

## Aims

- To aid in overnight recovery from daily stressors on the spine, a mattresses should provide enough support to keep spinal alignment close to neutral. Hence the first aim of this study was to determine if the firmness of a mattress spring affects spinal alignment when lying down.
- A greater understanding is needed of how different mattresses affect the diverse range of body shapes. Therefore this study will also assess if body shape effects spinal alignment when lying on different firmness' of mattresses.

## Methods

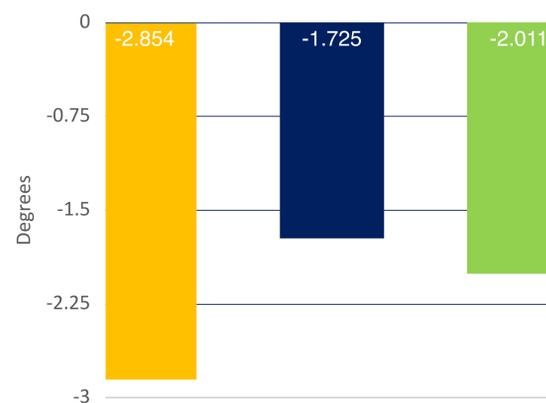
- Fifty-Nine participants' body measurements were taken to determine a difference in body types (see table 1).
- Three visually identical mattresses were tested. Internally each mattress contained a different firmness of spring unit (soft, medium, firm) with an identical gel foam comfort layer.
- A ten camera infrared movement analysis system recorded the three dimensional movement of retroreflective markers to allow measurement of the Upper-Mid Thoracic , Mid-Lower Thoracic, Lower Thoracic–Upper Lumbar, Upper-Lower Lumbar and Lower Lumbar–Pelvic areas of the spine.
- A static image of the spine was taken in a standing position and was used to define each individual's neutral posture. Deviations away from this neutral posture were assessed under the three different conditions during side lying.

DEMOGRAPHICS	MEAN (SD)	RANGE
Age (years)	35.07 (12.50)	18 - 63
Height (m)	1.71 (0.12)	1.514 - 1.97
Weight (kg)	79.09 (16.31)	42.2 - 116.2
BMI (kg/m <sup>2</sup> )	26.76 (4.16)	18.15 - 44.54
Shoulder Height (cm)	142.99 (10.29)	122.7 - 166.6
Shoulder Width (cm)	42.33 (4.21)	35.3 - 51.8
Waist Height (cm)	109.39 (8.59)	93.6 - 130.2
Waist Circumference (cm)	87.96 (11.61)	64.8 - 122.4
Hip Height (cm)	91.47 (7.52)	79.2 - 112.1
Hip Circumference (cm)	103.34 (8.41)	83.3 - 135.9

Table 1: Demographic of all 59 participants.

## Results

Spinal alignment was assessed on all 59 participants and only one significant difference was found in the Upper Thoracic to Mid-Thoracic region of the spine with a Medium mattress moving the spine away from the neutral position the most (see graph 1). With a large range of body shapes, the extremes in body types may have been cancelling each other out. This was then explored in the sub-grouping.



Graph 1: Upper Thoracic to Mid Thoracic spinal deviations.

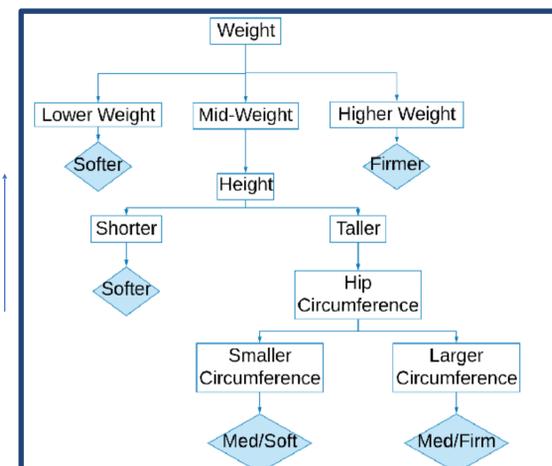
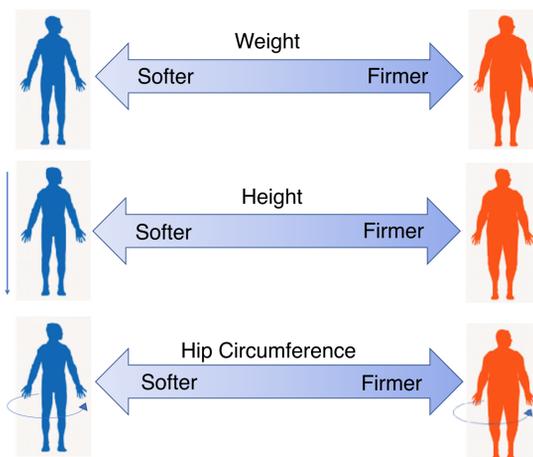
## Sub-Grouping Analysis

Further analysis showed significant differences in spinal alignment between the different mattress conditions within different body shape subgroups.

Subgroups were defined using body weight, height, and hip circumference. There was no significant differences in the other body measurements taken when subgrouping was considered.

**The subgroupings showed a more neutral spinal alignment in the following groups:**

- Those with a higher body weight needed a firmer spring unit.
- Those with a lower body weight needed a softer spring unit.
- Taller people needed a firmer spring unit.
- Shorter people needed a softer spring unit.
- Those with a larger hip circumference needed a firmer spring unit.
- Those with a smaller hip circumference needed a softer spring unit.



## Conclusion

This study suggests that a 'one size fits all' approach to mattresses may not be appropriate. Contrasting body types need different levels of support to improve overall spinal alignment, allowing the intervertebral disc to rehydrate, and spinal muscles to relax throughout the night. The use of simple anthropometric measurements could make the selection of the most appropriate mattress easier for the general public.

