



Increased neurophysiological understanding could help practitioners to develop and improve rehabilitation and exercises approaches in AIS

Lessons learned on trunk neurophysiology and motor control from Adolescent Idiopathic Scoliosis. A scoping review

Background and objective: Compared to other joints, the spine faces specific challenges due to the main function of stability (instead of movement for the limbs) and the need to protect the spinal cord. The neurophysiological control of this complexity is critical, and its failure could contribute to some spinal disorders, like Adolescent Idiopathic Scoliosis (AIS). Many different exercise types have shown some efficacy in AIS, with the only commonality of what all exercises do: changing the spinal neurophysiological control. Hence, a better understanding of spine neurophysiology could lead to the development of improved rehabilitation. To this aim we synthesized the current evidence and identify interesting insights on spinal neurophysiology.

Results: The mean year of publication was 2006 (standard deviation [SD]=13.0; range=1961-2022). A total of 2712 AIS patients and 911 healthy controls were included in the selected studies.

In general, the articles reported an asymmetric electromyographic **activity of the trunk muscles** both in term of amplitude and timing.

A few studies described modified **muscular activation patterns in brace** participants with AIS.

As regards the central nervous system investigation, **cerebellar volume** was found to be higher in AIS patients compared with healthy controls. Different degrees and patterns of asymmetry of **cortical excitability** was observed using transcranial magnetic stimulation and evoked potentials.

Also, dysfunctions of the **vestibular system** have been reported, with some authors hypothesizing that vestibulo-spinal system imbalance could contribute to AIS development.

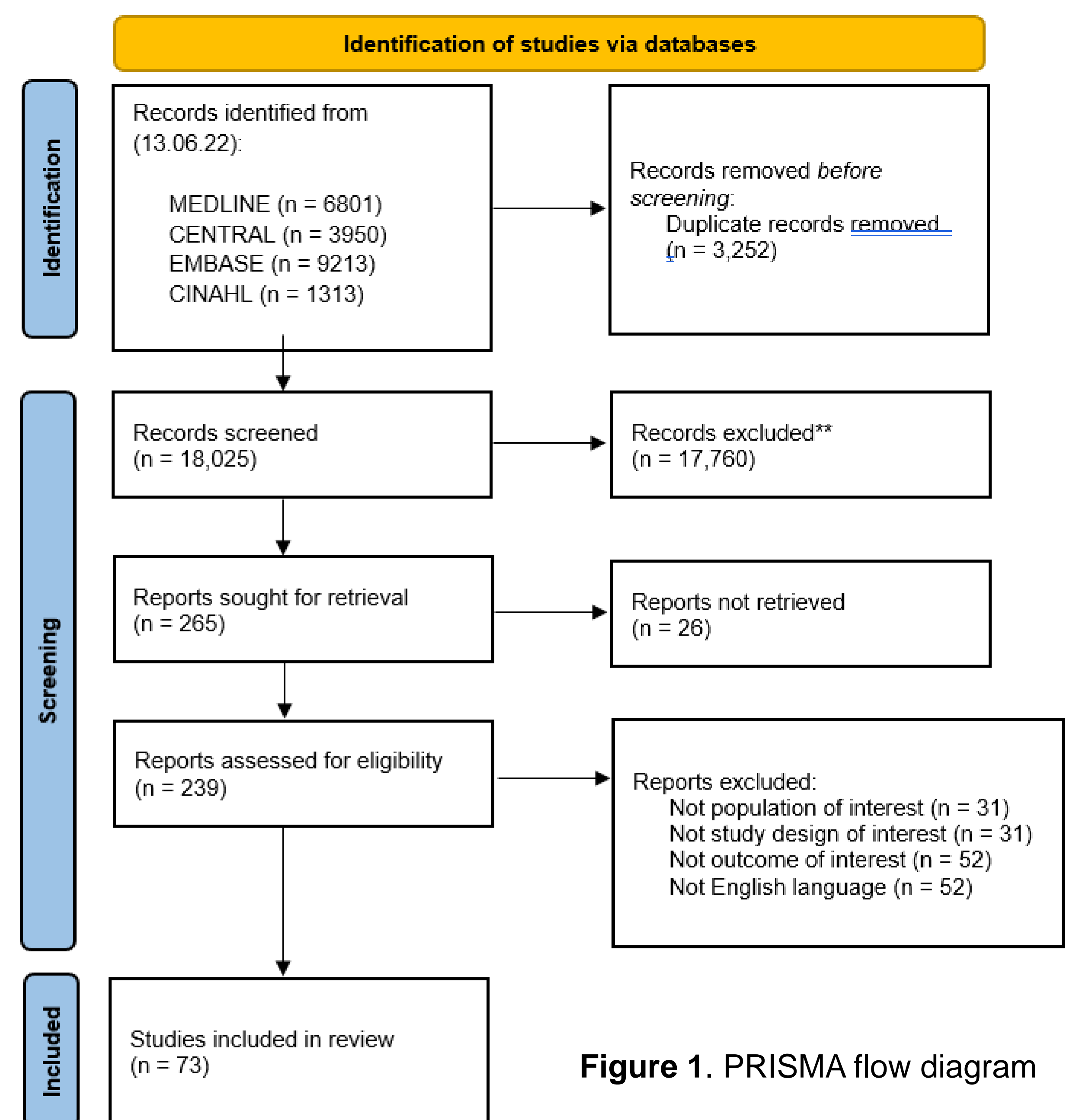


Figure 1. PRISMA flow diagram

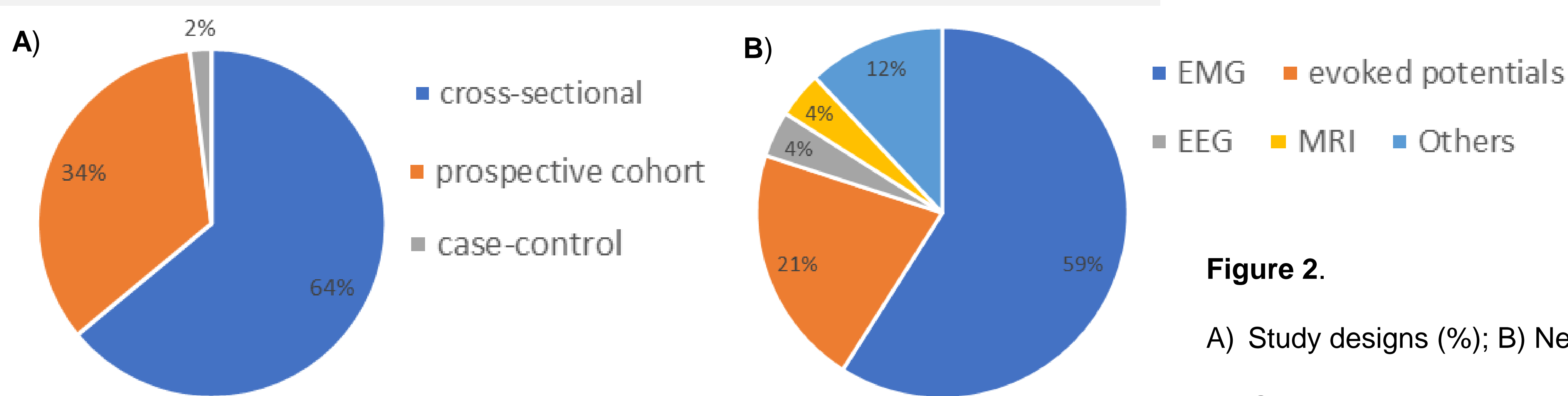


Figure 2.

A) Study designs (%); B) Neurophysiological assessment techniques (%).

EMG=electromyography EEG=electroencephalography MRI=magnetic resonance imaging

Methods Scoping review

We systematically searched four databases including English primary peer-reviewed studies that explored trunk motor control with any neurophysiological assessment method in AIS, published until June 2022. We collected all relevant information concerning study design and methodology, author and publication details, study participants, outcomes, and assessment measures.

Limitations: We did not consider non-English literature or published protocols. Moreover, we did not contact the authors of unretrieved articles to obtain further information.

Claudio Cordani, Giulia Fregna, Matteo Johann Del Furia, Fabio Zaina, Stefano Negrini



UNIVERSITÀ DEGLI STUDI DI MILANO

I.R.C.C.S. Ospedale Galeazzi - Sant'Ambrogio
Gruppo San Donato

