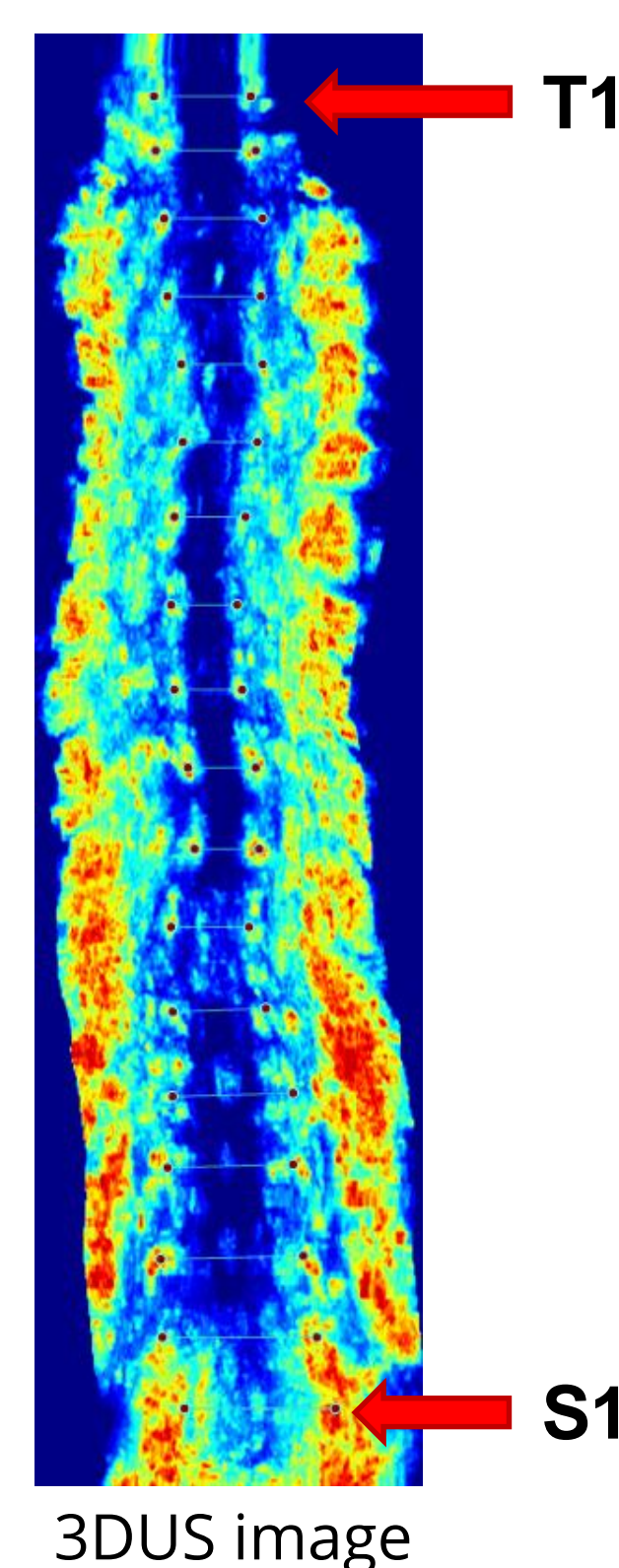


## Introduction



- Scoliosis is a 3D deformation of the spine.<sup>1</sup>
  - Adolescent idiopathic scoliosis (AIS) is scoliosis in adolescents without a known cause.
  - Patients with AIS have many x-rays taken of their spines, increasing risk of cancer.<sup>2</sup>
- EOS Imaging
  - Frontal and lateral x-rays taken simultaneously
  - Reduces radiation by up to 9x<sup>3</sup>
  - When an x-ray is taken, patients' arms have to be raised.
    - Unknown if effect on habitual standing
  - Inconsistent positioning across healthcare centers
- 3D Ultrasound imaging (3DUS)
  - Non-invasive information in all 3 planes

**Objective:** Comparing arm position used during radiography that best represents habitual standing posture in healthy adolescents and adolescents with idiopathic scoliosis.

## Methods

### Search Strategy

- Databases searched: Medline, CINAHL, Embase, and Web of Science (all on June 29, 2022)
- Strategy created with terms using our inclusion and exclusion criteria (listed below)

### Screening Strategy

- Two reviewers screened 1,332 abstracts
- Third reviewer would resolve conflicting votes
- Included papers moved into a full text review

### Extraction

- Used a Google spreadsheet
- Extracted data included sample size, angle measurements and imaging type

### Data Synthesis

- Study quality analyzed using the appraisal tool for Cross-Sectional Studies (AXIS)
  - Level of Evidence statements were created using a method adapted by Cornelius et al.
  - Meta-analysis done for relevant studies

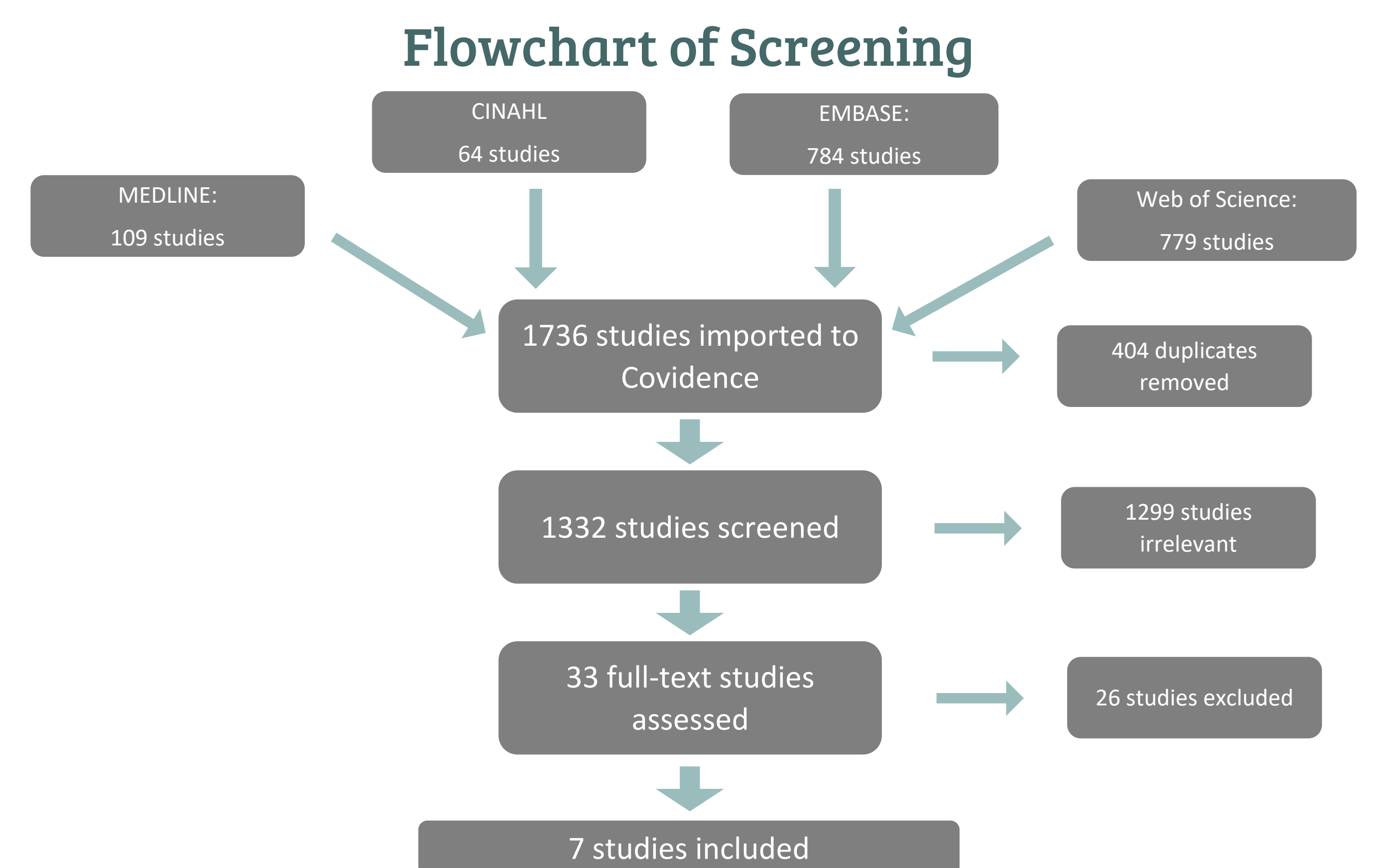
### Sample Extracted Data

Study	N	Age (years)	Image method	Arm position
Faro 2004	50	14.7 ± 2.3	Lateral spine x-ray	• Standing • Clavicle
Marks 2009	22	13 ± 2 (12-20)	Reflective markers, 8 cameras	• Standing • Active 30° • Passive 30° • Clavicle
Marks 2003	15	12 ± 1.9 (10-14)	Reflective markers, 36-in x-ray	• Standing • Shoulder 45° • Knees 45° • Shoulders/knees 45°
Asano 2015	24	11.9	3D projection scanner	• Standing • Clavicle
Wojciech 2013	694	10-18	3D surface topography	• Standing • Clavicle
Abe 2016	42	12.6	3D projection scanner	• Standing • Clavicle
Pasha 2016	37	10-18	EOS bi-planar x-ray	• Clavicle • Hands on wall

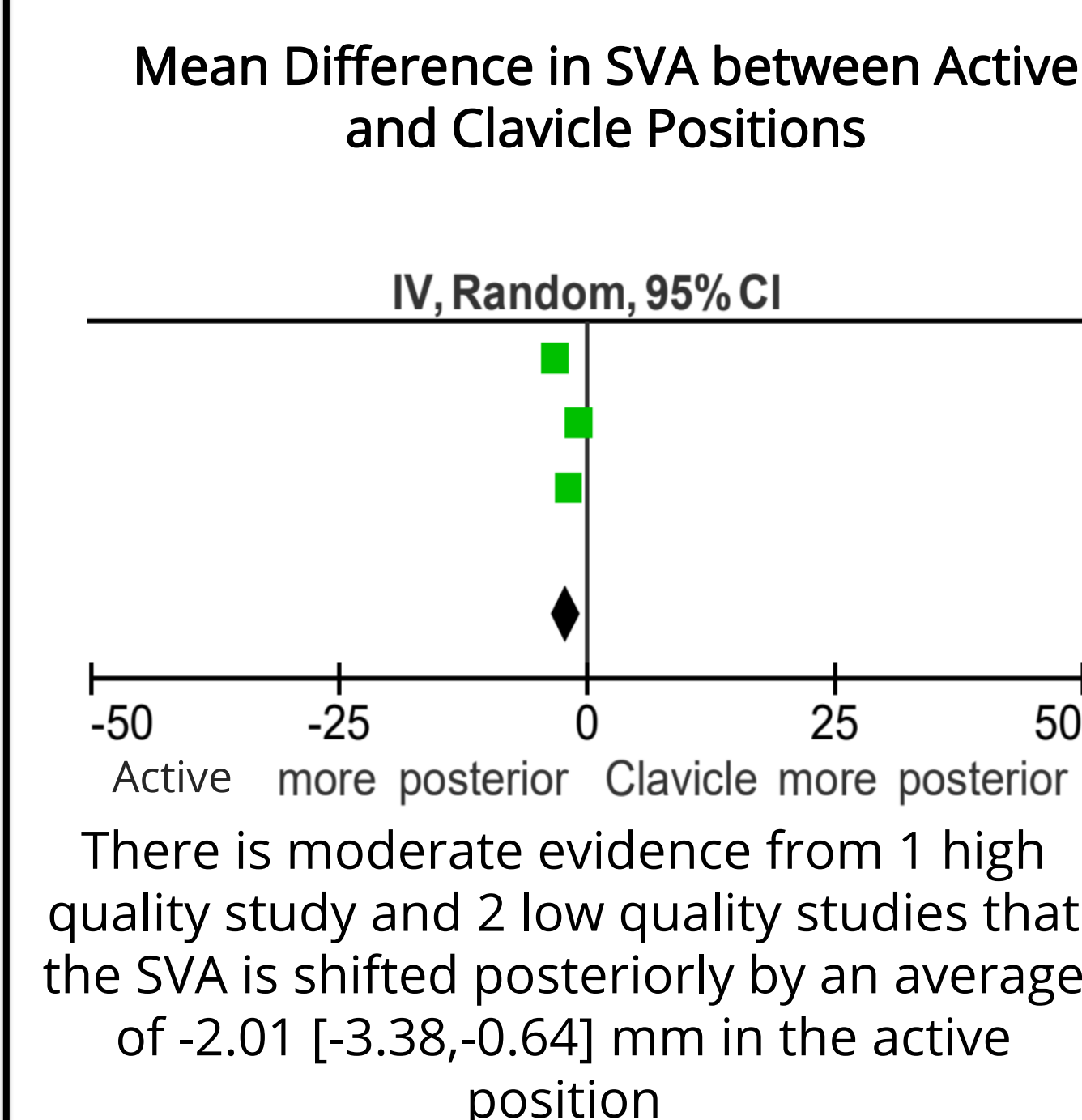
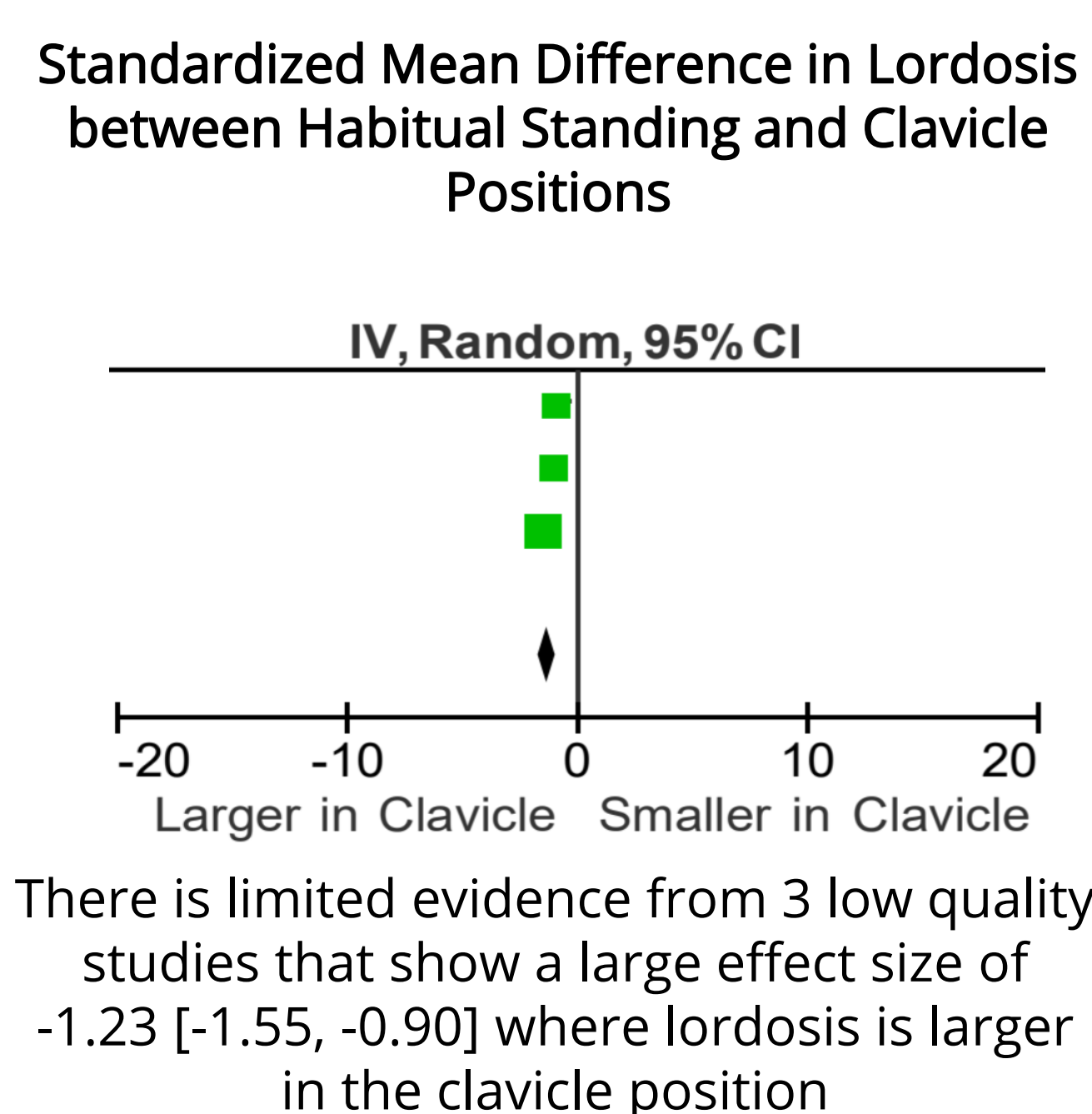
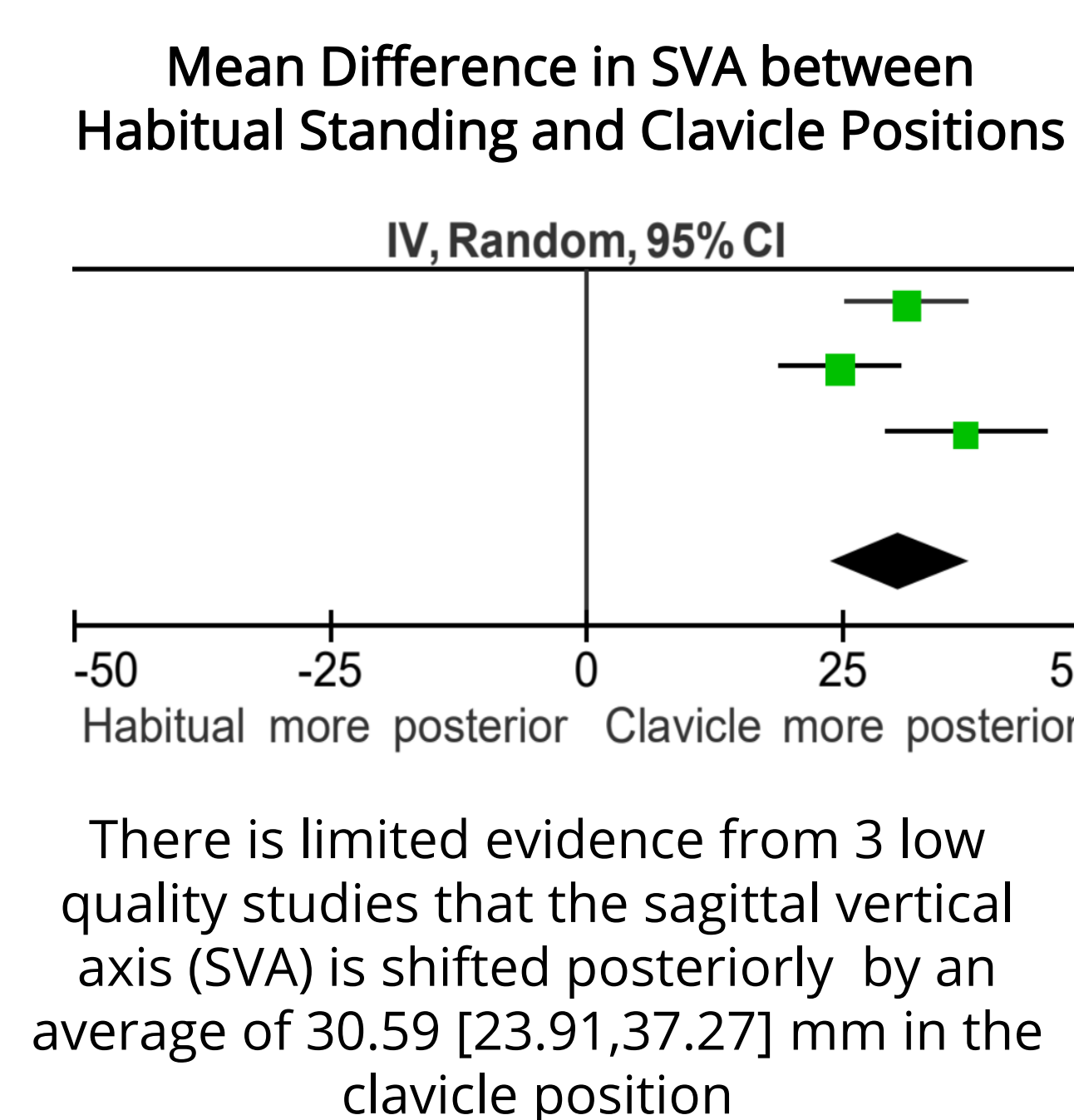
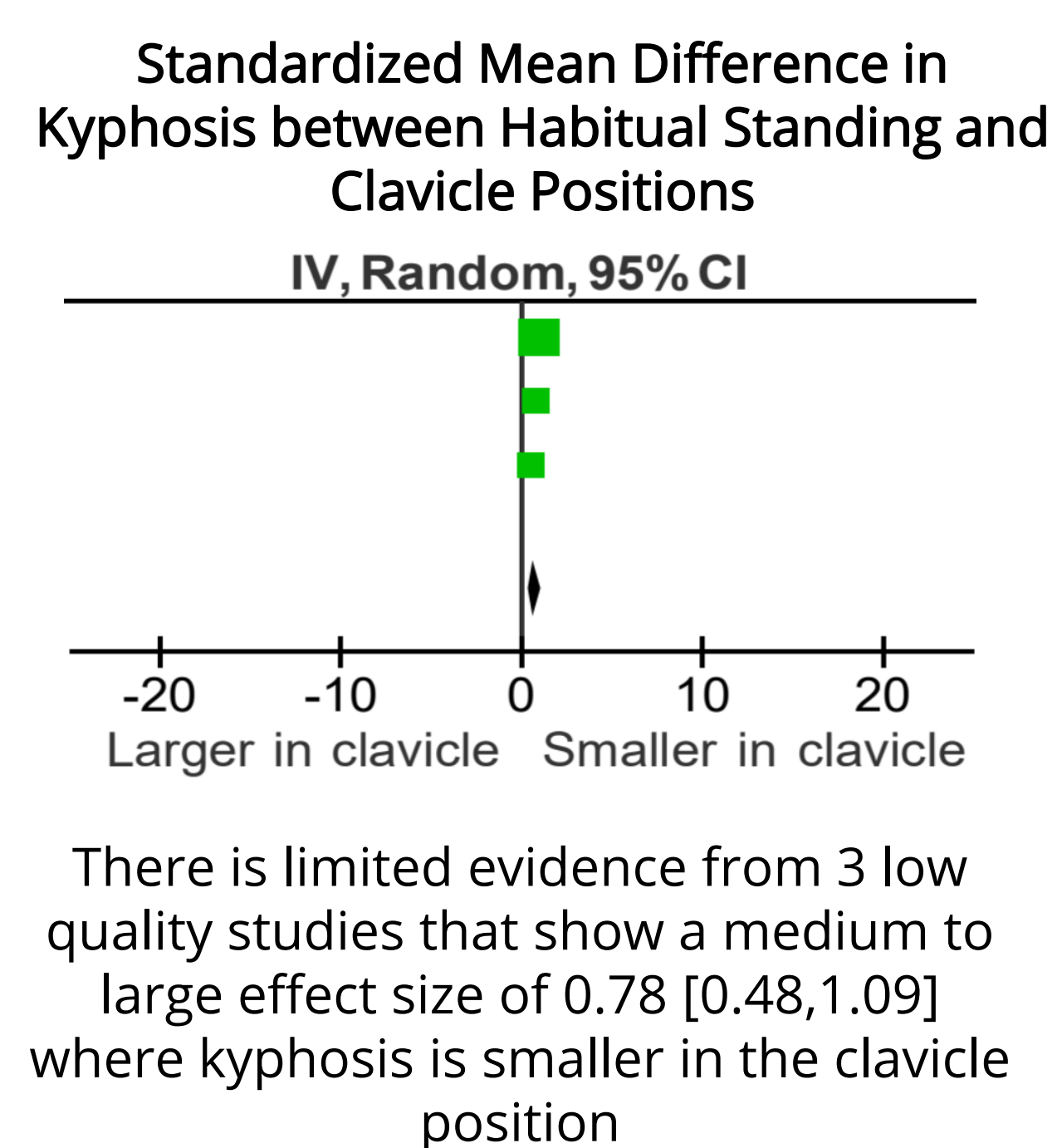
Inclusion Criteria	Exclusion Criteria
Between and including 10 and 18 years old	Over the age of 18 or under the age of 10
AIS or healthy controls	Pregnant or gave birth within 2 years
Comparison to at least 1 standing position	Spinal surgery/spinal fusion
Ultrasound, x-ray, Standing MRI, Fluoroscopy, or Surface topography used	Only sitting or lying positions; No comparison to a standing position
Cohort or Cross-sectional study design	Under 10 participants in sample
	Case report
	Any diagnosis other than AIS

## Results

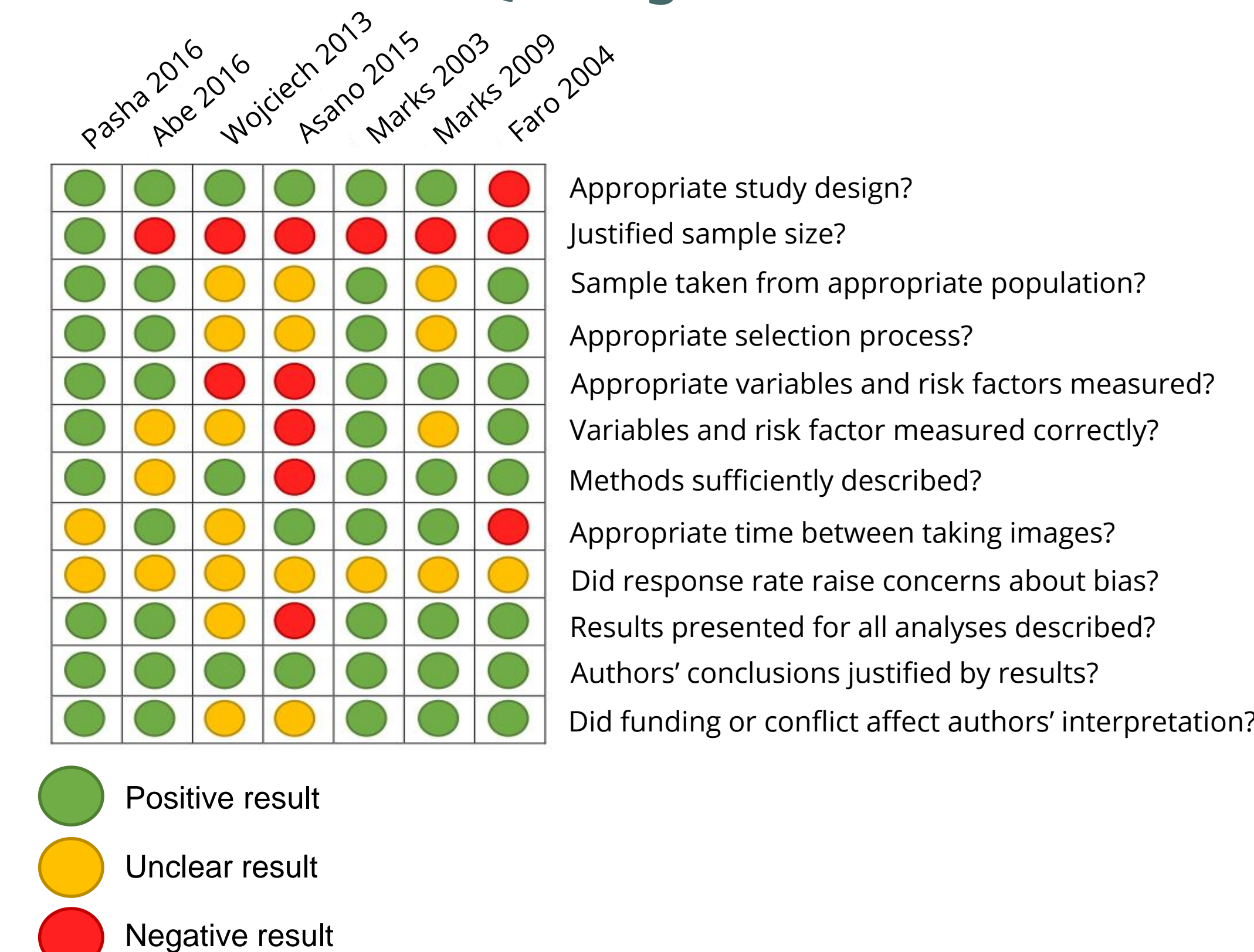
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## Meta-analysis



## AXIS Quality Assessment



## Conclusions

- AXIS shows that the studies were rated moderately or low quality, but small number of relevant studies show limited results
- Many studies missing relevant information (Cobb angle, AIS groups, positioning information)
- Most common positions compared were Habitual Standing, Clavicle, and Active positions
- Most common spinal parameters measured were whole thoracic kyphosis, lordosis, and SVA
- Research shows the position most similar to habitual standing was the Clavicle position but this still has moderate effects on spinal parameters (most notably SVA)
- In the future, more research needs to be done with more positions to create a broader range of results and to find a position that is more similar to habitual standing
- There is research underway to show the effect of 10 arm positions on parameters of the spine

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