VALIDATION OF TRUE SPINE LENGTH RADIOGRAPHIC MEASUREMENTS

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INTRODUCTION

- Diminishing returns effect for T1–S1 height lengthenings for EOS

- Lengthening of spine still occurs
  - Growth out of Coronal Plane
  - Increased Thoracic Kyphosis
DIMINISHING RETURNS

Diagram showing changes in spine length (H) and total length (L) over time, with notation of ΔH and ΔL.
6 Phantom Spine Alignments
  ◦ 0° to 75° at 15° intervals

Measured:
  ◦ True Length (TL)
  ◦ Chord Length (C)

One reviewer for physical measurements

Two reviewers for photographic measurements
RESULTS – PHANTOM MODEL

- Average error between photographic measurement and physical measurement
  - 1.81mm (0.06 to 4.42mm)

- Average measurement error between the two observers:
  - 0.27mm (0.00 to 0.55mm)
RESULTS – PHANTOM MODEL

PHANTOM INTER-RATER RELIABILITY

- T1-L1 True Spine Length
- T1-L1 Chord Length
- T1-L1 Vertical Height
- Average

[Bar chart showing the reliability data for the mentioned measurements.]
**Methodology – Clinical Images**

**Commercial Software**
- **Coronal Measurements**
  - T1–L1 Height
  - Cobb Angle
- **Sagittal Measurements**
  - T1–L1 Height
  - T1–L1 Chord
  - Thoracic Kyphosis Angle

**Custom Software**
- **Coronal Measurements**
  - T1–L1 Height
  - T1–L1 Chord Length
  - T1–L1 True Spine Length
- **Sagittal Measurements**
  - T1–L1 Height
  - T1–L1 Chord
  - T1–L1 True Spine Length
METHODOLOGY

VERTICAL HEIGHT

GEOMETRIC CHORD

TRUE SPINE LENGTH
RESULTS – CLINICAL IMAGES

INTER-RATER RELIABILITY

<table>
<thead>
<tr>
<th>Metric</th>
<th>Custom Software</th>
<th>Commercial Software</th>
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</thead>
<tbody>
<tr>
<td>True Spine Length</td>
<td>0.97 ± 0.03</td>
<td>1.00 ± 0.00</td>
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<tr>
<td>Vertical Height</td>
<td>0.95 ± 0.02</td>
<td>1.00 ± 0.00</td>
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<tr>
<td>Chord Length</td>
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RESULTS – CLINICAL IMAGES

INTRA-RATER RELIABILITY

CUSTOM SOFTWARE

COMMERCIAL SOFTWARE

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CONCLUSION

- Image measurement of True Spine Length was shown to be accurate and repeatable in phantom assessment

- In Clinical Image Assessment:
  - Coronal Images – Very Good Agreement
  - Sagittal Images – Moderate Agreement

- No Statistical Differences found between the Custom and Commercial software measurements
Thank You