

THE EXTREMITIES

Subjective and Objective

**Outcomes Assessment of the Upper and
Lower Extremity and Physical Exercise**

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Disclaimer: Please note that there are many methods of screening patients as well as many physical exercise options available that may not be included in these teaching materials. The methods chosen are peer-reviewed / evidence based and when available, multiple author citations are included with the associated information. Each patient will require individual monitoring and, exercise induced discomfort is common and must not be confused with “harm.” At the same time, exceeding tissue capacities can injure tissue and slow, methodical introduction of physical exercise and screening is necessary. Communicate with the health care provider if and when questions arise.

Joint Range of Motion

Source: Luttgens, K. & Hamilton, N. (1997). *Kinesiology: Scientific Basis of Human Motion, 9th Ed.*, Madison, WI: Brown & Benchmark.

Introduction

These notes include objective screening with range of motion (ROM) utilizing the goniometer screening procedures of the peripheral joints to objectively track progress of patients during active care/physical exercise management. This coupled with the subjective outcomes assessment tools located on pages 16 and 18 (upper and lower extremity, respectively), allows for patient progress to be tracked when utilizing physical exercise procedures. It is recommended that these objective outcome measures be utilized regardless of the clinical diagnosis or specific functional loss. Because the ROM screen usually occurs at a time separate from the initiation of active care/physical exercise, please refer to the Extremity Physical Exercise Manual when utilizing active care with patients in the clinical setting.

Joint flexibility is defined as the range of motion (ROM) that occurs at a joint. The measurement of a joint ROM can be accomplished with a 2-arm goniometer and/or an inclinometer. This manual will utilize the double-arm goniometer when measuring joint ROM and the degrees of movement will be reported from the starting position to the end point of movement. With both arms of the goniometer positioned together (overlapping each other), the goniometer is first positioned in the appropriate plane (frontal, sagittal, or transverse), parallel with the extremity being screened. As the patient ACTIVELY (under their own power) moves their extremity to the endpoint of their ROM, the movable arm of the goniometer moves with the moving extremity to its endpoint where the measurement in degrees is taken. The pivot (axis of goniometer) is placed over the joint. When anatomical landmarks are well defined, the accuracy of measurement is greater. If there is more soft tissue surrounding the joint area, measurement error can be more frequent.

Terminology (See class notes from weekend 1 for a more complete list of terminology):

- Active motion is the patient's movement of the joint through a specified ROM.
- Passive motion is the examiner's movement of the extremity/joint through a specified ROM.

Purposes

The purpose of this Workshop is to practice screening the ROMs of the major joints of the body using a double-armed goniometer. Students need to memorize the ROM terminology used to describe different joint motions allowed at the major joints of the body.

Summary

Improving joint flexibility is essential for injury prevention. One may increase joint flexibility (range of motion) by regular stretching. Table 1 summarizes the average ROMs published. Compare your measurements with these values.

Average ROMs (Adapted from Luttgens & Hamilton, 1997)

Joint/Segment	Movement	Source 1*	Source 2*	Source 3*	Source 4*
Elbow	Flexion <u>150°</u>	140	145	145	145
	Hyperextension	0	0	0	0- <u>10</u>
Forearm	Pronation	80	90	<u>90</u>	80
	Supination	80	85	<u>90</u>	90
Wrist	Extension (Dorsiflexion)	60	<u>70</u>	70	50
	Flexion (Palmar flexion)	60	90	<u>80°</u>	60
	Radial Deviation	20	<u>20</u>	20	20
	Ulnar Deviation	30	<u>30</u>	35	30
Shoulder	Flexion	<u>180</u>	170	130	180
	Extension	50	30	80	<u>60</u>
	Abduction	<u>180</u>	170	180	180
	Adduction	<u>50</u>	-	-	-
Shoulder w/ Abducted Arm	Internal Rotation	<u>90</u>	90	70	60-90
	External Rotation	<u>90</u>	90	70	90
	Horizontal Adduction NA	-	-	-	135
	Horizontal Adduction NA	-	-	-	45
Hip	Flexion <u>135°</u>	100	120	125	120
	Hyperextension	<u>30</u>	10	10	30
	Abduction <u>50°</u>	40	45	45	45
	Adduction <u>30°</u>	20	-	10	0-25
Extended Hip	Internal Rotation <u>43°</u>	40	35	45	40-45
	External Rotation <u>42°</u>	50	45	45	45
Knee	Flexion (Prone) <u>148°</u>	150	120	140	130
Ankle	Plantar flexion <u>50°</u>	20	45	45	50
	Dorsiflexion	30	15	<u>20</u>	20
Cervical Spine	Flexion <u>50°</u>	60	-	-	40
	Hyperextension <u>63°</u>	75	-	-	40
	Lateral Flexion <u>45°</u>	45	-	-	45
	Rotation <u>85°</u>	80	-	-	50
Lumbar-thoracic Spine	Flexion <u>65°</u>	45-50	-	-	45
	Hyperextension <u>30°</u>	25	-	-	20-35
	Lateral Flexion <u>25</u>		-	-	30
	Rotation NA	30	-	-	45

NOTE: Items in **BOLD** are used in the Exam forms included in these notes

References

Luttgens, K. & Hamilton, N. (1997). *Kinesiology: Scientific Basis of Human Motion, 9th Ed.*, Madison, WI: Brown & Benchmark.



NOTE: Please refer to the slide handouts or extremity screening manual for the goniometer techniques.

UPPER & LOWER EXTREMITY OUTCOMES & EXAM FORMS

Upper Extremity Functional Index

Name _____ Date _____ DOI _____ (Key: LEFT/RIGHT)

We are interested in knowing whether you are having any difficulty at all with the activities listed below because of your upper limb problem for which you are currently seeking attention. Please check (√) an answer for **each** activity.

Today, do you or would you have any difficulty at all with:

	0	1	2	3	4
Activities	Extreme Difficulty Or Unable to Perform Activity	Quite a Bit of Difficulty	Moderate Difficulty	A Little Bit of Difficulty	No Difficulty
1) Any of your usual work, household, or school activities					
2) Your usual hobbies, recreational or sporting activities					
3) Lifting a bag of groceries to waist level					
4) Lifting a bag of groceries above your Head					
5) Grooming your hair					
6) Pushing up on your hands (e.g., from bathtub or chair)					
7) Preparing food (e.g., peeling, cutting)					
8) Driving					
9) Vacuuming, sweeping, or raking					
10) Dressing					
11) Doing up buttons					
12) Using tools or appliances					
13) Opening doors					
14) Cleaning					
15) Tying or lacing shoes					
16) Sleeping					
17) Laundering clothes (e.g., washing, ironing, folding)					
18) Opening a jar					
19) Throwing a ball					
20) Carrying a small suitcase with your affected limb)					

Stratford PW, Binkley JM, Stratford DM. Development and initial validation of the upper extremity functional index. Physiotherapy Canada Fall 2001;259-266.

Score _____/80

MDC (minimum detectable change) = 9 pts

Error +/- 5 scale points

2) If Prior Treatment: Patient's Global Impression of Change (PGIC) (Bolton, et al):

Since beginning treatment at this clinic, how would you describe the change (if any) in ACTIVITY LIMITATIONS, SYMPTOMS, EMOTIONS, and OVERALL QUALITY OF LIFE, related to your painful condition? (Circle one number):

Much Better

No Change

Much Worse

0 1 2 3 4 5 6 7 8 9 10

Hurst H, Bolton J. Assessing the clinical significance of change scores recorded on subjective outcome measures. J Manipulative Physiol Ther 2004;27:26-35

3) Pain Level (QVAS): Right Now: _____ / 10; Usual / Typical: _____ / 10; At Best: _____ / 10; At Worst: _____ / 10

FOR OFFICE USE ONLY:

4) ROM (active, active assisted and/or passive) (visual, goniometer, inclinometer, other: SP Diff. L / R: _____ / _____)

Shoulder	Abduction	Adduction	Forward Flexion	Extension	Int. Rotation	Ext. Rotation	Scapular Elevation	Scapula Protrac	Scapula Retract	Painful arc
Normal	180	50	180	60	90	90				
Left										
Right										
MM	Mid Delt, SS	PecMaj, Lat	Delt, Coracobr	Lat, TeresMaj	IS, TeresMin	Subscap, Pect	Trap, LevSc	SerrAnt	Rhom [2]	

Elbow	Flexion	Extension	Supination	Pronation
Normal	150	10	90	90
Left				
Right				
MM	Brachialis, Biceps C5, 6	Triceps C7	Biceps C5, 6 supinator C6	Pronator teres C6 , Pronator quad C8-T1

Wrist	Palmar Flexion	Extension / Dorsiflexion	Ulnar Deviation	Radial Deviation
Normal	80	70	30	20
Left				
Right				
MM	FCR, FCU	ECRL, ECRB, ECU	FCU, ECU	ECRB, ECRL, APL, EPB

5) NEUROLOGICAL EXAMINATION

Level	Motor test, [cord level, nerve]	Motor <u>x/5 +/-</u> L R	Reflex [cord level]	DTR <u>Wexler</u> L R	Sensation	Exam (1.Pin; 2.2-Pt; 3.Vib; 4.Semmes-W) L = < > R
C5	Deltoid [C5 axillary n.] Biceps [C5,6 musculocutaneous n]	<u>_/5</u> <u>_/5</u> <u>_/5</u> <u>_/5</u>	Biceps [C5, C6]	<u>_/5</u> <u>_/5</u>	C5 / Axillary n.	
C6	Biceps [C5,6 musculocutaneous n] Wrist Extensors [C6,7 radial n]rad=C6 uln=C7	<u>_/5</u> <u>_/5</u> <u>_/5</u> <u>_/5</u>	Brachioradialis [C6]	<u>_/5</u> <u>_/5</u>	C6 / Musculocut. n.	
C7	Triceps [C7 radial n.] Wrist Flexors [C7 median/ulnar n] Finger Extenders [C7 radial n]	<u>_/5</u> <u>_/5</u> <u>_/5</u> <u>_/5</u> <u>_/5</u> <u>_/5</u>	Triceps [C7]	<u>_/5</u> <u>_/5</u>	C7 / Digit 3, palmar [variable]	
C8	Finger Flexors [C8,T1 median/ulnar n]	<u>_/5</u> <u>_/5</u>	Wrst(C7,8); Uln(C8,1)	<u>_/5</u> <u>_/5</u>	C8 / Med antebr cut n.	
T1	Finger Abd/Add [T1 ulnar n]	<u>_/5</u> <u>_/5</u>	Ulnar (C8, T1)	<u>_/5</u> <u>_/5</u>	T1 / Med antebr cut n.	
Pathological	Hoffman (Corticospinal tract) / UMN _____ / _____		Clonus (L / R elb / knee)		Spastic / flaccid Paralysis L / R UE / LE	
Grip / Pinch Strength	Right hand: (Pain induced Y / N)			Left hand: (Pain induced Y / N)		
Dominant L/R (Circle)	1st _____ kg/lbs; 2nd _____ kg/lbs; 3rd _____ kg/lbs			1st _____ kg/lbs; 2nd _____ kg/lbs; 3rd _____ kg/lbs		
Circumference	Upp Ext.: Brach. _____ / _____ in. / cm (_____ " above elbow)			AnteBr. _____ / _____ in. / cm (_____ " below elbow)		

6) Please refer to the History, other outcome measure results & Physical Examination form and for additional information

Lower Extremity Functional Scale

Name _____ Date _____ DOI _____ (Key: LEFT/RIGHT)

We are interested in knowing whether you are having any difficulty at all with the activities listed below because of your lower limb problem for which you are currently seeking attention. Please check (√) an answer for **each** activity.

Today, do you or would you have any difficulty at all with:

	0	1	2	3	4
Activities	Extreme Difficulty Or Unable to Perform Activity	Quite a Bit of Difficulty	Moderate Difficulty	A Little Bit of Difficulty	No Difficulty
1) Any of your usual work, household, or school activities					
2) Your usual hobbies, recreational or sporting activities					
3) Getting into or out of the bath					
4) Walking between rooms					
5) Putting on your shoes or socks					
6) Squatting					
7) Lifting an object, like a bag of groceries from the floor					
8) Performing light activities around your Home					
9) Performing heavy activities around your Home					
10) Getting into or out of a car					
11) Walking 2 blocks					
12) Walking a mile					
13) Going up or down 10 stairs (about 1 flight of stairs)					
14) Standing for 1 hour					
15) Sitting for 1 hour					
16) Running on even ground					
17) Running on uneven ground					
18) Making sharp turns while running fast					
19) Hopping					
20) Rolling over in bed					

Binkley JM, Stratford POW, Lott SA, Riddle DL. The lower extremity functional scale (LEFS): Scale development, measurement properties, and clinical application. Physical Therapy 1999;79:371-383.

Score _____/80

MDC (minimum detectable change) = 9 pts

Error +/- 5 scale points

2) If Prior Treatment: Patient's Global Impression of Change (PGIC):

Since beginning treatment at this clinic, how would you describe the change (if any) in **ACTIVITY LIMITATIONS, SYMPTOMS, EMOTIONS, and OVERALL QUALITY OF LIFE**, related to your painful condition? (Circle one number):

Much Better

No Change

Much Worse

0 1 2 3 4 5 6 7 8 9 10

Hurst H, Bolton J. Assessing the clinical significance of change scores recorded on subjective outcome measures. J Manipulative Physiol Ther 2004;27:26-35

3) Pain Level (QVAS): Right Now: _____ / 10; Usual / Typical: _____ / 10; At Best: _____ / 10; At Worst: _____ / 10 (Von Korff, 2000)

FOR OFFICE USE ONLY:

4) ROM (active, active assisted and/or passive) (visual, goniometer, inclinometer, other: _____)

Hip	Abduction	Adduction	Flexion	Extention	Internal Rotation	External Rotation
Normal	50	30	135	30	43	42
Left						
Right						
MM	Glut medius	Adductor longus	Iliopsoas	Glut Max	Adductor longus, brevis	Glut max, obt. ext.

Knee	Flexion	Extention	Internal Rotation	External Rotation
Normal	148	0	10	10
Left				
Right				
MM	Semimemb/tend/biceps	Quad	cannot be isolated	cannot be isolated

Ankle	Dorsiflexion	Plantar flexion	Inversion	Eversion
Normal	20	50	35	15
Left				
Right				
MM	Tibialis ant, EDL, EHL	Gastroc, Soleus, Plantaris	Tibialis post, FDL, FHL	Peronius, long, brev, tertius

5. NEUROLOGICAL EXAMINATION: Rule out Nerve Root lesion

Level	Motor test: [cord level, nerve]	Motor x/5 + / -		Reflex [cord level]	DTR (Wexler)		Sensation	Exam (1.Pin; 2.2-pt 3.Vib; 4.Semmes-W)
		L	R		L	R		
T12-L3	Iliopsoas -Hip Flexion [T12-L3]	___/5;	___/5	Cremasteric (L1,2)	P / A	P / A	T12-L3 derm.	
L2-L4	Quadriceps - Knee Ext. [L3,4 femoral n.] Hip adductors [L2-4 obturator n.]	___/5;	___/5	Patellar [L2,L3, L4]	___/5;	___/5	L2-L4 dermatome	
L4	Tibialis Anterior [L4, deep peroneal n.]	___/5;	___/5	Patellar [L2,L3, L4]	___/5;	___/5	L4 dermatome	
L5	Ext Hall Long [L5, deep peroneal n.] Ext Dig Long/Brev [L5, deep peroneal n.] Gluteus Medius [L5, supr. glut.n.]	___/5;	___/5	Hamstring / (semitendinosus) [L4, L5, S1, 2]	___/5;	___/5	L5 dermatome	
S1	Peroneus Lng/Brev [L5,S1 sup.peroneal n.] Gastrocnemius-soleus [S1, inf. glut. n.]	___/5;	___/5	Achilles [S1]	___/5;	___/5	S1 dermatome	
Chest: Insp _____ Exp _____ (____ ICS)		Low Ext.: Thigh _____ / _____ in. / cm (_____ " above Patella)			Calf _____ / _____ in. / cm (_____ " below patella)			

6) Please refer to the History, other outcome measure results & Physical Examination, especially, lower Extremity QFCE test results for additional information