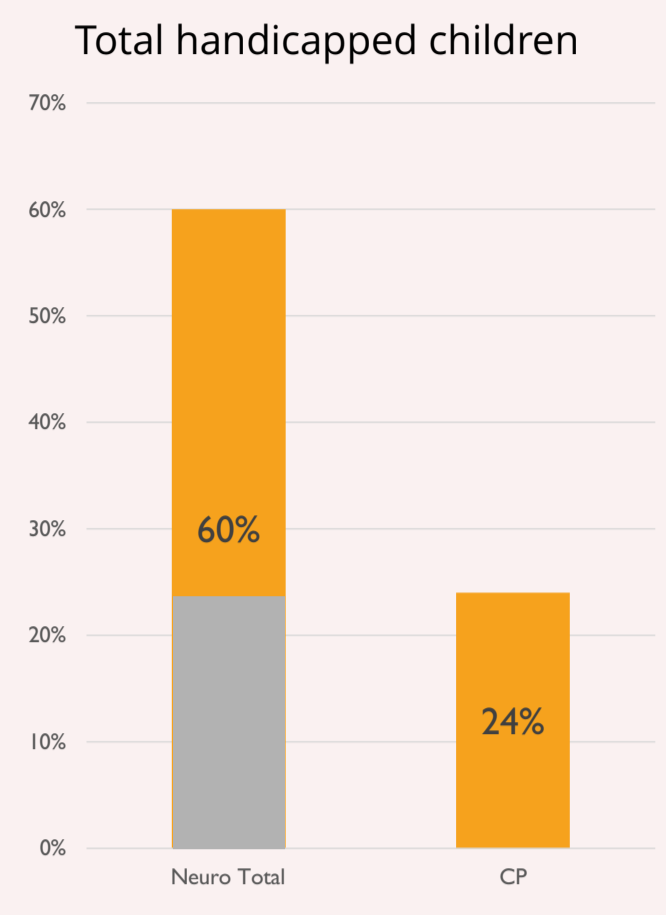


# The implementation of Translingual Neurostimulation (TLNS) for treating balance impairments in pediatric patients with Cerebral Palsy

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'Cerebral palsy describes a group of permanent disorders of the development of movement and posture, causing activity limitation, that are attributed to non-progressive disturbances that occurred in the developing fetal or infant brain'.



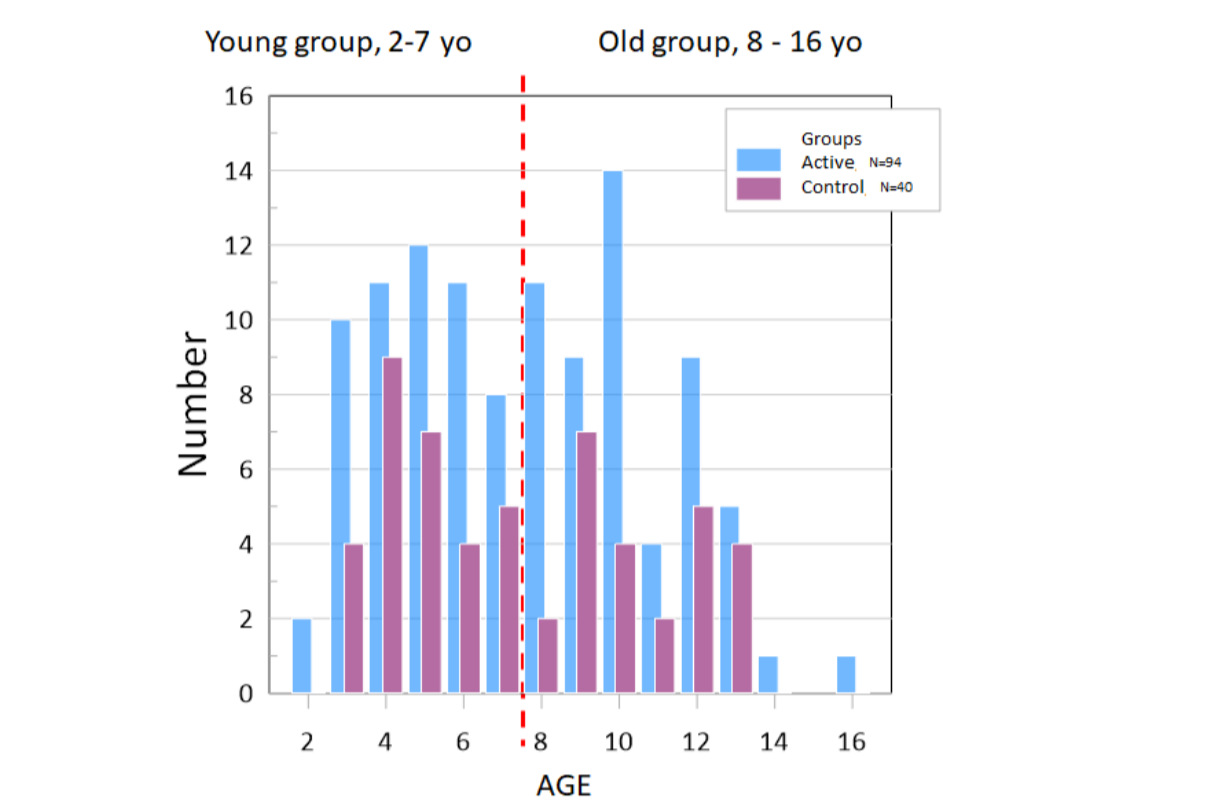
**World Health Organization's International Classification of Functioning, Disability and Health (ICF)**, has redefined the way clinicians understand CP and think about intervention options. From an ICF perspective, CP impacts on a person's

- **'functioning'**, (inclusive of body structures [e.g. limbs],
- **body functions** [e.g. intellectual function],
- **activities** [e.g. walking],
- **and participation** [e.g. playing sport]),

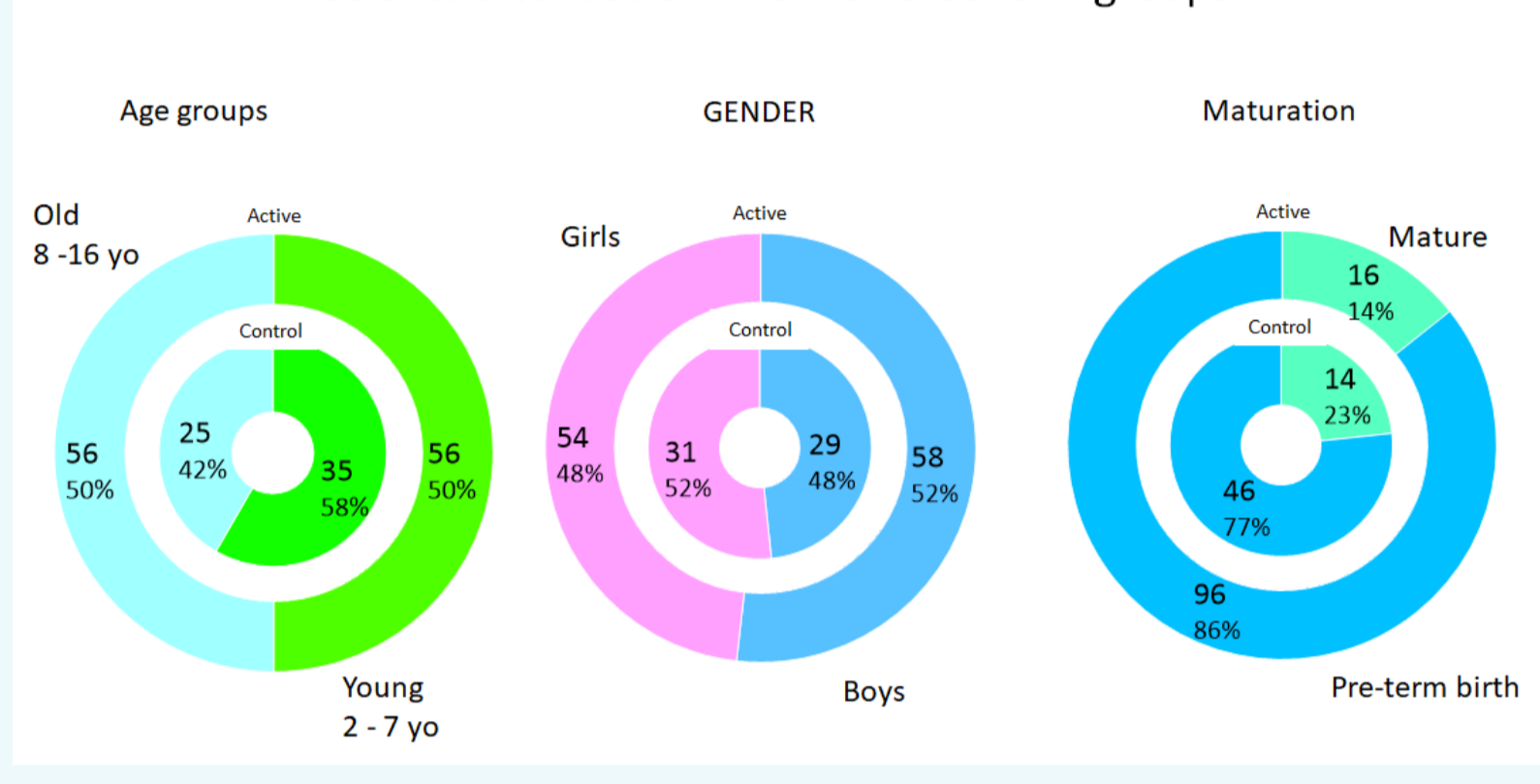
which in turn may cause **'disabilities'**, such as impairments, activity limitations, and participation restrictions.

**STUDY**  
A study was conducted at Sestroretsk City Hospital № 40 to assess the efficacy of a therapeutic exercise program (TEP) combined with translingual neurostimulation (TLNS) with a portable device on participants aged 2-17 years diagnosed with spastic diplegia CP with coordination and mobility symptoms.

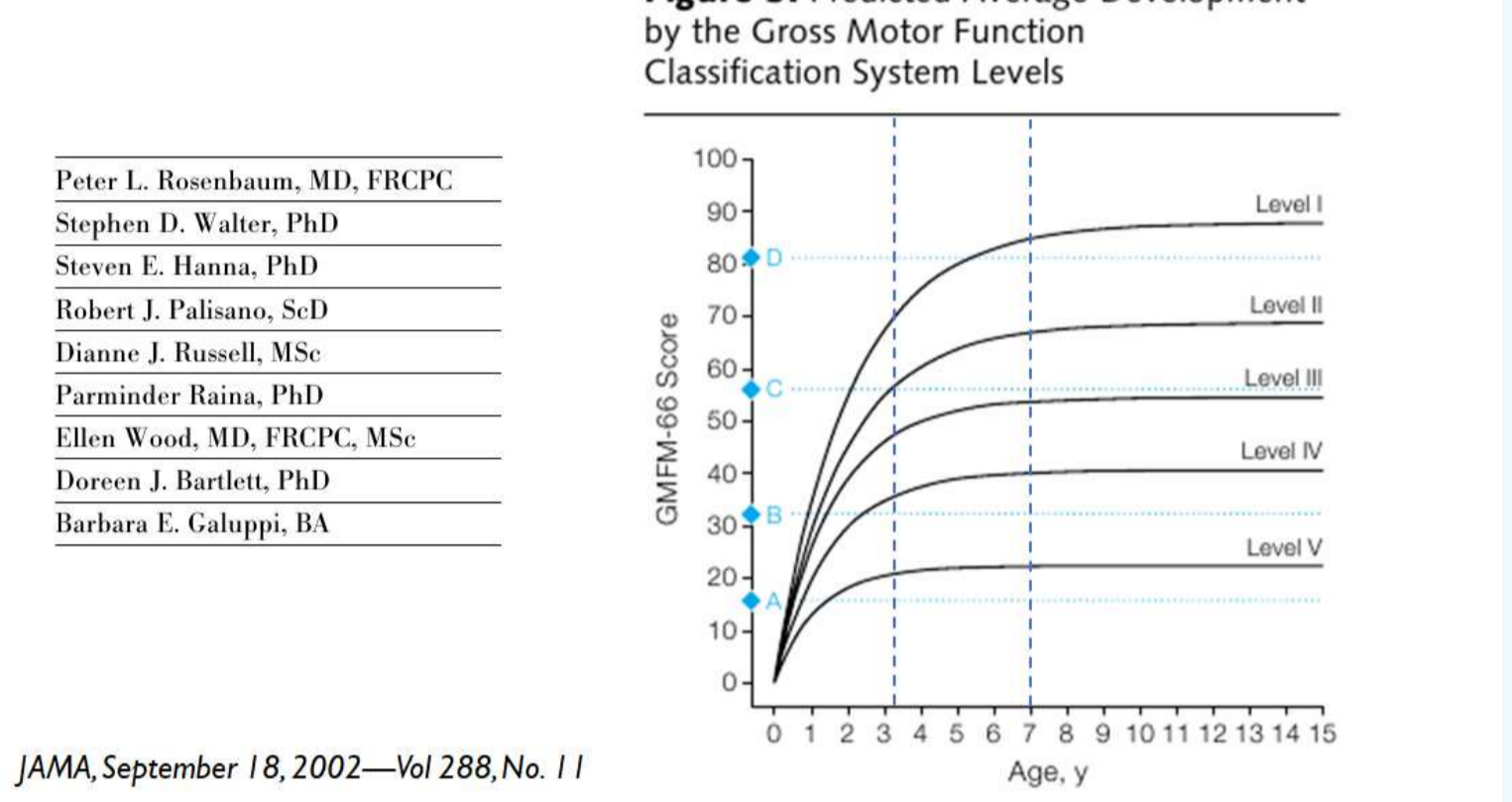
Patients distribution by age: Active (A) and Control (C) groups



Patients distribution: Active vs Control groups



Prognosis for Gross Motor Function in Cerebral Palsy: Creation of Motor Development Curves



In total 134 participants (63 girls and 71 boys; mean age, 7.8 ± 0.3 years) were enrolled in the primary experiment group (94) and in the control group (60).

**ASSESSMENT and SCORING**

**Balance – Berg Balance test**  
The **Berg Balance Scale** (or BBS) is a widely used clinical test of a person's static and dynamic balance abilities, named after Katherine Berg, one of the developers. The BBS is generally considered the gold standard for functional balance tests. Total conditions – 14, Performance Score 0 – 4, Total score - maximum 56

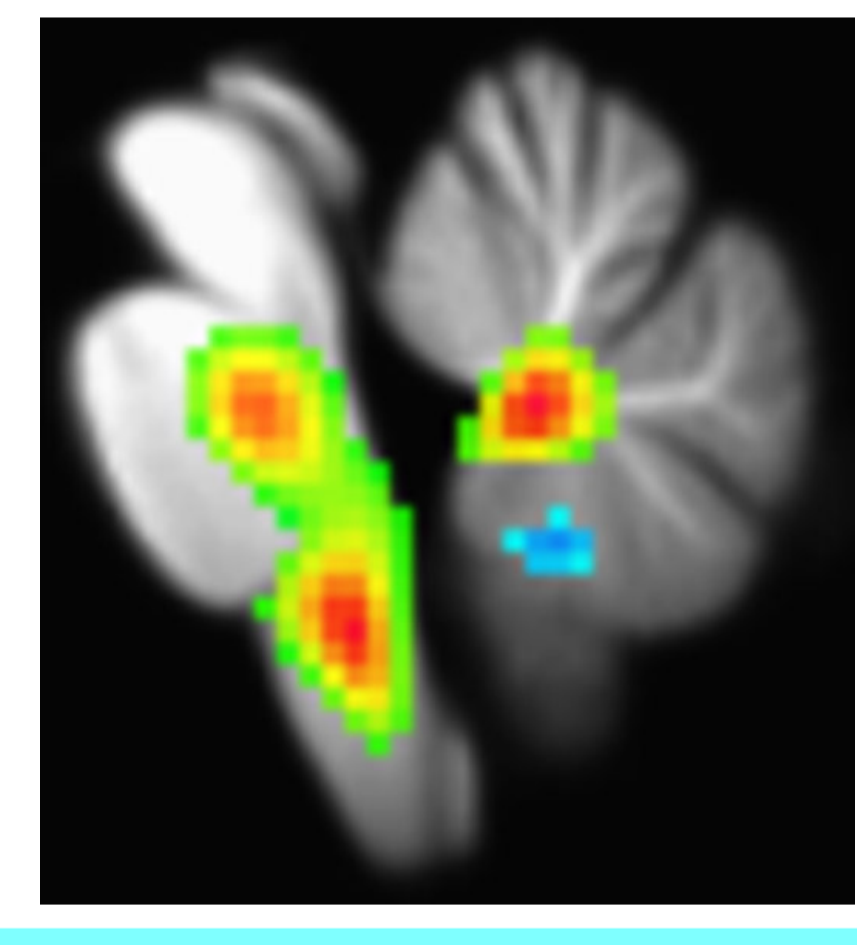
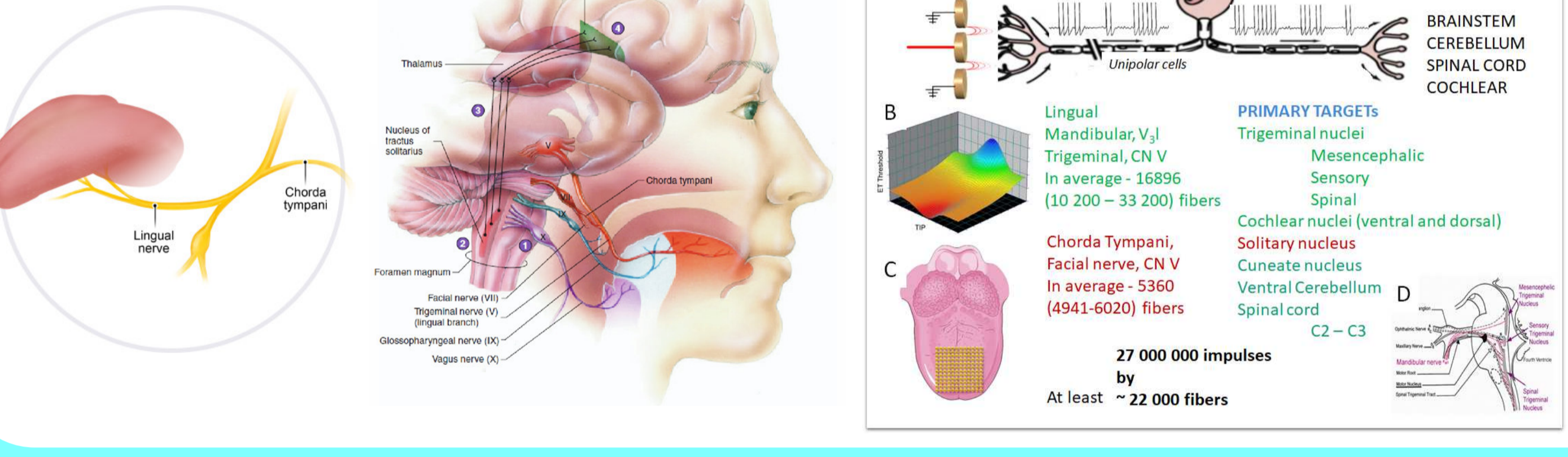
- GMFCS Level I-V**
1. Sitting to standing
  2. Standing unsupported
  3. Sitting unsupported
  4. Standing to sitting
  5. Transfers
  6. Standing with eyes closed
  7. Standing with feet together
  8. Reaching forward with outstretched arm
  9. Retrieving object from floor
  10. Turning to look behind
  11. Turning 360 degrees
  12. Placing alternate foot on stool
  13. Standing with one foot in front
  14. Standing on one foot
- Total**

Testing Groups	Active	Control
Number	94	40
F/M	43 / 51	20 / 20
Age	7.6 ± 0.3	7.8 ± 0.5
GMFCS	3.5 ± 0.1	3.7 ± 0.1
FMS5	2.1 ± 0.1	1.9 ± 0.2
FMS50	1.9 ± 0.1	1.8 ± 0.2
FMS500	1.7 ± 0.1	1.7 ± 0.2
ASHL	3.1 ± 0.1	3.3 ± 0.1
ASHH	2.7 ± 0.1	2.8 ± 0.1
BERG*	16.9 ± 1.3	12.1 ± 1.7

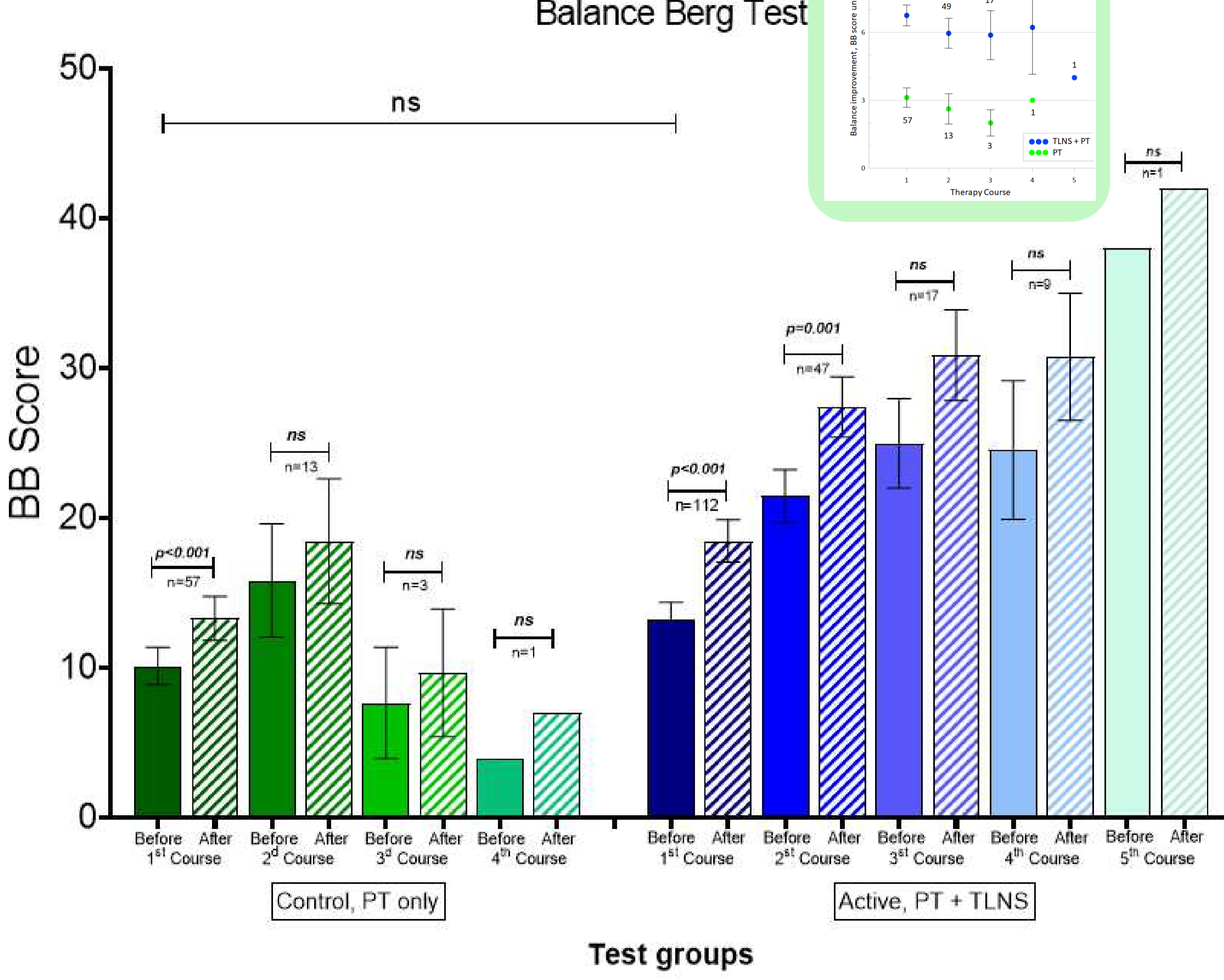
**Standard therapeutic exercise program (TEP)**



**TLNS**



**RESULTS**



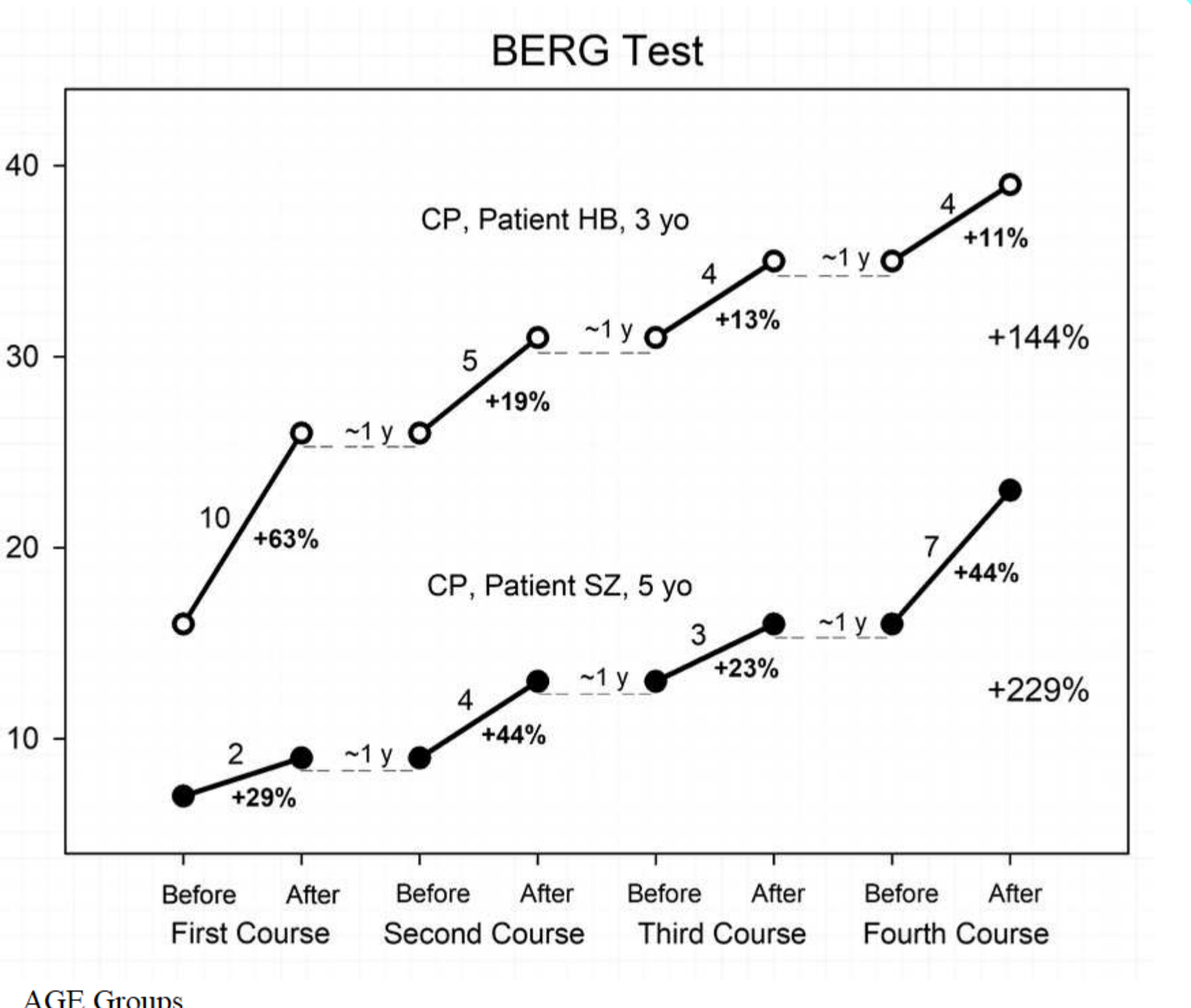
The study revealed that both groups of patients experienced improvement; however, the experimental group showed significantly more progress across all scales, in all age groups, and primarily sustained for 6-12 months.

The control group only experienced minimal efficacy from physical therapy, with only 77% of participants showing any improvement that was not sustained between courses.

In contrast, the active group exhibited a more significant improvement in balance performance, with 92% of participants experiencing twice the improvement of the control group.

This improvement was sustained between courses and accumulated over time, resulting in a cumulative gain of 30-35 points on the Berg scale.

Similar improvements were also observed in motor skills development and decreased spasticity.



SCALES	Young N=91		Old N=71	
	Active, n=56	Control, n=35	Active, n=56	Control, n=35
FMS 5m	+89%	+37%	+86%	+48%
FMS 50m	+75%	+20%	+70%	+32%
FMS 500m	+61%	+20%	+52%	+12%
Ashworth Hands	+52%	+34%	+61%	+32%
Ashworth Legs	+63%	+23%	+55%	+40%

IMPROVEMENT IN %

Translingual neurostimulation (TLNS) combined with physical therapy (TEP) positively affects the recovery of young patients with cerebral palsy. The improved balance resulting from this approach is sustained for up to a year between therapy sessions and can be consistently increased with regular therapy sessions. Therefore, TLNS coupled with TEP can be seen as a promising method of improving neurorehabilitation outcomes for children with CP and has great potential for advancing the usage of TLNS in CP.

