Jornadas sobre Clasificación de la Discapacidad en el Deporte

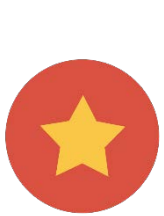
Deficiencias Físicas Elegibles y Métodos Evaluación I

Villanueva de la Cañada, 1 y 2 de abril de 2017

Prof. Dr. Raúl Reina Vaillo (UMH)

Estructura del Deporte Paralímpico

International Organizations of Sports for Disabled



Esgrima

Otros Deportes No Paralímpicos:

- Powerchair Hockey

Fútbol 5 Goalball Judo

- Bolos-9
- Powerlifting
- Tiro con Arco
- Tiro Olímpico

Federaciones Internacionales Específicas de Para-Deporte

Para-Deportes Integrados en Federaciones Internacionales

Ciclismo Pista - Ruta

Hípica

Tenis en Silla

Tenis de Mesa

Curling en Silla

Remo

Piragüismo

Taekwondo

Triatlón

Tiro con Arco

Bádminton

Otras Organizaciones

Otros Deportes No Paralímpicos:

- Baloncesto
- Cricket
- Ciclismo
- Fútbol / Futsal
- Balonmano
- Hockey
- Remo
- Esquí
- Taekwondo
- Tenis

inas
For para-athletes with an intellectual disability

CPISRA
acces to sport

- Frame Football
- Race Running
- Wheelchair Slalom

IFDS
Vela

INTERNATIONAL FEDERATION OF CP FOOTBALL
CP-Fútbol

EVOLUCIÓN SISTEMAS DE CLASIFICACIÓN

Stoke Mandeville Games

1948

Juegos Paralímpicos Seúl

'88 SEOUL PARALYMPICS

1988

Juegos Paralímpicos Barcelona

1992

Estrategia Clasificación

IPC
Classification Strategy

2003

Código Clasificación

2007

Código Clasificación Deportistas

2015

Modelos Buenas Prácticas

2017

Sistemas Clasificación Médicos

Sistemas de Clasificación Funcionales

Sistemas de Clasificación Específicos del Deporte y basados en Evidencias

Reina y Vilanova-Périz (2017)

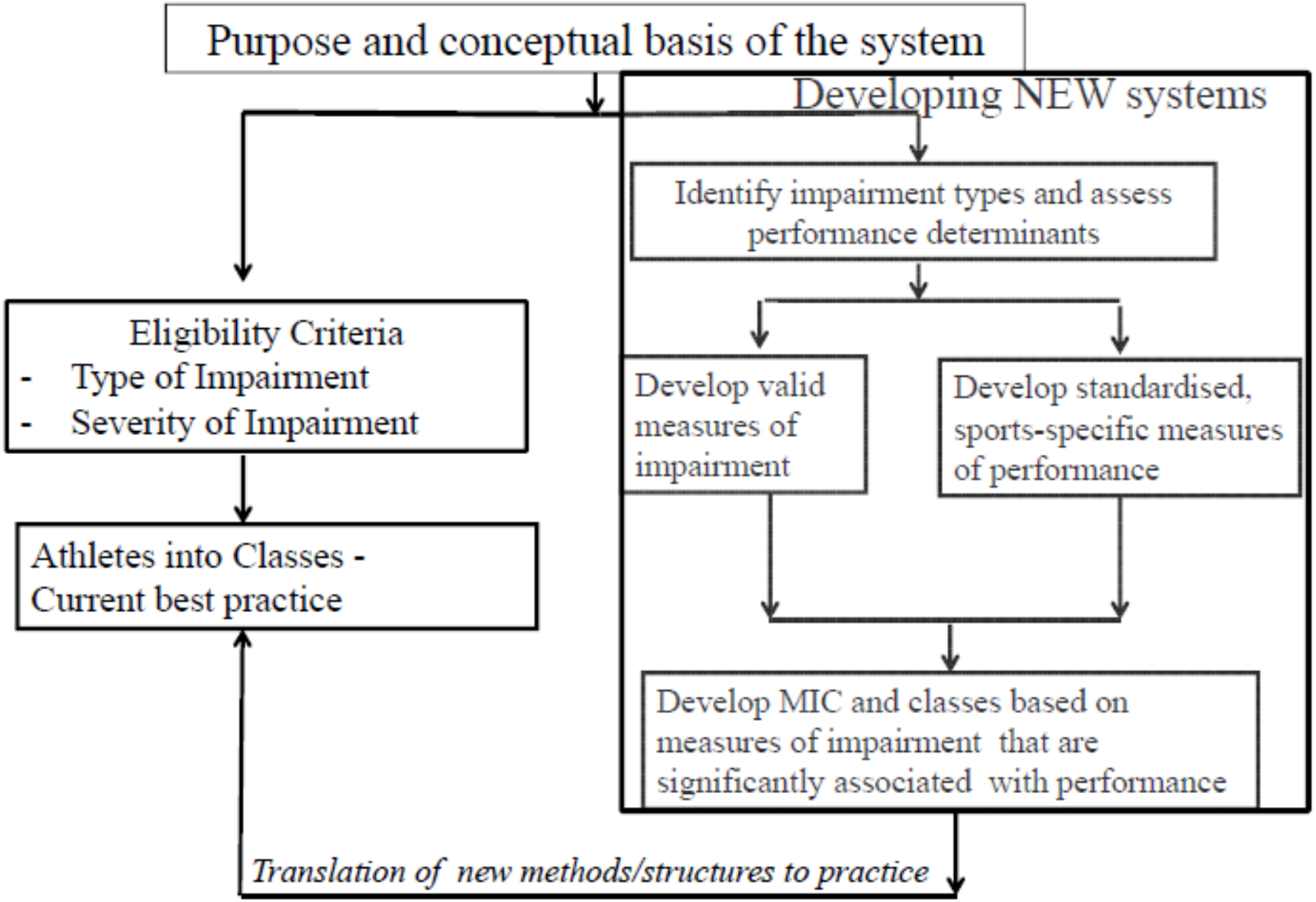
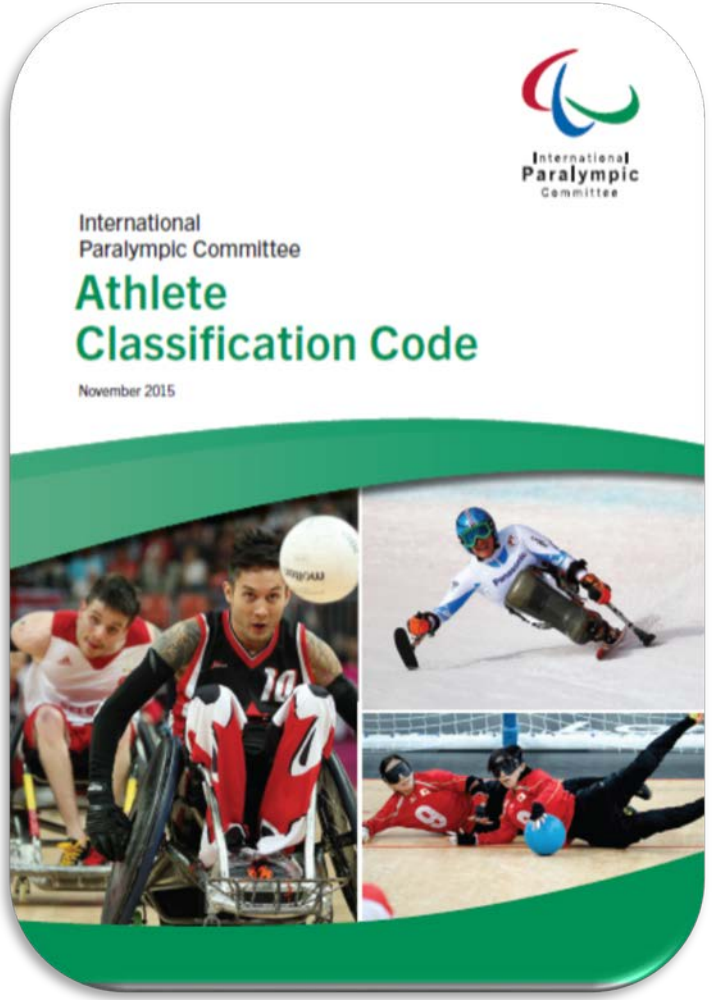


Fig 1: Enhancing Paralympic classification through science

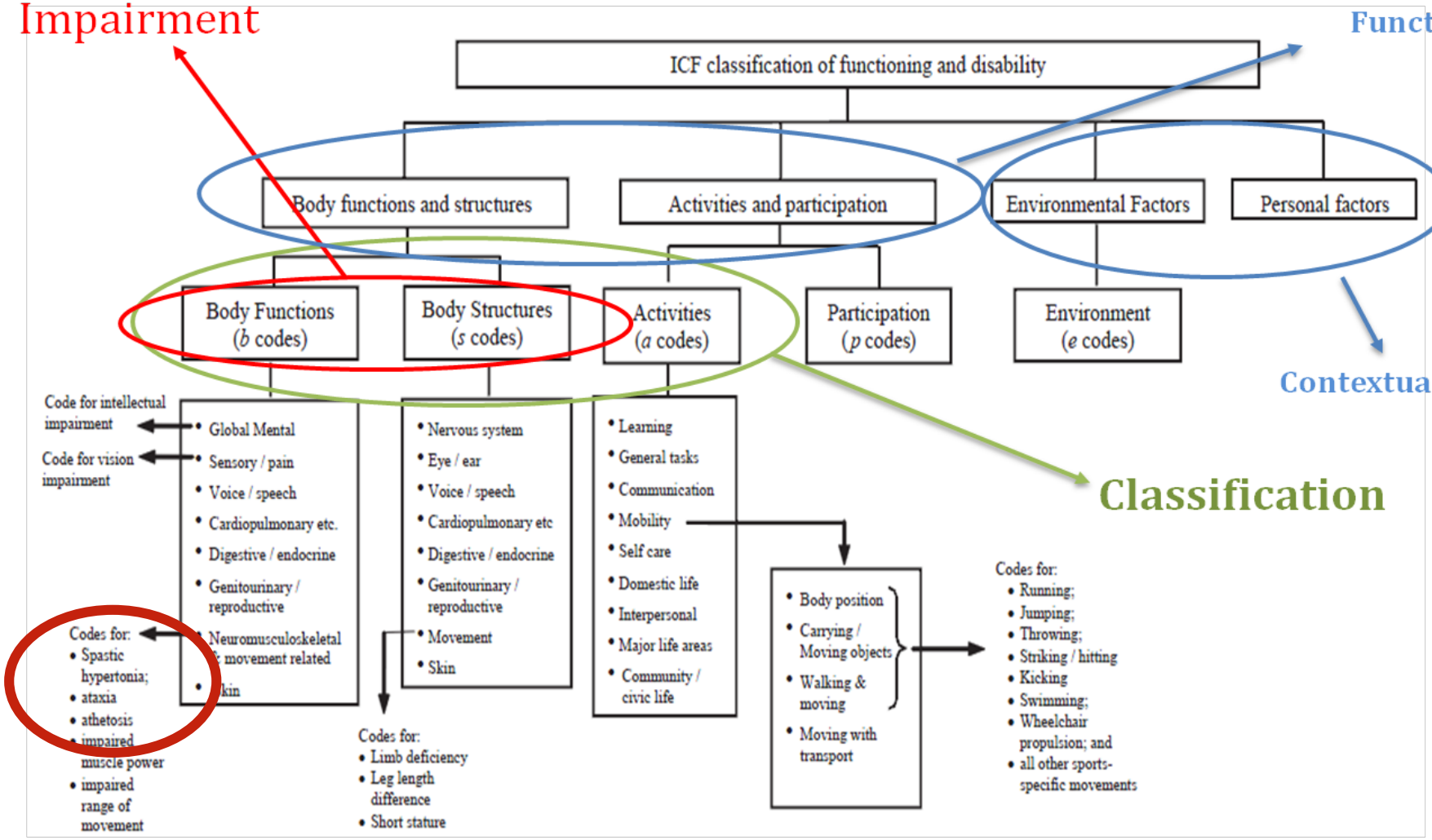
Tweedy (2017)

EVIDENCE-BASED CLASSIFICATION

- Esencial que todos los clasificadores midan los "*impairment*" (deficiencia) del mismo modo, usando:
  - Las posiciones de test descritas.
  - La localización exacta de los puntos de referencia y los métodos de medida.
  - Las escalas de valoración prescritas.
  - Una interpretación de los resultados estandarizada y objetiva.



ICF Y CLASIFICACIÓN



Tweedy & Vanlandewijck (2011)

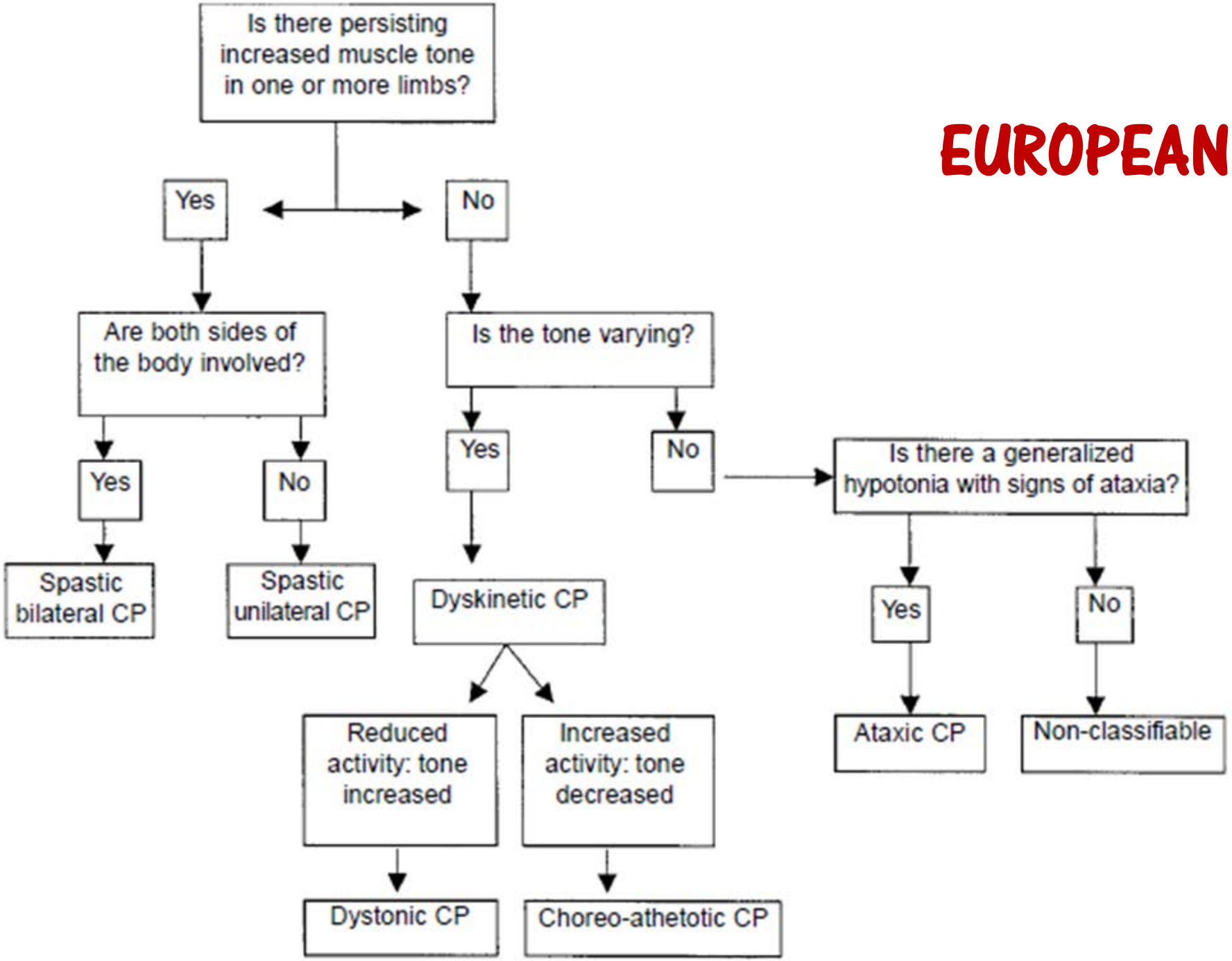
Health Conditions and Eligible Impairments

Eligible Impairments and Underlying Health Condition

- **Hypertonia**
- Athletes with hypertonia have an increase in muscle tension and a reduced ability of a muscle to stretch caused by damage to the central nervous system.
  - Examples of an Underlying Health Conditions include cerebral palsy, traumatic brain injury and stroke.
- **Ataxia**
- Athletes with Ataxia have uncoordinated movements caused by damage to the central nervous system.
  - Examples of an Underlying Health Conditions : cerebral palsy, traumatic brain injury, stroke and multiple sclerosis.
- **Athetosis**
- Athletes with Athetosis have continual slow involuntary movements.
  - Examples of an Underlying Health Conditions: cerebral palsy, traumatic brain injury and stroke.

Schwittai (2017)

EUROPEAN SURVEILLANCE



Cans et al. (2000)

EJEMPLO ELEGIBILIDAD: BOCCIA

1.2 Eligible Participants

BISFed provides an opportunity for individuals to compete in Boccia if they present with

1. A permanent severe neurological impairment in the Central Nervous System (CNS) affecting all four limbs, including:
   - spastic hypertonia,
   - dystonia,
   - athetosis
   - ataxia
2. A severe locomotor dysfunction in all four limbs of NON-Cerebral origin such as muscular skeletal disorders and limb deformities, including:
   - impaired muscle power
   - impaired passive range of movement
   - limb deficiency

   All athletes must provide medical evidence of their underlying condition and clinical diagnosis.

BISFed
Boccia International Sports Federation

2017

Medical Information

Note: The list of medical diagnosis shows examples and is not exhaustive.

Eligible Impairment (tick)	Name medical diagnosis relevant to impairment type (tick or add)	Documents to support the diagnosis (tick or add)
□ Impaired muscle power	□ Spinal Cord Injury □ Muscular Dystrophy □ Spina Bifida □ Polio Myelitis □ Multiple sclerosis □ Other_____	□ Medical Report □ ASIA scale □ Electromyography □ MRI □ X-rays □ Biopsy □ Other_____
□ Impaired passive range of motion	□ Arthrogryposis □ Joint Contractures □ Trauma □ Other_____	□ Medical Report □ X-rays □ Photographs □ Goniometric measures of joint limitations
□ Ataxia □ Athetosis □ Hypertonia	□ Cerebral Palsy □ Traumatic brain injury □ Multiple Sclerosis □ Stroke □ Other_____	□ Medical Report □ Modified Ashworth Scale □ Cerebral MRI or TC scan □ Other_____
□ Leg length difference	□ Trauma □ Dysmelia □ Other_____	□ Medical Report □ X-rays □ Photograph □ Other_____
□ Short stature	□ Achrondoplasia □ Osteogenesis Imperfecta □ Growth Hormone Dysfunction □ Other_____	□ Medical Report □ X-rays □ Photograph □ Other_____

MDF

FEDDF
FEDERACIÓN ESPAÑOLA DE DEPORTES DE PERSONAS CON DISCAPACIDAD FÍSICA

FEDPC
Federación Española de Deportes de Personas con Parálisis Cerebral y Daño Cerebral Adquirido

World Para Athletics (2017)

Medical history:

Athlete's condition is:	☐ Stable	☐ Progressive	☐ Fluctuating	☐ Permanent
Age of onset:	(yyyy)		☐ Congenital	
Past treatments:				
Current treatments:				
Anticipated future treatments:				

Additional details on medical diagnosis (if needed):

Medications and reason for prescription:

ASSESSING COORDINATION

Cerebral palsy
Stroke
Traumatic brain injury
Multiple sclerosis

Ataxia
Athetosis
Hypertonia

Impaired range of movement

Impaired strength

Impaired coordination = Coordination is the ability to voluntarily execute fluid, accurate and controlled movements rapidly

Bilateral/unilateral

Connick (2017)

The University Of Queensland
AUSTRALIA

HIPERTONÍA

Espasticidad

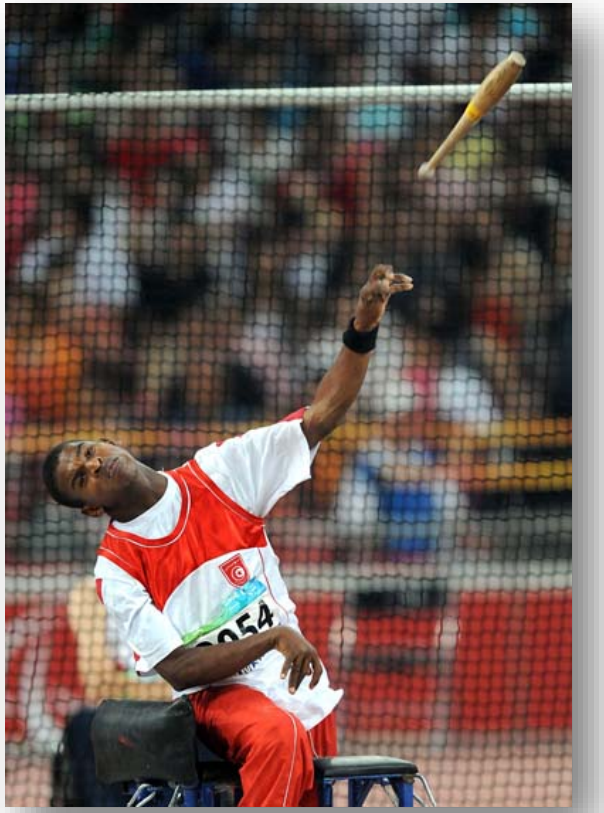
- Velocidad-dependiente
- Resistencia súbita inicial, seguida de relajación
- Músculos antigravitatorios
- Puede verse acompañada de clonus

Rigidez

- Resistencia al movimiento pasivo
- No dependiente de la velocidad de la movilización
- Relativamente uniforme en todo el ROM
- Mas común patrón flexor

Distonía

- Puede ser focal o general
- Contracciones fuertes y sostenidas que causan torsión
- Patrón muy variable



Babinski · Reflejos · Atrofia · Clonus → Extremidad con tono aumentado

ESPASTICIDAD

El patrón de postura y movimiento está alterado.

Reflejos de estiramiento exagerados (Hiperexcitabilidad)

Trastorno motor caracterizado por el aumento del tono muscular dependiente de la velocidad

Predomina en grupos musculares antigravitatorios.

Está presente en el síndrome de motoneurona superior

ESPASTICIDAD

- En la exploración:
  - Aumento del tono muscular
  - Aumento de los reflejos profundos.
  - Clonus.
  - Babinsky
  - **Movilidad poco diferenciada, en masa.**
  - **Disminución de la fuerza (aunque el tono sea alto).**
  - **Pérdida de selectividad de la orden nerviosa.**
  - Movimientos asociados.
  - **Falta de destreza y coordinación.**

Eur J Sport Sci. 2016 Sep;16(6):669-76. doi: 10.1080/17461391.2015.1132775. Epub 2016 Jan 11.

How much does lower body strength impact Paralympic running performance?

Beckman EM[1], Connick MJ[1], Tweedy SM[1].

⊕ Author information

Abstract

OBJECTIVES: Development of evidence-based methods of Paralympic classification requires research quantifying the relative strength of association between ratio-scaled measures of impairment and athletic performance. The purpose of this study was to quantify the extent to which muscle strength affects running performance in runners with and without brain impairment.

DESIGN: Cross-sectional study.

METHODS: Participants were 41 male runners: 13 with brain impairments (RBI) and 28 non-disabled (NDR). All participants completed a maximal 60-m sprint and a novel battery of three lower limb isometric strength tests.

RESULTS: RBI showed significantly lower strength scores compared with NDR on the more affected side in leg flexion (176 vs. 243 N), leg extension (993 vs. 1661 N) and plantarflexion (824 vs. 1457 N). Significant differences were also seen on the less affected side in plantarflexion (1072 vs. 1508 N). RBI were significantly slower in the acceleration phase (0-15 m) (3.2 s ± 0.3 vs. 2.8 s ± 0.2) and top speed phase (30-60 m) (4.3 s ± 0.6 vs. 3.8 s ± 0.3). Correlation analysis showed stronger relationships between strength and running performance in RBI than NDR; however, the correlations were not significant.

CONCLUSIONS: This study evaluated measures to assess strength for the purposes of classification and found that the measures were significantly different in RBI compared with NDR indicating the tests were able to capture strength impairment in this population. This study indicates that strength may be an important impairment type to assess in this population, as impairments of muscle strength may influence the outcome of running performance in athletes with more severe impairments.

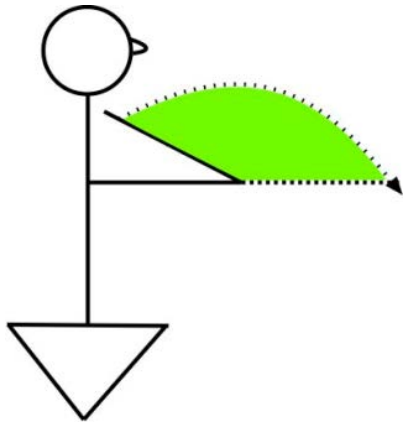
KEYWORDS: Athletic performance; disability sport; impairment; lower extremity; running; strength

ESPASTICIDAD

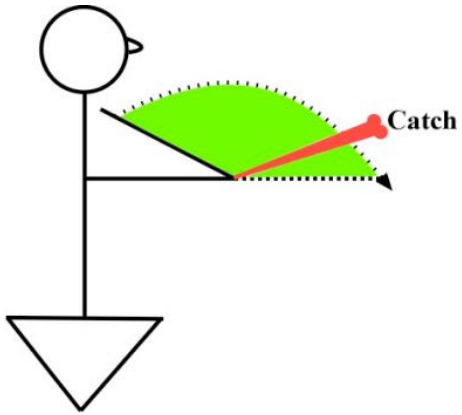
Escala de Ashworth

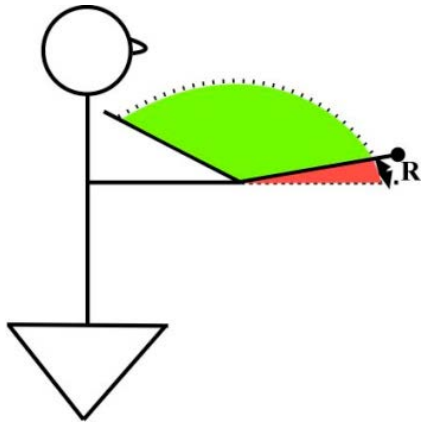
0	No hay cambios en la respuesta del músculo en los movimientos de flexión o extensión.
1	Ligero aumento en la respuesta del músculo al movimiento (flexión ó extensión) visible con la palpación o relajación, o solo mínima resistencia al final del arco del movimiento.
1+	Ligero aumento en la resistencia del músculo al movimiento en flexión o extensión seguido de una mínima resistencia en todo el resto del arco de movimiento (menos de la mitad).
2	Notable incremento en la resistencia del músculo durante la mayor parte del arco de movimiento articular, pero la articulación se mueve fácilmente.
3	Marcado incremento en la resistencia del músculo; el movimiento pasivo es difícil en la flexión o extensión.
4	Las partes afectadas están rígidas en flexión o extensión cuando se mueven pasivamente

ESPASTICIDAD

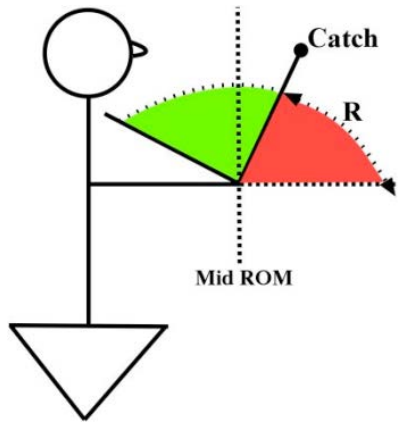


GRADO 0

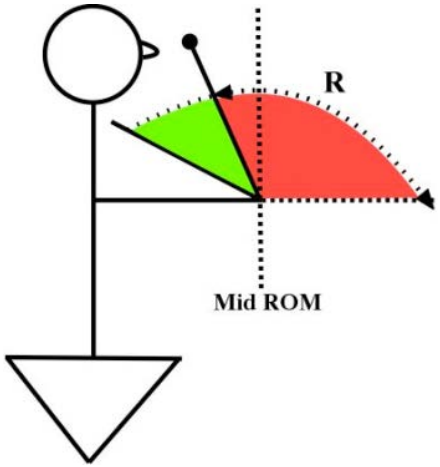




GRADO 1



GRADO 1+



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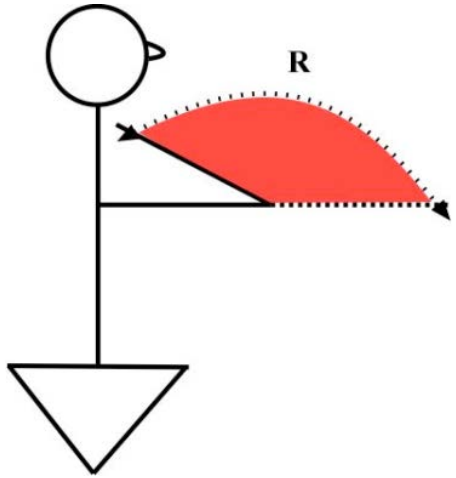
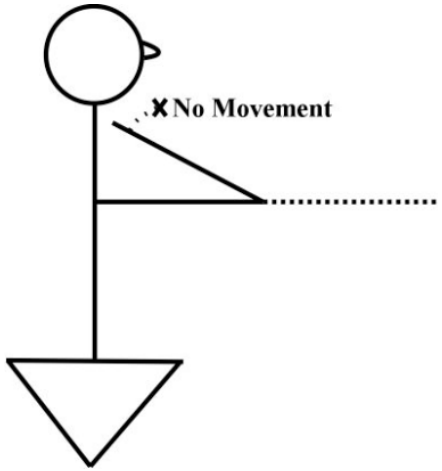


GRADO 3



GRADO 4

ESPASTICIDAD

Australian Spasticity Assessment Scale (ASAS)

0	No catch on rapid passive movement (RPM). “no spasticity”
1	Catch occurs on RPM followed by release. There is no resistance to RPM throughout rest of range
2	Catch occurs in second half of available range (after halfway point) during RPM and is followed by resistance throughout remaining range
3	Catch occurs in first half of available range (up to and including halfway point) during RPM and is followed by resistance throughout remaining range
4	When attempting RPM, the body part appears fixed but moves on slow passive movement

ESPASTICIDAD

Australian Spasticity Assessment Scale (ASAS)

1. Determina el rango de amplitud del movimiento.
2. Determina si está presente la resistencia/bloqueo: "catch" velocidad-dependiente cuando realizamos el movimiento.
3. Determina en qué parte del rango de movimiento ocurre la resistencia/bloqueo "catch".
4. Determina si hay más resistencia después del bloqueo o "catch".

Love, Gibson, & Blair (2012)

2.1 MIC and Methods of Assessment for wheelchair racing, running and jumping

2.1.1 Hypertonia

In Para athletics, spasticity grades refer to the Ashworth scale (1):

- Grade 0: No increase in tone
- Grade 1: Slight

*As the description indicates, Dystonia may equally be classified as a type of Hypertonia OR a type of involuntary movement pattern.

movement difficult

flexion or extension

Hypertonia is defined as increased muscle tone which is caused by central nervous system impairment and which results in increased resistance to passive lengthening of the muscle (4). One of the following types of hypertonia must be clearly clinically detectable – i.e., grade 1 on the Ashworth scale (1) at the wrist, elbow, shoulder, ankle, knee or hip.

Spastic hypertonia: Is defined as a velocity-dependent resistance to passive movement with a clasp-knife type of resistance (4). Clasp-knife resistance is resistance that is initially high and followed by a sudden relaxation. Velocity dependence increases as the speed of the passive movement increases, the resistance becomes greater and starts earlier in the range.

World Para Athletics (2017)

EJEMPLO: MIC EN CP-FOOTBALL

Section II.1. Minimum Impairment Criteria for Hypertonia

2.2. Spasticity grade 2 in one (1) muscle (Article 5.19) of lower limb;

2.3. Spasticity grade 1+ in two (2) different muscle groups (Article 5.19) of the same leg;

2.4. Bilateral Spasticity 1+ in the same muscle group;

2.5. Spasticity grade 1+ in one (1) muscle (Article 5.19) of lower limb; AND

- 2.5.1. Spasticity grade 3 in Biceps and/or Triceps; AND/OR
- 2.5.2. Spasticity grade 3 in Shoulder muscles.
- 2.5.3. No MIC for wrist and/or supination/pronation

2.6. Sustained clonus in one (1) muscle of lower limb, repeatable all the times.

2.7. Contracture in ankle of at least 0° dorsiflexion (dorsiflexion is not possible) AND neurological upper motor neuron signs of:

- 2.7.1. Noticeably brisk reflexes or clear difference in reflexes left vs. right.
- 2.7.2. Positive uni- or bilateral Babinski
- 2.7.3. Clonus > 3-4 beats (repeatable)

INTERNATIONAL FEDERATION OF CP FOOTBALL

2017

EJEMPLO: MIC EN CP-FOOTBALL

	Calfs	Hamstrings	Adductors
FT1 – A/C	MAS Grade 2 – 3; and	MAS Grade 2; or	MAS Grade 2
FT2 – A/C	MAS Grade 2 – 3; and	MAS Grade 1+; or	MAS Grade 1+
	MAS Grade 3	--	--
FT3 – A/C	MAS Grade 2; and	MAS Grade 1; or	MAS Grade 1
	MAS Grade 2 in only one of the (group) muscles		
	MAS Grade 1+ in at least two of the (group) muscles of the same leg		
FT3 – C	MAS 1+ in only one (group) muscle plus MAS Grade 3 in biceps and/or triceps and/or shoulder muscles (No MIC for wrist or supination/pronation)		

INTERNATIONAL FEDERATION OF CP FOOTBALL

2017

ATAXIA

Se caracteriza por:

- Patrón alterado de postura y/o movimiento.
- Suele presentar hipotonía
- **Incoordinación muscular.**
- Temblor intencional.
- Déficit de equilibrio.

Problemas en:

- Fuerza.
- Velocidad.
- **Coordinación.**
- Equilibrio.

- Finger-to-finger test
- Finger-to-nose test
- Toe-to-finger test
- Heel draw test
- Talón-punta en línea recta
- Marcha
- .....

2.1.2 Ataxia

Ataxia refers to an unsteadiness, incoordination or clumsiness of volitional movement (4). Eligible ataxias must result from either motor or sensory nervous system dysfunction. Motor ataxias most frequently result from malformation or damage to the cerebellum and are often associated with hypotonia (4). Motor ataxias are poorly compensated for by visual input. Sensory ataxias most frequently result from lower motor neuron damage or spinal cord disease, affecting vestibular function or proprioceptive function. Visual input can help compensate for sensory ataxia and so sensory ataxias are often more evident when eyes are closed (4).

When evaluating an athlete the Classification Panel should be satisfied that the ataxic movement is demonstrable and clearly evident during classification and that the observed ataxia is due to motor or sensory nervous system dysfunction as described. Tests that may be useful for determining this include but are not limited to:

- Finger-to-nose test (athlete touching own nose from the crucifix position);
- Finger-to-finger test (classifier presents his/her index finger and asks the athlete to touch it with his/her own index finger);
- Toe-to-finger test (classifier presents his/her index finger and asks the athlete to touch it with his/her toe);
- Heel shin test (i.e., draw the heel of one leg along the length of the contralateral shin, from ankle to knee and then in the reverse direction);

World Para Athletics (2017)

TEST ATAXIA DE SARA

3.6.1. *Gait*

Athlete is asked (1) to walk 5 m parallel to a wall including a half-turn (turn around to face the opposite direction of gait) and (2) to walk in tandem (heels to toes) without support 5 m on a line:

0 Normal, no difficulties in walking, turning and walking tandem (up to one misstep allowed);

1 Slight difficulties, only visible when walking 10 consecutive steps in tandem;

2 Clearly abnormal, tandem walking >10 steps not possible;

3 Considerable staggering, difficulties in half-turn, but without support;

4 Marked staggering, intermittent support of the wall required;

5 Severe staggering, permanent support of one stick or light support by one arm required;

6 Walking > 10 m only with strong support (two special sticks or stroller or accompanying person);

TEST ATAXIA DE SARA

3.6.3. Finger chase

Athlete sits on the bench and the Classifier in front performs five (5) consecutive sudden and fast pointing movements in unpredictable directions in a frontal plane, at about 50 % of Athlete´s reach. Movements have an amplitude of 30 cm and a frequency of one (1) movement every 2 s. Athlete is asked to follow the movements with his or her index finger, as fast and precisely as possible. Average performance of last 3 movements is rated:

0 No dysmetria

1 Dysmetria, under/ overshooting target < 5 cm

2 Dysmetria, under/ overshooting target 5-15 cm

3 Dysmetria, under/ overshooting target > 15 cm

4 Unable to perform 5 pointing movements

TEST ATAXIA DE SARA

3.6.4. Nose-finger test

Athlete sits on the bench and is asked to point repeatedly with his or her index finger from his/her nose to examiner's finger which is in front of the Athlete at about 90% of Athlete's reach. Movements are performed at moderate speed. Average performance of movements is rated according to the amplitude of the kinetic tremor:

0 No tremor

1 Tremor with an amplitude < 2 cm

2 Tremor with an amplitude 2-5 cm

3 Tremor with an amplitude > 5 cm

4 Unable to perform 5 pointing movements

TEST ATAXIA DE SARA

3.6.6. Heel-shin slide

Athlete lies on bench, without sight of his/her legs. He/she is asked to lift one leg, point with the heel to the opposite knee, slide down along the shin to the ankle, and lay the leg back on the examination bed. The task is performed three (3) times. Slide-down movements should be performed within 1 s. If Athlete slides down without contact to shin in all three trials, rate 4.

0 Normal

1 Slightly abnormal, contact to shin maintained

2 Clearly abnormal, goes off shin up to 3 times during 3 cycles

3 Severely abnormal, goes off shin 4 or more times during 3 cycles

4 Unable to perform the task

TEST ATAXIA DE SARA

3.7. Ataxia is also evaluated by some tests from the **Berg Balance Scale (BBS)**:

3.7.1. Reaching forward with Outstretched Arm while Standing

Athlete lifts arms to 90 degrees, stretching out the fingers and reaches forward as far as he or she can. The Classifier places a ruler at the end of fingertips when arm is at 90 degrees. Fingers should not touch the ruler while reaching forward. The recorded measure is the distance from where the end of the fingers start to where the fingers reach while the subject is in the most forward leaning position. When possible, the player must attempt to use both arms when reaching to avoid rotation of the trunk.

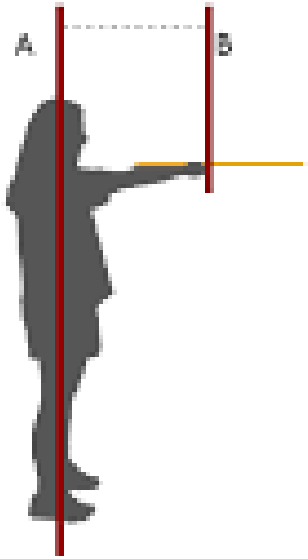
0 loses balance while trying/requires external support

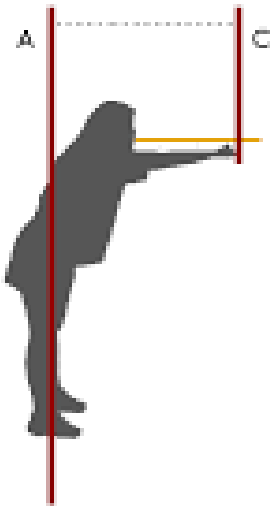
1 reaches forward but needs supervision

2 can reach forward 5 cm

3 can reach forward 12 cm

4 can reach forward confidently 25 cm





EJEMPLO: MIC EN CP-FOOTBALL

Gait	0	1	2	3	4	5	6	7	8
Stance	0	1	2	3	4	5	6	7	
Finger chase	0	1	2	3	4				
Nose-finger chase	0	1	2	3	4				
Fast alternating hands mov.	0	1	2	3	4				
Heel-shin slide	0	1	2	3	4				
	NE		**FT3**	**FT2**	**FT1**				

DISCINÉTICA (ATETOSIS…)

AFECTACIÓN SELECTIVA DE LOS GANGLIOS DE LA BASE

Se caracteriza por:

- Una fluctuación y cambio brusco del tono muscular
- Presencia de movimientos involuntarios, **incontrolados**, recurrentes.
- Persistencia de reflejos primitivos.

En función de la sintomatología se presenta:

- Forma coreoatetósica
- Forma distónica.
- Mixta

- **Dystonic** CP is dominated by abnormal postures (may give the impression of hypokinesia: reduced activity, i.e. stiff movement) and hypertonia (tone fluctuating, but easily elicitable tone increase). Characteristics are involuntary movements, distorted voluntary movements, and abnormal postures due to sustained muscle contractions (slow rotation, extension, flexion of body parts).

DISTONIA

- Variabilidad del tono muscular.
- Contracción en masa por falta de relajación del antagonista.
- Puede ser mas fija (mayor contracción en masa) o más variable.
- No hay atrofia.
- Buena fuerza pero mal regulada.
- Pocas contracturas.
- No existencia de fenómenos tróficos (grosor y longitud).
- Las deformidades dependen de mayor o menor variabilidad de contracción.
- Relajación en estado de reposo.
- Factores emocionales en primer término.
- A mayor voluntariedad mayor contracción distónica.

COREOATETOSIS

- No implican contracción fija.
- **Falta de control en los movimientos** (Diferencia entre corea y atetosis).
- Gran diferencia entre valoración estática y dinámica (+ que en la distonía)
- Repercusión fundamental en la motricidad manual, control postural y **coordinación**.
- Mayor influencia en la actividades manipulativas, las más precisas y menos en la motricidad automática (carreras).
- Factores emocionales muy importantes.

- **Choreo-Athetotic** CP is dominated by: hyperkinesia (increased activity, i.e. stormy movement) and hypotonia (tone fluctuating, but mainly decreased).
  - **Chorea** means rapid involuntary, jerky, often fragmented movements.
  - **Athetosis** means slower, constantly changing, writhing, or contorting movements.

DISCINÉTICA (ATETOSIS…)

- La puntuación es de naturaleza **CUALITATIVA**.
- La mesa de clasificación debe estar convencida de que la atetosis es **CLARAMENTE OBSERVABLE** en una de las siguientes acciones:
  - Movimiento involuntario de los dedos o MMSS a pesar de que el atleta trata de permanecer inmóvil.
  - Movimiento involuntario de los dedos de los pies o EEII a pesar de que el atleta trata de permanecer inmóvil.
  - Balanceo corporal involuntario en estático.
  - Postura atetósica característica en extremidades y/o tronco.
  - Dificultad para realizar movimientos explosivos o enérgicos.
  - Dificultad para detenerse después de correr a toda velocidad.
  - Falta de control al cambiar de posición.

DISCINÉTICA

- Movimientos y posturas involuntarias
- Localización en ganglios basales
- Al menos 1 de los siguientes test:
  - Movimientos involuntarios de dedos o EE.SS
  - Movimientos involuntarios de dedos pie o EE.II
  - Balanceo corporal en estático
  - Postura atetósica

World Para Athletics (2017)

Section III.2. Dyskinesia

3.5. Dyskinesia is evaluated by a modified version of the **Dyskinesia Impairment Scale** -DIS- (Monbaliu et al. 2012) to Evaluate Dyskinesia (D), Chorea (C) or Athetosis (A). The scale includes the next factors:

3.5.1. Body Regions according the regions descriptions included in Table 5.

3.5.2. Assessment of the Amplitude of movements are:

0 D/CA is absent

1 D/CA is present in < 10% of range of motion

2 D/CA is present in < 25% of range of motion

3 D/CA is present between 25-50% of range of motion

4 D/CA is present in > 50% of range of motion

3.5.3. Assessment of the Amplitude of movements are:

0 D/CA is absent

1 D/CA is present in < 10% of observed time

2 D/CA is present in < 25% of observed time

3 D/CA is present between 25-50% of observed time

4 D/CA is present in > 50% of observed time

e. Trunk forward flexion and returning to midline (in sitting)
   - Ask the athlete to bend all the way forwards and then return back to their original position (x6)
f. Shoulder abduction with the throwing arm (in sitting)
   - Ask the athlete to lift their arm up to their side and raise it above their head (x6)
g. Reaching and moving the ball from one side to the other
   - Ask the athlete to take a ball from a table (or the floor for foot player) in front of them and move it to the opposite side and then back to the original position (x2)
   - The ball should be placed within reach, but ensure that the movements include:
     - Forward reach, lateral reach, crossing the midline
   - You can use the athlete's wheelchair as a guide (have the ball outside the width of the chair and place the ball to the other side of the chair)
h. Foot player – Alternate heel/toe tapping
   - Ask the athlete to do alternate heel/toe taps with the leg they use to propel the ball (x6)

EJEMPLO: MIC EN BOCCIA

Minimal Impairment Criteria BC5

- Topography: Impairment(s) affect all four limbs
- Impairment: Spasticity
  - Athlete has at least Grade 1 in muscle group(s) that affect the propulsion of the ball into the field of play (Australian Spasticity Assessment Scale)
- Impairment: Athetosis/Dystonia
  - Athlete exhibits impairment for between less than 25% Duration and less than 25% Amplitude of range, in limb propelling the ball in to the field of play. (Adapted from Dyskinesia Impairment Scale)
- Impairment: Ataxia
  - Athlete has evidence of ataxia in finger nose and finger chase assessments and incoordination is observable when Athlete propels the ball into the field of play

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2017

SMVC

Section III.4. Selective Motor Control

3.8. Selective Voluntary Motor Control (SVMC) is the ability to isolate the activation of muscles in a selected pattern by voluntary movement or posture (Sanger et al., 2006).

3.9. The Selective Control Assessment of the Lower Extremity (SCALE) tool (Fowler et al., 2009), which analyzes monarthric active movement, will be used in rapid heel-toe test (see Table 6):

0 = no selective control, no (or minimal) contraction of the demanded muscles

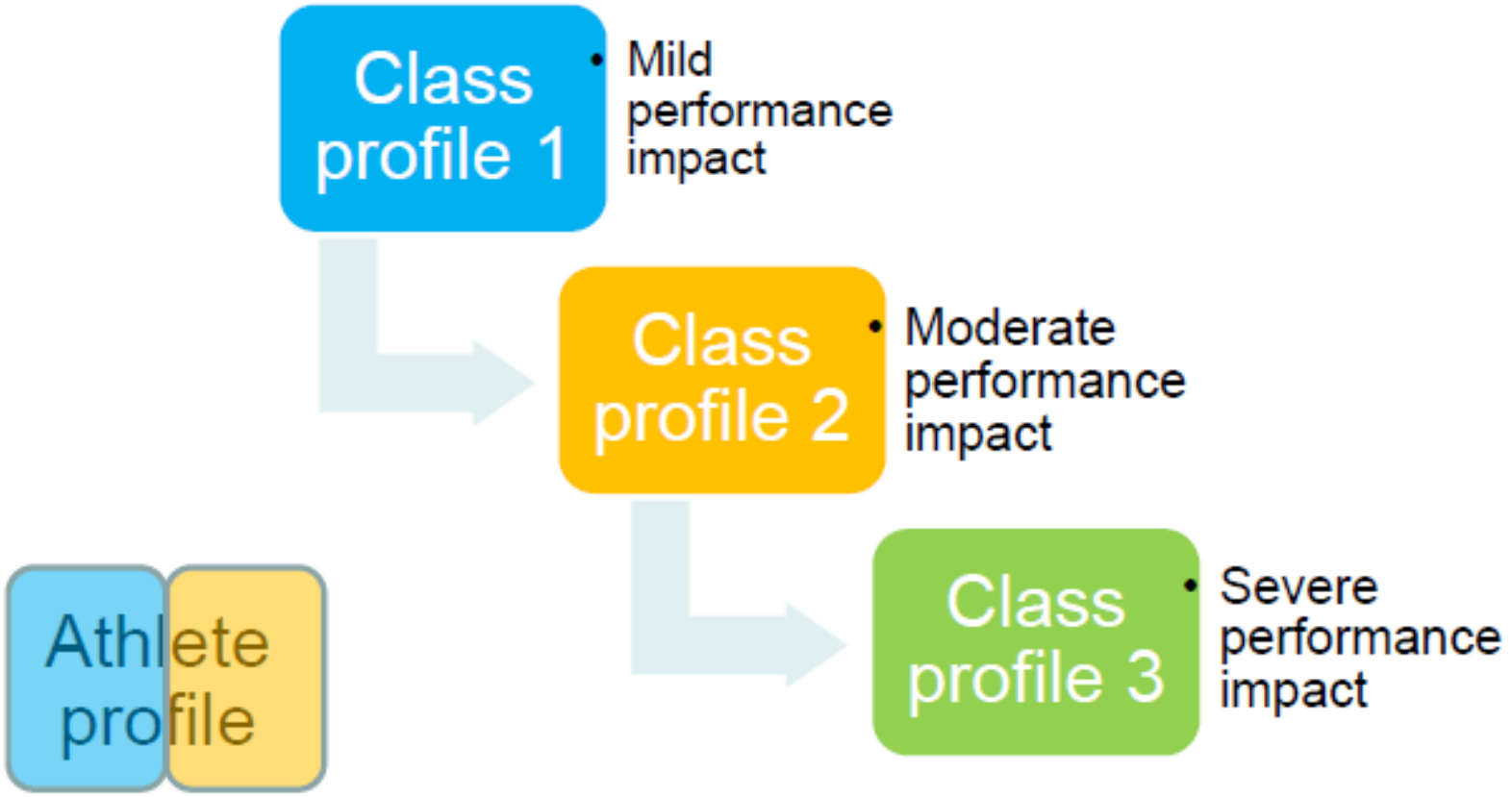
0.5 = small contraction, but almost no motion, and/or a lot of cocontraction

1 = mild selective control, not all muscles working in a correct way, no smooth motion, with cocontraction (not always), limited range

1.5 = good contraction, with correct muscles, but slightly limited range because of cocontraction or no perfect smooth motion

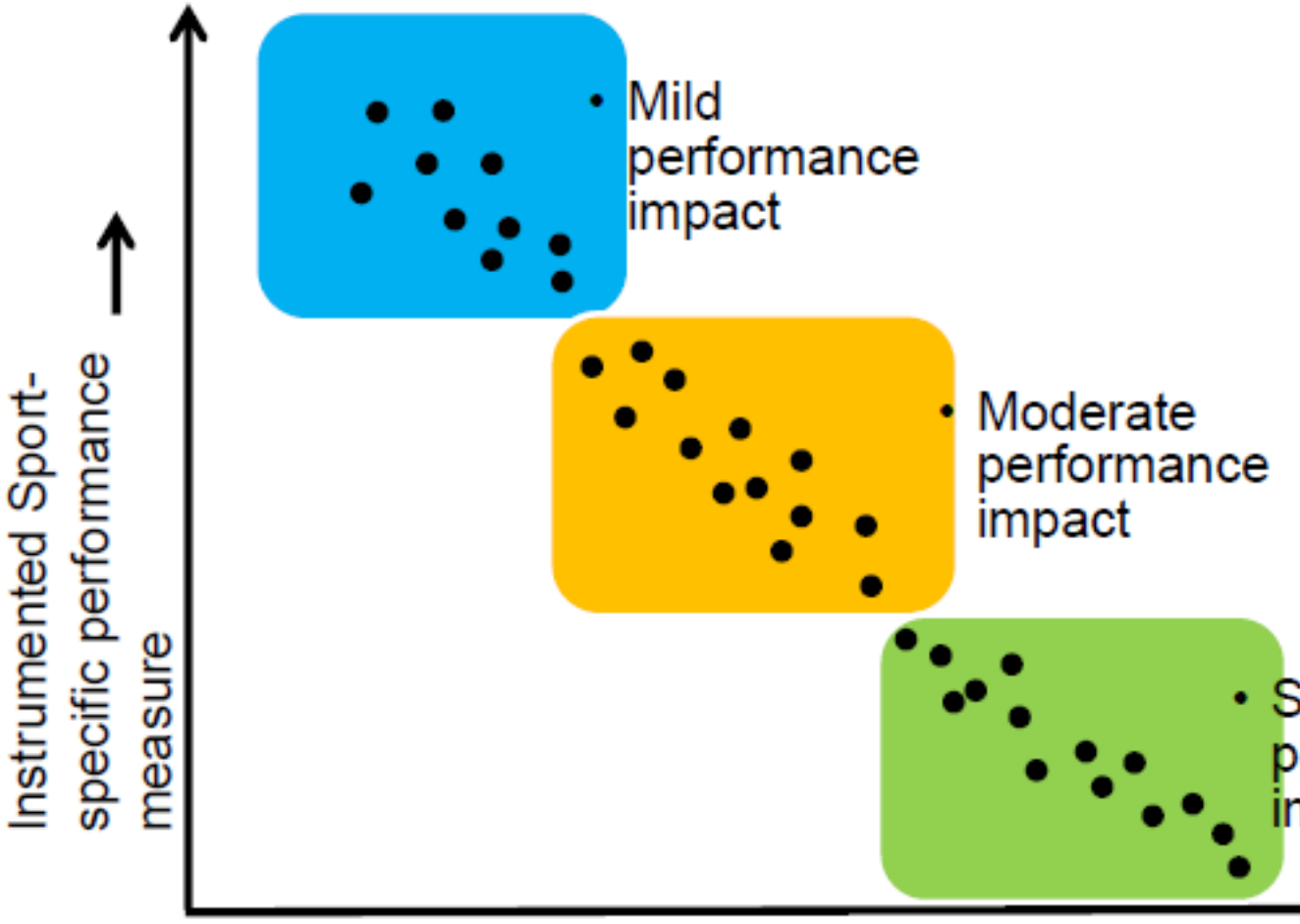
2 = perfect control, perfect contraction with correct muscles

CURRENT METHODS – ASSESSING COORDINATION



Connick (2017)

EVIDENCE-BASED METHOD – ASSESSING COORDINATION



Impairment measures are required to be:

- Impairment-specific
- ratio-scaled
- precise
- accurate
- related to performance

Connick (2017)

ASSESSING COORDINATION - STEPS

Step 1: Identify target sport and impairment type/s to be classified

Step 2: Develop theoretical model of the determinants of sports performance

Step 3a: Develop valid measures of impairment/s

Step 3b: Develop standardised, sport-specific measure/s of determinants of performance.

Step 4 – identify the key impairment tests – those that affect performance

Step 5: Build the classification structure, and develop methods to classify

Connick (2017)

LIMITACIONES EN LA ACTIVIDAD

- ***Coordination***, defined as the ability to voluntarily execute fluid, accurate movements rapidly.
- ***Balance***, defined as the ability to maintain the line of gravity (vertical line from center of mass) of a body within the base of support with minimal postural sway.
- ***Symmetry***, defined as the correspondence and/or movement similarity on opposite sides of a dividing line or plane.
- ***Range of movement*** **(ROM)**, defined as the full movement or optimal potential of a joint, usually its range of flexion and extension. Includes follow through.
- ***Performance***, activity limitation observed during the execution of a particular task or sport skill.

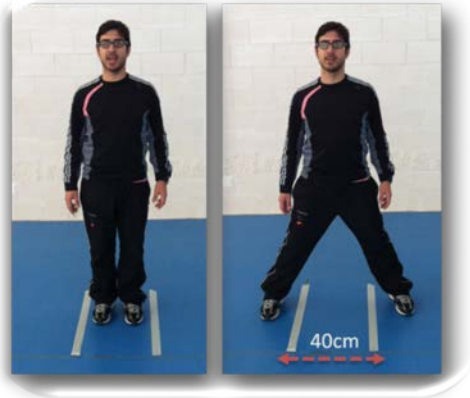
Reina, R., Sarabia, J., Sánchez, A., Beckman, E., Connick, M. y Tweedy, S. (2015)

Test Valoración

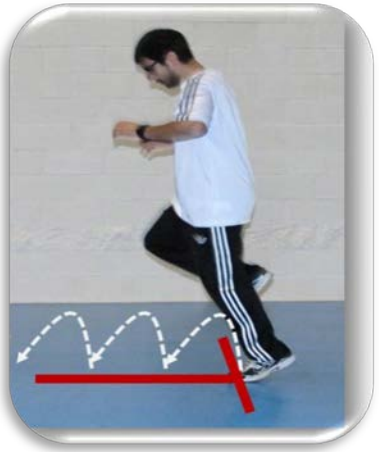
Extremidades Superiores	Extremidades Inferiores
Frotar Manos	Marcha de puntillas
Rápida Pronación / Supinación	Marcha sobre talones
Manipulación Pelota	Salto unipodal
	Pasos laterales
	Cruce de piernas D-I
	Skipping
	Talones - Glúteos

Test Valoración

Split jumps



Side stepping



4 bounds distance
One leg bounce

Salto horizontal

Flexión
plantar / dorsal

Running on
place

EJEMPLO: PARA-NATACIÓN

World Para Swimming

World Para Swimming

2017

5 Physical Assessment - Coordination Testing

5.1 Coordination Testing should be undertaken for Athletes with coordination Impairment (Hypertonia, Ataxia or Athetosis) or an eligible neurological disorder that exhibits in a similar fashion, including spasticity.

5.2 All coordination tests must be carried out as repetitions of sequences of movements and with variable speed. The resulting pattern of movement will be allocated a score in the range 0-5 as follows (Table 5).

Table 5 – *Scoring of Coordination Testing*

5	Controlled movement over the full range
4	At increasing pace, nearly full range of movement with slight spasticity and slight increase in muscle tone and/or slight coordination problems
3	At increasing pace, moderate range of movement, moderate spasticity with tone restricting movement and/or moderate coordination problems
2	Severely restricted range of movements with severe spasticity-hypertonic muscle stiffness and/or severe coordination problems
1	Very severely restricted range of movement due to severe hypertonic muscle stiffness and/or very minimally coordinated movements
0	no movement

Med Sci Sports Exerc. 2015 Oct;47(10):2216-23. doi: 10.1249/MSS.0000000000000643.

How Much Do Range of Movement and Coordination Affect Paralympic Sprint Performance?

Connick MJ[1], Beckman E, Spathis J, Deuble R, Tweedy SM.

Author information

Abstract

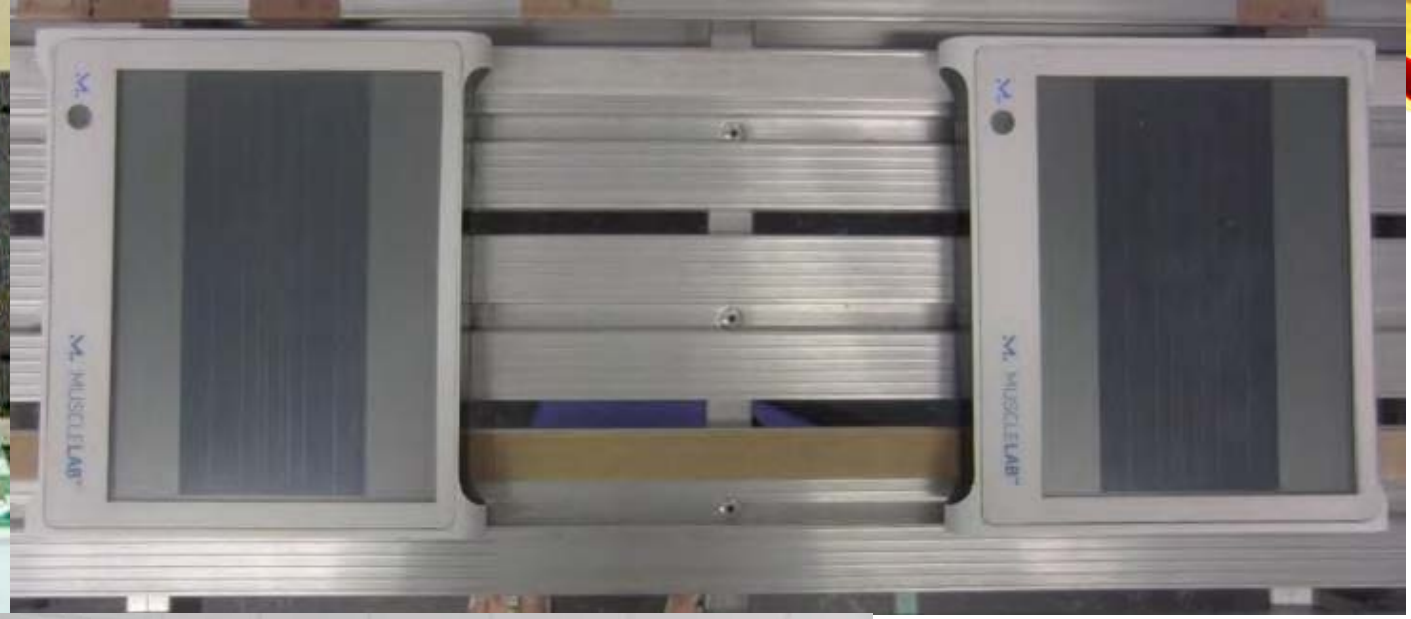
INTRODUCTION: Development of evidence-based methods of paralympic classification requires research quantifying the relative strength of association between ratio-scaled measures of impairment and sports performance. To date, no such research has been conducted. The purpose of this study was to quantify the extent to which range of movement (ROM) and coordination affect running performance in runners with and without brain impairment.

METHODS: Participants were 41 male runners, 13 with brain impairments (RBI) and 28 nondisabled (NDR). All participants completed a maximal 60-m sprint as well as a novel battery of five lower limb ROM tests and three lower limb coordination tests.

RESULTS: In the coordination tests, RBI showed significantly slower mean movement times compared to NDR on all measures (e.g., 0.54 s ± 0.12 s vs 0.34 s ± 0.05 s). Runners with brain impairments had significantly lower range of movement on five of ten measures (e.g., 25.9° ± 5.4° vs 37.0° ± 6.0°) and had significantly slower acceleration (0-15 m) (3.2 s ± 0.3 s vs 2.8 s ± 0.2 s) and top speed (30-60 m) (4.3 s ± 0.6 s vs 3.8 s ± 0.3 s). Five ROM measures significantly correlated with sprint performance in RBI and did not significantly correlate with sprint performance in NDR, satisfying convergent and divergent validity criteria. These individual tests explained 38% to 58% of the variance in sprint performance in RBI.

CONCLUSION: This is the first study to quantify the extent to which eligible impairments affect performance in a paralympic sport. Five of the ROM measures significantly affected sprint performance in RBI and were deemed valid for the purposes of classifying impairments in classes T35-T38. This study is an important methodological step toward development of evidence-based methods of classifying impairments in classes T35-T38 and provides practical methodological guidance to researchers in this field.

PMID: 25706295 DOI: 10.1249/MSS.0000000000000643



Connick (2017)

APLICACIÓN A IM

J Mot Behav. 2016;48(2):164-71. doi: 10.1080/00222895.2015.1058744. Epub 2015 Jul 16.

Using Fitts' Law to Detect Intentional Misrepresentation.

Deuble RL[1], Connick MJ[1], Beckman EM[1], Abernethy B[1], Tweedy SM[1].

⊕ **Author information**

Abstract

In paralympic classification, tests of impaired coordination (e.g., reciprocal tapping tasks) are effort dependent and therefore susceptible to intentional misrepresentation of abilities (IM)-deliberate exaggeration of impairment severity. The authors investigated whether reciprocal tapping tasks performed submaximally could be differentiated from tapping tasks performed with maximal voluntary effort, based on conformity with Fitts' law. Ten nondisabled participants performed 14 tapping tasks with their dominant hand on 3 separate occasions. Seven tasks were performed with MVE and the other 7 at speeds that were at least 20% slower. Results revealed that evaluating conformity with Fitts' law is a potentially valid method for objectively detecting IM during reciprocal tapping. Evaluation of sensitivity and specificity of the method is now warranted.

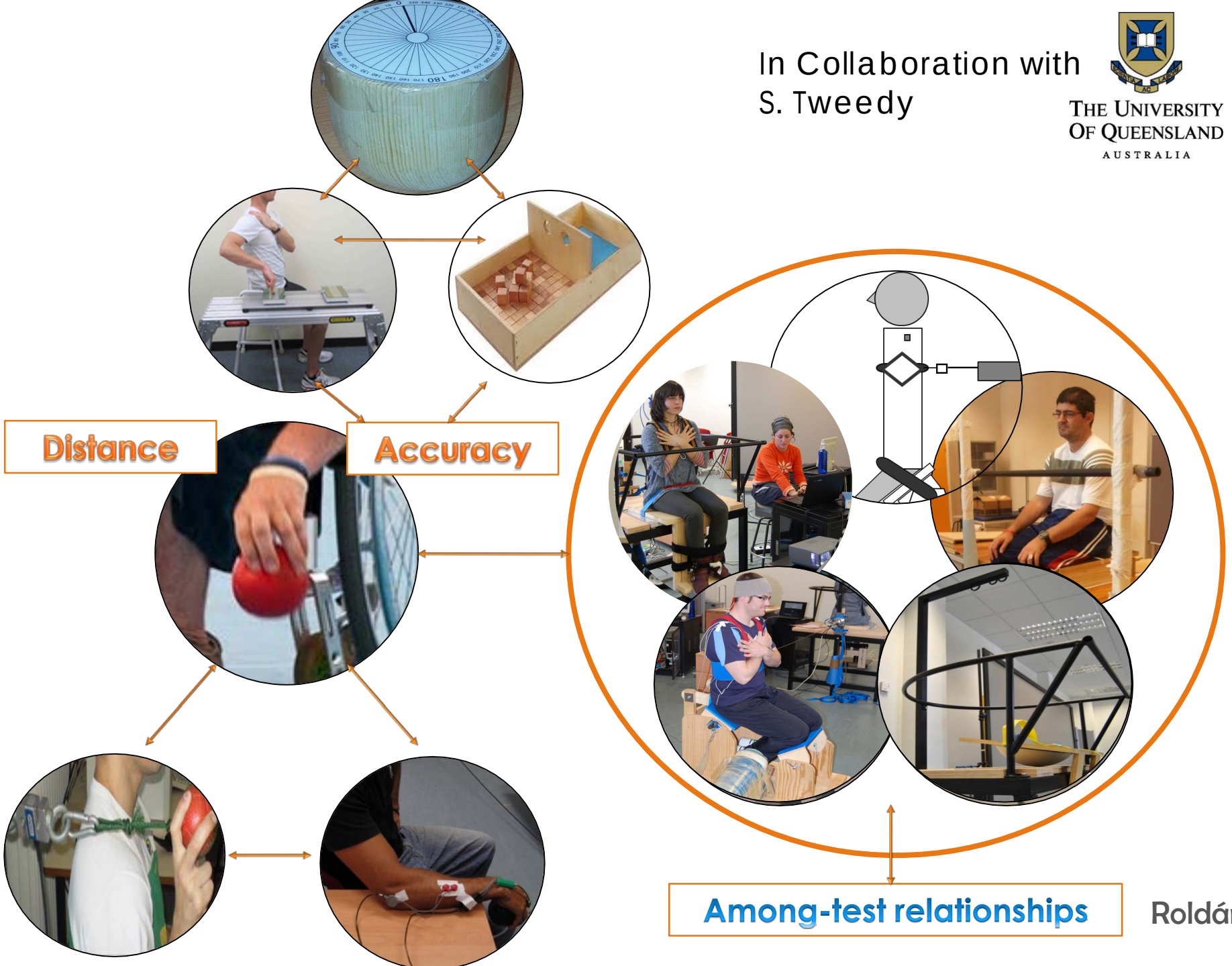
KEYWORDS: cheating; coordination; evidence-based classification; finger tapping; paralympic sport

PMID: 26181094 DOI: 10.1080/00222895.2015.1058744

[Indexed for MEDLINE]

In Collaboration with
S. Tweedy

THE UNIVERSITY OF QUEENSLAND
AUSTRALIA

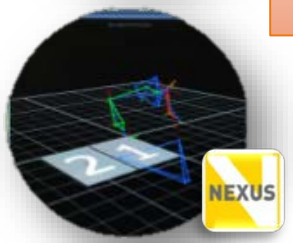


Roldán (2017)

WHEELCHAIR SLALOM

Sport specific test

Performance



Kinematic and kinetics analysis

STRENGTH

- Peak force.
- Rate of Force Development (RFD).
- Time to Peak and RFD.
- Trunk and elbow angles.

COORDINATION

- Upper limbs coordination were measured using a bilateral, discrete and continuous, tapping battery test.

TRUNK STABILITY

- The mean radial error was calculated as the vector distance magnitude (mm) average of the CoP from the target point.

LIMIT OF STABILITY

- Angles were measured in anteroposterior (coronal) and lateral (sagital) movement.

Domínguez (2017)