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## Introduction

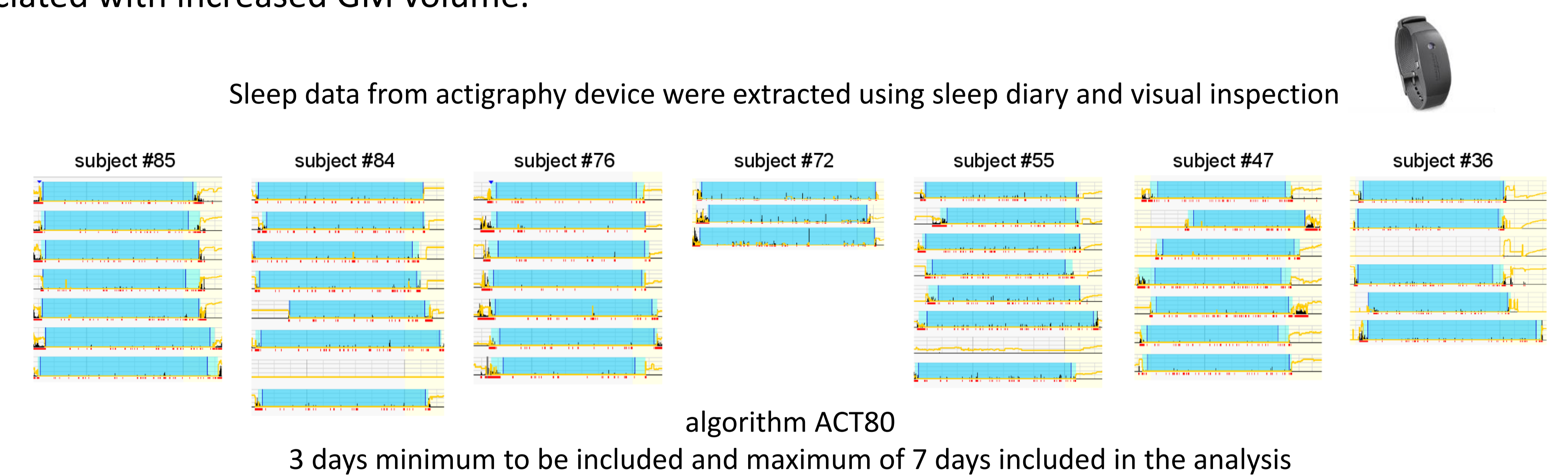
- Sleep is a fundamental mechanism that maintains brain physiology integrity<sup>1</sup> and contributes to emotion regulation<sup>2</sup> and cognition<sup>3,4</sup>.
- Evidence from the use of sleep diaries in childhood suggests that good sleep habits promote optimal brain development<sup>5,6</sup>.
- To date, no study has investigated the relation between objective sleep duration and efficiency, and brain development.

**Aim of this study** : Using actigraphy, we explored the prospective associations between sleep duration and efficiency and grey matter (GM) brain volume in late childhood.

**Hypothesis** : Greater sleep duration and efficiency measured in the two years preceding structural brain imaging will be associated with increased GM volume.

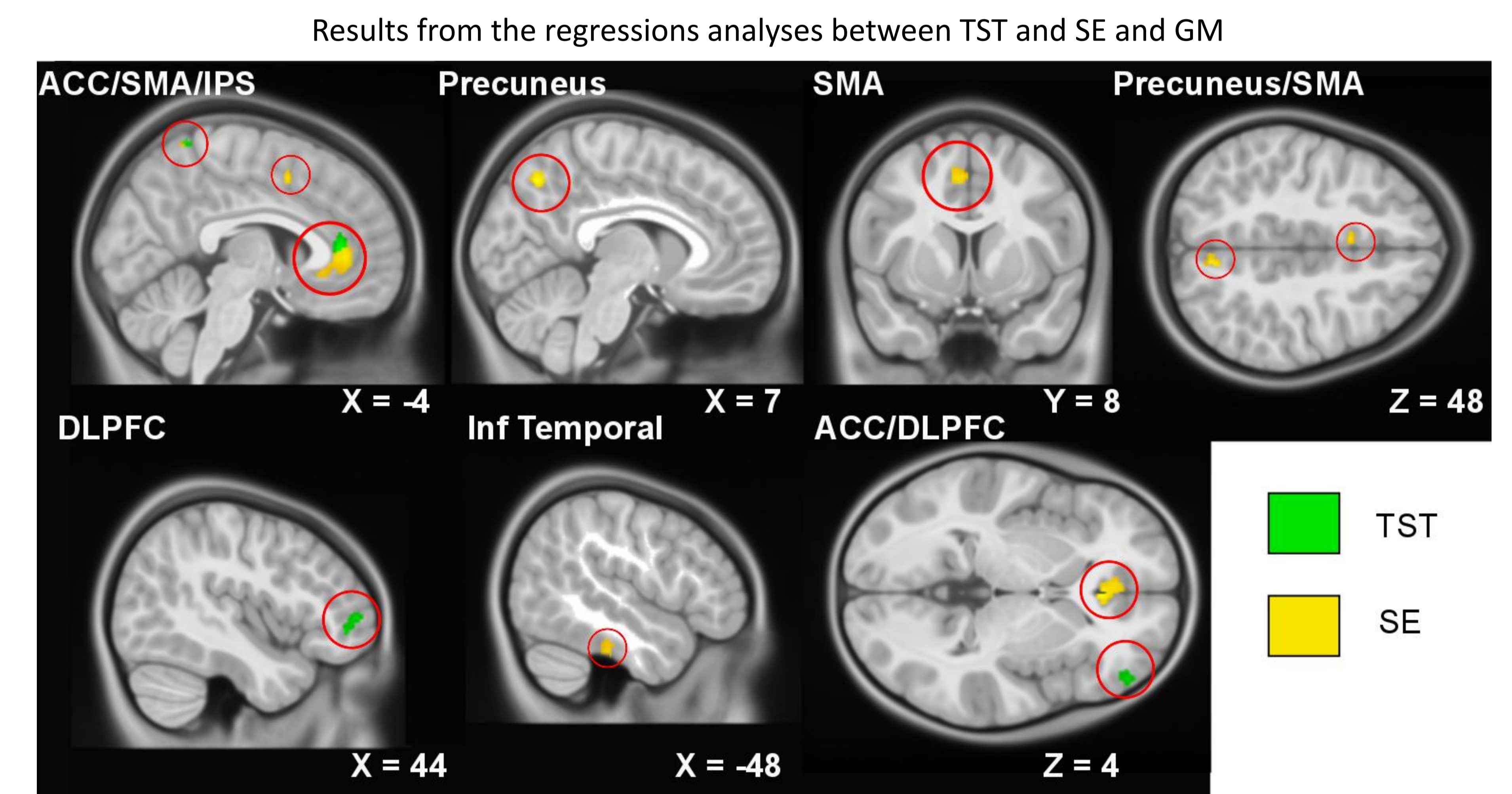
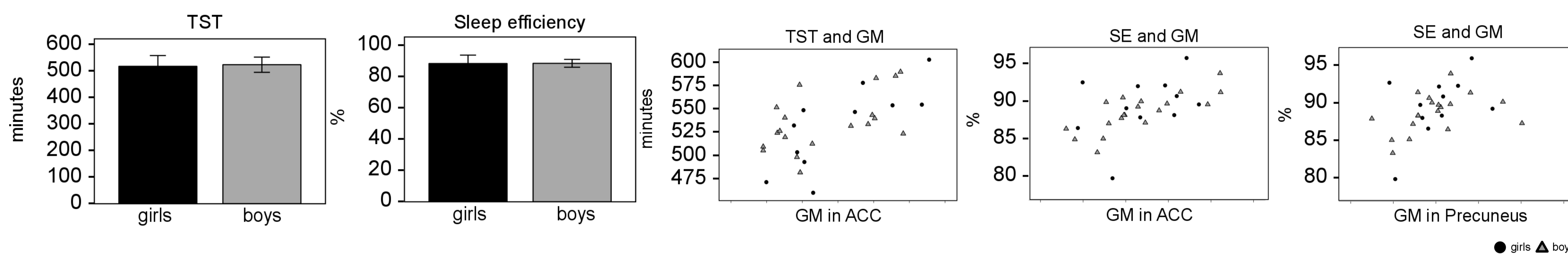
## Methods

- Children (n=31; 19F;12M) were followed as part of a larger longitudinal research project<sup>7</sup>.
- Between the ages of 7.8 and 9.6 years (MEAN±SD : 9 years ± 0.4, T1) they were asked to wear a wrist monitor (Actiwatch-2, Phillips-Respironics) for one week (mean number of valid days : 6 days ± 1.5).
- Approximately 2 years later (time interval : 2 years ± 0.6), children participated in a structural magnetic resonance imaging (MRI) protocol (MEAN±SD : 11 years ± 0.5).
- Voxel-based morphometry data were analyzed using the CAT12 toolbox (SPM12, MATLAB R2013a).
- Expected morphometric differences in children were handled using a pediatric template ([www.bic.mni.mcgill.ca](http://www.bic.mni.mcgill.ca)).
- Regression analyses were used to test the relation between sleep duration and efficiency and GM volume while controlling for brain volume (GM+WM) and age.



## Results

- Sleep duration (TST) did not differ between girls (532.6 ± 29.2 minutes) and boys (526.4 ± 41.3 minutes) (p = .63).
- Sleep efficiency (SE) did not differ between girls (88.3 ± 5.4 %) and boys (88.4 ± 2.5 %) (p = .94).



- Children who had longer TST had increased GM volume in the dorsolateral prefrontal cortex (dlPFC)\*, anterior cingulate cortex (ACC)\*, and intraparietal sulcus (IPS).
- Children who had greater SE had increased GM volume in the precuneus\*, anterior cingulate cortex (ACC)\*\*, intraparietal sulcus (IPS), supplementary motor areas (SMA)\*, and inferior temporal cortex.

(\*p<0.05 FWE-corrected for small volume of interest; \*\*p<0.05 FWE-whole brain)

## Conclusion

- Our results demonstrated that longer sleep duration and better sleep efficiency are associated with increased GM volume in various brain areas including regions of the default-mode network (precuneus), executive (dlPFC), sensorimotor (SMA) and attentional networks (ACC, IPS). Therefore, it is probable that adequate sleep duration and efficiency contributes to optimal brain development in regions associated with cognitive processes.

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