The Spinal Alignment and Range of Motion Measure (SAROMM)

Scoring on Page 1 updated 2018

Doreen Bartlett

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Administration Guidelines for the *Spinal Alignment and Range of Motion Measure*

The Spinal Alignment and Range of Motion Measure (*SAROMM)* is intended to be administered to people with a diagnosis of cerebral palsy by trained rehabilitation therapists in a community setting. It can be completed in 15 minutes with cooperative clients; 30 minutes might be required for those with more severe physical and cognitive impairments. To administer the measure, one needs 1) a firm sitting surface such that the individual is able to sit with the hips and knees both at approximately 90 degrees of flexion and 2) a floor or raised mat or other surface for testing in the supine position. If an individual is unable to attain or maintain bench sitting independently, two people might be required to administer the measure.

General Guidelines

The *SAROMM* has the two following sections: 1) *spinal alignment* and 2) *range of motion and muscle extensibility.* In both of these sections, the protocol begins with observation of the person's alignment and posture. If "normal" or "optimal" spinal alignment is not observed (i.e. the first picture for each of the first four items), the person is given up to three opportunities to actively correct to assume these positions. If these positions are assumed, a score of "zero" is given for these items. If the person cannot attain normal alignment through active movement, passive correction is conducted and the severity of the limitation is scored according to specific criteria which are subsequently described. For the range of motion items, if a person demonstrates posturing, passive range of motion is conducted and severity of limitation is also rated according to criteria that follow.

Determination of "End Range" (if the person is unable to actively correct or demonstrates characteristic posturing)

When conducting the passive correction on people with cerebral palsy, therapists should move the limbs slowly and firmly so as to minimize the effect of spasticity. For the most part, therapists should expect a firm end feel as a result of a soft tissue stretch or a capsular stretch. As two examples, this firm or springy sensation is felt when passive ankle dorsiflexion is performed with the knee in extension (the movement is stopped by the tension in the gastrocnemius muscle) or when testing hip external rotation (the movement is stopped by the joint capsule of the hip.

Scoring and Graphing:

After completing the *SAROMM*, record the value for each of the items on the first page of the scoresheet. Determine the Spinal Alignment Score by summing items 1 through 4. Record the mean value for this section. Determine the hip score by summing items 5 through 16, the knee score by summing 17 through 20, the ankle score by summing 21 through 24, and the upper extremity score by summing 25 and 26. Determine and record the mean value for each of these scores. Determine the Range of Motion Score by summing the hip, knee, ankle and upper extremity scores. Determine the total *SAROMM* score by summing the Spinal Alignment and the Range of Motion Scores.

The mean values can be plotted on the graph on the last page of the form for a visual representation of the information. This can provide rapid information about variations across parts of the body or over time.

For the purposes of the On Track Study (i.e. the longitudinal trajectories and the percentiles) simply sum the scores of all 26 items and then divide by 26.

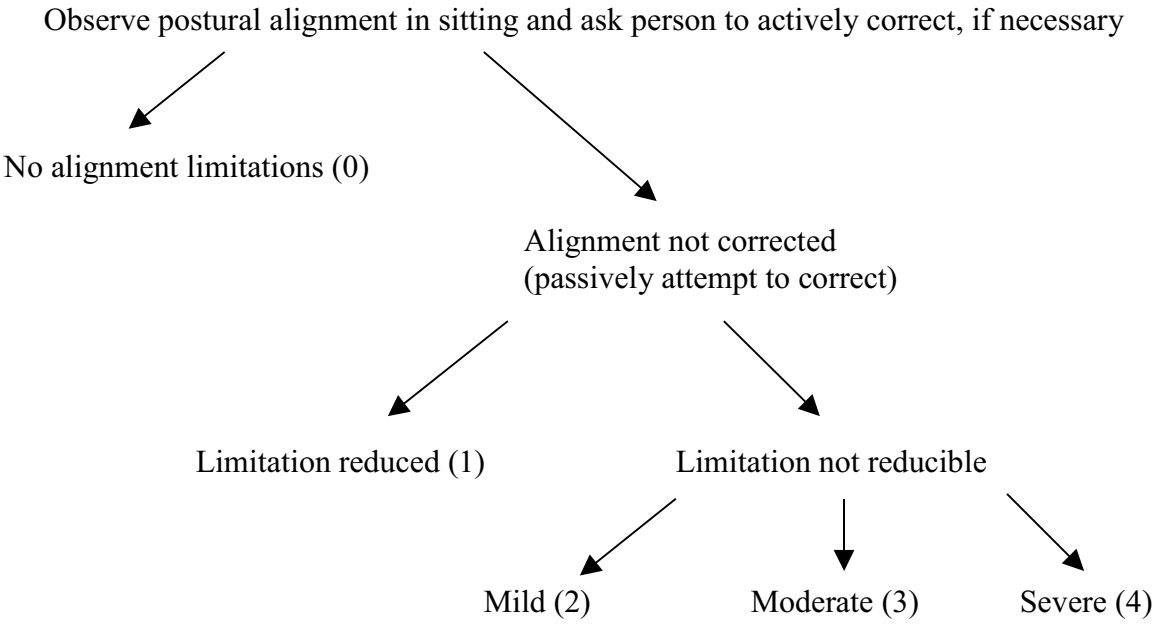
Spinal Alignment: Generic Scoring Protocol

0 "No alignment limitations with active correction"
1 "Flexible - passive" - limitation is muscular and dynamic; limitation is reducible through passive movement
2 "Fixed" - limitation is structural, static, not reducible and minimal
3 "Fixed" – limitation is structural, static, not reducible and moderate
4 "Fixed" – limitation is structural, static, not reducible and severe

Note: A score of "0" indicates that the person has no fixed alignment limitations and that he or she can actively correct, even though the optimal alignment might not be the typical posture assumed. A score of "1" is used to indicate that the individual has good alignment on passive correction only. This score is frequently given if the person does not assume optimal alignment after 3 requests to do so, as might occur when examining someone with cognitive limitations. These individuals are at greater risk of subsequently developing permanent alterations in spinal alignment and range of motion and a score of 1 reflects this level of risk.

Spinal Alignment : Generic Procedure

Notes: The client should be wearing shorts and either no top or a bathing suit top, halter top, or loose top to enable viewing of the spine. Items 1 to 4 are tested with the client sitting on a bench or chair with feet supported on the floor and with arms free, if able, or with support as necessary to prevent falling. Prior to the observation, ask the person to position themselves in their natural manner. Observe from side or back. **For cases in which you cannot decide between one of two scores, document the "highest" value. More severe limitations than that depicted in a specific figure should be scored at the higher value.**



Item 1: Cervical Spine in the Sagittal Plane (sitting)

Observe and ask to actively correct, as necessary

No alignment limitations = 0
(Figure 1)

lordosis is not reduced:
correct position by placing one hand on chin and the other on the occiput and passively reduce lordosis

reduced lordosis = 1
(passively corrected to position in Figure 1)

non-reducible lordosis

Mild = 2
(Figure 2)

Moderate = 3
(Figure 3)

Severe = 4

more severely limited than Figure 3.

Note: For those children and adolescents who typically position themselves in neck flexion, adapt the scoring. For example, if they are able to actively or passively correct to Figure 1, give a score of 0 or 1. Make a judgement to grade a fixed neck flexion deformity as "mild", "moderate" or "severe".

Item 2: Thoracic Spine in the Sagittal Plane (sitting)

Observe and ask to actively correct, as necessary

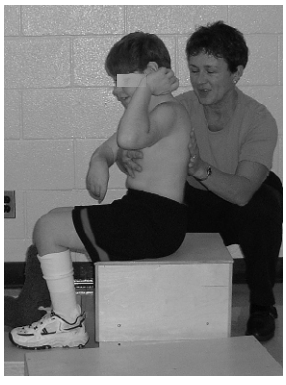
No alignment limitations = 0
(Figure 4)

kyphosis is not reduced: correct position with one hand on the chest and the other on the apex of the kyphosis and passively reduce

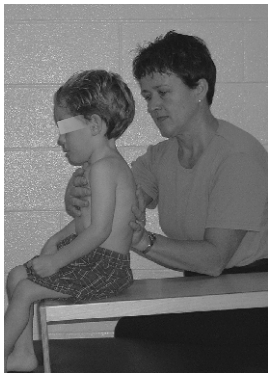
reduced kyphosis = 1 (passively correct to position in Figure 4)

non-reducible kyphosis

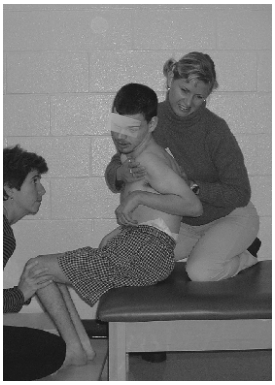
Mild = 2
(Figure 5)



Moderate = 3
(Figure 6)



Severe = 4
(Figure 7)



Item 3: Lumbar Spine in the Sagittal Plane (sitting)

Observe and ask to actively correct, as necessary

No alignment limitations = 0
(Figure 8)

lordosis/pelvic tilt not reduced: place hands on either side of the pelvis and correct alignment

reduced lordosis/pelvic tilt = 1 (passively corrected to position In Figure 8)

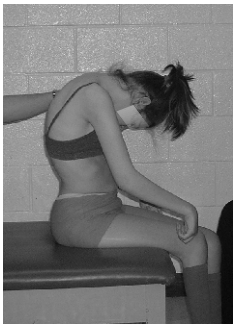
non-reducible

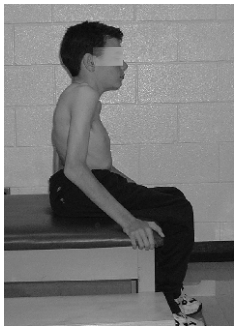
Mild = 2

Moderate = 3
(Figs. 9 and 10)

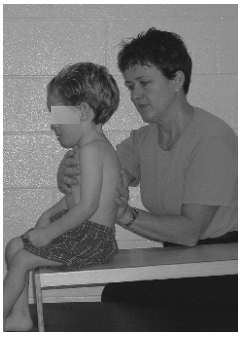
Severe = 4
(Figs. 11 and 12)

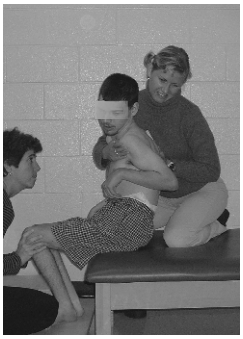
Less lordotic than Figure 9





Less posterior tilt than Figure 10





Note: these figures represent the pelvic position for scoring, but not the hand placement

Item 4: Spinal Alignment in the Frontal and Transverse Planes (sitting)

Note: lateral curvature of the spine is typically associated with some degree of rotation in the transverse plane, which is observed as a "rib hump" on forward bending. Although the "gold standard" for measurement of scoliosis is the Cobb method taken from an x-ray, this item is estimated simply by physical examination and observation for uniformity of administration to all individuals with cerebral palsy (i.e. not everyone will have had a spinal x-ray).

Observe
(look for unequal shoulder levels, pelvic obliquity, and palpate spinous processes to determine alignment), ask to actively correct as necessary.

No alignment limitations= 0
(*Figure 13)*

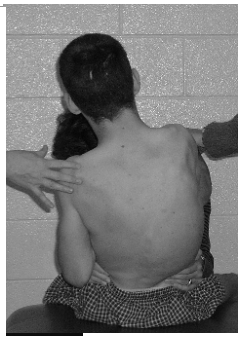
scoliosis not reduced; rib hump possibly observed: therapist attempts to passively correct in both frontal and transverse planes

Reduced scoliosis and
no rib hump observed = 1
(Passively corrected to position in Figure 13)
-this is a "functional scoliosis"

non-reducible scoliosis - rib hump present
- this is a "structural scoliosis"

Mild = 2
(Figure 14)

Moderate = 3
(Figure 15)



Severe = 4
(Figure 16)

Range of Motion and Muscle Extensibility

List of Abbreviations:

abd	abduction	flex	flexion
add	adduction	IR	internal rotation
dflex	dorsiflexion	plflex	plantarflexion
ER	external rotation	PROM	passive range of motion
ext	extension		

Generic Scoring Protocol

0 "Normal" – no restriction of ROM on passive testing and no postures typical of some children with cerebral palsy observed *(note: both criteria are required, so passive testing is important to conduct for all items)*

1 "Flexible - passive" - postural limitation is muscular and dynamic; limitation is reducible through passive movement

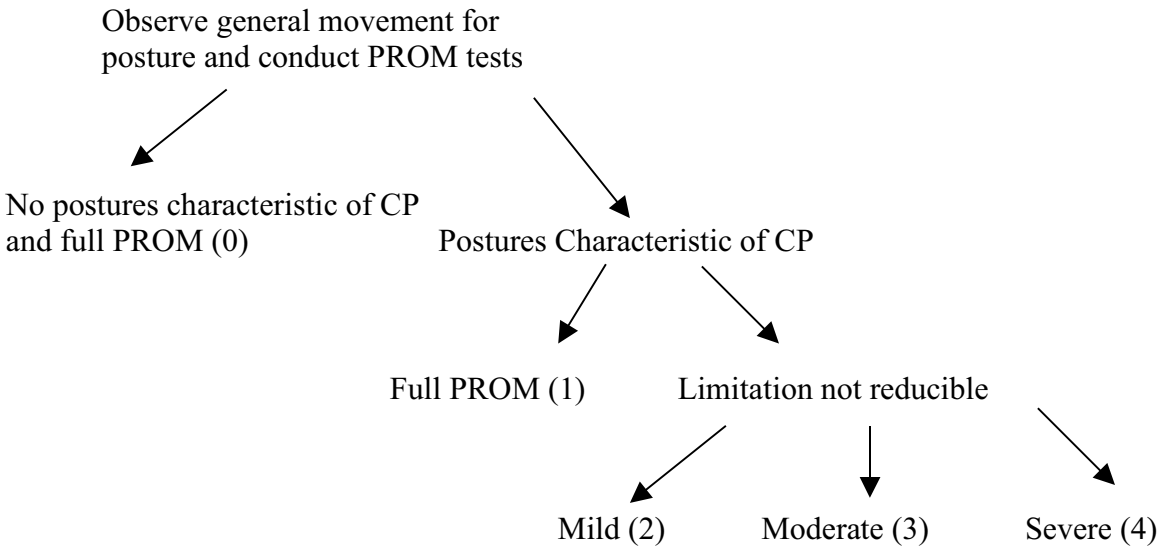
2 "Fixed" - limitation is structural, static, and irreducible and is minimal

3 "Fixed" – limitation is structural, static, and irreducible and is moderate

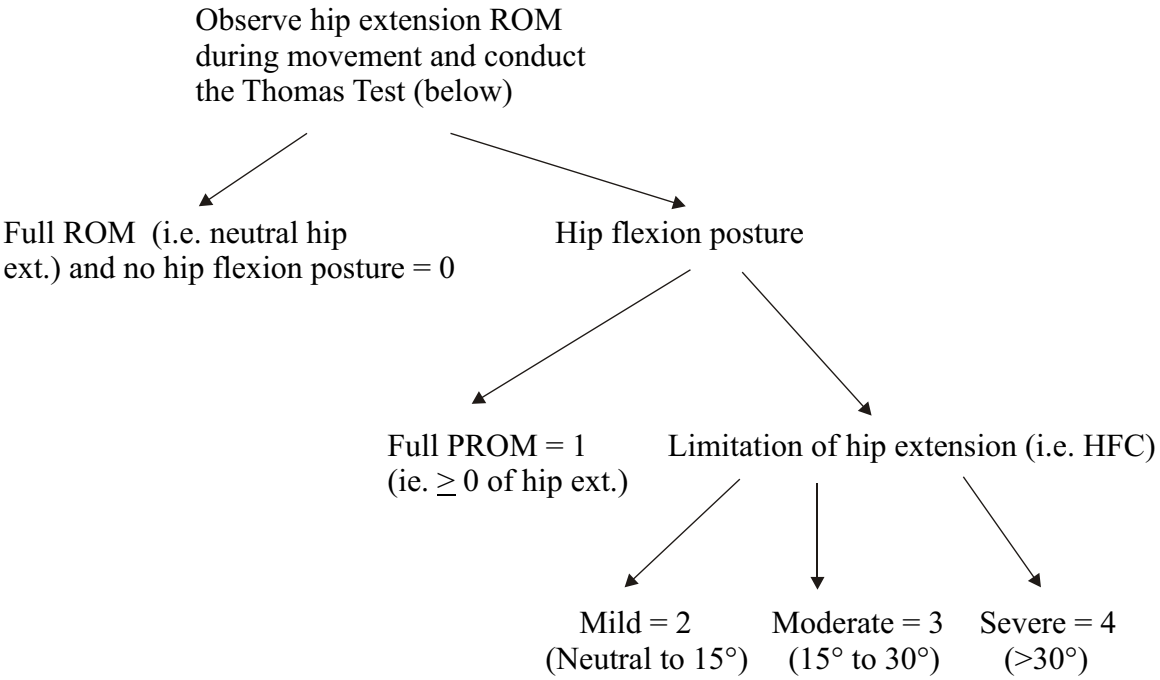
4 "Fixed" – limitation is structural, static, and irreducible and is severe

Generic Procedure

Start by observing the person's general movement for postures characteristic of some people with a diagnosis of cerebral palsy (CP). Therapists will be familiar with postures such as hip flexion, adduction and internal rotation, knee flexion, and ankle plantarflexion. Next, test passive range of motion (PROM). If the person does not demonstrate postures assumed by some people with CP, and the PROM is full, score a "0". If the person demonstrates these postures, and has full PROM, score a "1". If the person does not have full PROM, score a "2", "3", or "4" if limitation is mild, moderate, or severe, respectively, as specified by individual criteria. **For cases in which you cannot decide between one of two scores, document the "highest" number.** For example, if you cannot decide if a person should get a "2" or a "3", record "3".



Items 5 and 6: Hip Extension (supine) note: HFC = hip flexion contracture



Thomas Test

With the child or adolescent in supine lying on a mat, flex one leg toward the child's chest until the lumbar spine is flat and secure the contralateral leg into available extension range of motion *(Figure 17).* Repeat with other leg.

Note: Although the Prone Hip Extension Test has been demonstrated to be more accurate than the Thomas Test at measuring the extent of hip flexion contracture (Staheli, 1977), it is more difficult to conduct with larger and more severely involved people with CP, and requires specialized equipment not readily available in community settings.

Items 7 and 8: Hip Flexion (supine)

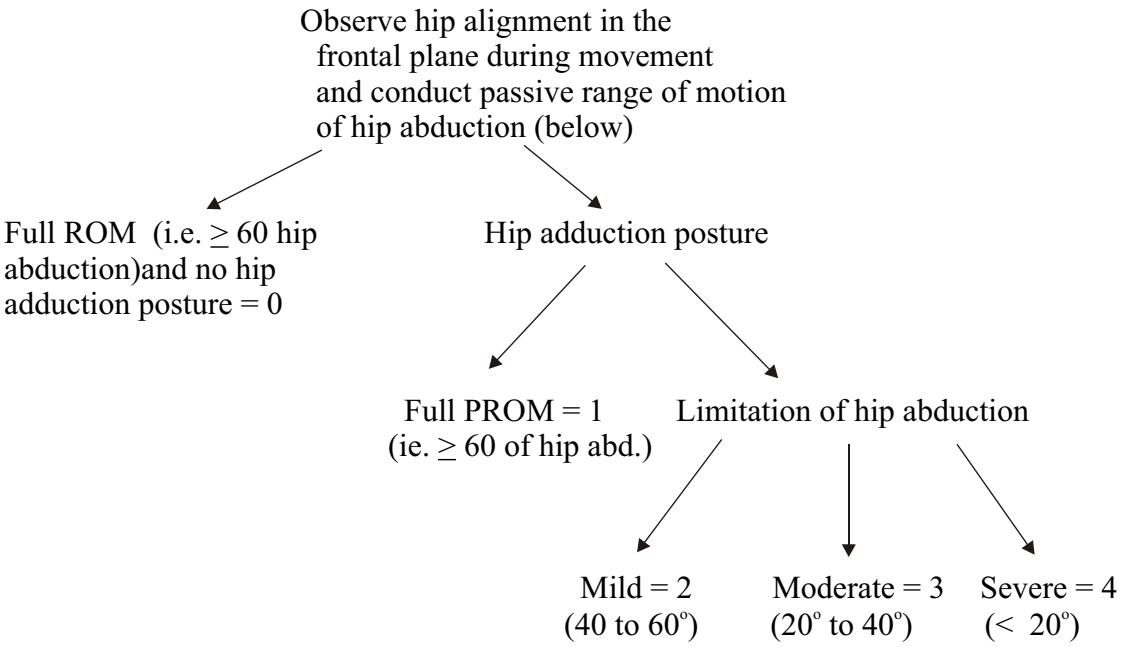
Observe hip flexion ROM during movement and conduct the Thomas Test (below)

- Full ROM (i.e. Hip flexion > 135°) and no hip extension posture = 0
- Hip extension posture
  - Full PROM = 1 (ie. ≥ 135° of hip flex.)
  - Limitation of hip flexion
    - Mild = 2 (110 to 135°)
    - Moderate = 3 (90° to 110°)
    - Severe = 4 (< 90°)

Thomas Test

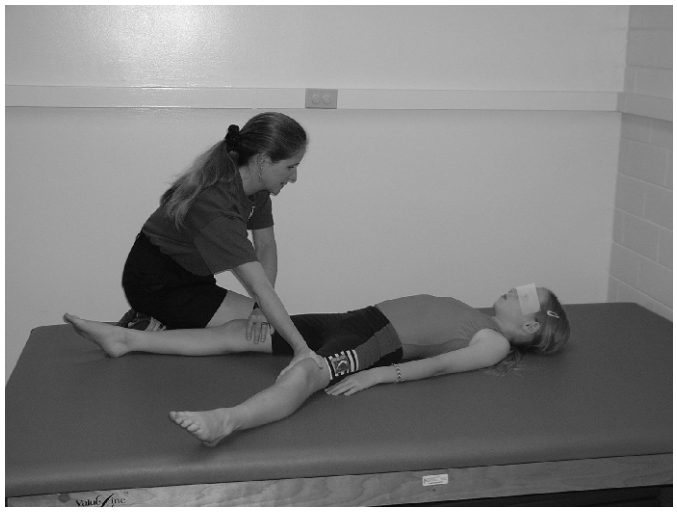
With the child or adolescent in supine lying on a mat, secure one leg into available extension range of motion and flex the contralateral leg into available flexion range of motion *(Figure 18)*. Repeat with other leg.

Items 9 and 10: Hip Abduction (supine: note values refer to unilateral measures**)**

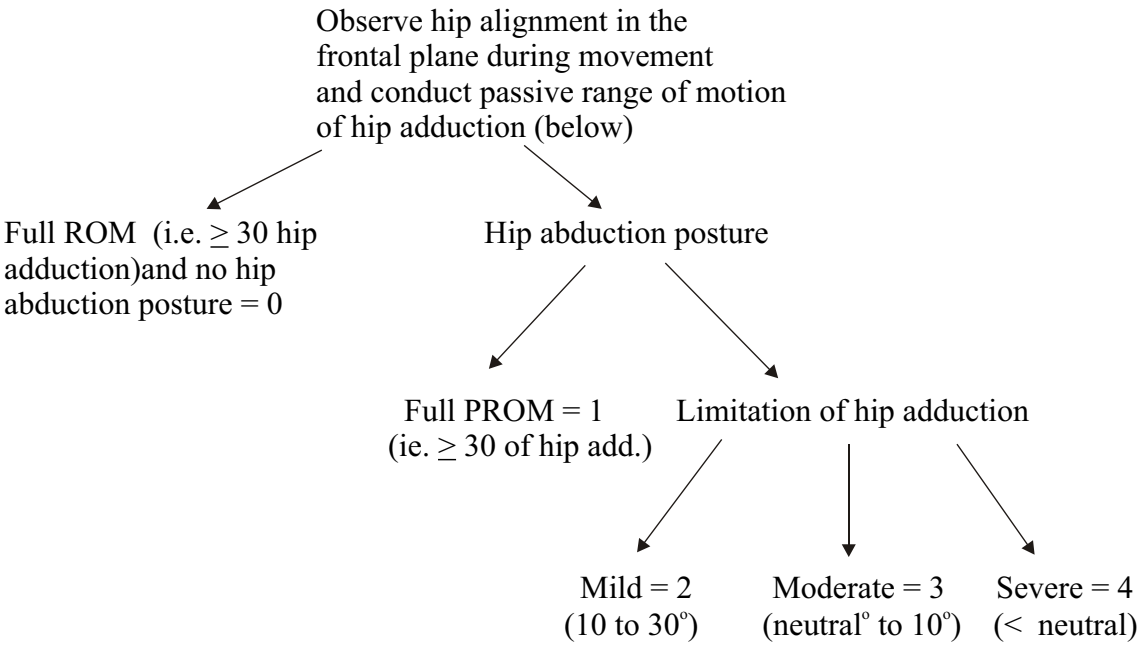


Hip abduction testing

With the child in supine lying on a mat, extend both hips to available range, secure one leg in neutral alignment, and then abduct the other leg to available range. Estimate the degree of abduction in each hip (*Figure 19)*.



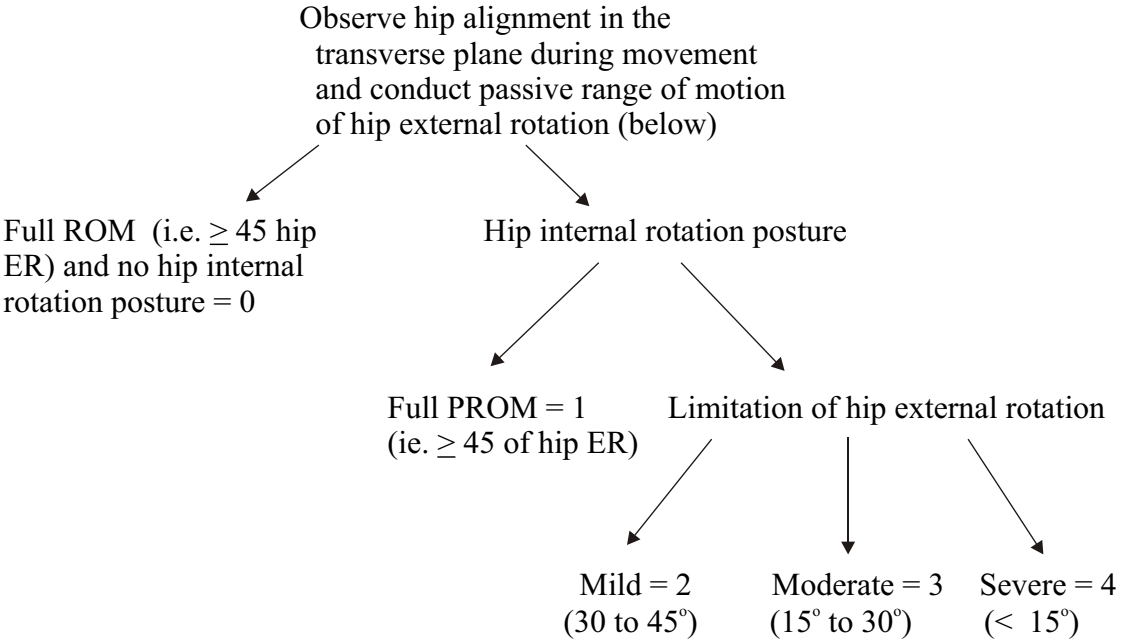
Items 11 and 12: Hip Adduction (supine: note values refer to unilateral measures**)**



Hip adduction testing

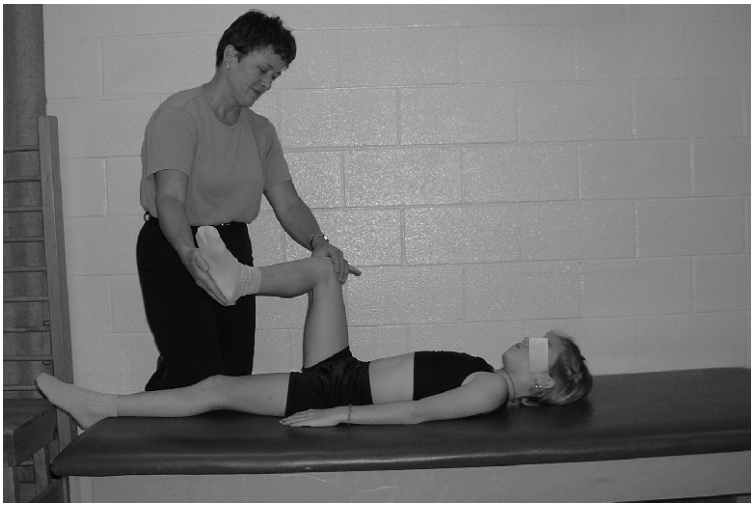
With the child in supine lying on a mat, extend both hips to available range, secure one leg in neutral alignment, and then adduct the other leg to available range. Estimate the degree of adduction in each hip (*Figure 19)*.

Items 13 and 14: Hip External Rotation (supine)

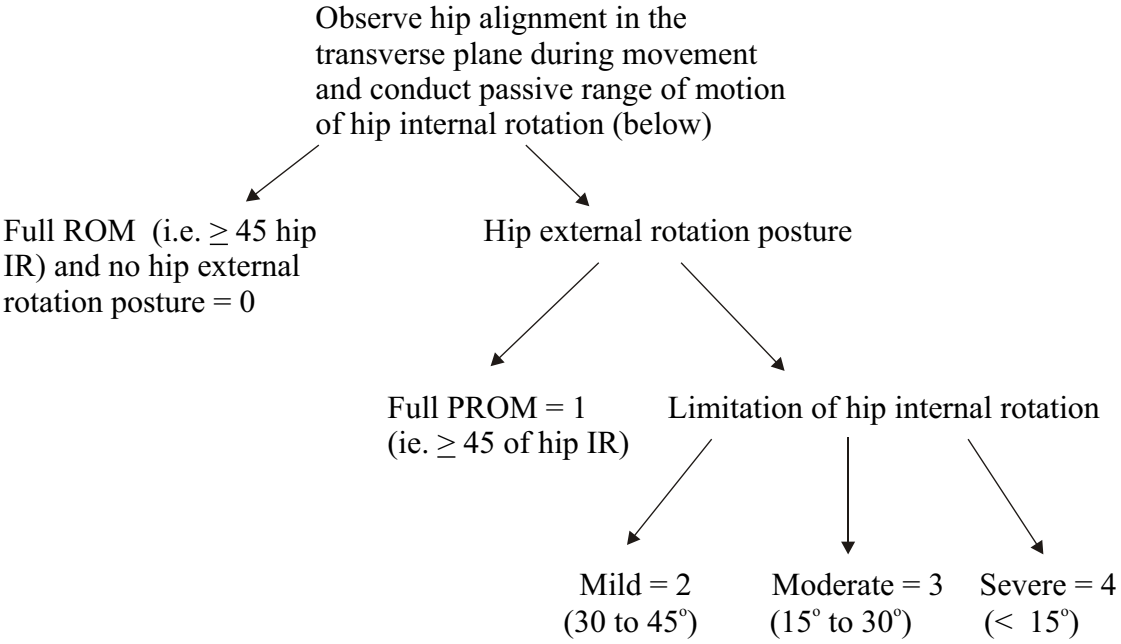


Hip external rotation testing

With the child in supine lying on a mat or sitting supported in a chair, flex one leg such that the hip and knee are at 90°. Externally rotate hip. Estimate the degree of external rotation *(Figure 21)*. Repeat with other leg.



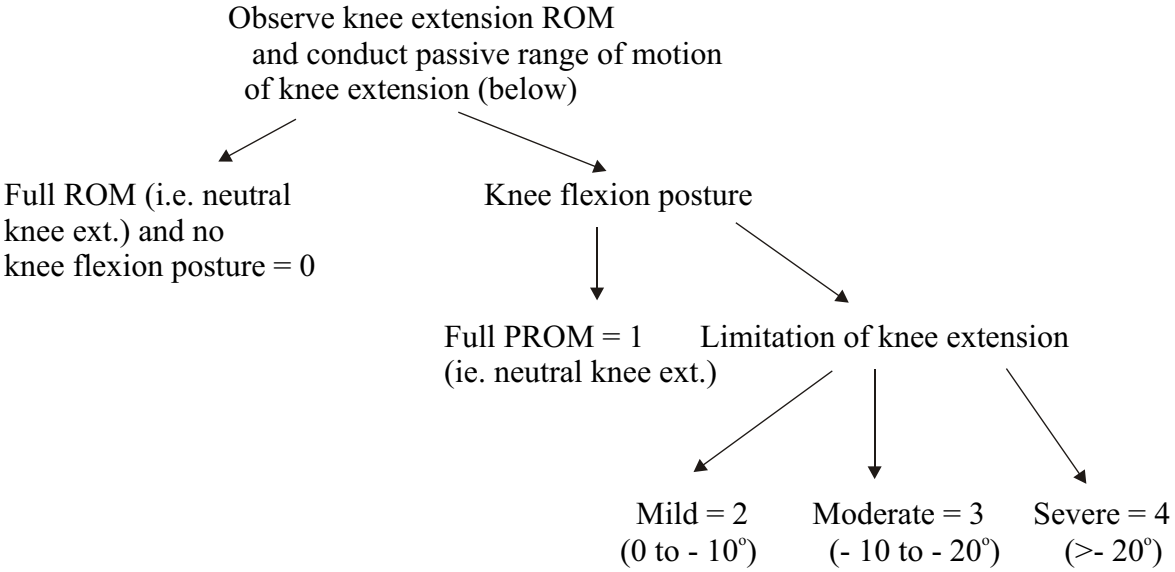
Items 15 and 16: Hip Internal Rotation (supine)



Hip internal rotation testing

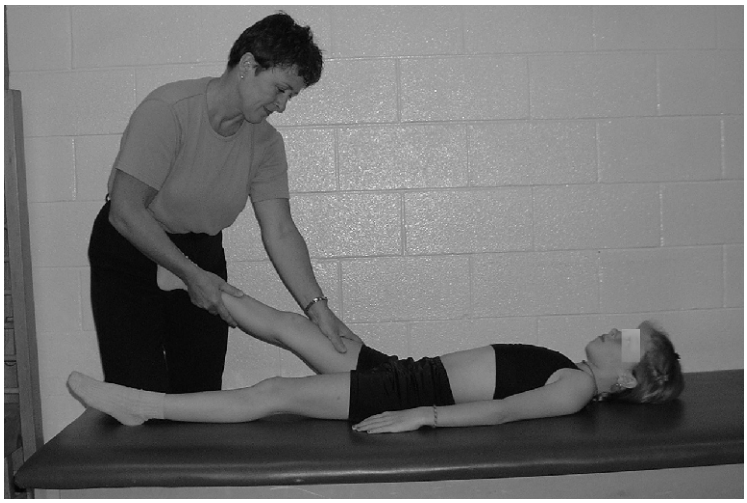
With the child in supine lying on a mat or sitting supported in a chair, flex one leg such that the hip and knee are at 90°. Internally rotate hip. Estimate the degree of internal rotation *(Figure 22)*. Repeat with other leg.

Items 17 and 18: Knee Extension (supine)

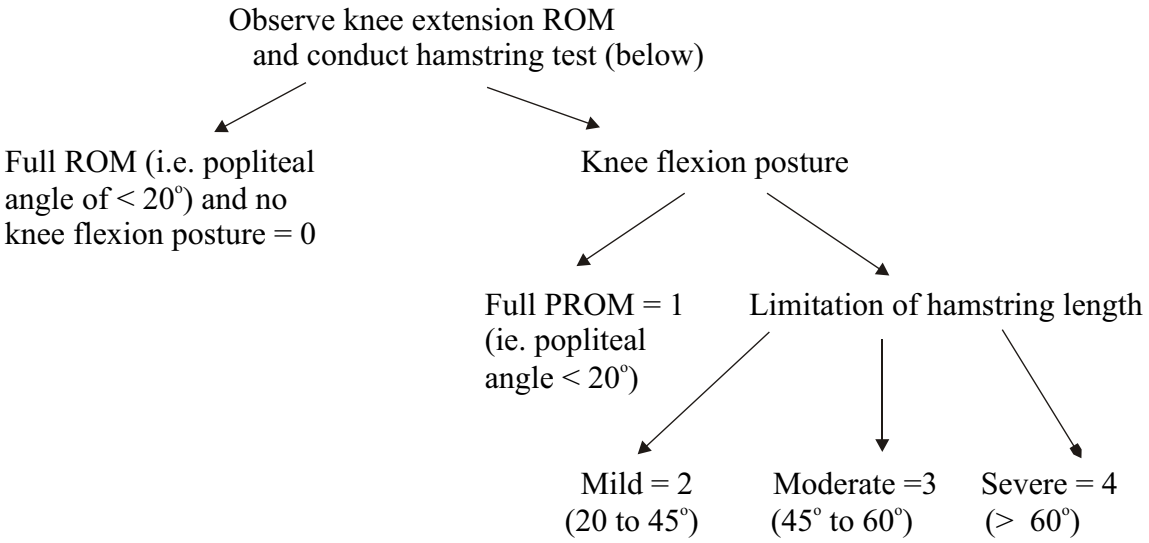


Knee extension testing

With child in supine lying on a mat (hips in very slight flexion), place one hand on the knee and the other behind the calf. Extend the knee fully. Estimate the degree of knee flexion contracture, if range is not to neutral extension (*Figure 23)*. Repeat with other leg.

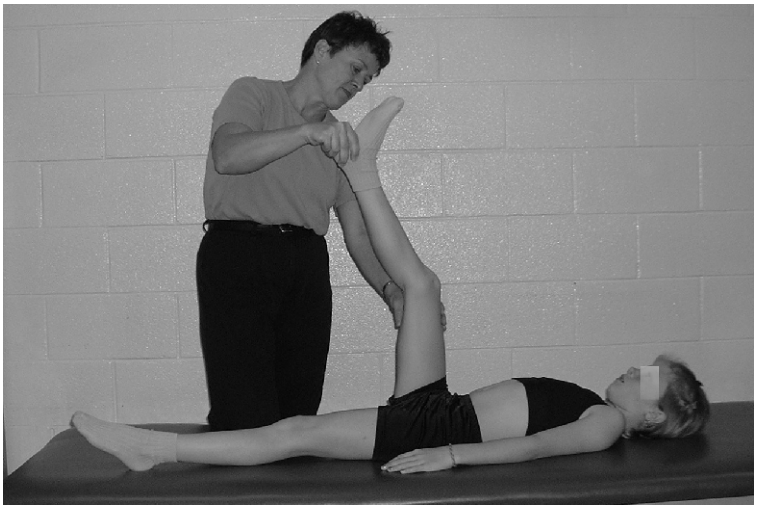


Items 19 and 20: Hamstring Extensibility (supine)



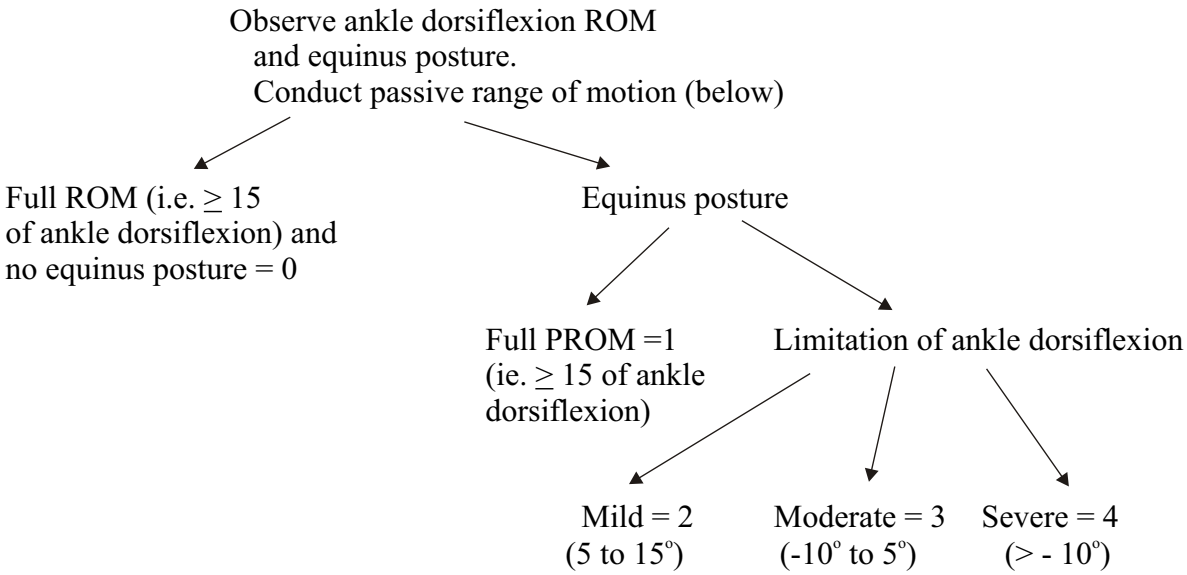
Test of Hamstring Extensibility

With the child in supine lying on a mat, flex one leg to 90° at the hip and knee, in the sagittal plane while securing the contralateral leg in extension to help stablize the pelvis. Place one hand at the anterior aspect of the knee, and other at the distal calf, posteriorly. Extend the knee to the end of available range. Estimate the angle between the vertical extension of the femur and the tibia (i.e. the number of degrees required to achieve full knee extension with the hip flexed to 90 degrees) *(Figure 24)*. This is the "popliteal angle". Repeat with other leg.



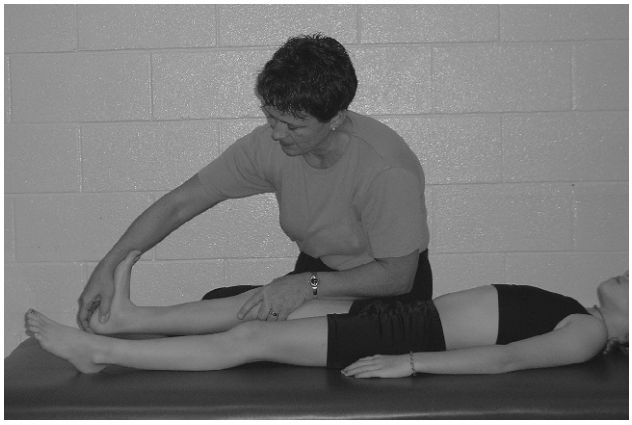
Note: this figure does not illustrate securing the contralateral leg into extension, which will be required for individuals with spasticity.

Items 21 and 22: Ankle Dorsiflexion (supine)

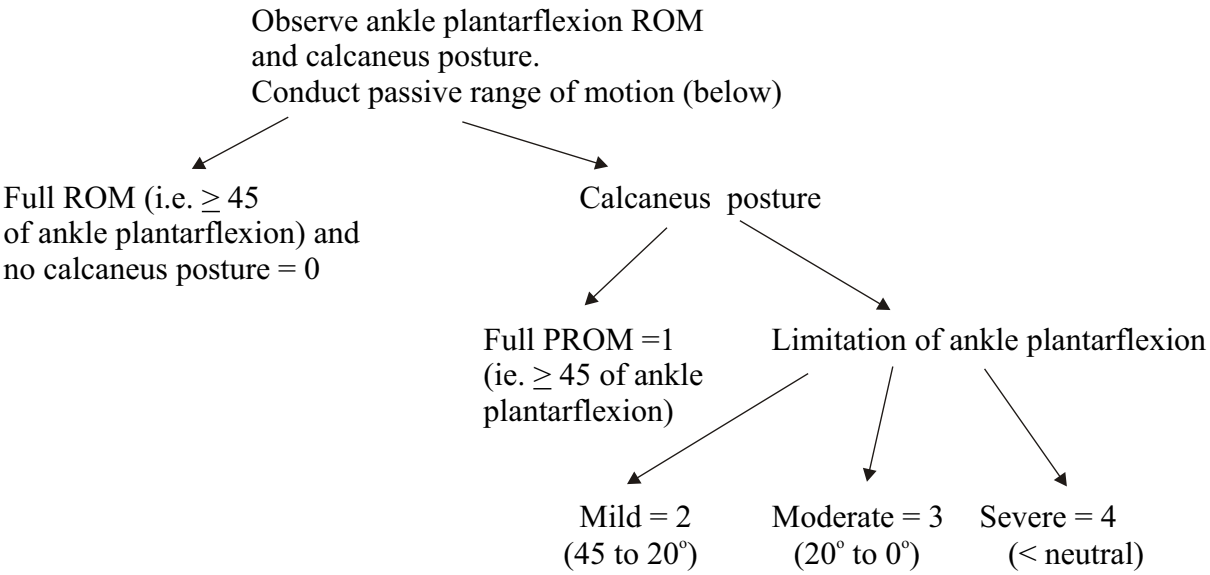


Ankle dorsiflexion testing

With the child in either supine or sitting, and the hip and knee in flexion, grasp one foot at the calcaneus with the subtalar joint in neutral. Fully dorsiflex the ankle, hold and gradually extend the knee to ascertain the extensibility of the gastrocnemius muscle. Estimate the degree of ankle dorsiflexion (*Figures 25 and 26)*. Repeat with other leg.



Items 23 and 24: Ankle Plantarflexion (supine)



Ankle plantarflexion testing

With the child in either supine or sitting, and the hip and knee in flexion, grasp one foot at the calcaneus with the subtalar joint in neutral. Fully plantarflex the ankle and ensure that the motion occurs at the talocural joint. Estimate the degree of ankle plantarflexion (*Figure 27)*. Repeat with other leg.

Items 25 and 26: Upper Extremity Range of Motion Screen (sitting)

Observe upper extremity posture and conduct passive range of motion (below)

No posture characteristic of CP and full ROM = 0 . (Figure 28)

Posture characteristic of CP (e.g. shoulder flexion, adduction, and internal rotation, elbow flexion, forearm pronation, and wrist and finger flexion)

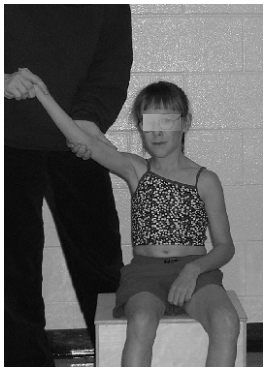
Full PROM = 1 (i.e. able to assume The "Y' of the "YMCA" position passively)

Limitation not reducible

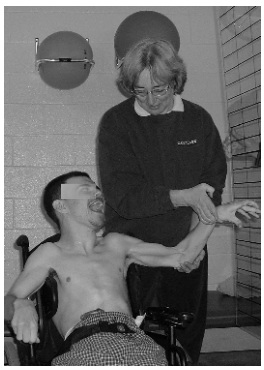
Mild = 2 *(Figure 29)*

Moderate = 3

Severe = 4 *(Figure 30)*



Between Figure 29 and Figure 30



Upper extremity range of motion screen *(see note next page)*
With the child in sitting, move the arm through shoulder forward flexion, abduction and external rotation, elbow extension, forearm supination, and wrist extension. Judge the amount of this range attainable. Repeat with other arm.

Note: the "characteristic posture" has some variations such as shoulder adduction, external rotation, elbow flexion, wrist extension and finger flexion. In cases of variation, please substitute the child's posture for the description above, and score accordingly.

Make a note of the asymmetries. Here are some examples of asymmetries of active movement: