

Supplementary material S2

Additional data

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For abbreviations see (1).

Table S1. Normalised cervical vertebrae measurements (modified from (2-8))

mm / (°)	C1	C2	C3	C4	C5	C6	C7
VRHa	16.0						
VRHp	10.4						
VRTa	6.9						
VRTp	8.3						
VRD	47.9						
FDD	33.5	25.1	17.5	16.2	16.1	16.1	16.0
FDW	32.1	21.1	24.6	25.6	26.5	26.9	26.4
LMa-VRa	5.4						
TP-LM	8.9						
C1Fac-D	21.8						
VBHa		20.5	14.2	13.5	12.8	13.1	14.7
VBHp		16.7	14.6	14.1	13.7	13.7	15.0
VBHpc			12.2	11.9	11.9	11.4	13.4
H		41.0					
DH		17.8					
DDDs		12.2					
DDDi		11.1					
DDWs		11.1					
DDWi		10.2					
ASH		16.0					
EPLH		4.2					
DI		13.4					
EPWi		19.7	20.8	21.7	22.8	25.2	29.5

EPWs							16.7
EPDs		12.7	15.0	15.6	15.6	16.2	16.7
EPDi		16.1	16.2	16.4	16.8	17.3	16.8
SPL-pi		36.8	30.8	30.6	29.9	35.8	46.7
SPL-ps		40.2	24.6	33.8	35.6	41.7	49.9
SPL		35.5	31.0	31.8	29.9	35.8	47.9
TPW	82.6	57.5	56.0	56.7	58.2	61.1	73.7
EPI-ti (°)		4.2	2.0	2.1	2.7	2.7	1.8
EPI-ts (°)			2.7	3.5	1.7	4.7	2.2
SPI (°)		19.8	22.0	20.0	20.0	13.9	14.3
DBHa		4.8	5.3	5.5	5.4	5.2	4.7
DBHp		4.2	3.3	3.0	3.0	3.3	3.5
D-Gap		1.7					
V-ind		1.0	0.8	0.8	0.8	0.9	0.8
L		53.6	46.5	46.7	49.3	55.9	63.3
PDI (°)			42.3	43.3	40.3	31.9	29.9
UJI (°)			43.0	43.9	39.8	45.0	53.6
PDW			5.9	5.7	5.9	6.2	6.9

Table S2. Normalised thoracic vertebrae measurements (modified from (9,10))

Mm/ (°)	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12
VBHa	17.1	18.2	18.3	19.1	19.2	19.1	19.1	19.6	20.8	22.7	23.8	25.5
VBHp	17.5	18.2	19.2	20.0	20.6	20.9	21.6	22.0	22.6	24.1	26.5	28.2
VBHpc	14.8	16.3	16.5	17.0	17.0	18.2	19.1	19.6	20.2	21.2	22.3	23.8
EPWi	29.1	28.7	27.1	27.2	28.3	29.6	30.5	32.0	34.6	37.1	41.0	44.1
EPWs	25.7	26.1	25.8	25.7	26.1	27.5	29.1	30.9	32.1	33.4	36.6	40.9
EPDi	20.6	22.6	24.4	25.7	27.0	28.2	29.9	30.8	32.5	33.1	33.3	35.0
EPDs	19.4	20.5	23.8	24.4	25.5	27.2	28.7	29.2	30.7	32.0	33.4	34.4
SPL	52.5	54.6	54.2	53.6	54.6	56.4	52.9	55.3	53.8	51.7	47.8	49.7
FDW	22.8	20.4	19.2	17.8	17.9	18.1	18.1	18.6	18.8	19.1	20.3	23.3
FDD	17.2	16.0	16.7	17.0	17.1	17.3	16.9	16.7	16.5	16.2	16.8	19.1
TPW	78.9	72.7	63.7	59.6	64.0	64.2	63.3	62.8	62.1	61.2	54.7	49.2
EPI-ti (°)	3.9	1.9	2.1	2.3	2.0	1.8	2.2	2.3	1.2	1.2	2.2	1.8
EPI-ts (°)	1.8	1.7	2.4	1.5	2.1	2.1	1.6	1.3	0.9	0.5	2.3	2.2
SPI (°)	14.7	15.1	15.5	15.9	16.4	16.8	17.2	17.6	18.0	18.4	18.8	19.2
DBHa	3.5	3.3	2.6	2.9	2.8	3.3	3.9	4.2	4.5	5.3	6.6	5.1
DBHp	3.7	3.8	3.6	3.8	3.9	4.3	4.3	4.4	4.4	4.9	5.2	5.6
V-ind	1.0	1.1	1.2	1.3	1.4	1.4	1.5	1.5	1.6	1.7	1.7	1.8

Table S3. Normalised lumbar vertebrae measurements (modified from (7,11-13))

mm / (°)	L1	L2	L3	L4	L5
VBHa	25.6	27.4	28.1	27.6	28.5
VBHp	27.1	28.0	27.8	26.9	25.5
VBHc	24.9	25.5	24.9	25.3	24.0
EPWi	45.4	47.7	50.3	51.9	51.8
EPWs	43.2	44.6	46.2	48.8	49.6
EPDi	34.5	35.0	34.9	35.1	34.2
EPDs	33.8	34.7	35.0	34.7	34.5
SPL-ps	53.0	56.2	57.1	55.2	51.7
SPL-pi	47.3	50.3	50.9	48.7	44.2
SPL	70.9	75.1	75.1	73.5	71.6
FDW	24.8	24.9	25.5	26.6	28.4
FDD	19.9	19.1	18.3	19.5	20.6
TPW	74.6	79.8	89.8	83.2	96.9
EPI-ti (°)	4.0	2.1	2.7	2.7	1.8
EPI-ts (°)	2.7	3.5	1.7	4.7	2.2
SPI (°)	19.6	19.8	20.1	20.9	21.3
DBHa	7.6	9.0	10.4	12.1	14.2
DBHp	6.6	9.0	10.4	12.1	14.2
V-ind	1.7	1.8	1.7	1.8	1.7
L	81.4	85.1	85.7	83.8	77.9

Table S4 Minimum full ROM angular values of the entire spine (°)

Region	C0-C2	C3-T1	C0-T1	T1-T12	T12-S1
Flexion (Rx)	14.7	30.8	45.5	27.6	15.1
Extension (-Rx)	-15.6	-32.9	-48.5	-12.4	-38.5
Lateral bending (\pmRy)	\pm 6.3	\pm 18.2	\pm 24.5	\pm 52.0	\pm 13.65
Axial rotation (\pmRz)	\pm 32.8	\pm 25.2	\pm 58.0	\pm 49.0	\pm 6.65

Table S5 Average full ROM angular values of the entire spine (°)

Region	C0-C2	C3-T1	C0-T1	T1-T12	T12-S1
Flexion (Rx)	20.3	42.6	42.9	52.4	22.4
Extension (-Rx)	-21.6	-45.5	-67.1	-23.6	-57.0
Lateral bending (\pmRy)	\pm 10.9	\pm 31.3	\pm 42.2	\pm 76.0	\pm 26.5
Axial rotation (\pmRz)	\pm 42.6	\pm 32.7	\pm 75.3	\pm 71.0	\pm 18.85

Table S6 Cervical spine inter-vertebral motion percentage calculations (%)

	C0-C1	C1-C2	C2-C3	C3-C4	C4-C5	C5-C6	C6-C7	C7-T1
Rx	19.1	13.2	7.9	11.7	12.2	13.3	11.4	11.4
Ry	11.6	14.3	13.6	14.0	12.8	11.9	10.9	10.9
Rz	4.7	51.9	7.7	8.6	7.7	7.7	6.8	5.8

Table S7 Thoracic spine inter-vertebral motion percentage calculations (%)

	T1- 2	T2- 3	T3- 4	T4- 5	T5- 6	T6- 7	T7- 8	T8- 9	T9- 10	T10- 11	T11- 12
Rx	6.0	6.0	6.0	6.0	6.0	8.0	8.0	9.0	9.0	15.0	21.0
Ry	6.0	9.0	9.0	7.0	7.0	7.0	10.0	9.0	9.0	12.0	15.0
Rz	15.0	12.0	11.0	11.0	11.0	11.0	11.0	7.0	5.0	3.0	3.0

Table S8 Lumbar spine inter-vertebral motion percentage calculations (%)

	T12-L1	L1-L2	L2-L3	L3-L4	L4-L5	L5-S1
Rx	9.1	13.0	15.8	18.2	21.6	22.3
Ry	11.6	16.5	19.9	24.6	16.3	11.0
Rz	11.6	16.6	19.5	22.0	18.9	11.4

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