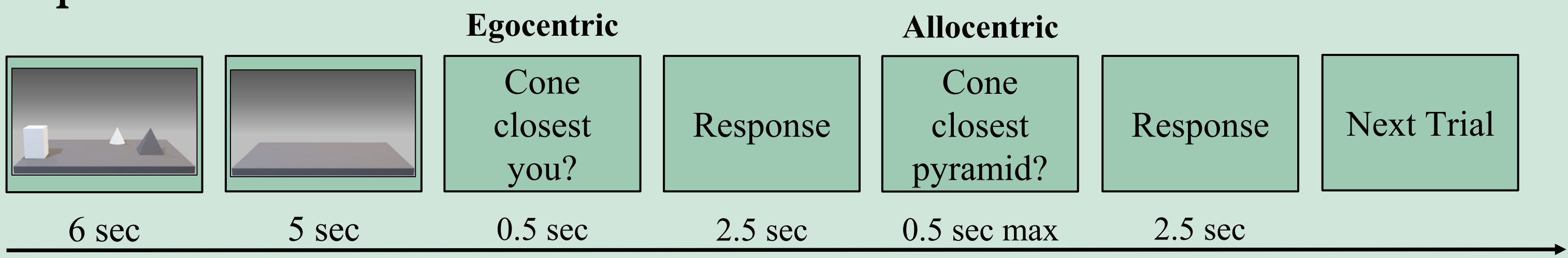


1. BACKGROUND

Human beings represent spatial information according to two classes of reference frames: **egocentric** (body-centered) and **allocentric** (object-centered)^[1-3]. Egocentric representations rely more on a Fronto-Parietal network, instead allocentric ones are mainly supported by Medio-Temporal regions^[4-9]. A **visuo-spatial translational process** between reference frames is required to deal with the natural complexity of the environment in which human beings move and act (i.e. switching ability)^[10-12]. Such **visuo-spatial switching** ability seems to be supported by Postero-Medial structures (Retrosplenial and Posterior Cingulate cortexes), as well as mediated by the Locus Coeruleus-Prefrontal Cortex Noradrenaline system (LCNA-PFC)^[13-14].

3. METHOD

- Participants:** N = 23 (13 females), age range 18-35 ($M_{age} = 23.78$, $SD_{age} = 4.61$)
- Stimuli:** triads of 3D geometrical objects
- Procedure and Task:** the Ego-Allo Switching Task^[12] was administered requiring participants to memorize triads of objects, then to provide two consecutive switching (from Ego-to-Allo, from Allo-to-Ego), and non-switching (Ego-Ego, Allo-Allo), spatial judgments about relative distances between memorized stimuli.
- Experimental Flow:**

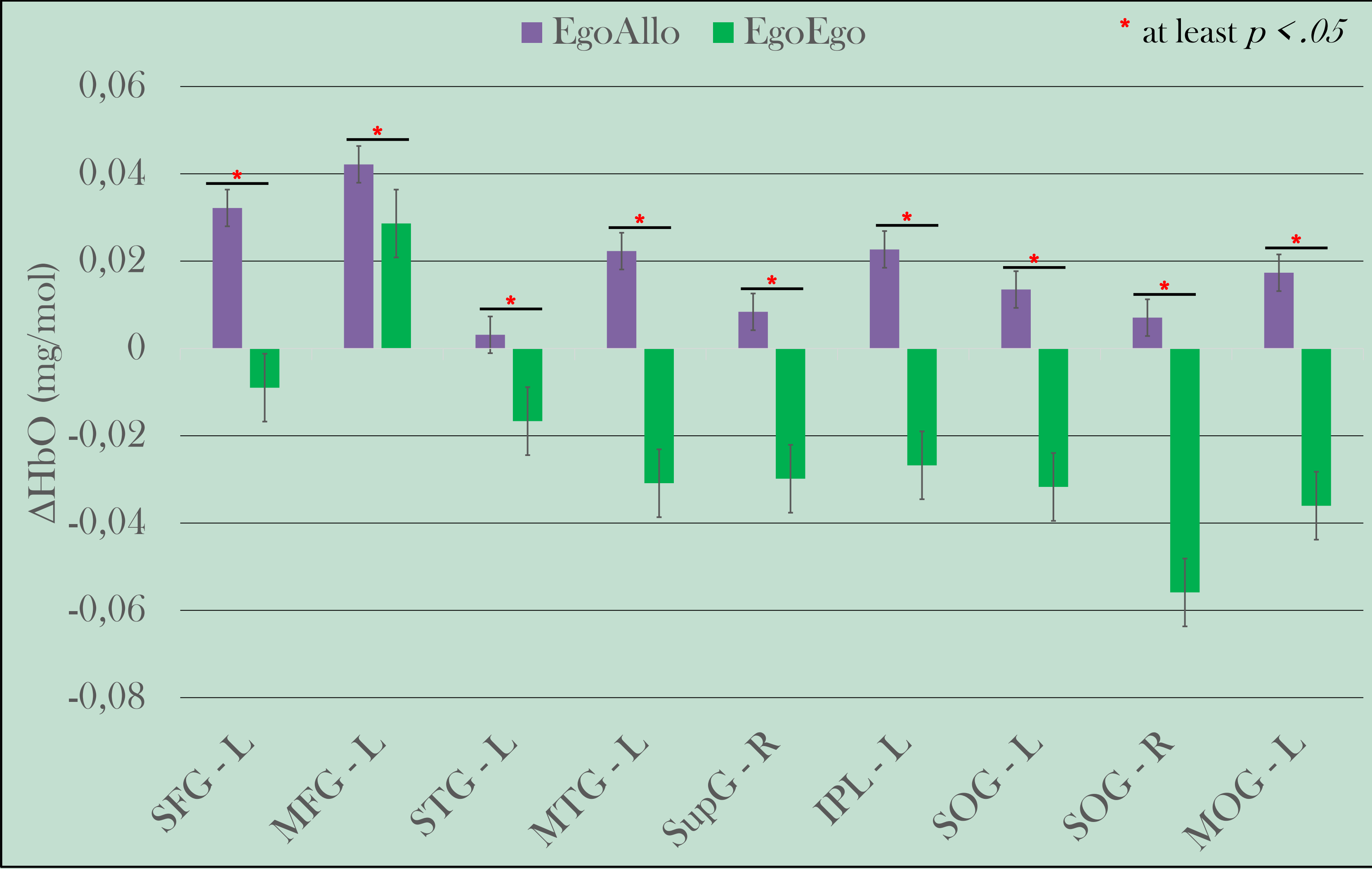


5. DATA ANALYSIS

The following one-tailed paired samples T-Tests were carried out on ΔHbO :

- Ego - Allo *Vs* Ego - Ego
- Ego - Ego *Vs* Ego - Allo
- Allo - Ego *Vs* Allo - Allo
- Allo - Allo *Vs* Allo - Ego

6. RESULTS



LEGEND

SFG= Superior Frontal Gyrus; **MFG**= Middle Frontal Gyrus; **PreG**= Precentral Gyrus; **PosG**= Postcentral Gyrus; **STG**= Superior Temporal Gyrus; **MTG**= Middle Temporal Gyrus; **SupG**= Supramarginal Gyrus; **SPL**= Superior Parietal Lobule; **IPL**= Inferior Parietal Lobule; **SOG**= Superior Occipital Gyrus; **MOG**= Middle Occipital Gyrus.

Significant **increase in ΔHbO was found in frontal regions** (i.e., Superior and Middle Frontal gyri) and **in the Temporo-Parietal Junction** (i.e., including Inferior Parietal Lobule, Supramarginal and Middle Temporal gyri), for Switching (Ego-Allo and Allo-Ego), *Vs* Non-Switching (Ego-Ego, and Allo-Allo), conditions. Furthermore, significant increase in ΔHbO were found in frontal regions only for allocentric Non-Switching (Allo-Allo), *Vs* Switching (Allo-Ego), conditions.

7. CONCLUSIONS

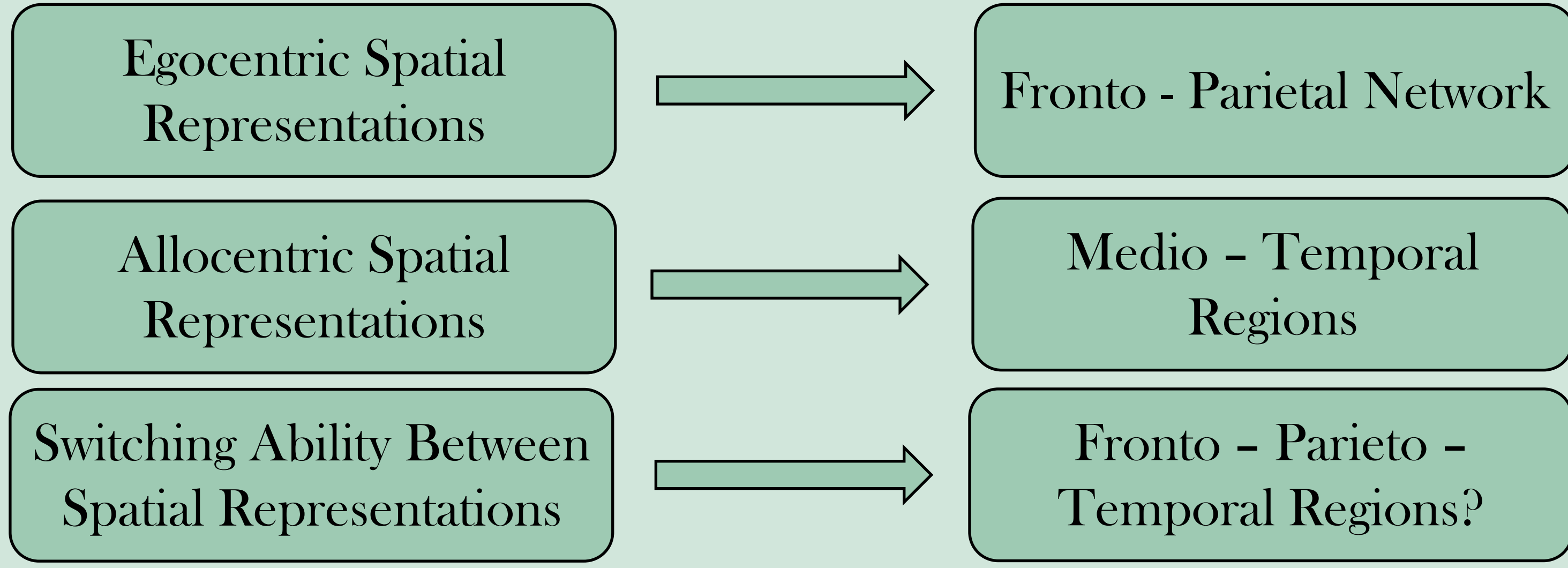
The visuo-spatial ability to switch between egocentric and allocentric frames of reference seems to be supported by a ventro–dorsal pathway, suggesting an involvement of a “vision for action” process^[16].

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2. RESEARCH QUESTION

Despite such visuo-spatial ability is pivotal in our daily life activities, to date it is unclear **which cortical regions are mainly involved in switching processes between spatial representations (?)**.



4. fNIRS DATA ACQUISITION

ΔHbO was recorded by Shimadzu FOIRE-3000 apparatus (sample freq. 4 Hz), by two source-detectors configurations covering (a) Fronto-Parietal and (b) Occipito-Temporal brain regions (designed with fOLD^[15]).

