

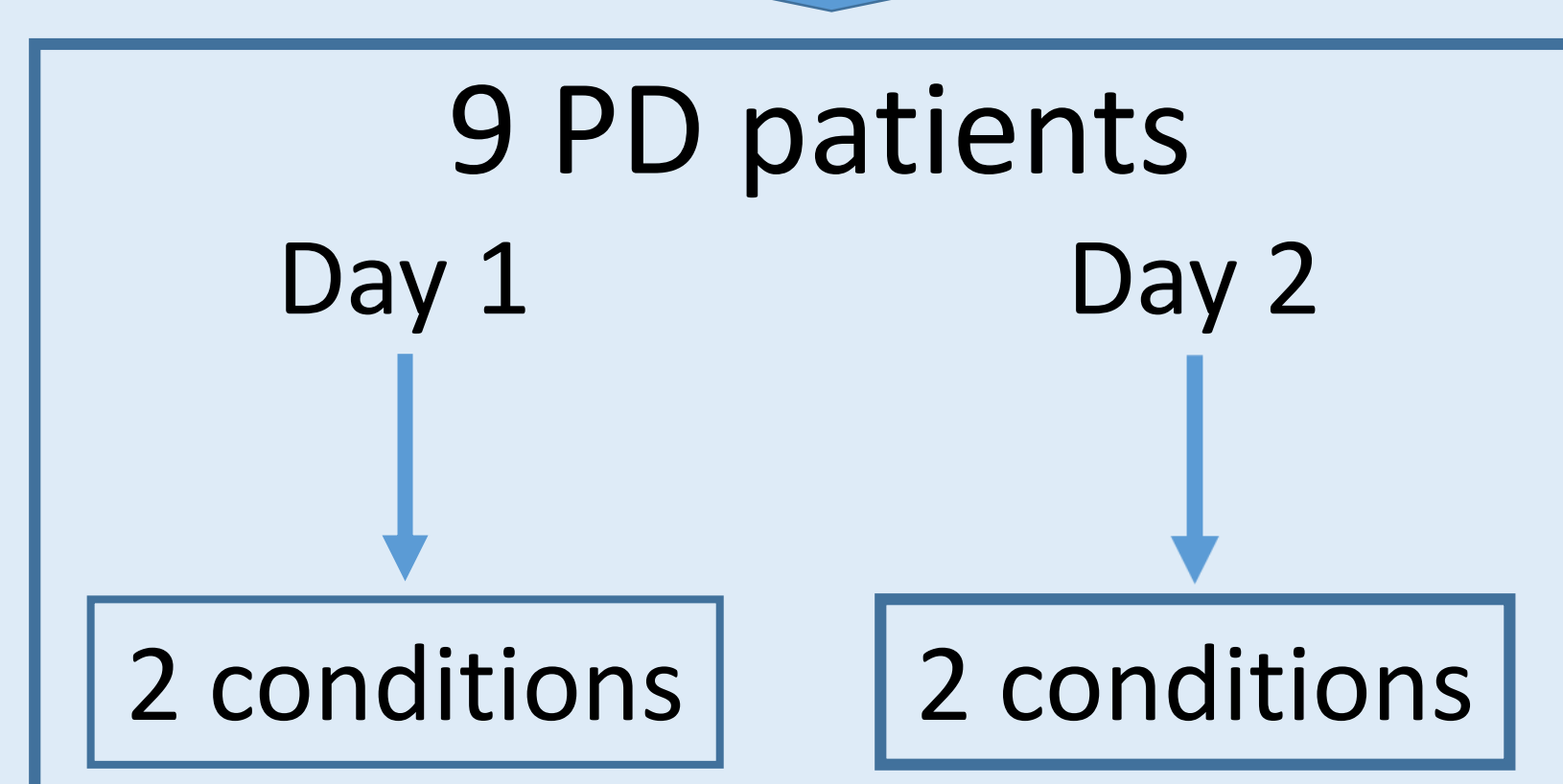
Introduction

Parkinson's Disease (PD) patients suffer from **gait impairments** responsible for falls and bad quality of life: reduced speed, reduced stride length and **randomness in stride duration variability (reduced Long-Range Autocorrelations (LRA))**[1]. Authors showed beneficial effects of isochronic **Rhythmic Auditory Stimulations (RAS)** on stride length and speed but a **deleterious effect on LRA** [2]. The aim of this prospective cohort study is to compare the effect of 3 different RAS (isochronic, random and autocorrelated) on PD patients' gait parameters and stride duration variability.

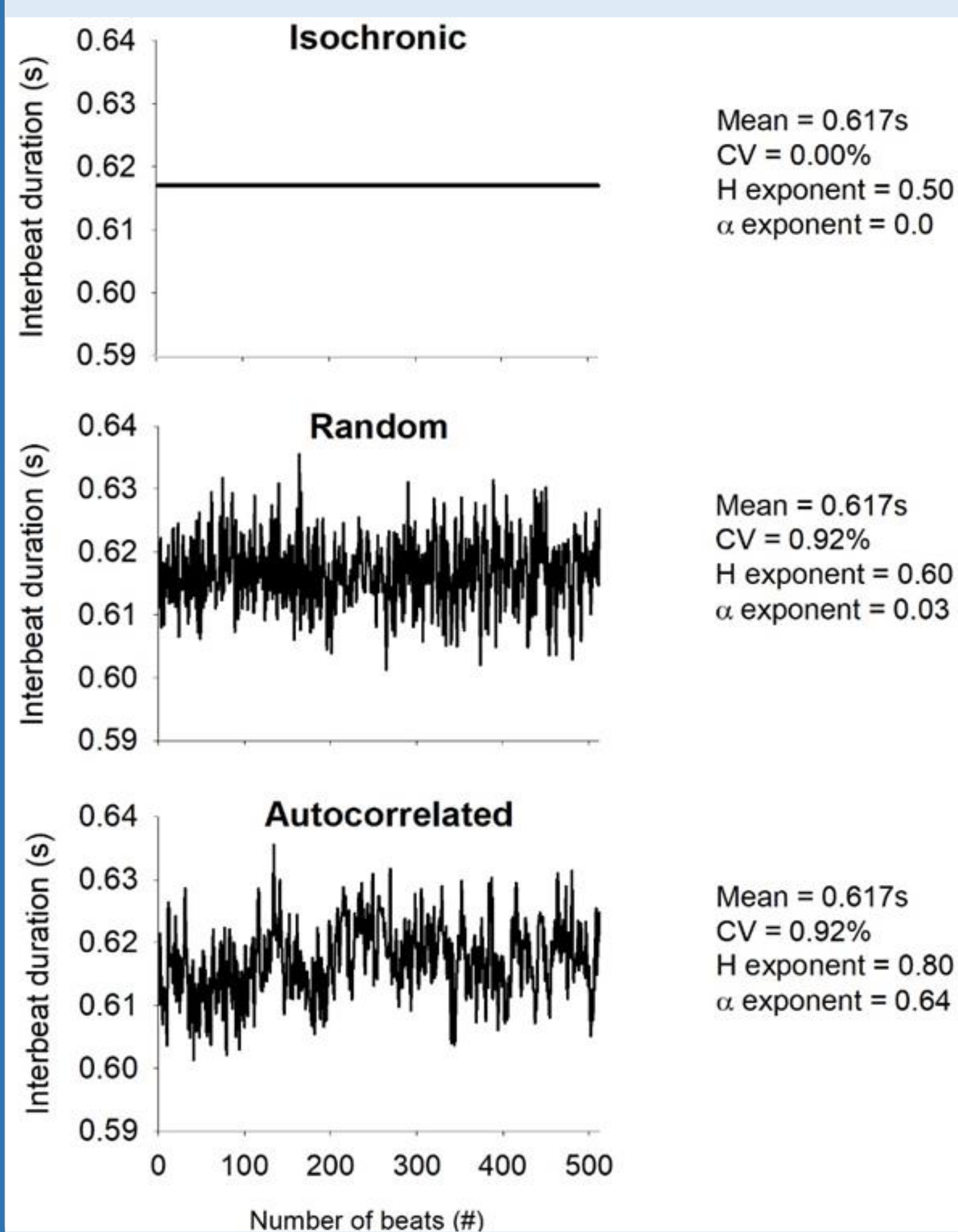
Method

4 walking conditions (512 gait cycles each), in a randomized order:

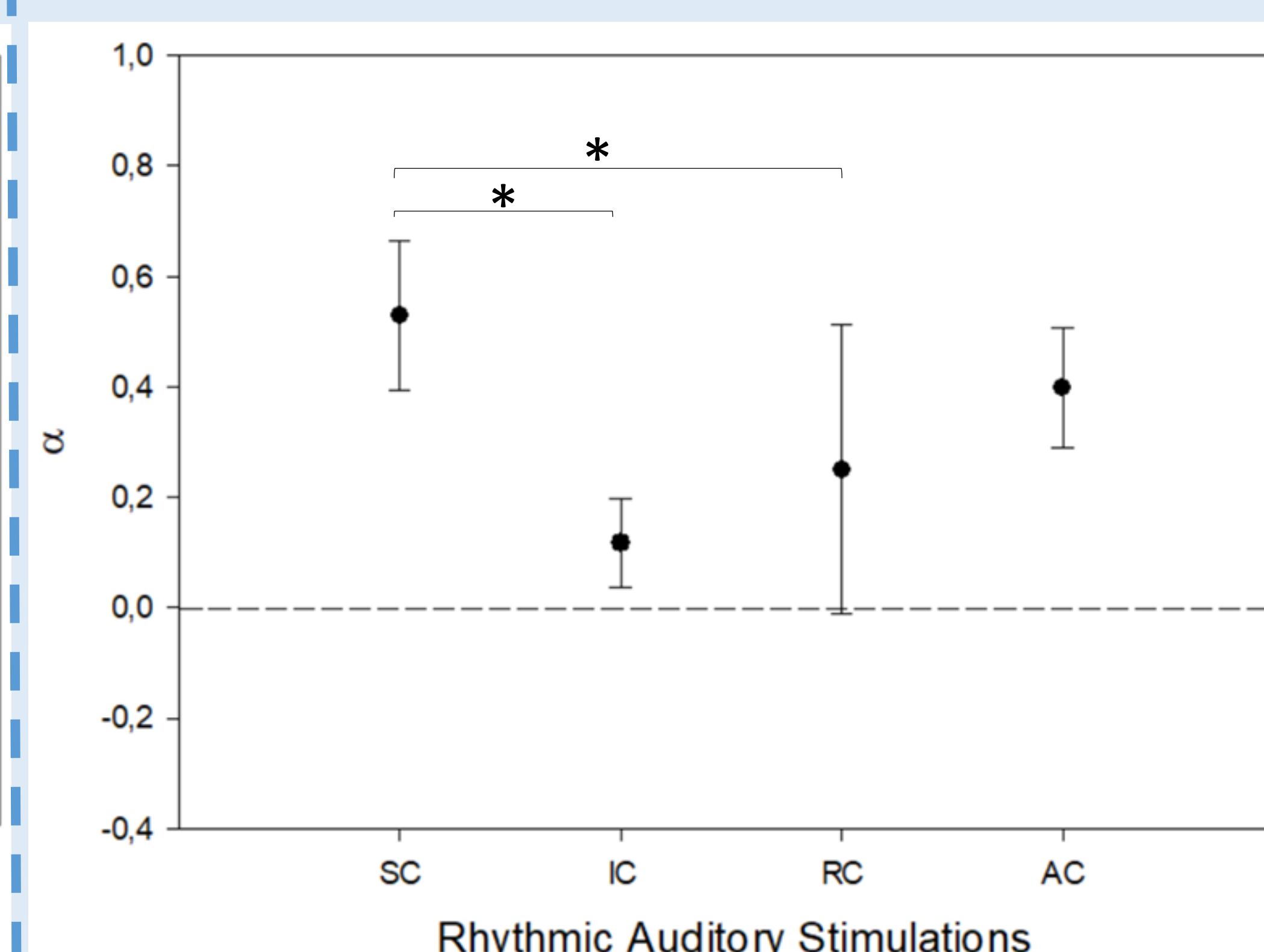
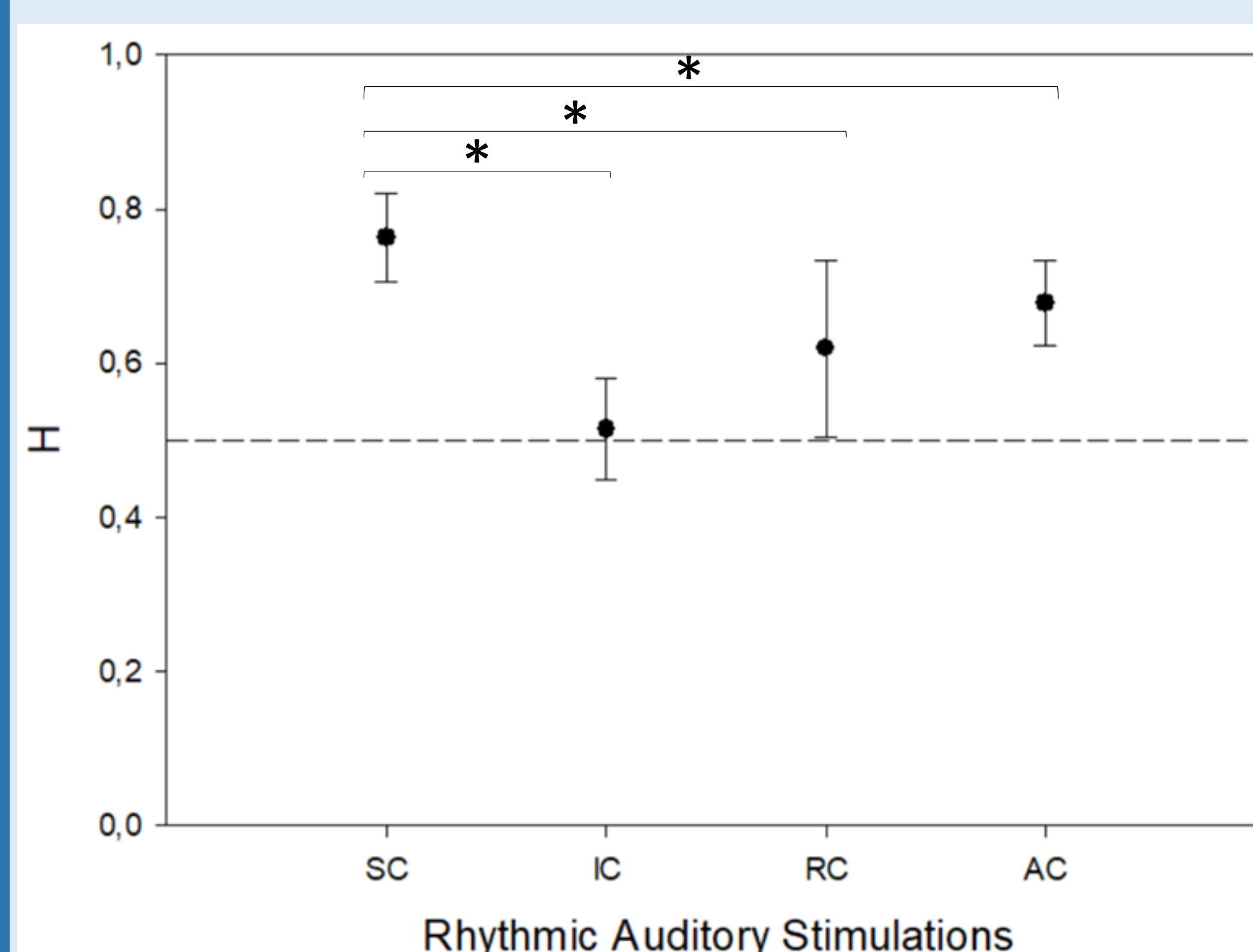
- **Spontaneous Condition (SC)**
- **Isochronic RAS Condition (IC)**
- **Random RAS Condition (RC)**
- **Autocorrelated RAS Condition (AC)**



Temporal structure of the RAS:

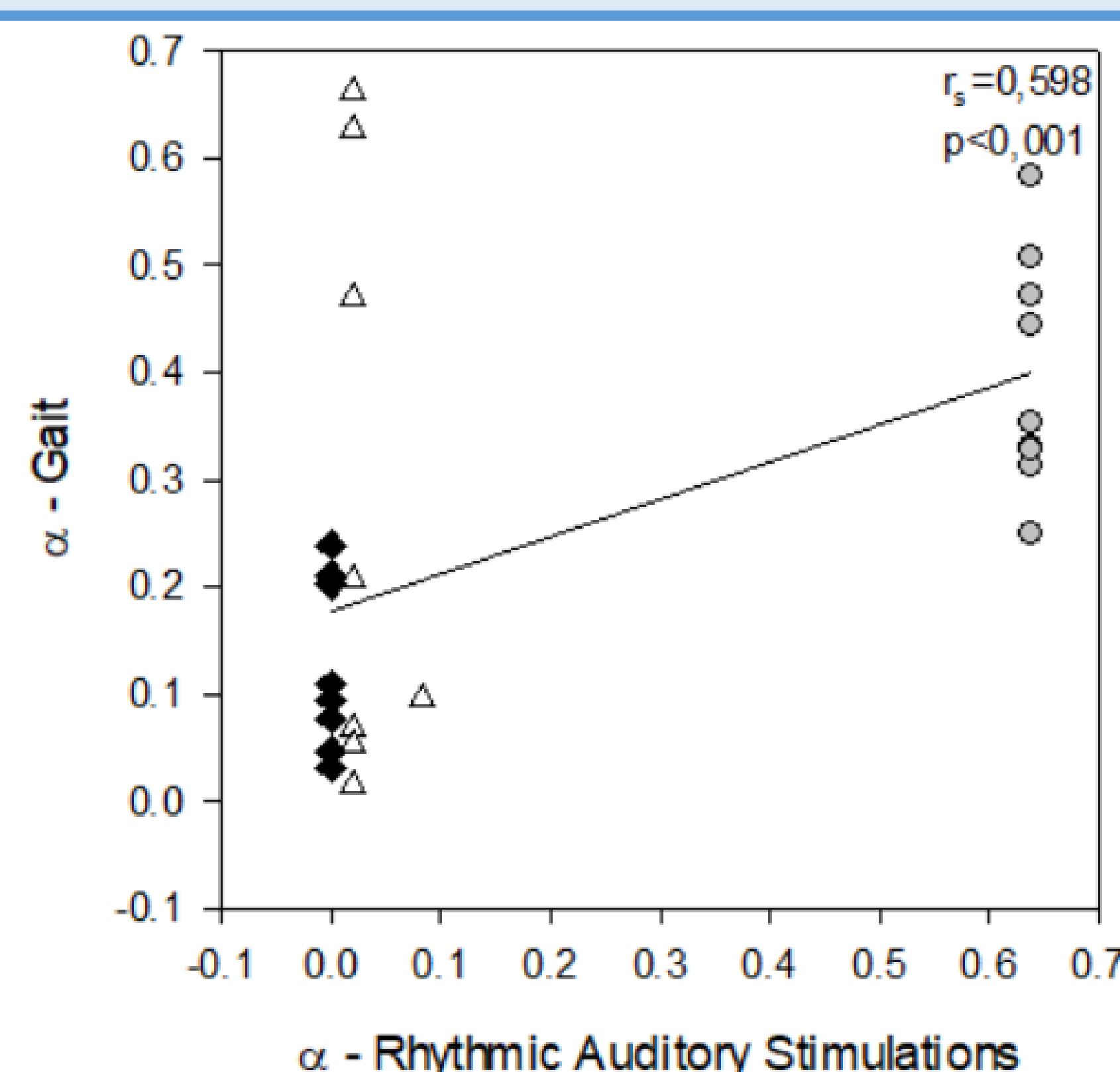
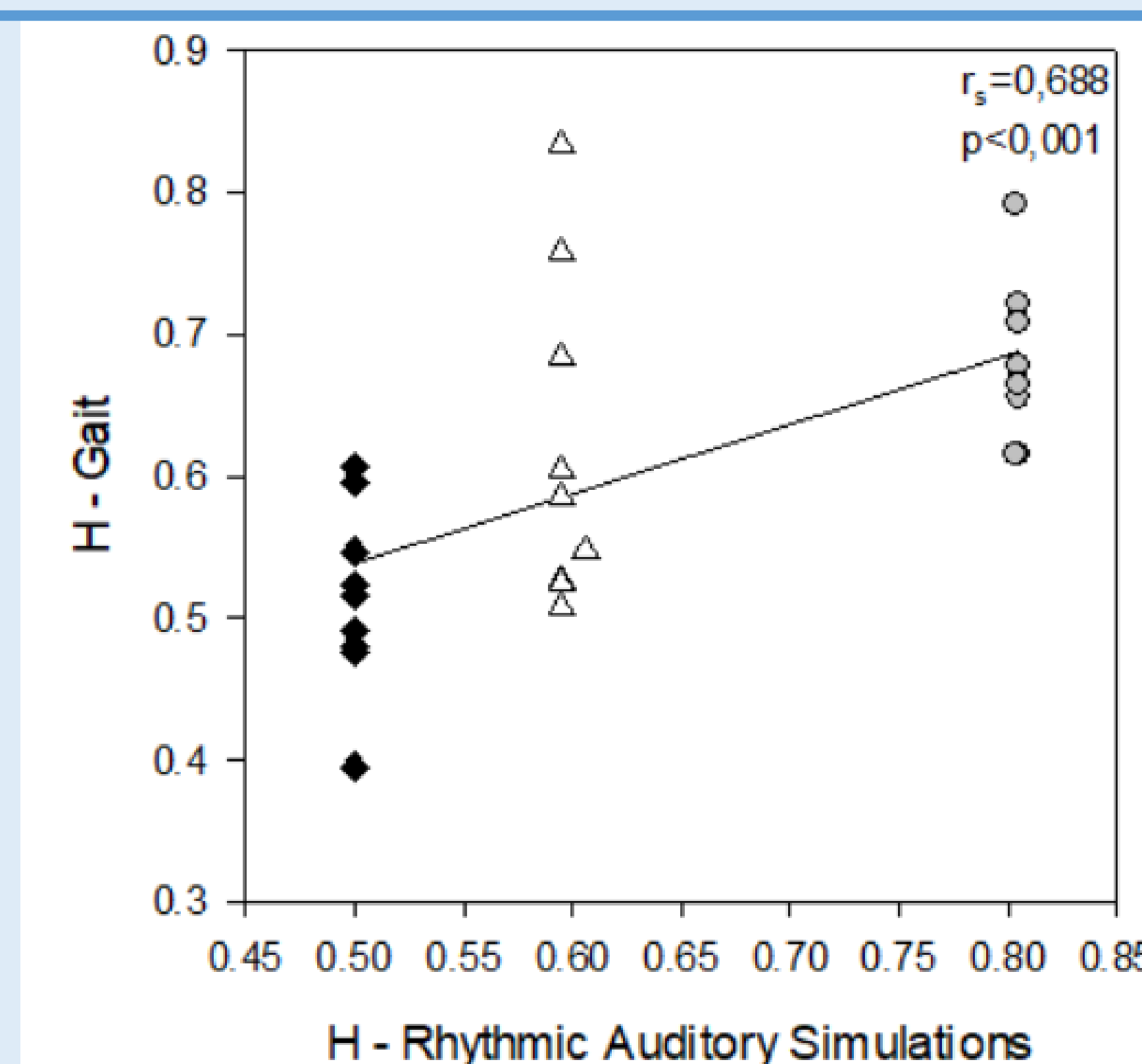


Results



- H exponents during IC, RC and AC < H exponent during SC
- H exponent during AC > H exponents during IC and RC

- α exponents during IC and RC < α exponent during SC
- α exponent during AC is not $\neq$ α exponent during SC



The higher the exponents in the RAS, the higher the patients' exponents

Discussion

An **isochronic metronome** causes the patient to walk **rigidly and inflexibly**, reducing patient's ability to adapt [2]. The autocorrelated RAS make it possible to answer this problem by proposing a variability in the given rhythm. Although no increase in the LRA could be demonstrated during AC, it should be noted that the autocorrelated RAS maintain an acceptable level of LRA. The **autocorrelated RAS would therefore maintain a good level of LRA while keeping the advantages of the metronome to improve conventional gait parameters** (step length, speed).

References

- [1] J. M. Hausdorff, "Gait dynamics, fractals and falls: finding meaning in the stride-to-stride fluctuations of human walking," Hum. Mov. Sci., vol. 26, no. 4, pp. 555–589, Aug. 2007.
- [2] J. M. Hausdorff, "Gait dynamics in Parkinson's disease: Common and distinct behavior among stride length, gait variability, and fractal-like scaling," Chaos Interdiscip. J. Nonlinear Sci., vol. 19, no. 2, p. 026113, Jun. 2009.