

Subjective Sleep Quality And Brain Structure In Cognitively Unimpaired Adults- Evidence From A Multicenter Neuroimaging Cohort



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Even in cognitively unimpaired adults, poorer sleep quality was associated with subtle structural brain differences, supporting sleep as a potential target for early dementia prevention.

BACKGROUND

Sleep Disturbances has been proposed as early markers of neurodegenerative processes. Evidence linking subjective sleep quality to brain structural changes is still limited; especially in cognitively unimpaired populations from low- and middle-income countries.

Objective: to examine the association between subjective sleep quality, global and regional brain volumes in cognitively unimpaired adults from the LatAm-FINGERS cohort.

METHODS

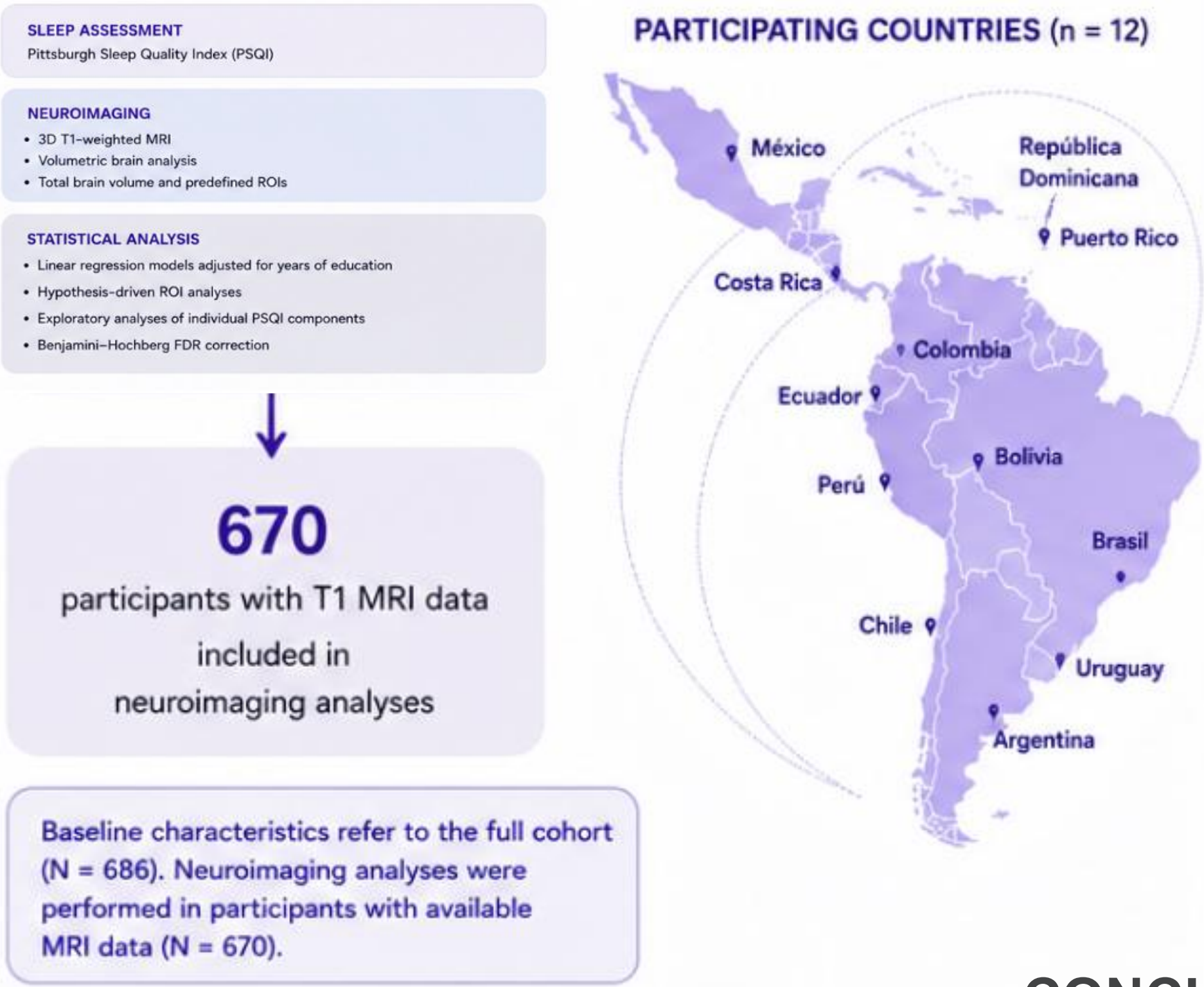


Table 1. Baseline characteristics of the LATAM-FINGERS cohort by country (N = 686)					
Country	N	Age, years mean ± SD	Education, years mean ± SD	MMSE score mean ± SD	PSQI global score mean ± SD
Argentina	78	66.97 ± 4.48	15.03 ± 1.78	28.13 ± 1.57	8.10 ± 3.87
Bolivia	37	65.97 ± 4.17	13.65 ± 2.94	27.32 ± 0.82	7.08 ± 3.62
Brasil_UFMG	19	69.00 ± 5.02	11.05 ± 3.82	25.95 ± 2.27	5.63 ± 4.10
Brasil_USP	43	67.63 ± 4.73	13.51 ± 3.41	27.63 ± 1.90	5.51 ± 2.54
Chile	86	68.88 ± 4.86	12.12 ± 3.31	26.52 ± 1.93	7.77 ± 3.21
Costa Rica	72	65.97 ± 3.83	13.62 ± 3.32	27.76 ± 1.92	7.31 ± 4.03
Ecuador	92	67.27 ± 4.37	13.53 ± 3.29	28.10 ± 0.98	7.49 ± 3.56
Perú	92	66.39 ± 4.31	14.39 ± 2.21	27.95 ± 1.45	6.51 ± 3.27
Rep. Dominicana	64	68.33 ± 4.45	8.61 ± 4.41	26.77 ± 2.46	6.36 ± 3.52
Uruguay	87	67.53 ± 5.09	14.28 ± 2.29	27.31 ± 0.77	6.97 ± 3.49
Total	686	67.32 ± 4.60	13.21 ± 3.50	27.48 ± 1.73	7.06 ± 3.57

MMSE = Mini-Mental State Examination; PSQI = Pittsburgh Sleep Quality Index (global score).

Table 2. Associations between subjective sleep quality (PSQI global score) and brain volumes. Linear regression models adjusted for years of education.							
Brain Outcome (ROI)	N	R ² (adj.)	F (df1,df2)	Model p	PSQI Global Score		p (FDR adj.) ¹
					β (standardized)	p (unadjusted)	
Total Brain Volume (Absolute)	670	0.049	17.27 (2;667)	<0.001	-0.069	0.067	-
Left Precuneus (Percentile) ²	670	0.017	5.69 (2;667)	0.004	0.081	0.035*	0.072
Right Precuneus (Percentile) ²	670	0.011	4.79 (2;667)	0.009	0.064	0.099	0.132
Bilateral Entorhinal Cortex (Percentile) ²	670	0.007	3.20 (2;667)	0.041	0.033	0.389	0.389

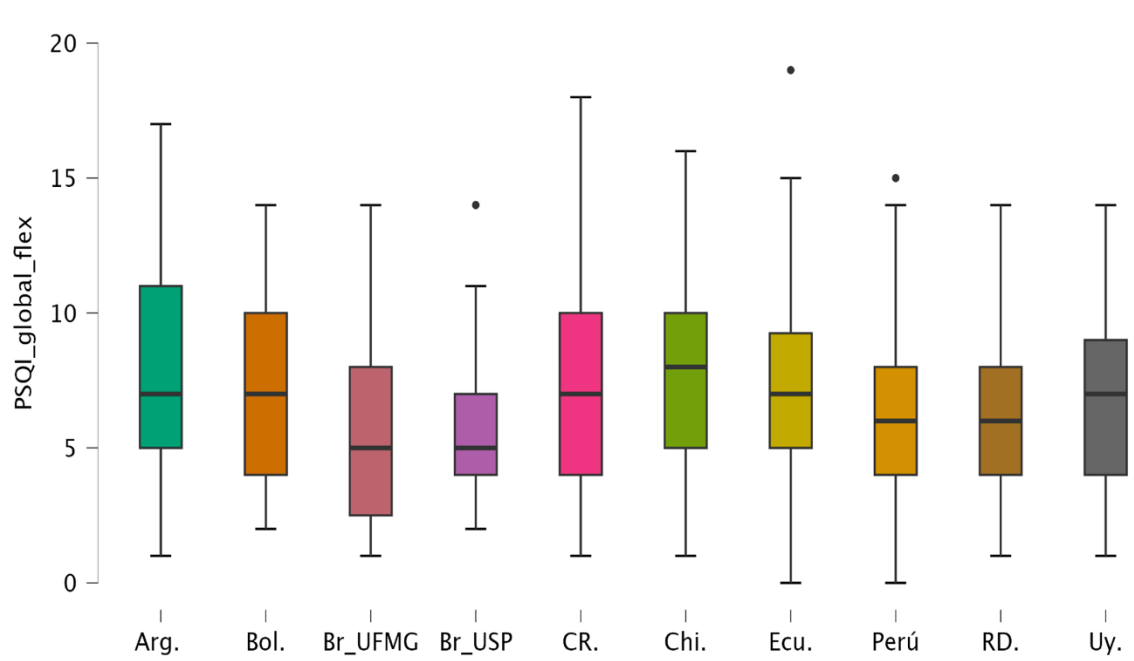
ROI = region of interest. PSQI = Pittsburgh Sleep Quality Index; FDR = Benjamini-Hochberg.

¹ False discovery rate (FDR) adjusted p values across the 4 tested brain outcomes.

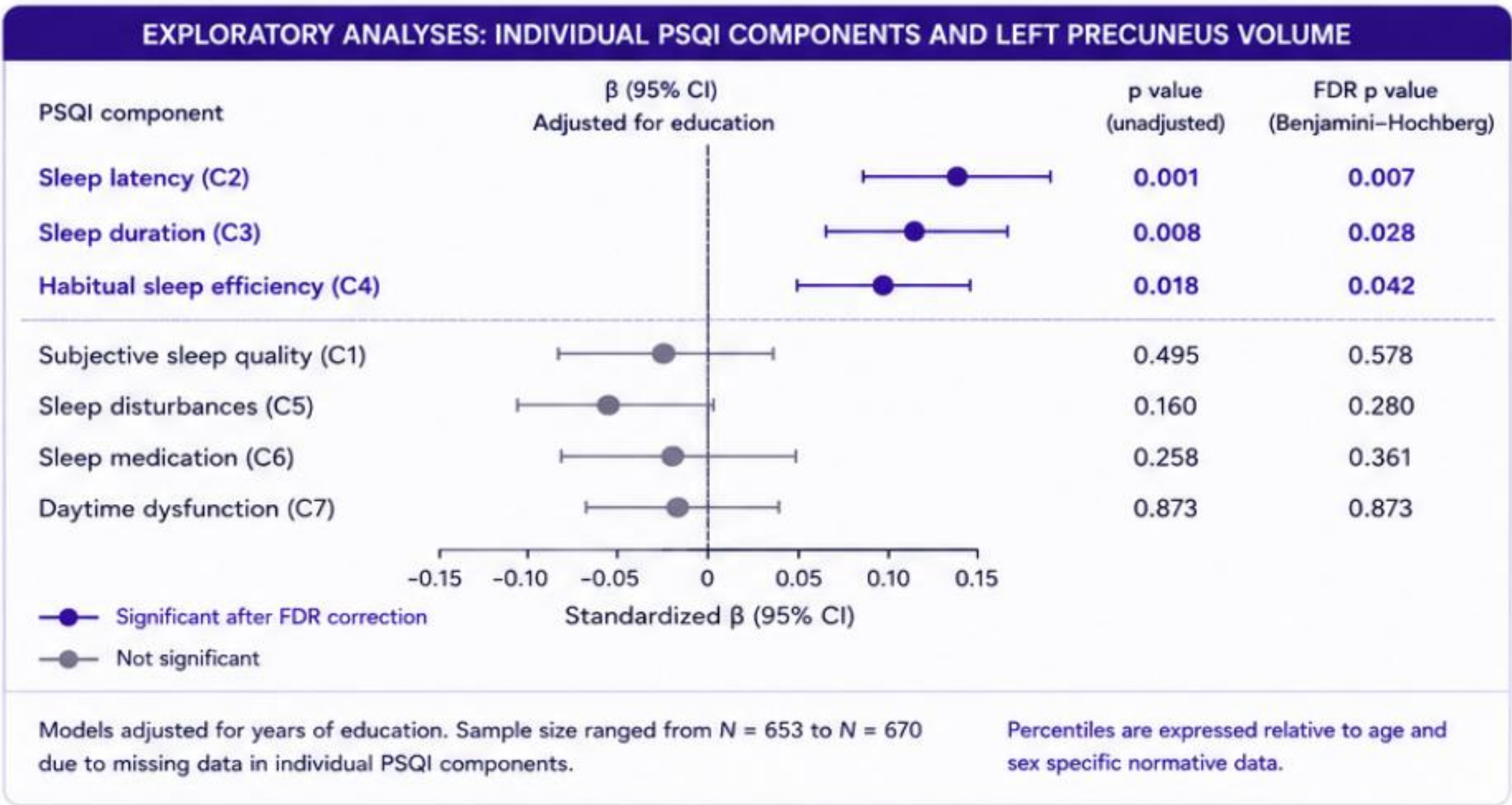
² Percentiles are expressed relative to age and sex specific normative data.

*Bold values indicate significant associations. No associations survived multiple comparisons correction.

RESULTS



- ✓ Education was independently associated with total brain volume ($\beta=0.21$, $p<0.001$) and left precuneus volume ($\beta=0.10$, $p=0.009$).
- ✓ Greater left precuneus volume was robustly associated with poorer objective sleep metrics but not with subjective components.
- ✓ Descriptive analysis of the Pittsburgh Sleep Quality Index (PSQI) revealed that a high percentage of the sample presented poor sleep quality, with 61.9% of the participants ($n = 415$) scoring above the clinical cutoff point of 5 (Global PSQI > 5). The remaining 38.1% ($n = 255$) were classified as good sleepers.



CONCLUSIONS

- **Structural Association & Potential Mechanisms:** Poorer subjective sleep quality was independently associated with a greater relative volume in the left precuneus, which could reflect early-stage reactive processes such as localized neuroinflammation or compensatory remodeling within the Default Mode Network (DMN).
- **Non-Linear Cortical Changes:** The positive direction of this association suggests that early cortical responses to sleep disturbances may be non-linear, preceding the typical atrophy observed in manifest neurodegeneration.
- **Implications for Prevention:** These subtle, localized structural variations highlight the precuneus as a sensitive region to sleep quality, supporting sleep hygiene as a potential non-invasive target for early dementia prevention strategies within LatAm FINGERS.

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