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Submission Title:

Are tilted writing and drawing after stroke related to a biased perception of the vertical ?

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Research Study Abstract

Topic

Clinical Sciences/Health Conditions

Sub-Topic:

Medical Rehabilitation (Including Cardiopulmonary)

Objectives

Establish diagnostic criteria for tilted writing and drawing after a right hemispheric stroke (RHS), test their feasibility and validity, use them to assess writing and drawing orientation on 61 post stroke individuals, search a link between these criteria, verticality perception and spatial neglect.

Design

This retrospective cohort study included 105 right handers: 61 individuals tested 30 days after a first RHS and 44 healthy subjects. We measured the inclination of the margin and of the lines on a writing test, and of the trees and baselines on a drawing copy test. Cut off for abnormality of writing and drawing orientation were determined from the 95th percentiles of healthy subjects values. We assessed patients visual and postural vertical, lateropulsion, corporal and extracorporal neglect, hemianopia.

Results

The mean lines tilt of the writing lines was a feasible, valid and reproducible criterion (ICC = 0.988 with 95% CI [0.975-0.994]; $p < 0,001$ SEM=0.94°; MDC=2.6°). The 3 other criteria were either not feasible or valid. Healthy subject wrote with a significant counterclockwise tilt ($p < 0.001$). The cut off for a pathological tilted writing was -4.9°. Eleven patients (18%) had a tilted writing. Compared to other patients they had a greater lateropulsion ($p=0.002$), a greater bias in the visual ($p < 0.001$) and postural ($p=0.005$) vertical, a greater extrapersonal neglect ($p=0.003$), more hemianopia ($p=0.002$). The principle determinant of the tilted writing was the visual vertical (OR=0.8; 95% CI [0.7-1]; $p=0.027$).

Conclusions

In this cohort study on 105 participants the mean lines' tilt was a feasible and valid criterion to assess writing orientation. It was found pathological in 11 patients, with a biased visual vertical perception as principle determinant. Healthy subjects had a significant counterclockwise writing tilt despite a precise verticality perception. The mean lines tilt should be systematically assessed after a RHS in order to diagnose and rehabilitate a biased perception of verticality.