

Discovering the brain activation patterns associated with somatosensory stimulation in the lower extremity in healthy adults at rest: preliminary results for a systematic review

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INTRODUCTION

- Limited mobility is one of the long-lasting consequences of stroke.
- The rehabilitation process of regaining mobility becomes critical.
- Somatosensory nervous system is the system that supports the mechanism of walking (Leys et al., 2001).
- Thus, the relationship between the somatosensory system and walking is critical to understand for future innovative rehabilitation interventions.

Aim: Determine the brain activation patterns associated with somatosensory stimulation in the lower extremity in healthy adults at rest.

METHODS

- Search Strategy:
 - Identified studies from MEDLINE (Ovid) (1998 to present) and PubMed.
 - Key search terms were:
 - 1) Somatosensory stimulation;
 - 2) Brain activation patterns;
 - 3) Neuroimaging modalities;
 - 4) Lower extremity
- Study Selection:
 - Any published papers that are in English, ranging from 1998 to 2020 with healthy adult participants (over 18 years of age);
 - Demonstrated an association between brain activation patterns and any somatosensory stimulation on at least one section of lower extremity (e.g., leg).

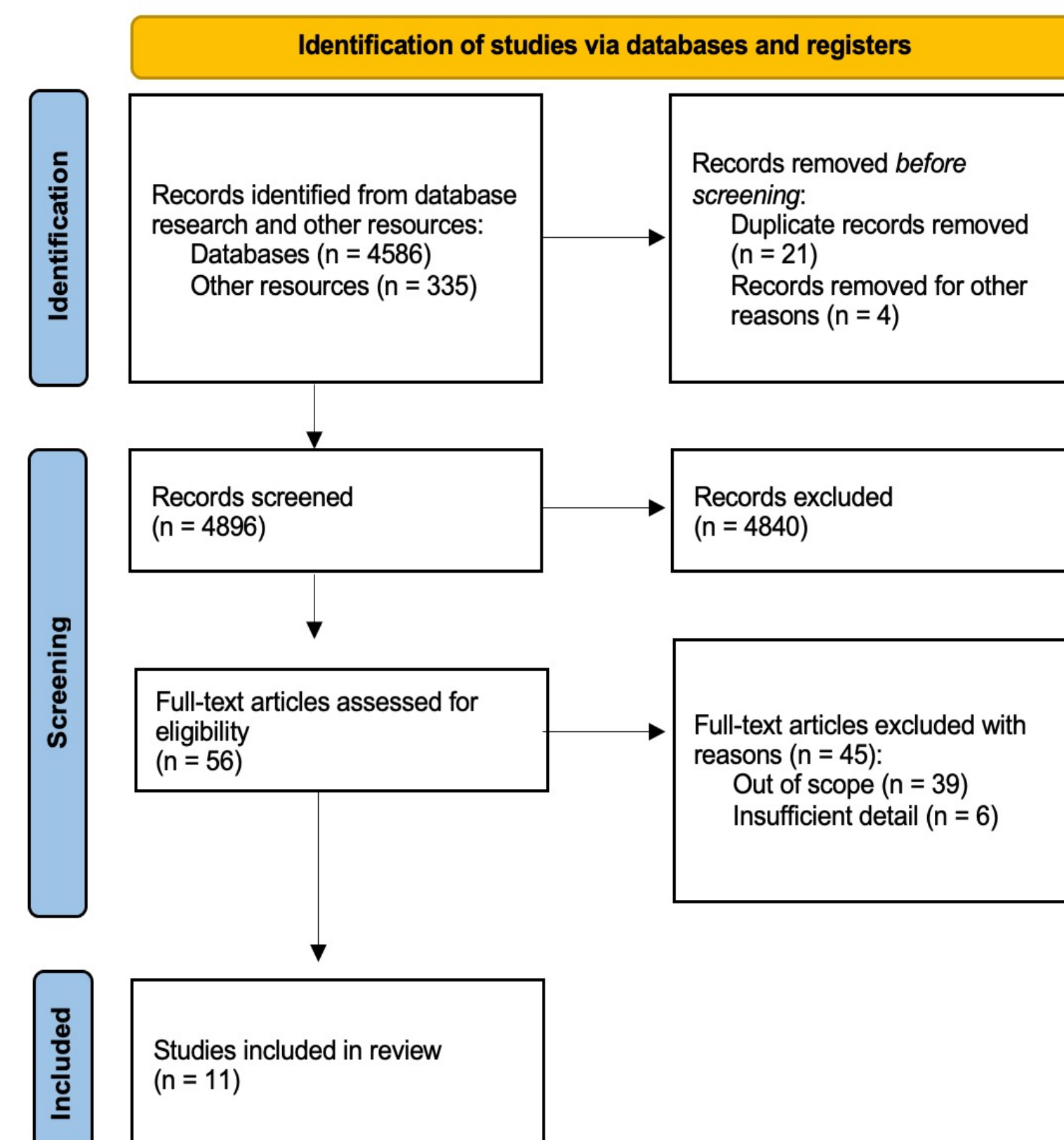


Fig 1. A PRISMA flow chart that shows the record selection and screening process.

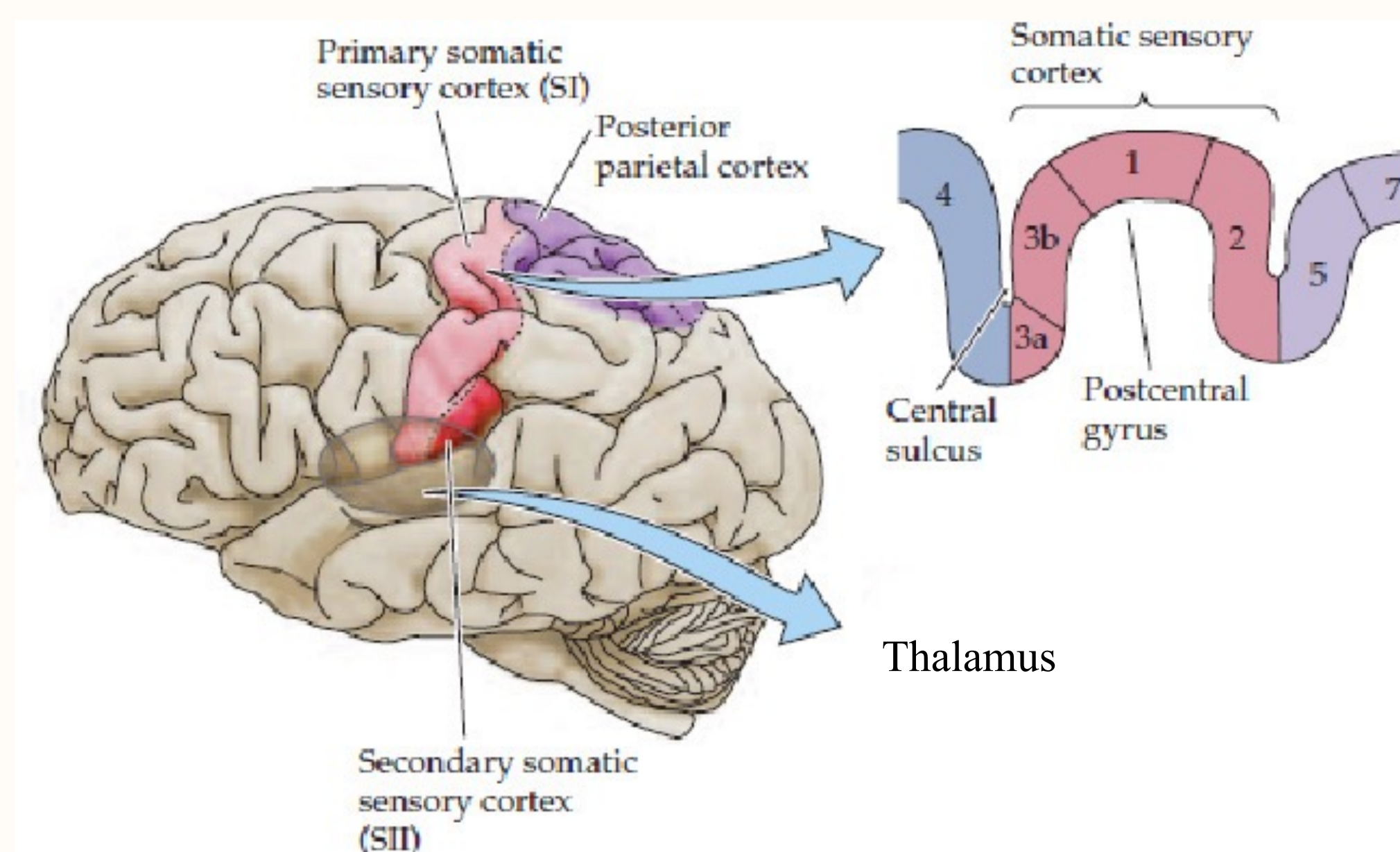


Fig 2. Brain regions of activation within one or more included studies.

RESULTS

Selected articles (n=11) underwent an extraction process and showed the following results:

- **Brain activation parts:** Inferior parietal lobule (n=2), Brodmann Area (BA) 1, 2, 3b (n=9), bilateral thalamus (n=5), middle frontal gyrus (n=3), right lingual gyrus (n=1), bilateral temporoparietal junction, contralateral BA 6, BA 4
- **Countries:** Korea, US, Canada, Switzerland, China
- **Gender:** All female participants (n=5), both gender (n=5) and one with all male participants (n=1)
- **Age:** 20-40 is the most popular range (n=8), 50+ age group is the second most common range (n=2), and an article with a range from 20-70
- **Dominant hand:** Most articles (n=8) have participants that are right-handed, the rest did not specify (n=3)
- **Stimulation:** Thermal stimulation (n=3), acupuncture (n=1), tactile stimulation (n=3), cold pain (n=1) and pressure stimulation (n=3)
- **Body parts:** Bottom of feet (n=7), Toes (n=2), Calf (n=2), Thigh (n=1)
- Dominant foot, ethnicity and skin color were originally included in the table, but is excluded due to lack of acknowledgments in most articles

DISCUSSION

- ALL studies are using fMRI
- Most areas that found activation are expected.
- Brodmann area(1,2,3a,3b) and the thalamus are the most commonly reported regions of activation.
- Activation in these areas may be due to function.
 - Brodmann area: process sensory information
 - Thalamus: relay sensory and motor signals to cerebral cortex
- Future direction: explore whether long term somatosensory stimulation can enhance mobility recovery.