

MODULE 1-P1: SPACE: Usability and fall risk

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1 Introduction

Digital tools that are capable of accurately assessing cognitive impairment may be beneficial for the prediction of falls. Such tools can capitalise on the role played by the hippocampus and the entorhinal cortex in navigation and early stages of cognitive impairment.

If successful, these tools may contribute in decreasing the number and costs of unnecessary diagnostic procedures and provide a more sensitive measure than current screening paper and pencil tests (e.g., Montreal Cognitive Assessment - MoCA).

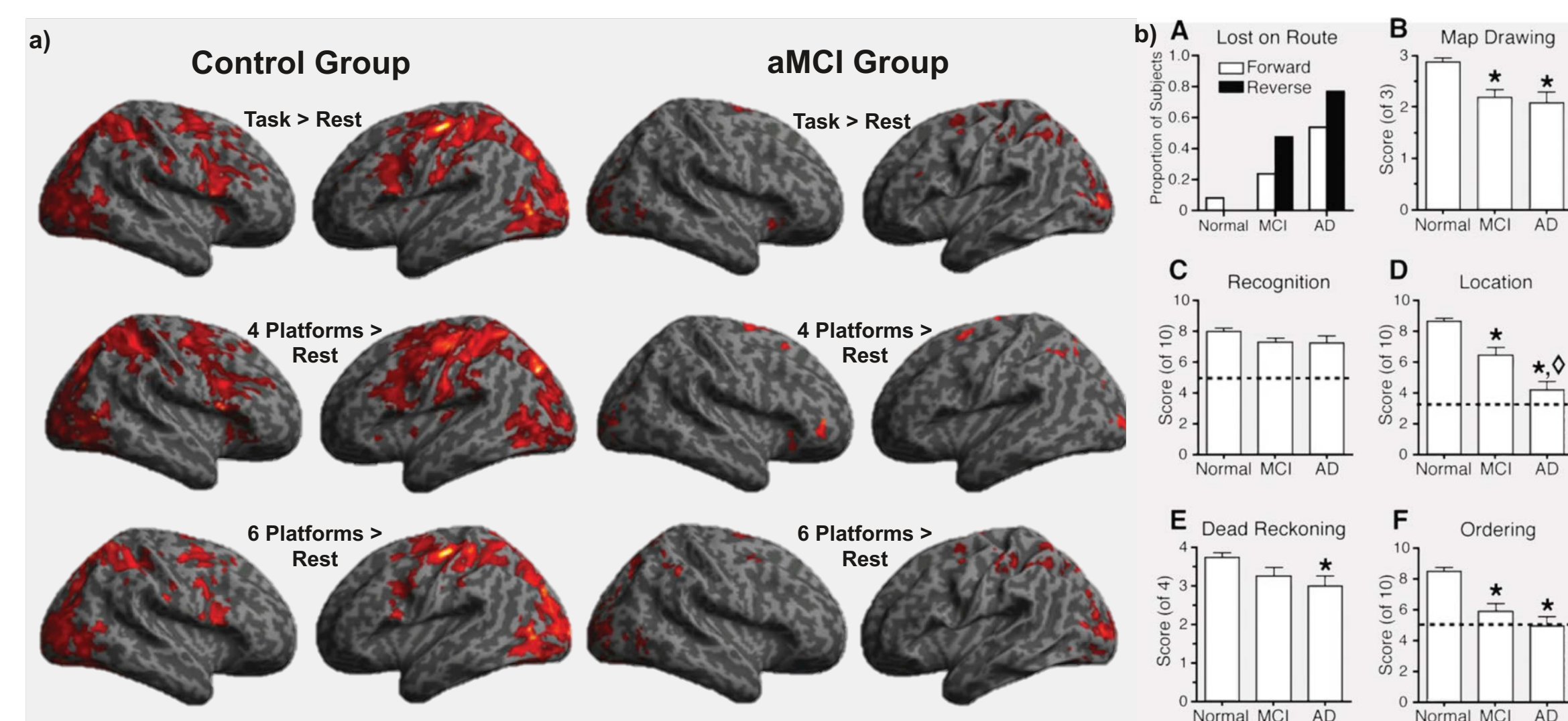


Figure 1: a) Activation patterns during a navigation task versus rest condition. Left side shows control data and right (Migo et al., 2015). b) Navigation performance in various tasks of MCI and AD patients (Delpolyi et al., 2007).

SPACE is a novel gamified tool played on iPad that assesses individual's spatial ability and that may provide digital markers of cognitive and neural impairment at an early stage.

4 References

- Migo, E. M., O'daly, O., Mitterschiffthaler, M., Antonova, E., Dawson, G. R., Dourish, C. T., ... & Morris, R. G. (2016). Investigating virtual reality navigation in amnesic mild cognitive impairment using fMRI. *Aging, Neuropsychology, and Cognition*, 23(2), 196-217.
- Delpolyi, A. R., Rankin, K. P., Mucke, L., Miller, B. L., & Gorno-Tempini, M. L. (2007). Spatial cognition and the human navigation network in AD and MCI. *Neurology*, 69(10), 986-997.

2 U-SPACE study

Background:

Several factors may influence the use of a novel technology and must be considered prior to clinical testing involving participants in the community and clinical patients. In our usability study (U-SPACE) we assess performance in SPACE among various conditions:



Performance in SPACE will be compared with scores from the System Usability Scale (SUS) and the User Experience Questionnaire (UEQ). Furthermore, we will explore the correlation between performance in SPACE with self-reported measure of navigation ability (Santa Barbara Sense of Direction scale - SBSOD) and with the MoCA score. Results will help in isolating norms that will assist in determining the difficulty of the tasks in future projects.

Aim:

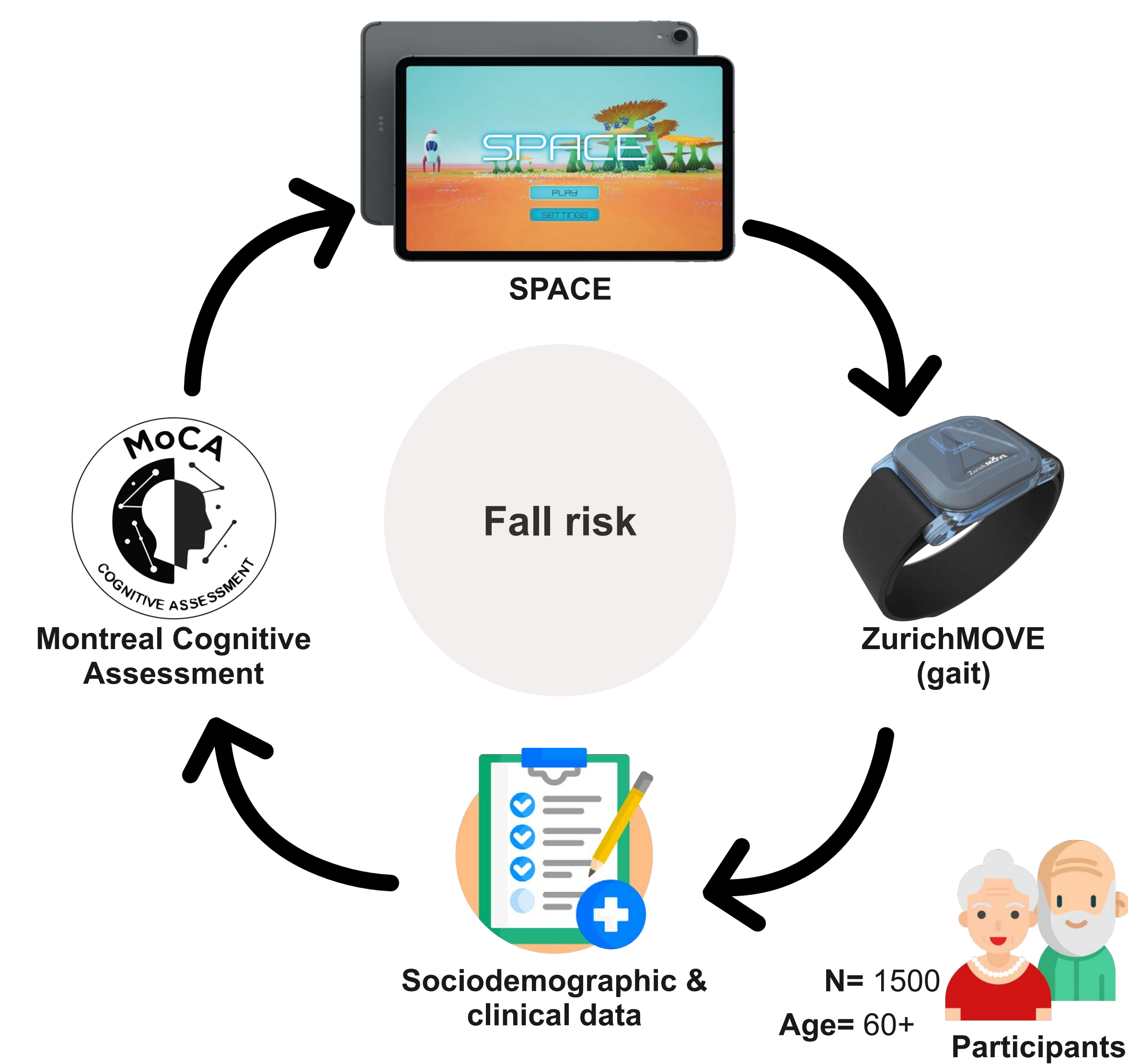
Evaluate the usability of SPACE and develop norms for assessing cognitive impairment informed by individual differences in navigation ability.

3 TARGET-SPACE study

Background:

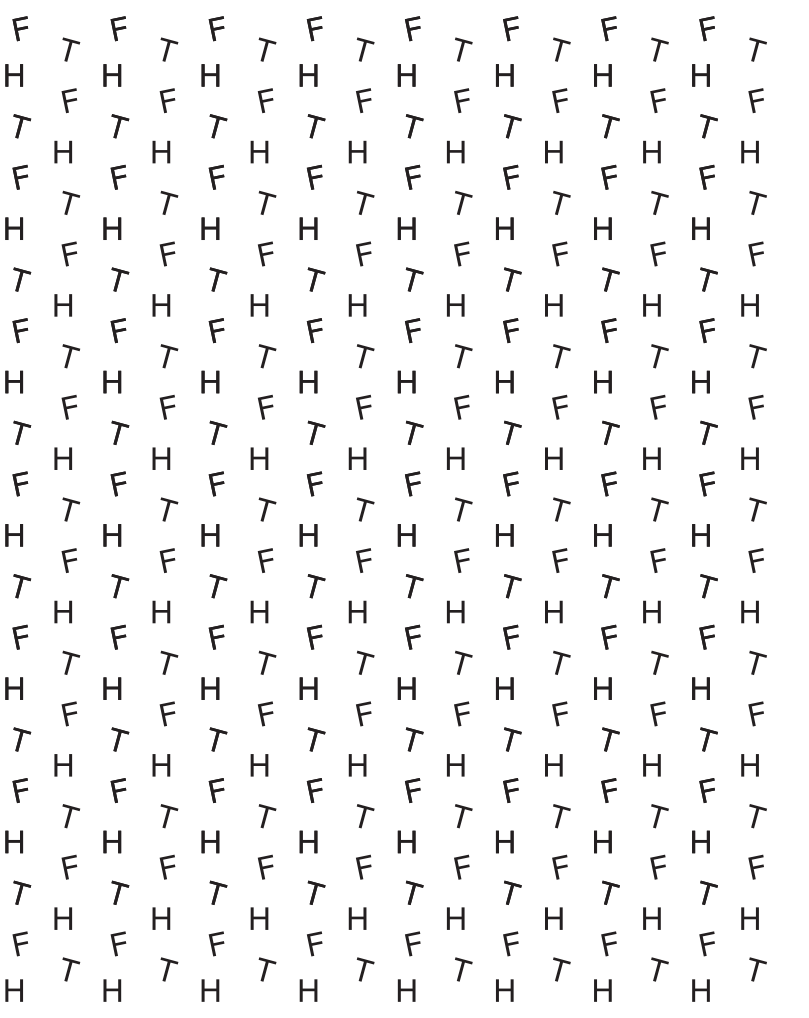
Falls are one of the leading causes of injury in older Singaporeans and elderly individuals with dementia are two to three times more likely to fall and injure compared to patients without dementia. The accurate detection of cognitive impairment may contribute in models used to predict fall risk.

SPACE will be administered as part of a large cohort study (TARGET) in which sociodemographic, psychosocial, MoCA, gait, and clinical data will also be collected.



Aim:

Improve the sensitivity for detecting fall risk by taking into account cognitive status assessed through a virtual navigation task.



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