Towards a quantitative MS assessment

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Fig.: The Watzmann with 2713m above sea level and 18.5km from Medical Park Loipl is considered to be the most beautiful mountain in the world (Bergsteiger Magazine, 2014).

Introduction

The clinical assessment of persons with MS (pwMS) is currently mainly based on the semi-quantitative EDSS [1]. In recent years, several scales incorporating quantitative assessment of sensorimotor and cognitive function have been established [2-5].

However, these tests are considered not sensitive enough to detect peculiarities in pwMS with subtle changes due to therapy or disease progression [2, 6]. Here, we introduce the Watzmann Severity Scale (WSS), a digitally assessed, quantitative sensorimotor estimate of disease severity in pwMS.

Methods

We assessed grip force, index finger tapping, visuomotor control (drawing a figure of eight and following a moving target), simple reaction times (visual stimuli), and quality of gait (spectral arc length based approach [7]) in a total of 59 patients and computed the z-score based vector product of Glass' delta (GΔ) (both upper-limbs if applicable).

0% represented the mean of normative data from healthy, age-matched controls, negative values above average, and positive values impaired.

Tab.: Characteristics of the current sample.

Sample size	59, 37% male
Age [a]	52±10 (26-79)
EDSS	4.4±2.0 (1.0-8.5) median: 4.0
Lat. pronounced impairment	47% dominant 46% non-dominant

Results

WSS scores ranged from -26% to 87% (27.4% ±30.1%, median: 22.3%) and were strongly correlated with the EDSS (R^2=.83, 2nd degree polynomial). pwMS revealed impairments in all dimensions but simple reaction times and tapping (grip force GΔ=.68 p<.01; tapping p=.25; visuomotor control GΔ=1.78 p<.01; gait GΔ=2.04 p<.01; simple reaction times p=.67). During a 16.5d ±6.8d in-hospital stay at Medical Park Loipl, scores of 53 patients improved significantly (p<.01, Cohen's d=.19), with 52% positive (>3% WSS gain) and 16% negative responders (>3% WSS loss).
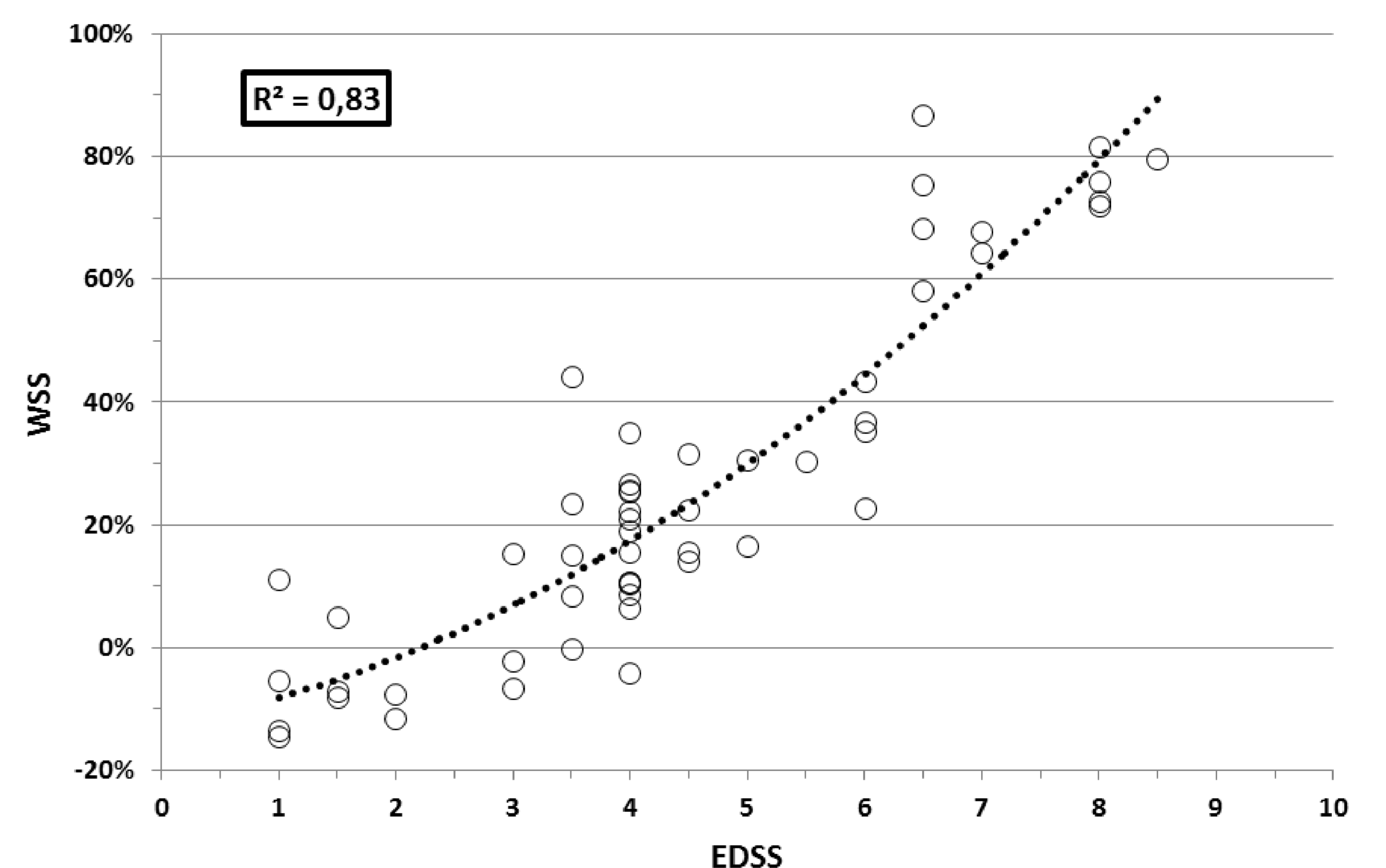

Fig.: 2nd degree polynomial correlation of Watzmann Severity Scale (WSS) and EDSS in 59 pwMS.

Discussion & Outlook

The WSS showed a strong, non-linear correlation with the EDSS, while being able to recognize even subtle changes of performance in different sensorimotor dimensions over the course of an in-hospital stay. pwMS revealed strongest impairments in visuomotor control and gait. The ongoing study aims to provide a quick, objective, reliable and low-cost assessment of impairment in pwMS.
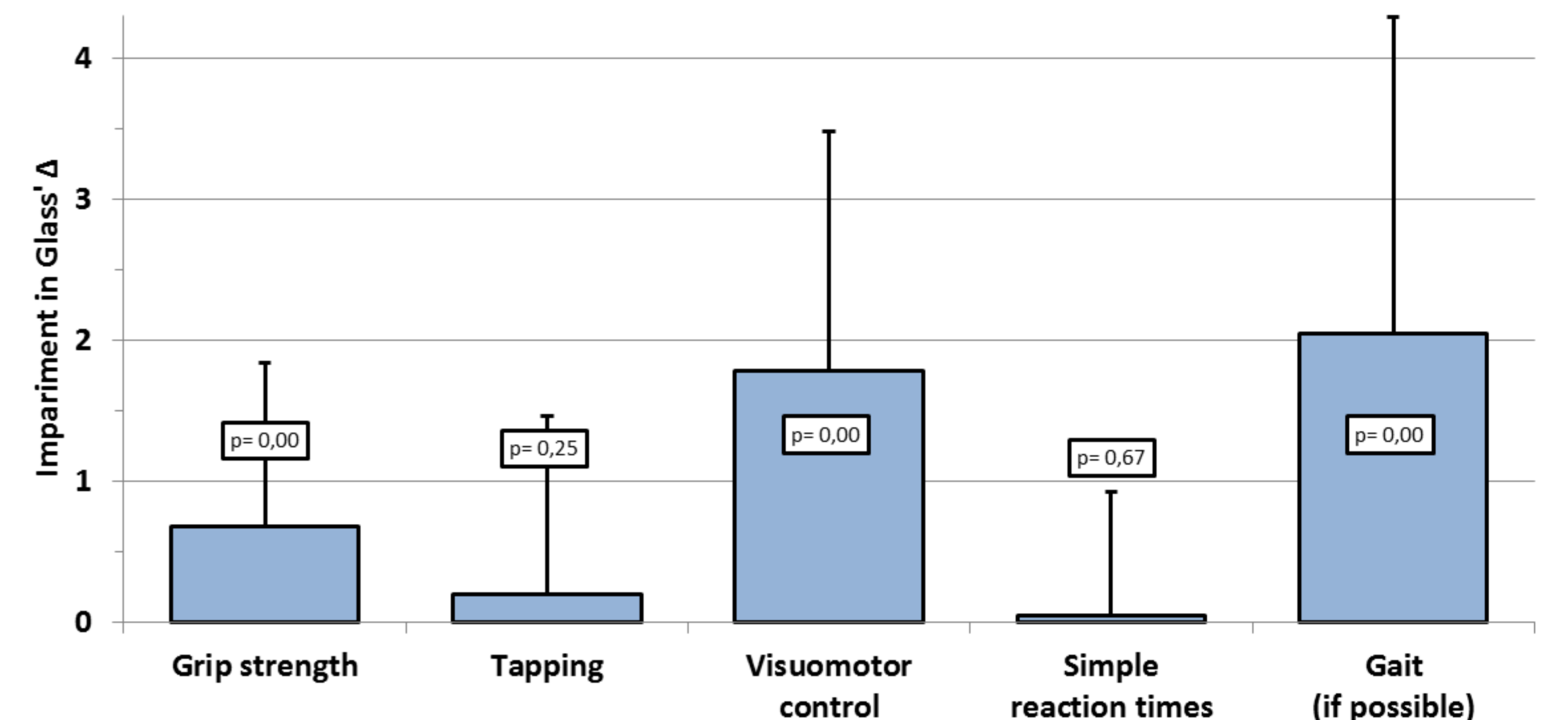

Fig.: Impairments in different dimensions of sensorimotor performance of 59 pwMS. Effect sizes are expressed in Glass' Δ.

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