ORIGINAL ARTICLE

Intraobserver Reliability of 4 Physiologic Movements of the Shoulder in Subjects With and Without Symptoms

Rachel E. Valentine, BSc, MCSP, Jeremy S. Lewis, PhD, MCSP, MAPA, MMPA

ABSTRACT. Valentine RE, Lewis JS. Intraobserver reliability of 4 physiologic movements of the shoulder in subjects with and without symptoms. Arch Phys Med Rehabil 2006;87: 1242-9.

Objective: To assess intraobserver reliability of 4 physiologic movements of the shoulder.

Design: Test-retest analyses. Blinded data entry.

Setting: Outpatient department in National Health Service teaching hospital.

Participants: Forty-five asymptomatic volunteers and 45 subjects with shoulder symptoms.

Interventions: Not applicable.

Main Outcome Measures: Intraclass correlation coefficients (ICC), 95% confidence intervals, and standard error (SE) of measurements for bilateral measurements of shoulder flexion and abduction (gravity dependent inclinometer), shoulder external rotation (tape measure), and shoulder internal rotation (visual estimation).

Results: For subjects without symptoms, single measure ICC results ranged from .85 to .96; SE of measurement results for the angular movements ranged from 2.1° to 2.8° and for the linear measurements 1.1 to 1.6cm. For subjects with symptoms, single measure ICC results ranged from .82 to .98; SE of measurement results for the angular movements ranged from 1.5° to 13.3° and for the linear measurements 1.3 to 1.6cm.

Conclusions: With the exception of painful shoulder flexion in the group of subjects with symptoms, the single-measure ICC results were very good to excellent and the highest SE of measurement values were 5.3° for the angular measurements and 1.6cm for the linear measurements. For clinicians involved in the management of subjects with shoulder symptoms, the SE of measurement results provide guidance as to the error associated with the individual measurements. Using the SE of measurement results, a clinician may determine if a clinically important change, be it negative or positive, has occurred as a result of any intervention offered.

Key Words: Intraobserver variation; Outcome assessment (health care); Range of motion, articular; Rehabilitation; Shoulder.

© 2006 by the American Congress of Rehabilitation Medicine and the American Academy of Physical Medicine and Rehabilitation

0003-9993/06/8709-10710\$32.00/0

doi:10.1016/j.apmr.2006.05.008

MUSCULOSKELETAL DISORDERS of the shoulder are extremely common, with 1 in 3 people experiencing shoulder pain at some stage of their lives.^{1,2} The clinical investigation of patients presenting with shoulder pathology involves: history taking, using appropriate outcome measurement scores, and assessing the shoulder with a series of clinical tests that include measuring the physiologic shoulder range of motion (ROM). Measuring ROM is a necessary and important part of the clinical examination, because deficiencies of physiologic movement have been reported in groups of patients whose shoulder pathology is associated with a traumatic onset, such as in sport, as well as those with no identifiable traumatic onset of symptoms.

Measuring shoulder ROM prior to, during, and at the end of a course of treatment provides the clinician with an indication of the effectiveness of the intervention. Randomized clinical trials investigating the effect of intervention on shoulder pathology have included measurements of shoulder ROM among the outcome measurements assessed to determine the effectiveness of the interventions.³⁻⁵ As such it is essential that reliable methods of measuring shoulder ROM that are easily accessible to clinicians are available to measure this component of shoulder function. The physiologic movements of the shoulder that are most commonly measured include flexion, abduction in the plane of the scapular, external rotation, internal rotation, and hand behind back.³⁻⁶

Recommendations for measuring internal and external rotation of the shoulder involve placing the shoulder at 90° abduction while the patient is lying in the supine position.^{7,8} Shoulder elevation in this range frequently provokes pain^{3,5} and is therefore not appropriate for patients experiencing discomfort in this range. It would therefore be advantageous to have a reliable method of measuring both internal and external rotation with the arm by the side, which is generally a less provocative position. The assessment of hand behind back is recommended by the American Academy of Orthopaedic Surgeons and the Society of American Shoulder and Elbow Surgeons,9 because it is commonly described by patients as a maneuver associated with restriction of movement and pain, when dressing, attending to personal hygiene, and during other activities of daily living (ADLs). However, the movement of hand behind back should not be considered as an assessment of the ability of the shoulder to internally rotate. Mallon et al¹⁰ reported that measuring shoulder internal rotation by the maximal vertebral level reached by the patient's thumb is an inexact method to measure this range. They conducted a radiologic analysis of the hand behind back movement in 8 subjects without shoulder symptoms and reported that internal rotation occurred at the glenohumeral joint when the arm was in front of the body and that scapulothoracic articulation contributed to the hand behind back maneuver by both extension (anterior tilt) and downward (internal) rotation of the scapula. They also reported from radiologic analysis that flexion at the elbow contributed substantially to the movement. In addition to this, Edwards et al¹¹ argued that the range of hand behind back would be adversely influenced by conditions involving the elbow, wrist, or thumb. As such, it is not possible to determine the amount of gleno-

From the Therapy Department, Chelsea and Westminster Hospital, London, UK (Valentine, Lewis); and Physiotherapy Department, St George's Hospital, London, UK (Lewis).

Supported by the Westminster Medical School Research Trust and the Chelsea and Westminster Healthcare NHS Trust Charity.

No commercial party having a direct financial interest in the results of the research supporting this article has or will confer a benefit upon the author(s) or upon any organization with which the author(s) is/are associated.

Reprint requests to Jeremy S. Lewis, PhD, MCSP, MAPA, MMPA, Therapy Department, Chelsea and Westminster Hospital, 369 Fulham Rd, London, UK, e-mail: *jeremy.lewis@chelwest.nhs.uk*.

Ridde et all Ridde et all Ridde et all Green et all Flexion, passive's Flexion, active to P1SIndt go grainmettry Noninmettry Statu Statu Statu Statu Statu Ridde et all Statu Flexion, active to P1SIndt go grainmettry Noninmettry Statu Statu Statu Statu Statu Ridde et all Statu Flexion, active to P1SIndt go grainmettry Statu Statu Statu Statu Statu Statu Statu Statu Flexion, active to and ROM Statu Flexion, active to and ROM Statu Statu Statu Statu Statu Statu Statu Flexion, active to and ROM Statu Statu Statu Statu Statu Statu Flexion, active to and ROM Statuu Statu<	Study	Measurement	Subjects	Method	Position	Intrarater Reliability	Interrater Reliability	Clinical Comment
Riddle et alPickon, passive*SLong gninometerVariableICC., aICC., aICC., aSEM and 95% CI NRSabari et al*Pisxon, passive to P1SnolinometerSupineICC. aICC. aICC. aSEM and 95% CI NRSabari et al*Pisxon, passiveA5+7SGoniometerSupineICC. aICC. aSEM and 95% CI NRSabari et al*Pisxon, passive to and ROMA5+7SGoniometerSittingICC., aICC., aSIttingICC. aSItting <td>Riddle et al¹³</td> <td>Flexion, passive*</td> <td>S</td> <td>Short goniometer</td> <td>Variable</td> <td>ICC_{1,1}=.98</td> <td>ICC_{1,1}=.87</td> <td>SEM and 95% CI NR</td>	Riddle et al ¹³	Flexion, passive*	S	Short goniometer	Variable	ICC _{1,1} =.98	ICC _{1,1} =.87	SEM and 95% CI NR
Green et al ¹⁷ Subari et al ¹⁸ Pictorio, native to P1SIndimenter Sitting Subari et al ¹⁴ Pictorio, nativeSIndimenter Subari et al ¹⁴ Pictorio, nativeSIndimenter Subari et al ¹⁴ Pictorio, nativeSNotice Sitting	Riddle et al ¹³	Flexion, passive*	S	Long goniometer	Variable	ICC _{1,1} =.98	ICC _{1,1} =.89	SEM and 95% CI NR
Sabari et all Sabari et all Pickion, passiveAS i 7S GoniometerGoniometer Supine $ CC_2, = 94$ SEM and 95%, CI NR SEM and 95%, CI NR <td>Green et al¹⁷</td> <td>Flexion, active to P1</td> <td>S</td> <td>Inclinometer</td> <td>Sitting</td> <td>ICC=.49</td> <td>ICC=.72</td> <td>SEM and 95% CI NR</td>	Green et al ¹⁷	Flexion, active to P1	S	Inclinometer	Sitting	ICC=.49	ICC=.72	SEM and 95% CI NR
Sabari et all Subari et all Pickion, passiveAS - 7S GoniometerGoniometer Sitting $ CC_2, = 55$ SEM and 95% CI NR 	Sabari et al ³⁴	Flexion, passive	AS+?S	Goniometer	Supine	$ICC_2 = .94$		SEM and 95% CI NR
Sabari et al Subari et al Subari et al Parksion, passive to and ROMAS + 7S SolutionGoniometer Sitting $ CC_{c}, = 95, SEM = 13^{\circ}, CC_{c}_{a}, = 70, SEM = 13^{\circ}, SEM and 95\%, CI NRHayes et alHayes et alParksion, passive to and ROMSGoniometerSitting CC_{c}, = 30, SEM = 13^{\circ}, CC_{c}, = 70, SEM = 13^{\circ}, SEM and 95\%, CI NRNot reliableHayes et alHiddle et all10 del et allAbduction, passive to and ROMSGoniometerSitting CC_{c}, = 30, SEM = 13^{\circ}, SEM$	Sabari et al ³⁴	Flexion, active	AS+?S	Goniometer	Supine	ICC ₂ =.95		SEM and 95% CI NR
Sabari et al ¹⁴ Hayes et al ¹⁴ Flexion, active Flexion, passive to end ROM SShifting VisualICC str str Str ICC str str Str <br< td=""><td>Sabari et al³⁴</td><td>Flexion, passive</td><td>AS+?S</td><td>Goniometer</td><td>Sitting</td><td>$ICC_2 = .95$</td><td></td><td>SEM and 95% CI NR</td></br<>	Sabari et al ³⁴	Flexion, passive	AS+?S	Goniometer	Sitting	$ICC_2 = .95$		SEM and 95% CI NR
Hayes et all**Flexion, passive to end ROMSVisualSitting sting(CC_1=53, SEM=13°, 95%, C1 = 38°CCC_1=70, SEM=13°, 95%, C1 = 38°Not reliableHayes et all**Flexion, active to end ROMSGoniometerVariable(CC_1=54)(CC_1=64)SEM and 95%, C1 NRRiddle et all*3Abduction, passive *SLong goniometerVariable(CC_1=98)(CC_1=64)SEM and 95%, C1 NRCroft et all*1Abduction, passive end ROMSDiagramNot stated(CC=34)SEM and 95%, C1 NRCroft et all*1Abduction, passive end ROMSDiagramNot stated(CC=98)SEM and 95%, C1 NRCroft et all*1Abduction, passive end ROMSDiagramNot stated(CC=98)SEM and 95%, C1 NRCroft et all*1Abduction, active to P1SInclinometerStilling(CC=38)(CC=77)SEM and 95%, C1 NRSabari et all*4Abduction, activeA5+75GoniometerStilling(CC=98)SEM and 95%, C1 NRSEM and 95%, C1 NRSabari et all*4Abduction, activeA5+75GoniometerStilling(CC=98)SEM and 95%, C1 NRSEM and 95%, C1 NRSabari et all*4Abduction, active to end ROMSVisualStilling(CC=98)SEM and 95%, C1 NRSEM and 95%, C1 NRSabari et all*4Abduction, active to end ROMSSNot oniometerStilling(CC=98)SEM and 95%, C1 NRSabari et all*4Abduction, active to end ROMSSNot oniometer<	Sabari et al ³⁴	Flexion, active	AS+?S	Goniometer	Sitting	$ICC_2 = .97$		SEM and 95% CI NR
Hayes et al ¹⁹ Flexion, active to end ROMSGroinmeterSitting <br< td=""><td>Hayes et al¹⁸</td><td>Flexion, passive to end ROM</td><td>S</td><td>Visual</td><td>Sitting</td><td>ICC_{2,1}=.59, SEM=13°, 95% Cl, ±26°</td><td>ICC_{2,1}=.70, SEM=19°, 95% CI, ±38°</td><td>Not reliable</td></br<>	Hayes et al ¹⁸	Flexion, passive to end ROM	S	Visual	Sitting	ICC _{2,1} =.59, SEM=13°, 95% Cl, ±26°	ICC _{2,1} =.70, SEM=19°, 95% CI, ±38°	Not reliable
Riddle et alAduction, passive*SShort goniometerVariableICC $_1$ = 98ICC $_1$ =	Hayes et al ¹⁸	Flexion, active to end ROM	S	Goniometer	Sitting	ICC _{2,1} =.53, SEM=17°, 95% Cl, ±34°	ICC _{2,1} =.69, SEM=25°, 95% CI, ±50°	Not reliable
Riddle et al 13Advduction, passive to P1SLong goniometr DiagramVariable $ICC_1, = .98$ $ICC_1, = .87$ SEM and 95% CI NRCroft et al 14Abduction, passive to P1SDiagramNot statedICC = .94SEM and 95% CI NRCroft et al 14Abduction, passive to P1SIngeramNot statedICC = .38ICC = .93SEM and 95% CI NRGreen et al 17Abduction, active to P1SInclinometerStitingICC = .93ICC = .77SEM and 95% CI NRSabari et al 34Abduction, activeAS +7SGoniometerSupineICC = .99SEM and 95% CI NRSabari et al 34Abduction, passiveAS +7SGoniometerSupineICC = .99SEM and 95% CI NRSabari et al 34Abduction, passive AAS +7SGoniometerStitingICC = .99SEM and 95% CI NRSabari et al 34Abduction, passive AAS +7SGoniometerStitingICC = .99SEM and 95% CI NRSabari et al 34Abduction, passive ASGoniometerStitingICC = .92SEM and 95% CI NRSabari et al 34Abduction, passive ASGoniometerStitingICC = .92SEM and 95% CI NRAbduction, passive ASGoniometerStitingICC = .96SEM -19*Not reliableAbduction, passive ASGoniometerStitingICC = .96SEM -21*Possiting ICC = .95SEM and 95% CI NRHayes et al 35Abduction, passive ASGoniometerStitingIC	Riddle et al ¹³	Abduction, passive*	S	Short goniometer	Variable	ICC _{1.1} =.98	ICC _{1.1} =.84	SEM and 95% CI NR
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	Riddle et al ¹³	Abduction, passive*	S	Long goniometer	Variable	ICC _{1,1} =.98	ICC _{1.1} =.87	SEM and 95% CI NR
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	Croft et al ²¹	Abduction, passive to P1	S	Diagram	Not stated	.,.	ICC=.84	SEM and 95% CI NR
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	Croft et al ²¹	Abduction, passive end ROM	S	Diagram	Not stated		ICC=.95	SEM and 95% CI NR
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	Croft et al ²¹	Abduction, preselected range	Not stated	Visual ROP	Not stated		ICC=.99	SEM and 95% CI NR
Sabari et al Sabari et al Abduction, passiveAS +7S Abduction, activeGoniometerSupine SupineICC2 = 98SEM and 95% CI NR SEM and 95% CI NR SEM and 95% CI NRSabari et al Abduction, activeAbduction, passiveAS +7S Abduction, passiveGoniometerSitting Sitting ICC2 = 97ICC2 = -99SEM and 95% CI NR SEM and 95% CI NRSabari et al Hayes et al 	Green et al ¹⁷	Abduction, active to P1	S	Inclinometer	Sitting	ICC=.38	ICC=.77	SEM and 95% CI NR
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	Sabari et al ³⁴	Abduction, passive	AS+?S	Goniometer	Supine	$ICC_2 = .98$		SEM and 95% CI NR
Sabari et alAbduction, passiveAS+7SGoniometerSitting $ CC_2=95$ SEM and 95% CI NRSabari et alAbduction, activeAS+7SGoniometerSitting $ CC_2=97$ $ CC_{2,1}=.60, SEM=19^\circ, g5\% CI, ±38^\circ$ Not reliableHayes et alAbduction, active to end ROMSGoniometerSitting $ CC_{2,1}=.60, SEM=23^\circ, g5\% CI, \pm 38^\circ$ $ CC_{2,1}=.60, SEM=21^\circ, g5\% CI, \pm 38^\circ$ Not reliableHayes et alAbduction, active to end ROMSGoniometerSitting $ CC_{2,1}=.60, SEM=21^\circ, g5\% CI, \pm 38^\circ$ Not reliablede Winter et alAbduction, passive ¹ SElectronicSitting $ CC_{1,1}=.98$ $ CC_{2,1}=.61, SEM=21^\circ, g5\% CI, \pm 38^\circ$ Not reliableRiddle et alR, passive*SShort goniometerVariable $ CC_{1,1}=.98$ $ CC_{1,1}=.90$ SEM and 95% CI NRRiddle et alER, passive to end ROMSDiagramNot stated $ CC=.37$ Not reliableCroft et alER, passive to end ROMSDiagramNot stated $ CC=.37$ Not reliableGreen et alFR, passive to end ROMSInclinometerSupine $ CC=.75$ $ CC=.36, SEM=14^\circ, SEM=40^\circ, SEM=40^$	Sabari et al ³⁴	Abduction, active	AS+?S	Goniometer	Supine	$ICC_2 = .99$		SEM and 95% CI NR
Sabari et al Hayes et al 18Abduction, active Adduction, passive to end ROMAS+?S SGoniometer StitualSitting SICC2=97SEM and 95% Cl NR ICC2_1=.60, SEM=19°, 95% Cl, ±48°Not reliableHayes et al 18Abduction, active to end ROMSGoniometerSitting SICC2_1=.58, SEM=23°, 95% Cl, ±46°ICC2_1=.69, SEM=21°, 95% Cl, ±38°Not reliableHayes et al 18Abduction, passive'SElectronic inclinometerSittingICC2_1=.58, SEM=23°, 95% Cl, ±46°ICC2_1=.69, SEM=21°, 95% Cl, ±38°Not reliableHayes et al 18Abduction, passive'SElectronic inclinometerSittingICC2_1=.58, SEM=23°, 95% Cl, ±46°Changes in ROM <20°-25° = possible MERiddle et al 13ER, passive*SSont goniometer inclinometerVariableICC1, =.98ICC2, 1=.69, SEM=21°, 95% Cl, ±38°Changes in ROM <20°-25° = possible MECroft et al Croft et al Croft et al Green et al Hayes et al 18ER, passive*SNot statedICC1, =.98ICC2, 1=.67, SEM=14°, 95% Cl, ±28°Not reliableHayes et al Hayes et al Hayes et al 18ER active to end ROMSInclinometerSupineICC2, =.67, SEM=11°, 95% Cl, ±28°ICC2, =.57, SEM=14°, 95% Cl, ±28°Not reliableHayes et al Hayes et al Hayes et al 18ER active to end ROMSInclinometerSupineICC2, =.67, SEM=11°, 95% Cl, ±28°ICC2, =.57, SEM=14°, 95% Cl, ±28°Not reliableHayes et al Hayes et al Hayes et al <b< td=""><td>Sabari et al³⁴</td><td>Abduction, passive</td><td>AS+?S</td><td>Goniometer</td><td>Sitting</td><td>$ICC_2 = .95$</td><td></td><td>SEM and 95% CI NR</td></b<>	Sabari et al ³⁴	Abduction, passive	AS+?S	Goniometer	Sitting	$ICC_2 = .95$		SEM and 95% CI NR
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	Sabari et al ³⁴	Abduction, active	AS+?S	Goniometer	Sitting	$ICC_2 = .97$		SEM and 95% CI NR
Hayes et alAbduction, active to end ROMSGoniometerSitting $ICC_{2,1}=.50, SEM=23^{\circ}, 95\% Cl, \pm 46^{\circ}$ $ICC_{2,1}=.69, SEM=21^{\circ}, 95\% Cl, \pm 38^{\circ}$ Not reliablede Winter et alAbduction, passive*SElectronicSitting $ICC_{2,1}=.69, SEM=21^{\circ}, 95\% Cl, \pm 38^{\circ}$ Changes in ROM <20^{\circ}-25^{\circ} = ICC=.28 (CL side)	Hayes et al ¹⁸	Abduction, passive to end ROM	S	Visual	Sitting	ICC _{2,1} =.60, SEM=21°, 95% Cl. ±42°	ICC _{2,1} =.66, SEM=19°, 95% Cl, ±38°	Not reliable
de Winter et alAbduction, passive*SElectronic inclinometerSittingICC=.83 (affected side), ICC=.28 (CL side)Changes in ROM <20°-25° = possible MERiddle et alER, passive*SShort goniometerVariableICC_1,1=.98ICC_1,1=.90SEM and 95% Cl NRRiddle et alER, passive to end ROMSDiagramNot statedICC_1,1=.98ICC_1,1=.90SEM and 95% Cl NRCroft et alER, passive to end ROMSDiagramNot statedICC=.37Not reliableCroft et alER, preselected rangeNot statedVisual ROPNot statedICC=.75ICC=.65SEM and 95% Cl NRGreen et alFR, in abduction-active to P1SInclinometerSupineICC=.75ICC=.65SEM and 95% Cl NRHayes et alER, passive to end ROMSVisualSittingICC_2,1=.67, SEM=11°, 95% Cl, ±22°ICC_2,1=.57, SEM=14°, 95% Cl, ±28°Not reliablede Winter et alFR, passive to end ROMSElectronic inclinometerSupineICC_2,1=.67, SEM=11°, 95% Cl, ±22°ICC_2,1=.57, SEM=14°, 95% Cl, ±28°Not reliablede Winter et alIR, passive*SShort goniometerVariableICC_1,1=.93ICC_2,1=.57, SEM=14°, 95% Cl, ±28°Not reliablede Winter et alIR, passive*SShort goniometerSupineICC_1,1=.93ICC_2,1=.57, SEM=14°, 95% Cl, ±28°Not reliablede Winter et alIR, passive*SShort goniometerSupineICC_1,1=.93ICC_2,1=.57, SEM	Hayes et al ¹⁸	Abduction, active to end ROM	S	Goniometer	Sitting	ICC _{2,1} =.58, SEM=23°, 95% CL +46°	ICC _{2,1} =.69, SEM=21°, 95% CL +38°	Not reliable
Riddle et al13ER, passive*SShort goniometer goniometerVariable VariableICC_1,=.98 ICC_1,=.99ICC_1,=.90 ICC_1,=.88SEM and 95% Cl NRRiddle et al13ER, passive*SLong goniometer goniometerVariableICC_1,=.98 VariableICC_1,=.88SEM and 95% Cl NRCroft et al21ER, passive to end ROMSDiagramNot statedICC_1,=.99ICC_1,=.88SEM and 95% Cl NRGreen et al17ER, in neutral-active to P1SInclinometerSupineICC=.75ICC=.65SEM and 95% Cl NRGreen et al17ER, passive to end ROMSVisualSittingICC_2,1=.67, SEM=11°, 95% Cl, ±22°Not reliableNot reliableHayes et al18ER active to end ROMSGoniometerSupineICC_2,1=.67, SEM=11°, 95% Cl, ±22°ICC_2,1=.57, SEM=14°, 	de Winter et al ³⁵	Abduction, passive [†]	S	Electronic	Sitting		ICC = .83 (affected side),	Changes in ROM <20°-25° =
Indicide at 1^{13} ER, passive*SLong goniometer goniometerVariable VariableICC_1,1.00 VariableICC_1,1.00 ICC_1,1.29ICC_1,1.00 ICC_1,1.29ICC_1,1.00 ICC_1,1.29ICC_1,1.00 ICC_1,1.29ICC_1,1.00 ICC_1,1.29ICC_1,1.00 ICC_1,1.29ICC_1,1.00 ICC_1,1.29ICC_1,1.20 ICC_1,1.29ICC_1,1.20 ICC_1,1.29ICC_1,1.20 ICC_1,1.29ICC_1,1.20 ICC_1,1.29ICC_1,1.20 ICC_1,1.29ICC_1,1.20 ICC_1,1.29ICC_1,1.20 ICC_1,1.29ICC_1,1.20 ICC_1,1.20ICC_1,1.20 ICC_1,23ICC_1,1.20 ICC_1,23ICC_1,1.20 ICC_1,23ICC_1,1.20 ICC_1,23ICC_1,1.20 ICC_1,23ICC_1,1.20 ICC_1,23ICC_1,1.20 ICC_1,23ICC_1,1.20 ICC_1,23ICC_1,1.20 ICC_1,23ICC_1,1.20 ICC_1,23ICC_1,1.20 ICC_1,23ICC_1,1.20 ICC_1,23ICC_1,1.20 ICC_1,23ICC_1,1.20 ICC_1,23ICC_1,1.20 ICC_1,23ICC_1,1.20 ICC_1,23ICC_1,1.20 ICC_2,23ICC_1,1.20 ICC_2,23ICC_1,1.20 ICC_2,23ICC_1,1.20 ICC_2,23ICC_1,23ICC_1,23ICC_1,23ICC_1,23ICC_1,23ICC_2,23ICC_	Riddle et al ¹³	FR passive*	S	Short agniometer	Variable	ICC= 98	$ICC_{1} = 90$	SEM and 95% CLNB
Induct of alEn, passiveSEnd g of induction of inductionInduction <td>Riddle et al¹³</td> <td>ER passive*</td> <td>S</td> <td>Long goniometer</td> <td>Variable</td> <td>ICC = 99</td> <td>ICC = 88</td> <td>SEM and 95% CLNR</td>	Riddle et al ¹³	ER passive*	S	Long goniometer	Variable	ICC = 99	ICC = 88	SEM and 95% CLNR
Croft et alER, passive to end ROMSIndignmNot statedNot statedICC =.45Not reliableGreen et alER, in neutral-active to P1SInclinometerSupineICC =.85ICC =.88SEM and 95% CI NRGreen et alER, in abduction-active to P1SInclinometerSupineICC =.75ICC =.65SEM and 95% CI NRHayes et alER, passive to end ROMSVisualSittingICC1 =.67, SEM = 11°, 95% CI, ±28°Not reliableHayes et alER active to end ROMSGoniometerSittingICC1 =.65, SEM = 14°, 95% CI, ±28°Not reliableHayes et alER, passive to end ROMSGoniometerSupineICC1 =.65, SEM = 14°, 95% CI, ±28°Not reliablede Winter et alER, passive to end ROMSElectronicSupineICC1 =.65, SEM = 14°, 95% CI, ±28°Not reliableRiddle et alIR, passive toSShort goniometerVariableICC1 =.93ICC1 =.65 (CL side)possible MERiddle et alIR, passive to P1SLong goniometerVariableICC1 =.94ICC1 =.55SEM and 95% CI NRGreen et alIR, in abduction-active to P1SInclinometerSupineICC1 =.92ICC1 =.73SEM and 95% CI NRGreen et alIR, passive to P1SInclinometerSupineICC1 =.94ICC1 =.55SEM and 95% CI NRGreen et alHBB to P1SVisualStandingICC =.84ICC =.73SEM and 95% CI NR<	Croft et al ²¹	EB passive to end BOM	S	Diagram	Not stated	1001,1 100	ICC = 43	Not reliable
Green et al 17 ER, in neutral-active to P1SInclinometerSupineICC=.85ICC=.86SEM and 95% Cl NRGreen et al 17 ER, in abduction-active to P1SInclinometerSupineICC=.75ICC=.65SEM and 95% Cl NRHayes et al 18 ER, passive to end ROMSVisualSittingICC_2,1=.67, SEM=11°, 95% Cl, $\pm 22°$ 95% Cl, $\pm 28°$ Not reliableHayes et al 18 ER active to end ROMSGoniometerSittingICC_2,1=.65, SEM=14°, 95% Cl, $\pm 28°$ Not reliableHayes et al 18 ER, passive to end ROMSElectronicSupineICC_2,1=.65, SEM=14°, 95% Cl, $\pm 28°$ Not reliableHayes et al 18 ER, passive to end ROMSElectronicSupineICC_2,1=.65, SEM=14°, 95% Cl, $\pm 28°$ Not reliableHayes et al 18 ER, passive to end ROMSElectronicSupineICC_2,1=.65, SEM=14°, 95% Cl, $\pm 28°$ Not reliableHayes et al 13 IR, passive to end ROMSElectronicSupineICC_1,1=.93ICC_1,2=.90 (affected side), ICC=.56 (CL side)Possible MERiddle et al 13 IR, passive to SSont goniometerVariableICC_1,1=.93ICC_{1,1}=.43SEM and 95% Cl NRGreen et al 17 IR, in abduction-active to P1SInclinometerSupineICC=.82ICC_1,4SEM and 95% Cl NRGreen et al 17 HBB to P1SVisualStandingICC=.84ICC=.73SEM and 95% Cl NR	Croft et al ²¹	FR preselected range	Not stated	Visual ROP	Not stated		ICC = 37	Not reliable
Green et alIn adduction active to P1SInclinometerSupineICC =.75ICC =.65SEM and 95% CI NRHayes et alER, passive to end ROMSVisualSittingICC_2,1=.67, SEM=11°, 95% CI, $\pm 22°$ ICC_2,1=.57, SEM=14°, 95% CI, $\pm 28°$ Not reliableHayes et alER active to end ROMSGoniometerSittingICC_2,1=.65, SEM=14°, 95% CI, $\pm 28°$ ICC_2,1=.57, SEM=14°, 95% CI, $\pm 28°$ Not reliableHayes et alER, passive *SElectronic inclinometerSupineICC_1,1=.93ICC_1,1=.43SEM and 95% CI NRRiddle et alIR, passive *SShort goniometer inclinometerVariableICC_1,1=.94ICC_1,1=.55SEM and 95% CI NRRiddle et alIR, in abduction-active to P1SInclinometerSupineICC_1.820°ICC_1.1=.55SEM and 95% CI NRGreen et alIR, in abduction-active to P1SInclinometerSupineICC_1.1=.94ICC_1.1=.55SEM and 95% CI NRGreen et alIR, in abduction-active to P1SInclinometerSupineICC=.82ICC=.73SEM and 95% CI NRGreen et alFRHB to P1SVisualStandingICC=.84ICC=.73SEM and 95% CI NR	Green et al ¹⁷	FR in neutral-active to P1	S	Inclinometer	Sunine	ICC= 85	ICC = 88	SEM and 95% CLNB
Hayes et alER, passive to end ROMSVisualSitting $ICC_{2,1}=.67, SEM=11^{\circ}, 95\% Cl, \pm 28^{\circ}$ Not reliableHayes et alER active to end ROMSGoniometerSitting $ICC_{2,1}=.67, SEM=11^{\circ}, 95\% Cl, \pm 28^{\circ}$ Not reliableHayes et alER active to end ROMSGoniometerSitting $ICC_{2,1}=.65, SEM=14^{\circ}, 95\% Cl, \pm 28^{\circ}$ Not reliablede Winter et alER, passive*SElectronicSupine $ICC_{1,1}=.93$ $ICC_{1,1}=.43$ SEM and 95% Cl NRRiddle et alIR, passive*SShort goniometerVariable $ICC_{1,1}=.94$ $ICC_{1,1}=.55$ SEM and 95% Cl NRGreen et alIRIn abduction-active to P1SInclinometerSupine $ICC_{2,1}=.67, SEM=14^{\circ}, 95\% Cl, \pm 28^{\circ}$ SEM and 95% Cl NRGreen et alIR, in abduction-active to P1SInclinometerVariable $ICC_{1,1}=.93$ $ICC_{1,1}=.43$ SEM and 95% Cl NRGreen et alIR, in abduction-active to P1SInclinometerSupine $ICC=.82$ $ICC=.73$ SEM and 95% Cl NRGreen et alStandingICC=.84ICC=.73SEM and 95% Cl NR	Green et al ¹⁷	EB in abduction-active to P1	S	Inclinometer	Sunine	ICC = 75	ICC = 65	SEM and 95% CLNB
Hayes et alER active to end ROMSGoniometerSitting $ICC_{2,1}=.65, SEM=14^{\circ}, 95\% Cl, \pm 28^{\circ}$ $ICC_{2,1}=.57, SEM=14^{\circ}, 95\% Cl, \pm 28^{\circ}$ Not reliablede Winter et al IS ER, passive [‡] SElectronicSupine $ICC_{1,1}=.93$ $ICC_{1,1}=.43$ Changes in ROM <20^{\circ}-25^{\circ} = 90\% Cl, \pm 28^{\circ}Riddle et alIR, passive [*] SShort goniometerVariable $ICC_{1,1}=.93$ $ICC_{1,1}=.43$ SEM and 95% Cl NRRiddle et alIR, passive [*] SLong goniometerVariable $ICC_{1,1}=.94$ $ICC_{1,1}=.55$ SEM and 95% Cl NRGreen et alIR, in abduction-active to P1SInclinometerSupine $ICC=.82$ $ICC=.73$ SEM and 95% Cl NRGreen et alISVisualStanding $ICC=.84$ $ICC=.73$ SEM and 95% Cl NR	Hayes et al ¹⁸	ER, passive to end ROM	S	Visual	Sitting	ICC _{2,1} =.67, SEM=11°, 95% Cl. ±22°	ICC _{2,1} =.57, SEM=14°, 95% Cl. ±28°	Not reliable
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	Hayes et al ¹⁸	ER active to end ROM	S	Goniometer	Sitting	ICC _{2,1} =.65, SEM=14°, 95% CI, ±28°	ICC _{2,1} =.57, SEM=14°, 95% CI, ±28°	Not reliable
Riddle et al13IR, passive*SShort goniometerVariableICC_{1,1}=.93ICC_{1,1}=.43SEM and 95% CI NRRiddle et al13IR, passive*SLong goniometerVariableICC_{1,1}=.94ICC_{1,1}=.55SEM and 95% CI NRGreen et al17IR, in abduction-active to P1SInclinometerSupineICC=.82ICC=.44SEM and 95% CI NRGreen et al17HBB to P1SVisualStandingICC=.84ICC=.73SEM and 95% CI NR	de Winter et al ³⁵	ER, passive [‡]	S	Electronic inclinometer	Supine	·	ICC=.90 (affected side), ICC=.56 (CL side)	Changes in ROM <20°-25° = possible ME
Riddle et al13IR, passive*SLong goniometerVariableICC $_{1,1}$ =.94ICC $_{1,1}$ =.55SEM and 95% CI NRGreen et al17IR, in abduction-active to P1SInclinometerSupineICC=.82ICC=.44SEM and 95% CI NRGreen et al17HBB to P1SVisualStandingICC=.84ICC=.73SEM and 95% CI NR	Riddle et al ¹³	IR, passive*	S	Short goniometer	Variable	ICC _{1 1} =.93	ICC _{1 1} =.43	SEM and 95% CI NR
Green et al17IR, in abduction-active to P1SInclinometerSupineICC=.82ICC=.44SEM and 95% CI NRGreen et al17HBB to P1SVisualStandingICC=.84ICC=.73SEM and 95% CI NR	Riddle et al ¹³	IR, passive*	S	Long goniometer	Variable	ICC ₁₁ =.94	ICC ₁₁ =.55	SEM and 95% CI NR
Green et al ¹⁷ HBB to P1 S Visual Standing ICC=.84 ICC=.73 SEM and 95% CI NR	Green et al ¹⁷	IR, in abduction-active to P1	S	Inclinometer	Supine	ICC=.82	ICC=.44	SEM and 95% CI NR
	Green et al ¹⁷	HBB to P1	S	Visual	Standing	ICC=.84	ICC=.73	SEM and 95% CI NR

Table 1: Review of Studies Investigating the Reliability of Measuring Shoulder ROM

1243

Download English Version:

https://daneshyari.com/en/article/3453202

Download Persian Version:

https://daneshyari.com/article/3453202

Daneshyari.com