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Impact of information processing speed on episodic memory in multiple sclerosis: a survival analysis

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INTRODUCTION

- Episodic memory (EM) disorder is one of the most observed and complained cognitive deficits in MS (Chiaravalloti et DeLuca, 2008 ; Goverover et al., 2007). Nevertheless, the mechanism at the origin of this learning deficit is controversial in the literature (Saenz, 2014).
- Notably, the impact of reduced speed processing Information (SPI) on EM remains unclear, despite the importance of this possible relationship on rehabilitation strategies.
- The Selective Reminding Test (SRT) is widely used to assess EM deficits in MS. Time limits or fixed number of trials make it difficult to distinguish between the effect of low ability and lack of time. In this line, a possible beneficial effect of extra-time on performance has been debated (Goverover et al., 2009).

OBJECTIVE

Use time-to-event data approach (survival analysis focuses on the time until twice recall the total word's list occurs at the SRT) to characterize the progression of learning in PwMS compared to matched healthy controls.

METHOD

Participants

	Controls (n=157)	RRMS (n=60)	SPMS (n=57)	PPMS (n=40)
Sex ration (W/M)	105/52	44/16	40/17	21/19
Age (mean / SD)	45.93 (10.02)	39.93 (9.15)	49.58 (8.42)	49.78 (9.96)
Educational level (mean / SD)	12.73 (2.18)	13.33 (2.63)	12.7 (2.41)	11.65 (2.83)
Disease duration (mean / SD)	/	7.66 (6.25)	20.14 (9.42)	7.97 (7.11)
EDSS (median / range)	/	2 [0 ; 5.5]	6 [3.5 ; 8]	6 [1 ; 8]

Material

SRT (Buschke et al., 1987) uses a selective reminding procedure during 11 learning trials. In the first trial, the participant listens a list of 15 unrelated words and then repeat as many words as she/he can recall. On each subsequent trial, the participant is reminded only of the words that were not recalled on the previous one. The test is stopped after the 11 trials or after the participant recalls the 15 words on 2 consecutive trials.

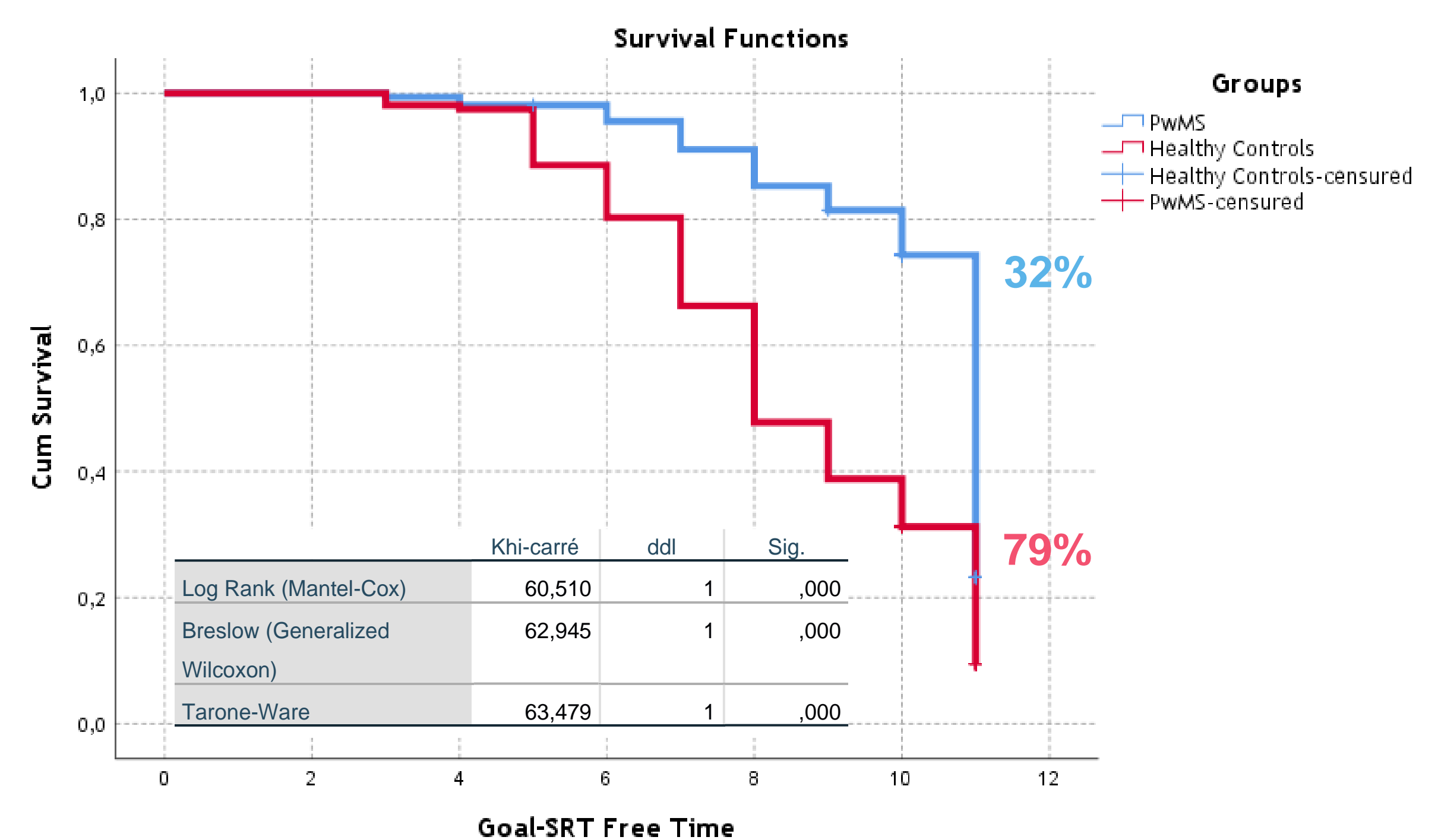
Statistic analysis

Time-to-event data approach (i.e., survival analysis, Kleinbaum & Klein, 2005), focuses on the time until a particular event (i.e. recalls the 15 words on two consecutive trials).

RESULTS

1) PwMS vs Healthy Controls

- 32% of patients manage to recall the entire list of words, twice consecutively (SRT-goal), compared to 79% of controls.
- The mean survival times (to achieve SRT-goal) decreased from 10.23-trials in patients (IC₉₅[9.98; 10.45]) to 8,48-trials in controls (IC₉₅[8.14; 8.83]), indicating that controls achieved the recall on two consecutive trials sooner than patients.
- Learning curves analysis showed a slow learning trend for patients. More and more patients completed the task as trials progress, but slower.

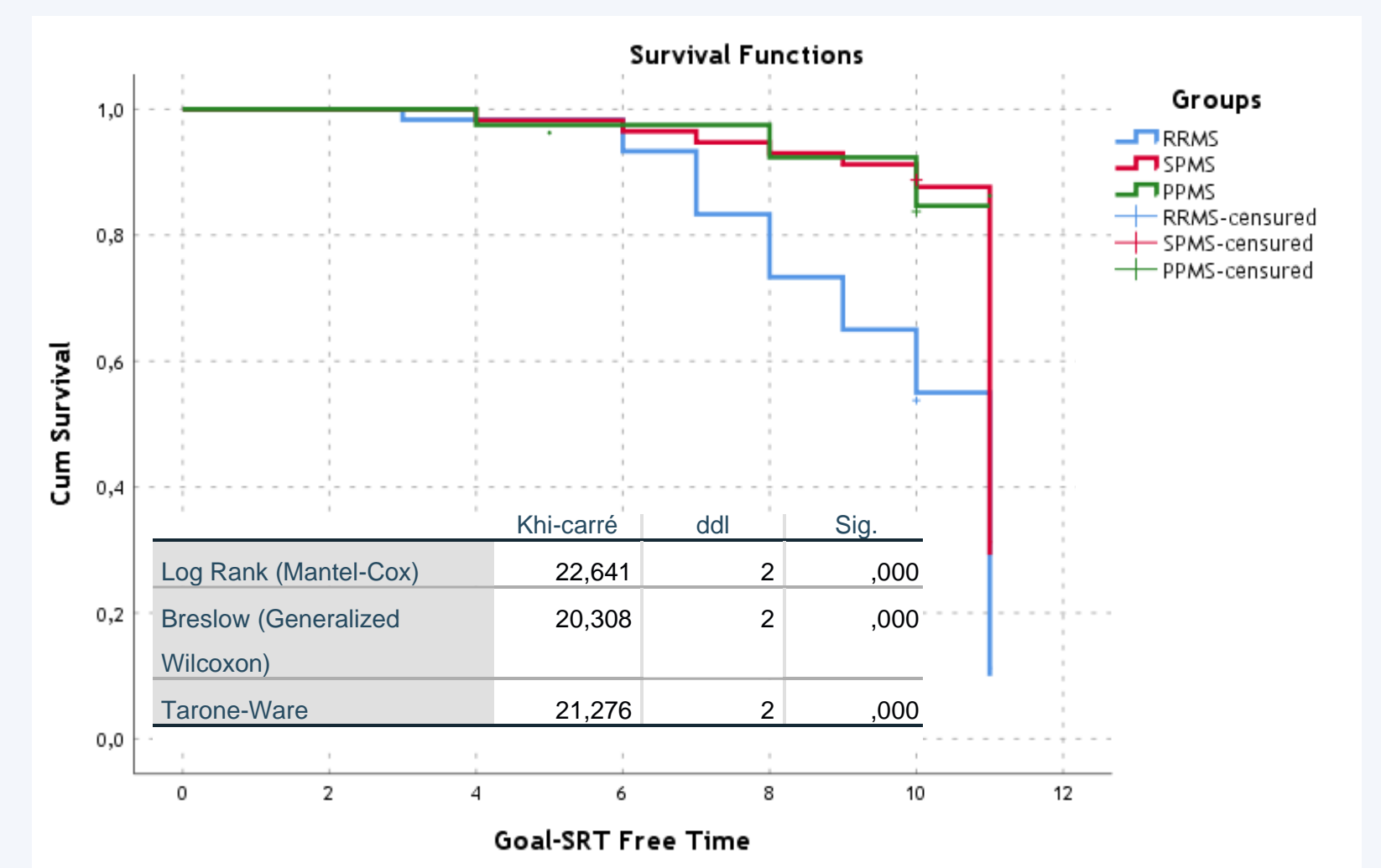
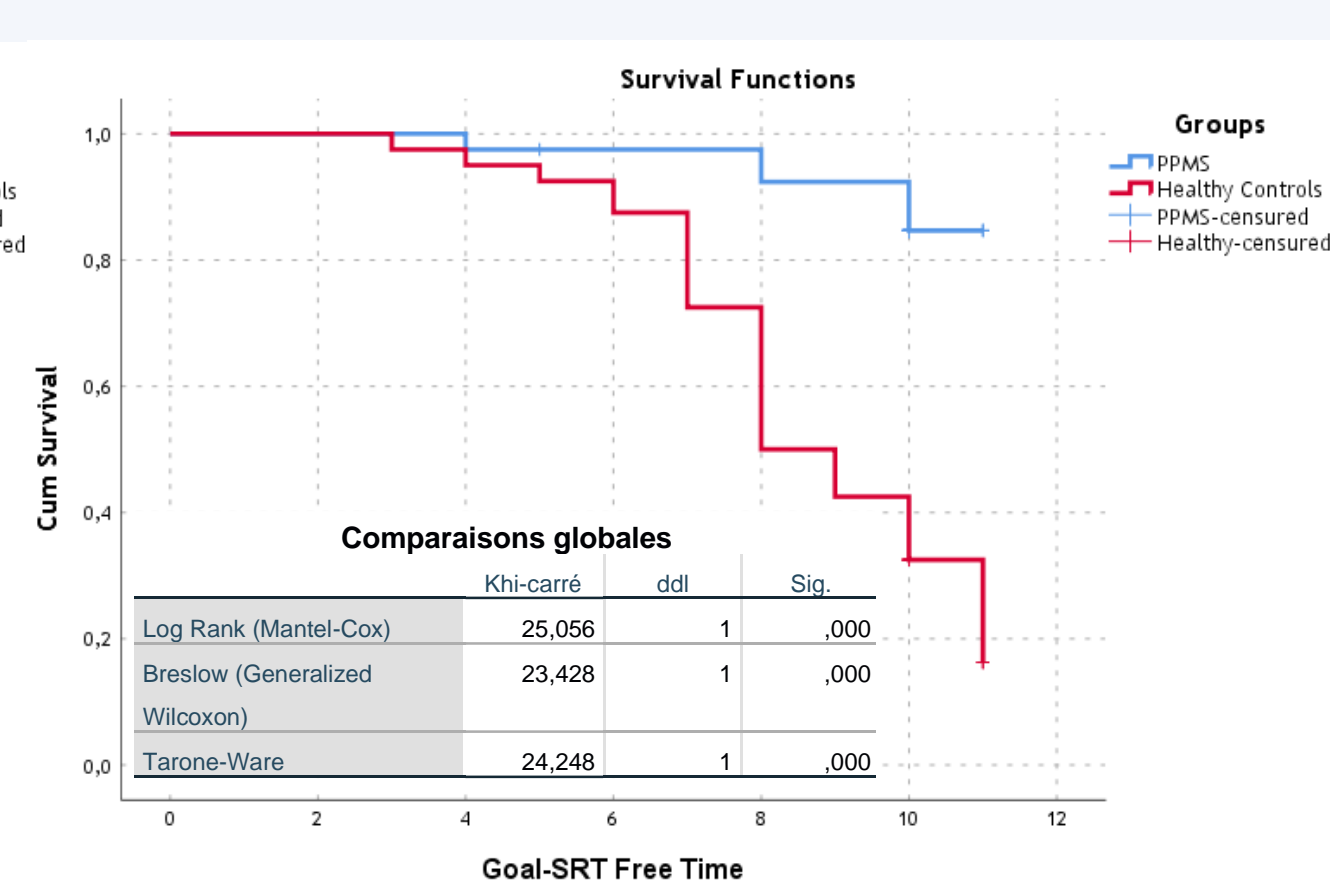
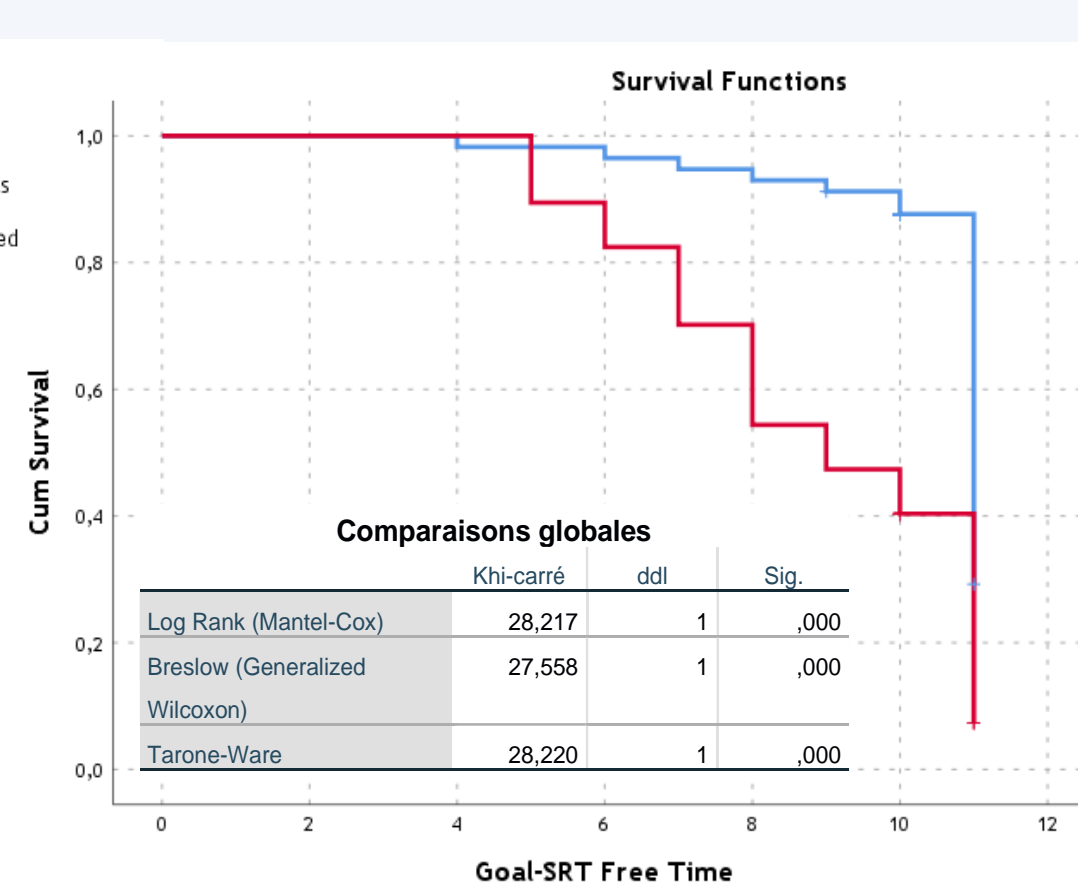
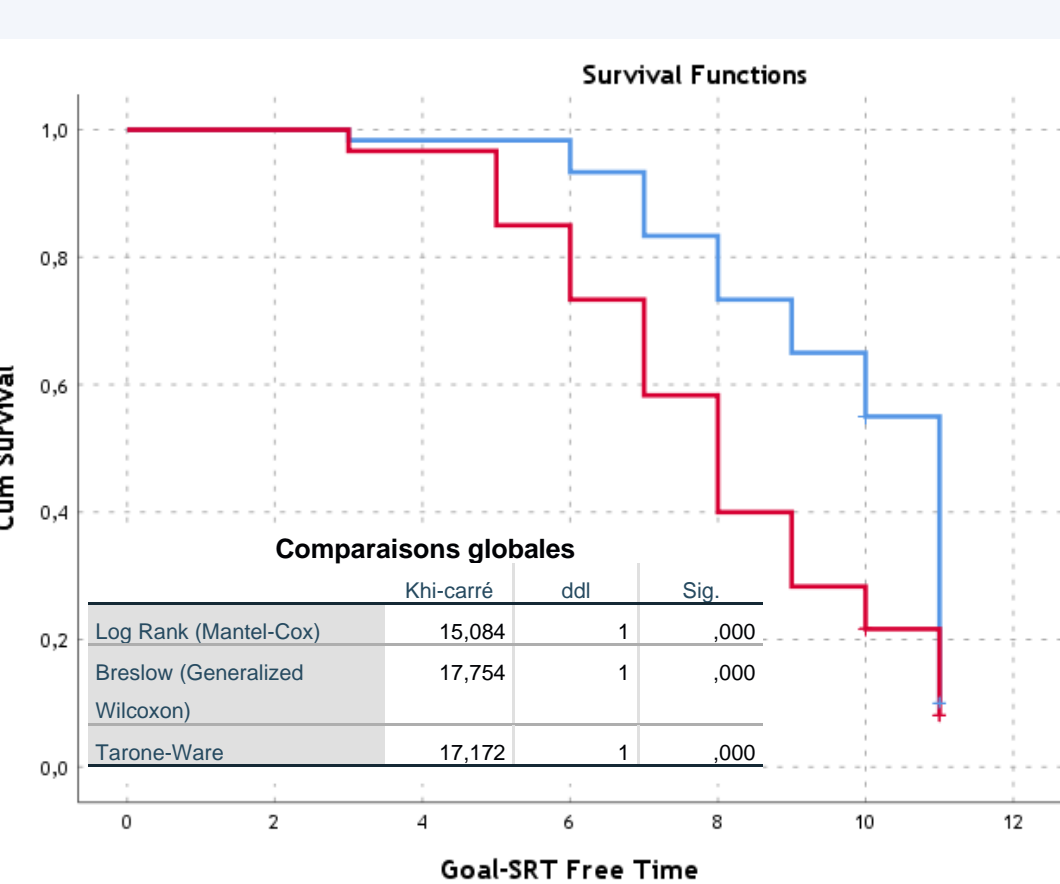


2) MS Phenotypes vs Healthy Controls

- Each MS-survival curves differs to their healthy controls matched, with an effect of MS on the ability to achieve the SRT-goal and an effect of the clinical form of the disease, to the detriment of progressive forms compared to relapsing-remitting forms.

3) RRMS vs SPMS vs PPMS

- 60% of RRMS patients manage to recall the SRT-goal, compared to 16% of SPMS and 15% of PPMS.
- The mean survival times decreased from 9.6-trials in RRMS patients (IC₉₅[9.17; 10.12]) to 10.6-trials in SPMS and PPMS patients (IC₉₅[10.2; 10.9]).



DISCUSSION

- Learning curves analysis showed a slow learning trend for patients. More and more patients completed the task as trials progress, but slower.
- The evolution of the learning would be broadly similar in MS and controls for the first six trials, favoured by the beneficial effect of rehearsals during an apprenticeship. In the 9th trials, the proportion of healthy subjects completing the task is significantly higher than that of patients. MS patients are less quickly able to learn a list of words than healthy, who requires a lower time, underline a slow learning over time in MS patients (DeLuca et al., 1994).
- Survival analysis provides a complementary assessment of EM to the traditional paradigm, and an innovative way to address slow-learning in MS. This study underlines a possible beneficial effect of extra-time on learning performance, such an "open-trial" procedure for SRT (DeLuca, 1994)

References