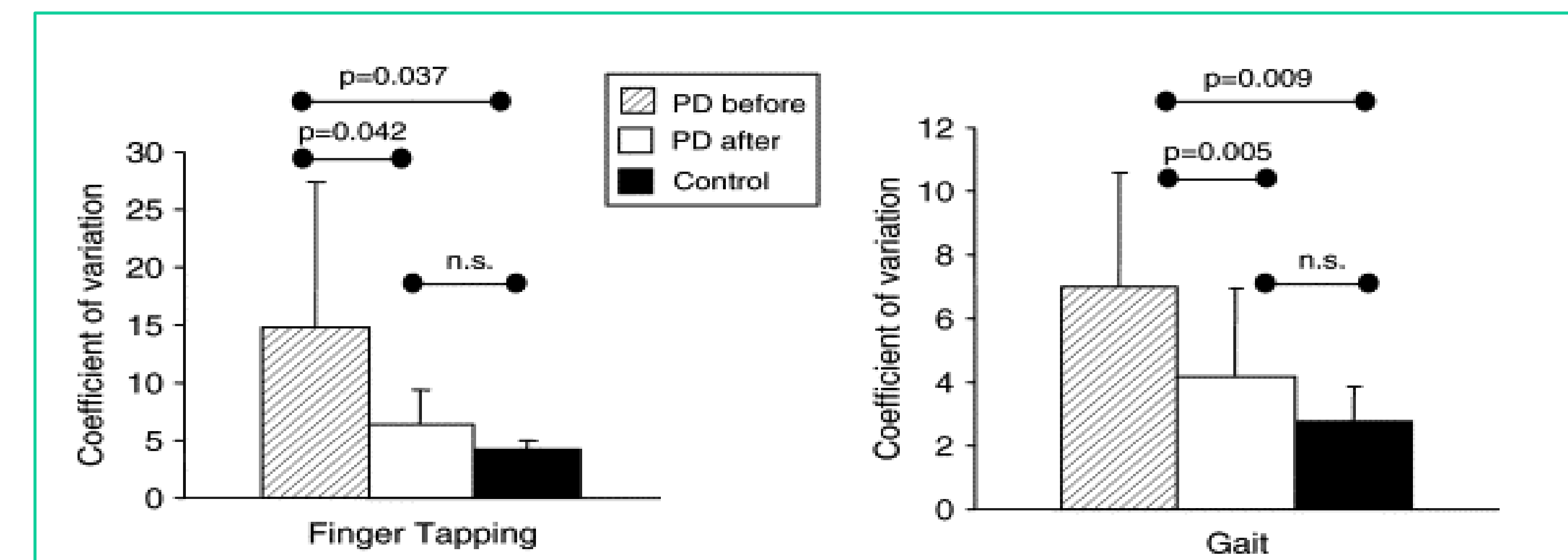
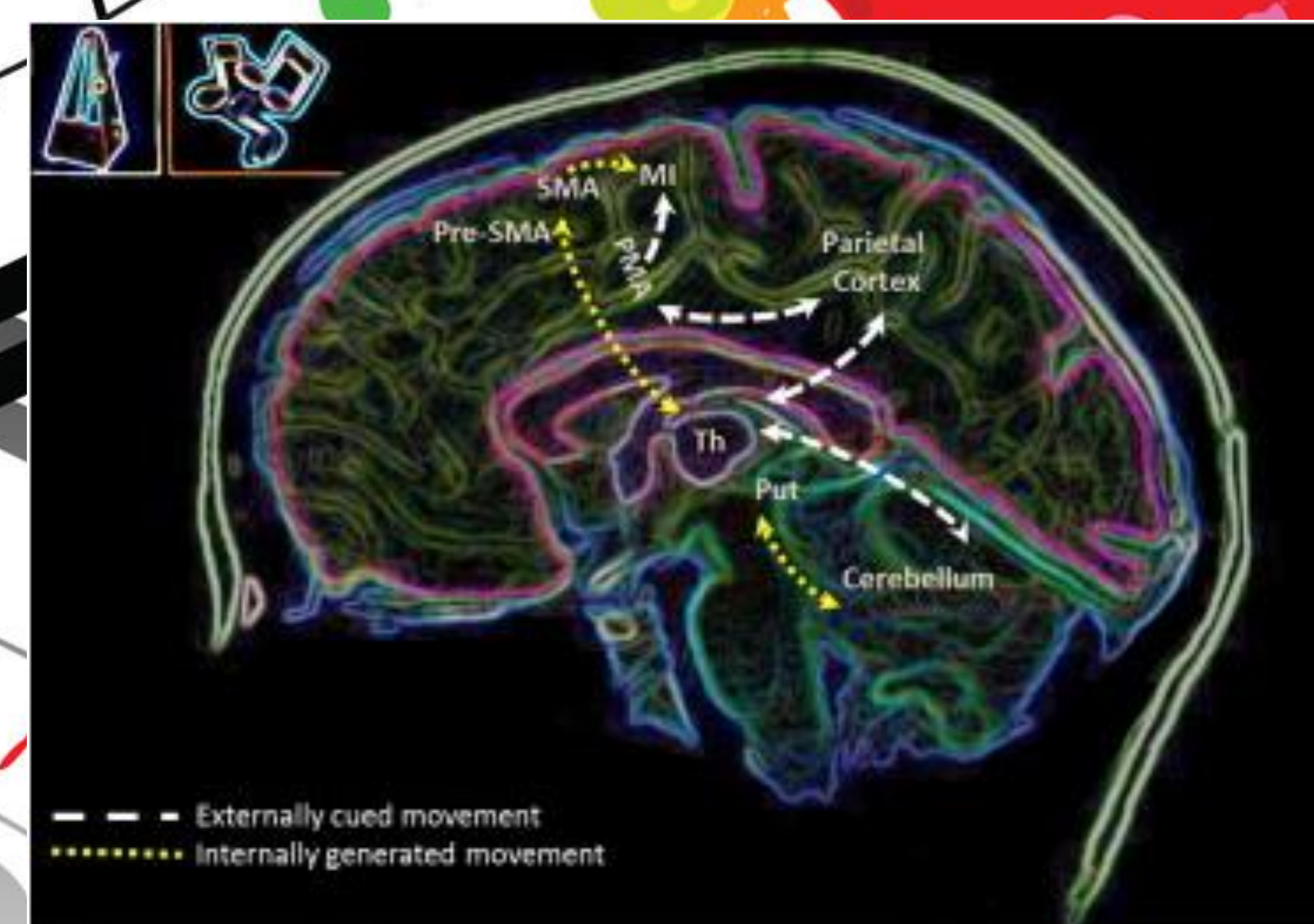


Figure 4: Coefficient of variation of finger tapping and gait interventions for Patients with Parkinson's disease before and after music based movement therapy compared to the control. After therapy the coefficient was significantly less in both interventions for PD patients.<sup>6</sup>

## Conclusion

- Neurological movement therapy is an effective form of treatment to improve spatio-temporal aspects of gait and other motor task
- Improvements in gait last beyond therapy and positively influence patient ambulatory independence and overall quality of life.

## Recommendations

- Further studies using a longitudinal style to investigate how long movement-based music therapy is effective post treatment.<sup>4</sup>
- Further applications of movement-based music therapy to movement task other than gait which influence daily living.<sup>1</sup>

## References

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