

# Domiciliary gaze stability and oculomotor exercises improves balance after stroke.

## BetterBalance, a randomized controlled trial

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### BACKGROUND

As mechanisms of gaze stability, both visual stabilization and the vestibulo-ocular reflex are needed to coordinate the movements of the head, trunk and pelvis during walking<sup>1,2</sup>. Balance impairment after stroke is strongly associated with more severely impaired motor function, a decrease in recovery potential and an increase of the number of falls<sup>3-5</sup>.

### PURPOSE

To verify the efficacy of a domiciliary training program to improve balance impairment due to stroke in senior patients.

### METHODS / RESULTS

Randomized open controlled trial registered at ClinicalTrials.gov (NCT02280980).

Data were analyzed per protocol. Relative Risk (RR) for the primary outcome was estimated with 95% confidence interval (95%CI). A multivariable logistic regression model assesses the decrease of the risk for falls.

217 patients with stroke admitted for physiotherapy as outpatients, 147 older than 60 years, 83 fulfill inclusion criteria, 12 excluded for previous balance problems

Consent obtained and baseline assessment (n=71)

Block randomization with stratification by age, functionality (Motor Assessment Scale) and balance/risk of fall (BBS ≤ 45 points or/and TUG > 14 seconds)

Observational group (OG) n=35  
current rehabilitation program (CRP)

Intervention group (IG) n= 36  
CRP + domiciliary plan of gaze stability and oculomotor exercises (twice a day, three weeks)

Final assessment

3 excluded (CRP interrupted for more than one week)  
OG n=32

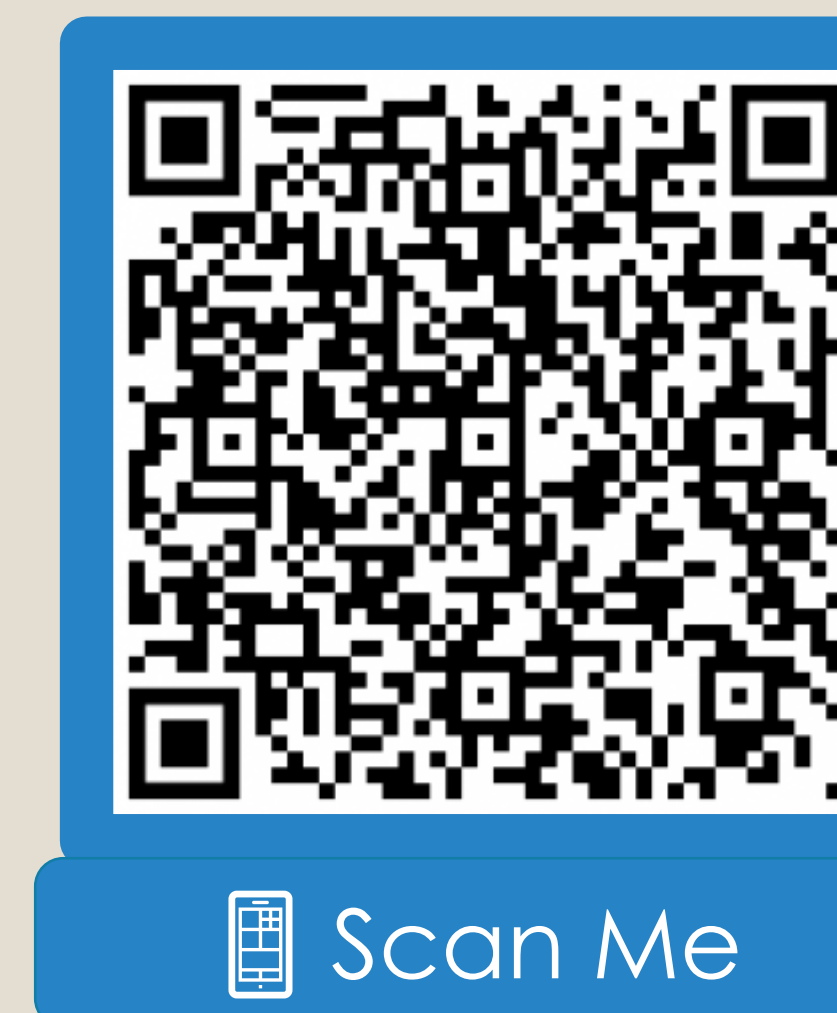
7 excluded (CRP interrupted for more than one week - 5; lack of adherence to the plan - 2)  
IG n=29

**Inclusion Criteria:** 3 to 15 months after the diagnosis of stroke; balance deficit (positive Romberg Test); ability to walk alone 3 meters.

**Exclusion Criteria:** previous balance problems, severe osteo-articular problems, previous exposure to oculomotor or gaze stability exercises.

**Primary outcome:** the incidence of falls.

**Surrogate outcomes:** the variation of the estimated risk for falls by Berg Balance Scale (BBS) and Timed Up and Go Test (TUG); minimum difference of 4 seconds in TUG and 4 points in BBS.



QR Code  
Video: Domiciliary gaze stability and oculomotor exercises

**Sample:** Aged 60-87 years old (median OG 73 years; IG 74 years). Similarly distributed by gender, type of stroke and reported falls before recruitment.

### Major Findings

4 patients fell in the OG. No falls were registered in the IG.

The surrogate outcome occurred in 11/32 OG patients and in 26/29 IG patients (RR 2.61; 95%CI 1.59 - 4.28; p<0.001). All the IG females reached the surrogate outcome.

The increase of BBS was larger in the IG (median difference 7 vs. 2; p<0.001).

A weak evidence of difference on TUG was observed (median difference OG=-0.72 sec. and IG=-1.28 sec.; p=0.059).

The model for decrease of the estimated risk for falls revealed that:

The intervention lead to a 21.4 fold increase on the odds (αOR 21.43; 95%CI 4.75 - 96.66; p<0.001).

Females had 4.75 fold higher odds for decrease than males (αOR 4.75; 95%CI 1.11 - 20.25; p=0.035).

### CONCLUSIONS/IMPLICATIONS

This trial did not reach power to assess the efficacy of the intervention as actually preventing falls, although evidence was obtained that complementary oculomotor and gaze stability exercises decrease the estimated risk for falls; this decrease is larger in females.

Domiciliary oculomotor and gaze stability exercises are a promising approach as a complement in the physiotherapy intervention after stroke, whenever balance impairment is present. Given the high incidence of falls in these patients and their social and economic impact, this can be an efficient strategy to improve balance and reduce the risk for falls.

**References:** 1. Hain TC, Ramaswamy TS and Hillman MA. Anatomia e Fisiologia do Sistema Vestibular Normal. In: Herdman S. Reabilitação Vestibular. 2nd ed. Manole (Brasil); 2002, pp. 5 - 24. 2. Cromwell RL, Newton RA, Carlton LG. Horizontal plane head stabilization during locomotor tasks. *J Mot Behav* 2001, 33: 49-58. 3. Bayouk J, Boucher J and Leroux A. Balance training following stroke: effects of task-oriented exercises with and without altered sensory input. *Int J Rehabil Res* 2006, 29: 51-59. 4. Bonan IV, Colle FM, Guichard JP, et al. Reliance on visual information after stroke. Part I: balance on dynamic posturography. *Arch Phys Med Rehabil* 2004, 85: 268-273. 5. Weerdesteyn V, Niet M, Duijnhoven H, et al. Falls in individuals with stroke. *J Rehabil Res Dev* 2008, 45: 1195-1214.

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