Eye-movements and cognitive features in Parkinson's Disease: a preliminary study by means of an Eye-Tracking technology

B. Poletti [1], L.Carelli[1], E. Lepori[1], S. Torre[1], F. Solca[2], A. Brugnera[3], F. Mancini[1], S. Tagini[1], J. Pasquini[2], J. Sassone[4,5], F. Girotti[1], A. Ciammola[1], V. Silani[1,2]

[1]Department of Neurology and Laboratory of Neuroscience - IRCCS Istituto Auxologico Italiano, Milan, Italy; [2]Department of Pathophysiology and Transplantation, "Dino Ferrari" Center, Università degli Studi di Milano, Milan, Italy; [3]Department of Human and Social Sciences, University of Bergamo, Bergamo, Italy; [4]Vita-Salute San Raffaele University, Milan, Italy; [5]Division of Neuroscience San Raffaele Scientific Institute, Milan, Italy

Introduction

The cerebral structures mainly involved in the pathogenesis of Parkinson's Disease (PD) also underpin the eye-movements control[1]. Thus, eye-movements alterations might be informative of illness stage and might help a more accurate diagnosis[2].

The aim of this study is to compare eye-movements between patients affected by PD and age-matched healthy controls (HC). A further aim is to probe the possible differences in eye-movements with different gaze directions (up, down, left, right). Moreover, we correlate eye-movements parameters with neuropsychological tests, behavioral, and neurological assessment.

Methods

Neuropsychological tests (the Frontal Assessment battery – FAB, Montreal Cognitive Assessment – MoCA, The Italian Version of Edinburgh Cognitive and Behavioural ALS Screen – ECAS[3], the Reading the Mind in the Eyes Test – RME, and the Story-based Empathy Task – SET), behavioral features (The Frontal Behavior Inventory - FBI and the ECAS-Care Interview), psycho-affective aspects (Beck Depression Inventory I - BDI-I, the State-Trait Anxiety Inventory - STAI-Y), apathy (I-DAS) and quality of life (Short-Form Health Survey 36 - SF-36 and the Parkinson's disease questionnaire - PDQ39 in PD) are assessed. Participants have to gaze to the same/opposite direction of a visual target (Figure 1). Amplitude, peak velocity and reaction times are recorded using the EyeLink1000.

Results

In PD group a significant negative correlation (r= -0.5210, p= 0.015) between the amplitude and the participants' age is found. Eye-movements in PD are found to be more ipometric (p= 0.0012) (Figure 2) and to have a lower peak velocity than HC (p= 0.0042) (Figure 3), especially for upwards movements. In PD patients, eye-movements amplitude and peak velocity significantly correlate only with the RME (r= 0.531, p= 0.013) (Figure 3).

Conclusions

Our results preliminary support the hypothesis that eye-movements features might be related to illness stages and progression of disease in PD.
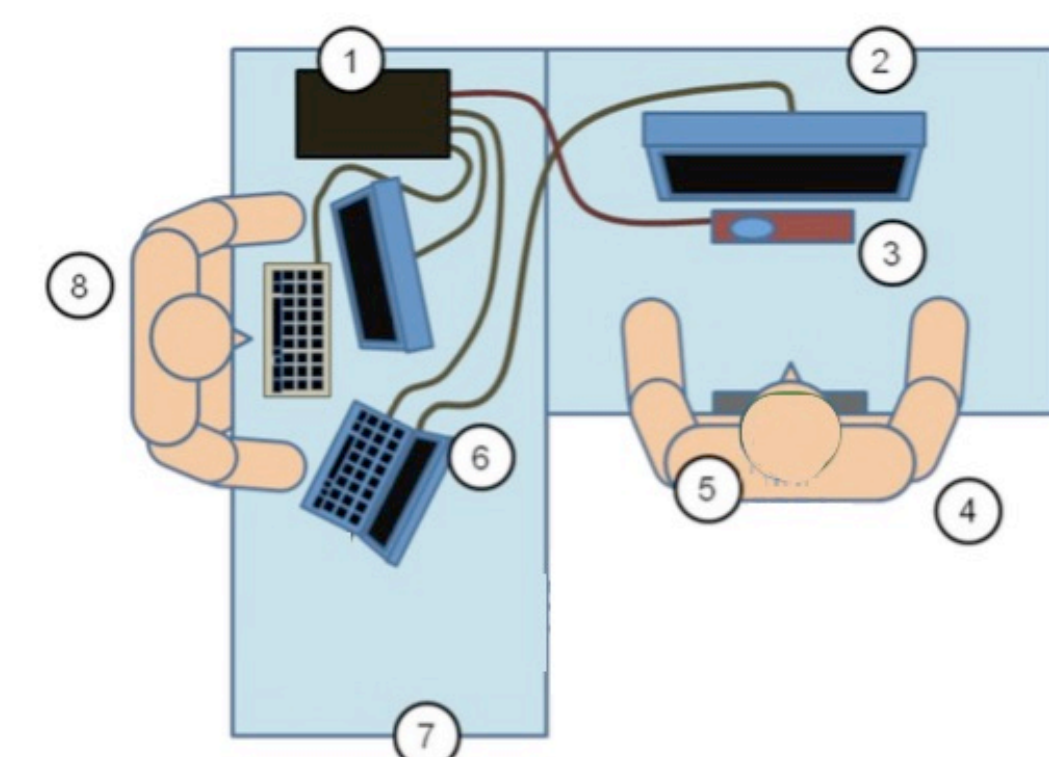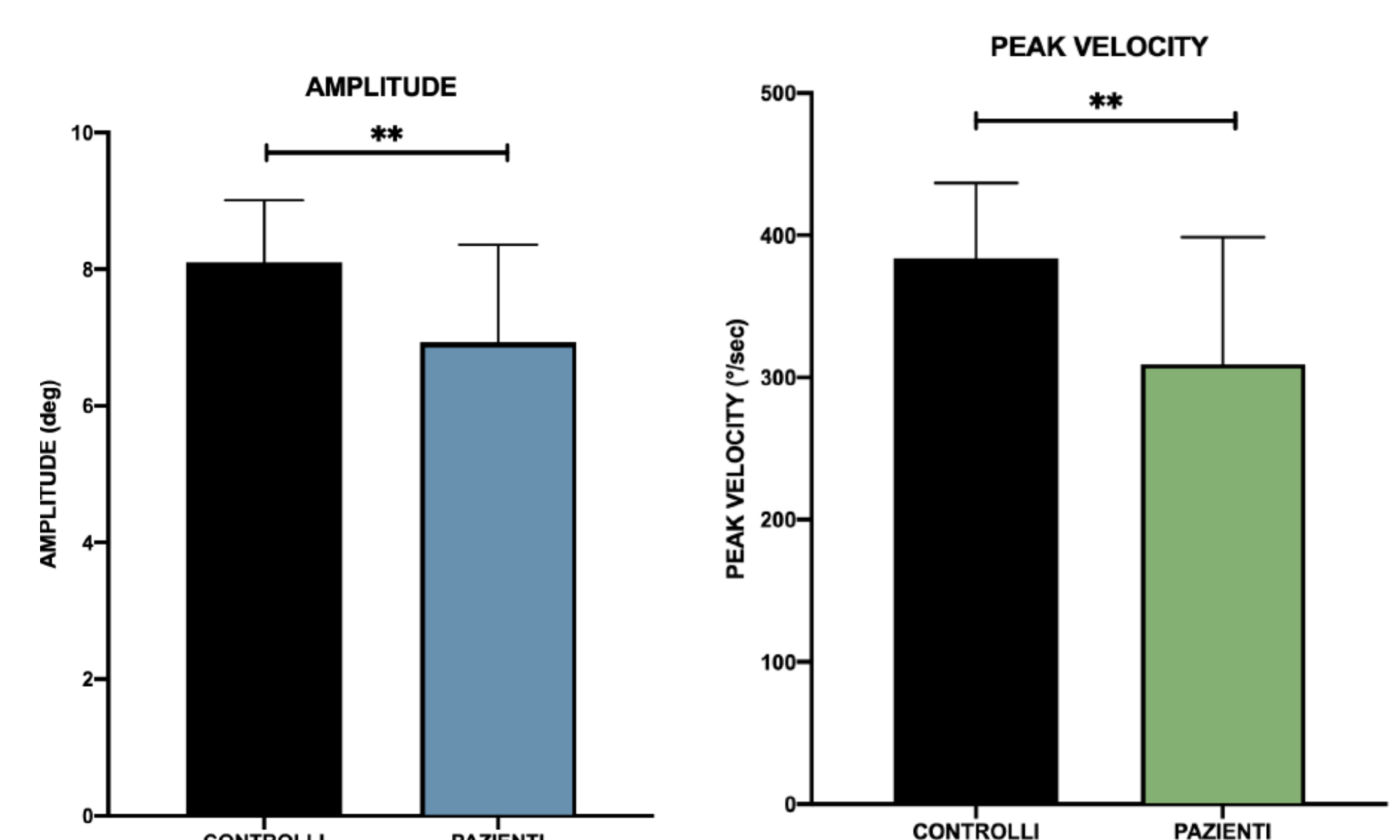

Figure 1. Experimental setting.

Figure 2. Comparison of amplitude between HC and PD.

Figure 3. Comparison of peak velocity between HC and PD.
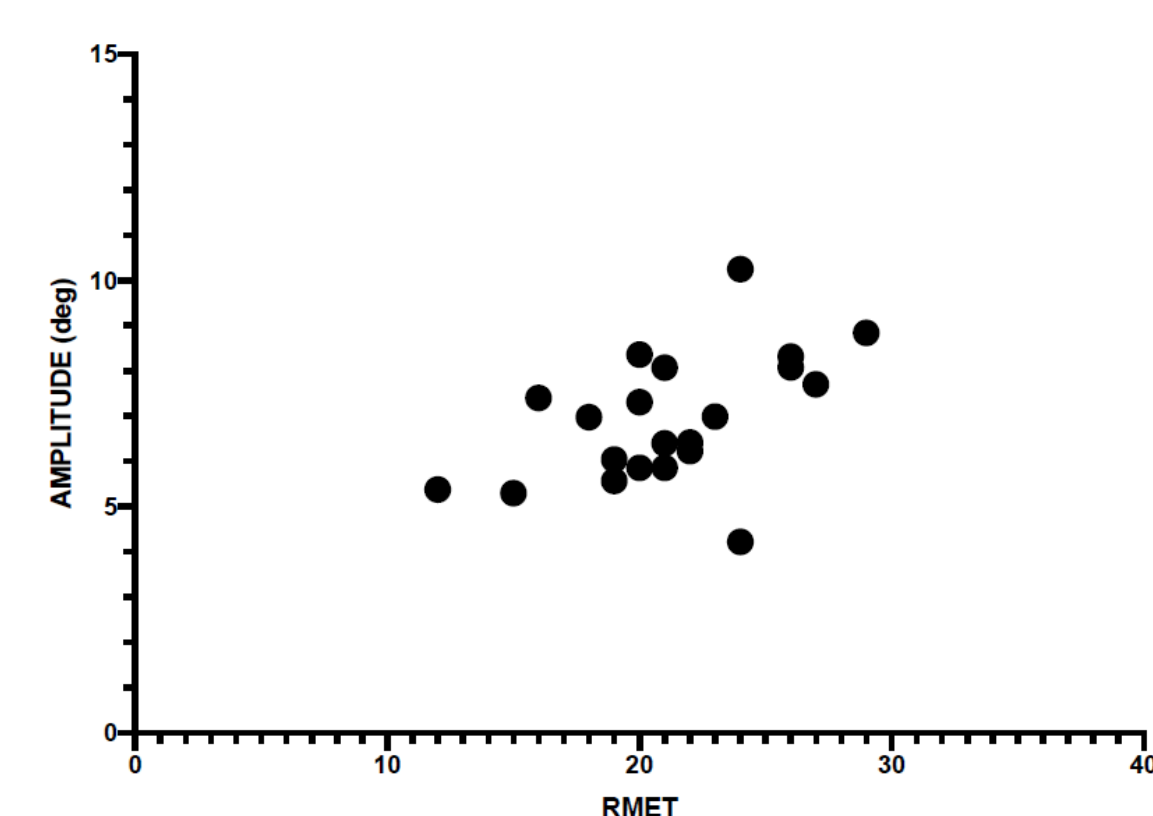

Figure 3. Correlation between amplitude and RMET in PD.

Reference

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