

Supplementary file

Pubmed

The following formula was used in the classic search bar:

(gait[tiab] OR walk[tiab] OR walking[tiab] OR locomotor[tiab] OR locomotion[tiab]) AND (“ankylosing spondylitis” [tiab] OR spondyloarthritis[tiab])

Cochrane Library

Advanced search → formula: (“gait” OR “walk” OR “walking” OR “locomotor” OR “locomotion”) AND (“ankylosing spondylitis” OR “spondyloarthritis”) - default search field: *Title, Abstract, Keywords*.

PEDro

Search 1: ankylosing spondylitis gait

Search 2: ankylosing spondylitis walk

Search 3: ankylosing spondylitis walking

Search 4: ankylosing spondylitis locomotor

Search 5: ankylosing spondylitis locomotion

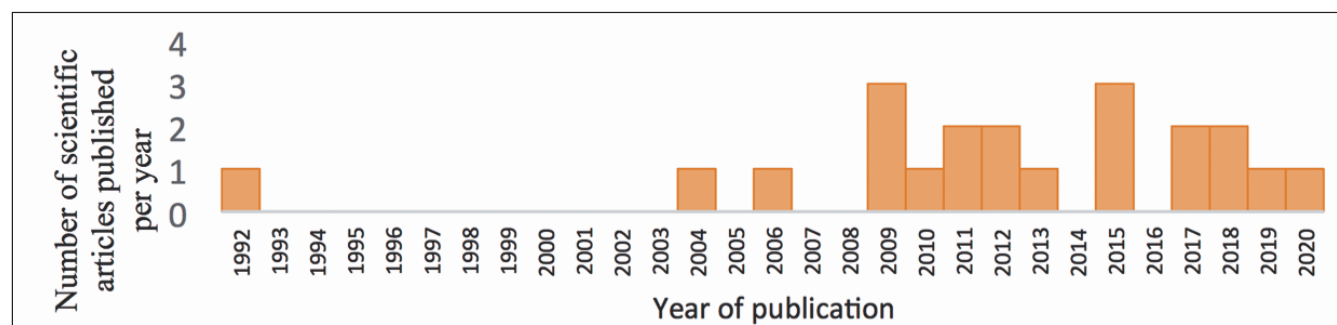
Search 6: spondyloarthritis gait

Search 7: spondyloarthritis walk

Search 8: spondyloarthritis walking

Search 9: spondyloarthritis locomotor

Search 10: spondyloarthritis locomotion



Supplementary Fig. S1. Number of scientific articles published per year on gait and ankylosing spondylitis.

Supplementary Table S1. List and values of gait parameters used in studies with laboratory measurements to compare AS and HC groups including continuous estimate of relative phase, joint moments and peak vertical ground reaction force (n=3).

Gait parameters	Number of studies	Study	Sign.	Results (mean ±SD) or direction of difference (↑↓) with phase of gait cycle (% of stance or name)
Continuous estimate of relative phase (CRP) in degrees (circular standard deviation)				
CRP in ° (whole gait cycle)	1	Mangone <i>et al.</i> (14)	<i>p</i> =0.002	↓
CRP in ° (loading response)	1	Mangone <i>et al.</i> (14)	<i>p</i> <0.001	↓
CRP in ° (mid-stance)	1	Mangone <i>et al.</i> (14)	NS	
CRP in ° (terminal stance)	1	Mangone <i>et al.</i> (14)	<i>p</i> <0.002	↑
CRP in ° (pre-swing)	1	Mangone <i>et al.</i> (14)	<i>p</i> <0.001	↓
CRP in ° (swing)	1	Mangone <i>et al.</i> (14)	NS	
Joint moments in % of body weight X height (Del Din) or in N m/kg (Zhang)				
Trunk extension/flexion	1	Del Din <i>et al.</i> (16)	0-50%: NS 50-100%: <i>p</i> <0.05	AS = 9.4 ±4.7, HC = 8.9±3.5 50-100%: ↑ in fl
Trunk abduction/adduction	1	Del Din <i>et al.</i> (16)	0-50, 83-100: <i>p</i> <0.05 50-83%: NS	AS = 2.0±0.7, HC = 2.1±0.4 0-50, 83-100: ↓ in abd
Trunk external/internal	1	Del Din <i>et al.</i> (16)	NS	AS = 1.7±1.0, HC = 1.8±2.8
Hip extension/flexion	2	Del Din <i>et al.</i> (16) Zhang <i>et al.</i> (17)	0-3%: <i>p</i> =0.044 3-100% : NS NS: <i>p</i> =0.304 <i>p</i> =0.002 <i>p</i> <0.001	6.0±3.6, HC = 7.7±2.3 0-3%: ↓ in ext Init contact: AS = 0.1±0.2, HC = 0.1±0.2 Toe-off: AS = 0.2±0.2 (↓ in fl), HC = 0.3 ±0.1 gc: AS = 0.1±0.3(↓ in fl), HC = 0.1±0.4
Hip abduction/adduction	2	Del Din <i>et al.</i> (16) Zhang <i>et al.</i> (17)	0-16%: NS 16-100%: <i>p</i> <0.05 NS: <i>p</i> =0.506 NS: <i>p</i> =0.558 <i>p</i> <0.001	AS = 5.0±0.6, HC = 5.4±2.0 16-100%: ↓ in ab Init contact: AS = 0.1±0.1, HC = 0.0±0.1 Toe-off: AS = -0.0±0.1, HC = -0.03±0.1 gc: AS =0.2±0.2 (↓ in abd), HC = 0.3±0.3

Gait parameters	Number of studies	Study	Sign.	Results (mean $\pm$ SD) or direction of difference ($\uparrow$ / $\downarrow$) with phase of gait cycle (% of stance or name)
Hip external/internal	2	Del Din <i>et al.</i> (16)	0-100%: $p<0.05$	AS = 0.9 ± 0.3, HC = 1.6 ± 2.2 0-100%: $\downarrow$ in ext rot
		Zhang <i>et al.</i> (17)	NS: $p=0.231$ NS: $p=0.214$ $p<0.001$	Init contact: AS = -0.0 ± 0.1 , HC = -0.0 ± 0.1 Toe-off: AS = -0.01 ± 0.04 , HC = -0.0 ± 0.0 gc: AS = 0.0 ± 0.0 (in ext rot), HC = 0.0 ± 0.0
Maximal hip fl moment	1	Zhang <i>et al.</i> (17)	$p<0.001$	AS = 0.7 ± 0.2 (in fl), HC = 1.0 ± 0.2
Maximal hip ext moment	1	Zhang <i>et al.</i> (17)	NS: $p=0.340$	AS = 0.8 ± 0.3 , HC = 0.9 ± 0.2
Maximal hip abd moment	1	Zhang <i>et al.</i> (17)	NS: $p=0.728$	AS = 0.4 ± 0.2 , HC = 0.4 ± 0.3
Maximal hip add moment	1	Zhang <i>et al.</i> (17)	NS: $p=0.127$	AS = 0.4 ± 0.3 , HC = 0.5 ± 0.3
Maximal hip ext rotation moment	1	Zhang <i>et al.</i> (17)	$p<0.001$	AS = 0.2 ± 0.08 ($\downarrow$ in ext rot), HC = 0.2 ± 0.1
Maximal hip int rotation moment	1	Zhang <i>et al.</i> (17)	NS: $p=0.165$	AS = 0.1 ± 0.1 , HC = 0.1 ± 0.1
Knee extension/flexion	2	Del Din <i>et al.</i> (16)	0-83%: $p<0.01$ 83-100%:NS	AS = 4.2 ± 1.6, HC = 3.7 ± 1.7 0-83%: $\downarrow$ in ext
		Zhang <i>et al.</i> (17)	NS: $p=0.084$ NS: $p=0.769$ $p<0.001$	Init contact: AS = -0.0 ± 0.1 , HC = 0.0 ± 0.1 Toe-off: AS = 0.1 ± 0.1 , HC = 0.1 ± 0.09 gc: AS = 0.2 ± 0.2 (in fl), HC = 0.1 ± 0.16
Maximal knee fl moment	1	Zhang <i>et al.</i> (17)	$p=0.010$	AS = 0.7 ± 0.3 ($\uparrow$ in fl), HC = 0.6 ± 0.2
Maximal knee ext moment	1	Zhang <i>et al.</i> (17)	$p<0.001$	AS = 0.3 ± 0.1 ($\downarrow$ in ext), HC = 0.4 ± 0.1
Knee valgus/varus	1	Del Din <i>et al.</i> (16)	NS	AS = 2.5 ± 0.8 , HC = 2.3 ± 0.8
Knee external/internal	1	Del Din <i>et al.</i> (16)	0-16%: $p<0.01$ 16-100%:NS	AS = 0.6 ± 0.3, HC = 0.8 ± 0.8 0-16%: $\downarrow$ in extension
Ankle plantarflexion/dorsiflexion	2	Del Din <i>et al.</i> (16)	0-50%: $p<0.05$ 50-83%:NS	AS = 8.7 ± 0.6, HC = 7.0 ± 2.1 0-50%: $\downarrow$ in plantarflexion
		Zhang <i>et al.</i> (17)	83-100%: $p<0.05$ NS: $p=0.406$ NS: $p=0.621$ $p<0.001$	83-100%: $\uparrow$ in dorsiflexion Init contact: AS = 0.0 ± 0.0 , HC = 0.01 ± 0.01 Toe-off: AS = -0.0 ± 0.1 , HC = -0.01 ± 0.1 gc: AS = -0.3 ± 0.3 ($\uparrow$ in plant fl), HC = -0.2 ± 0.3
Maximal ankle dorsi moment	1	Zhang <i>et al.</i> (17)	$p<0.002$	AS = 0.1 ± 0.1 (in dorsi fl) , HC = 0.3 ± 0.4
Maximal ankle plant moment	1	Zhang <i>et al.</i> (17)	NS: $p=0.296$	AS = 1.1 ± 0.3 , HC = 1.0 ± 0.4
Ankle eversion/inversion	1	Del Din <i>et al.</i> (16)	NS	AS = 1.6 ± 0.4 , HC = 1.4 ± 0.4
Ankle external/internal	1	Del Din <i>et al.</i> (16)	0-16%:NS 16-100%: $p<0.001$	AS = 1.6 ± 0.6, HC = 2.8 ± 1.5 16-100%: $\downarrow$ in external
Peak vertical ground reaction force in N/kg during gc				
Left	1	Zhang <i>et al.</i> (17)	NS: $p=0.155$	AS = 10.8 ± 1.2 , HC = 11.2 ± 0.5
Right	1	Zhang <i>et al.</i> (17)	NS: $p=0.446$	AS = 11.1 ± 1.3 , HC = 11.3 ± 0.7
Average	1	Zhang <i>et al.</i> (17)	NS: $p=0.255$	AS = 11.0 ± 1.2 , HC = 11.2 ± 0.6

Values are round to the nearest tenth. For Zhang study (17), flexion, abduction and external rotation of hip and knee, dorsiflexion of ankle and right obliquity of shoulder-pelvic are positive.

Sign: significance between patients with AS and healthy controls; NS: not significant, AS: ankylosing spondylitis, HC: healthy controls; NA: not applicable; LR: loading response; PS: pre swing; gc: whole gait cycle; init: initial; max: maximal; min: minimal; fl: flexion; ext: extension; abd: abduction; add: adduction; int: internal; ext: external; plant: plantar flexion; dorsi: dorsiflexion.

Supplementary Table S2. List and values of surface electromyography parameters used in studies with laboratory measurements to compare gait in AS and HC groups (n=1).

Muscle	Number of studies	Study	Sign.	Results (mean $\pm$ SD) or direction of difference ($\uparrow$ / $\downarrow$)
Standardised IEMG for single leg stance phase				
Gluteus maximus	1	Zhang <i>et al.</i> (17)	NS: $p=0.191$	AS = 0.23 ± 0.14 , HC = 0.19 ± 0.06
Gluteus medius	1	Zhang <i>et al.</i> (17)	NS: $p=0.911$	AS = 0.25 ± 0.16 , HC = 0.25 ± 0.94
Rectus femoris	1	Zhang <i>et al.</i> (17)	NS: $p=0.251$	AS = 0.28 ± 0.16 , HC = 0.23 ± 0.08
Biceps femoris	1	Zhang <i>et al.</i> (17)	NS: $p=0.061$	AS = 0.19 ± 0.08 , HC = 0.14 ± 0.06
Tibialis anterior	1	Zhang <i>et al.</i> (17)	$p=0.013$	AS = 0.19 ± 0.10 ($\uparrow$), HC = 0.11 ± 0.06
Gastrocnemius	1	Zhang <i>et al.</i> (17)	NS: $p=0.657$	AS = 0.32 ± 0.18 , HC = 0.35 ± 0.18
Standardised IEMG for swing phase				
Gluteus maximus	1	Zhang <i>et al.</i> (17)	NS: $p=0.296$	AS = 0.23 ± 0.13 , HC = 0.20 ± 0.06
Gluteus medius	1	Zhang <i>et al.</i> (17)	$p=0.019$	AS = 0.23 ± 0.15 ($\uparrow$), HC = 0.14 ± 0.06
Rectus femoris	1	Zhang <i>et al.</i> (17)	NS: $p=0.476$	AS = 0.22 ± 0.16 , HC = 0.19 ± 0.06
Biceps femoris	1	Zhang <i>et al.</i> (17)	NS: $p=0.837$	AS = 0.30 ± 0.14 , HC = 0.31 ± 0.14
Tibialis anterior	1	Zhang <i>et al.</i> (17)	NS: $p=0.632$	AS = 0.29 ± 0.09 , HC = 0.27 ± 0.10
Gastrocnemius	1	Zhang <i>et al.</i> (17)	NS: $p=0.057$	AS = 0.16 ± 0.13 , HC = 0.10 ± 0.05
Standardised RMS for single-leg-stance phase				
Gluteus maximus	1	Zhang <i>et al.</i> (17)	NS: $p=0.374$	AS = 0.38 ± 0.08 , HC = 0.35 ± 0.08
Gluteus medius	1	Zhang <i>et al.</i> (17)	NS: $p=0.401$	AS = 0.35 ± 0.08 , HC = 0.37 ± 0.08
Rectus femoris	1	Zhang <i>et al.</i> (17)	$p=0.019$	AS = 0.34 ± 0.08 ($\uparrow$), HC = 0.29 ± 0.04
Biceps femoris	1	Zhang <i>et al.</i> (17)	NS: $p=0.379$	AS = 0.37 ± 0.09 , HC = 0.34 ± 0.07
Tibialis anterior	1	Zhang <i>et al.</i> (17)	NS: $p=0.449$	AS = 0.35 ± 0.07 , HC = 0.37 ± 0.06
Gastrocnemius	1	Zhang <i>et al.</i> (17)	NS: $p=0.087$	AS = 0.40 ± 0.07 , HC = 0.35 ± 0.27
Standardised RMS for swing phase				
Gluteus maximus	1	Zhang <i>et al.</i> (17)	$p=0.025$	AS = 0.39 ± 0.07 ($\uparrow$), HC = 0.33 ± 0.06
Gluteus medius	1	Zhang <i>et al.</i> (17)	NS: $p=0.905$	AS = 0.36 ± 0.09 , HC = 0.36 ± 0.09
Rectus femoris	1	Zhang <i>et al.</i> (17)	$p<0.001$	AS = 0.38 ± 0.07 ($\uparrow$), HC = 0.29 ± 0.06
Biceps femoris	1	Zhang <i>et al.</i> (17)	NS: $p=0.218$	AS = 0.35 ± 0.06 , HC = 0.33 ± 0.05
Tibialis anterior	1	Zhang <i>et al.</i> (17)	NS: $p=0.083$	AS = 0.40 ± 0.79 , HC = 0.45 ± 0.07
Gastrocnemius	1	Zhang <i>et al.</i> (17)	NS: $p=0.784$	AS = 0.38 ± 0.10 , HC = 0.37 ± 0.08

Sign: significance between patients with AS and healthy controls; NS: not significant, AS: ankylosing spondylitis, HC: healthy controls; IEMG: integrated electromyography; RMS: root mean square amplitude.