Development of Paratriathlon Specific Classification System for ambulant and wheelchair user athletes

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WHAT IS PARATRIATHLON?

750m Swim - 20km Bike - 5km Run
Quest for inclusion in the Paralympic programme.

Adoption of the Profile System (2009) - used impairment rather than functional ability or activity limitation to group athletes into sport classes

December 2010:
Acceptance into the 2016 Rio de Janeiro Paralympic Games conditional to striving towards IPC Code compliance
Spring 2011
- Becoming part of the ITU Strategic Plan
- Executive Board & Departmental involvement
- Sport Dept. action items / Alignment with IPC principles
- Special Budget provisions
- Hiring of dedicated staff
- Research Working Group
The classification system had to change to:

- Use the International Classification of Function Disability and Health (ICF) as a guideline
- Be based on scientific evidence.
- Define eligible types of impairments.
- Define minimum impairments criteria.
- Classify individuals according to the extent of activity limitation caused by their impairments.
ACTION ITEMS

- Literature review – Key Movements identification
- Re-evaluation of Current ITU Scorecard & elements
- Variables and tests to be considered
- Review of the eligible impairment types
- Requirements for eligibility for athletes with Neurological related impairments
- Hypothesis Testing
- Selection of athletes for the study (Data Collection)
- Assessments tests – technical part
- Statistical analysis

University CEU, Cardenal Herrera - Valencia-SPAIN → Ethics Committee endorsement

INTERNATIONAL TRIATHLON UNION
### AMBULANT ATHLETES

#### KEY BODY ELEMENTS

<table>
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<tr>
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<th>FLEXION</th>
<th>EXTENSION</th>
<th>ROTATION</th>
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#### PT2-PT4

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### INTERNATIONAL TRIATHLON UNION

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<th>RUN IMP</th>
<th>SWIM IMP</th>
<th>BIKE IMP</th>
<th>RUN IMP</th>
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- Flexion: Flexion
- Extension: Extension
- Rotation: Rotation
- Abduction: Abduction
- Adduction: Adduction
- Dorsiflexion: Dorsiflexion
- Plantar flexion: Plantar Flexion
- Ext rotation-eversion: Ext ROTATION-Eversion
- Int rotation-inversion: Int ROTATION-Inversion
### Neurological Impairments

#### Hypertonia, Ataxia, Aethetosis Profile

**Family Name:**

**First Name:**

**N F:**

**Condition:**

**Type:**

**Acquired:**

**Date:**

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#### Eligible Impairment (Must show evidence in 1 or more Impairment Types)

**(a) Spasticity:**

- Cerebral: Left □ Right □ Bilateral □ None □
- Babinski: Unilateral Left □ Right □ Bilateral □

**Spasticity Grade (Ashworth)**

- Elbow (flexors) (L) (R)
- Wrist (flexors) (L) (R)
- Knee (quadriiceps, sitting position) (L) (R)
- Knee (flex-extend, supine position, knee over edge of bench) (L) (R)
- Knee (hand-hanging, supine position) (L) (R)
- Ankle (gastrocnemius, sitting position) (L) (R)

A clear difference between active and passive ROM (ankle and wrist) □

**Comments:**

**(b) Ataxia:**

- Finger-Nose Test: (L) Accurate □ Inaccurate □ Tremor □ (R) Accurate □ Inaccurate □ Tremor □
- Finger-nose-finger: (L) Accurate □ Inaccurate □ Tremor □ (R) Accurate □ Inaccurate □ Tremor □
- Heel-Shin: (L) Accurate □ Inaccurate □ Tremor □ (R) Accurate □ Inaccurate □ Tremor □

- Single Leg Support: (L) open eyes □ 10 sec □ Yes □ NO □
- (L) closed eyes □ 10 sec □ Yes □ NO □
- (R) open eyes □ 10 sec □ Yes □ NO □
- (R) closed eyes □ 10 sec □ Yes □ NO □

- Dysarthria □
- Dysdiadochokinesia (signs of) □

**Comments:**

**(c) Aethetosis:**

- Facial Movement (Involuntary □) (around the mouth) □
- Involuntary movements of limbs □
- Inability to hold still □

**Comments:**

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**International Triathlon Union**
Hypothesis 1: The proposed score card defines key movements in the sport of Triathlon.

Hypothesis 2: The proposed score card defines minimum eligibility requirements. The factoring matrix accounts for impairments which do and do not impact performance in the sport of Triathlon.

Hypothesis 3: The inclusion of sport specific tests will better reflect how impairment relates to activity limitation in triathlon and the transition component.
<table>
<thead>
<tr>
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<tr>
<td>1</td>
<td>Both arms (or residual limb) able to move through a functional range of motion with continuous arm action</td>
</tr>
<tr>
<td>2</td>
<td>Able to catch water with both hands</td>
</tr>
<tr>
<td>3</td>
<td>Able to rotate the trunk to breath to at least one side</td>
</tr>
<tr>
<td>4</td>
<td>Able to initiate a propulsive kick with both legs in a symmetrical manner (needs a 1 in both propulsion and symmetry)</td>
</tr>
<tr>
<td>5</td>
<td>Able to exit the water without assistance.</td>
</tr>
<tr>
<td>6</td>
<td>Able to ride a conventional bike without any ITU approved bike adaptation</td>
</tr>
<tr>
<td>7</td>
<td>Able to maintain a steady symmetrical and coordinated body position with a cadence at 80-90rpm</td>
</tr>
<tr>
<td>8</td>
<td>Able to pedal out of the saddle.</td>
</tr>
<tr>
<td>9</td>
<td>Able to have a functional grip with both hands on the handlebar.</td>
</tr>
<tr>
<td>10</td>
<td>Able to adopt an aero position on the bike or have the potential to do so</td>
</tr>
<tr>
<td>11</td>
<td>Able to run without the use of ITU approved assistive devices (ie. crutches/canes/prosthetic/orthosis)</td>
</tr>
<tr>
<td>12</td>
<td>Able to maintain a symmetrical and coordinated running stride for 3 minutes at 10km/h</td>
</tr>
<tr>
<td>13</td>
<td>Able to perform a counter-movement jump with both feet</td>
</tr>
</tbody>
</table>
Counter Movement Jump

Figure 1. Countermovement Jump Technique
### VARIABLES CORRELATION SUMMARY

**Pearson Correlation:**
- $r < 0.30$ low correlation
- $0.30 \leq r \leq 0.70$ moderate correlation
- $r > 0.70$ strong correlation

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<tr>
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<td>-0.544</td>
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<td>power3seg</td>
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<td>Time Up and Go (TUG)</td>
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WEIGHT IN EACH SEGMENT

mPEUCH2011 TRI-1
- 29.41%
- 17.29%
- 3.70%
- 2.07%
- 47.54%

mPEUCH2011 TRI-2
- 13.41%
- 2.70%
- 41.05%
- 1.68%
- 33.17%

mPEUCH2011 TRI-3
- 17.17%
- 2.97%
- 41.05%
- 2.04%
- 33.17%

mPEUCH2011 TRI-4
- 16.53%
- 2.50%
- 32.74%
- 1.82%
- 46.41%

mPEUCH2011 TRI-5
- 16.53%
- 2.50%
- 32.74%
- 1.82%
- 46.41%

mPEUCH2011 TRI-6
- 19.35%
- 3.12%
- 1.68%
- 1.14%
- 44.45%

mOEUCH2011
- 29.92%
- 16.46%
- 0.74%
- 51.74%

INTERNATIONAL TRIATHLON UNION
### Functional Athlete Profile

1. **Both arms (or residual limb) able to move through a functional range of motion with continuous arm action.**
2. **Able to catch water with both hands.**
3. **Able to rotate the trunk to breath to at least one side.**
4. **Able to initiate a propulsive kick with both legs in a symmetrical manner (needs a 1 in both propulsion and symmetry).**
5. **Able to exit the water without assistance.**
6. **Able to ride a conventional bike without any ITU approved bike adaptation.**
7. **Able to maintain a steady symmetrical and coordinated body position with a cadence at 80-90rpm.**
8. **Able to pedal out of the saddle.**
9. **Able to perform a symmetrical and coordinated running stride for 3 minutes at 10km/h.**
10. **Able to perform a counter-movement jump with both feet.**

### Medical Information

#### Athlete Description on How Impairment Has an Impact on the Sport

- **Diagnosis/Health Condition:**
  - Congenital
  - Acquired
  - Date
  - Progressive
  - Fluctuating

#### Other Factors That May Impact Classification

- **Secondary Conditions:**
  - Epilepsy
  - Asthma
  - Autonomic Dysreflexia

#### Current Medications

- **Wheelchair Use:**
  - Always
  - Sometimes
  - Never

---

### Scorecard

| Neck Flexion | Neck Extension | Trunk Rotation | Fingers Flexion | Shoulder Flexion | Shoulder Extension | Elbow Extension | Trunk Upper Abdomen Flex | Lower Abdomen Flex | Hip Flexion | Hip Abduction | Hip Adduction | Trunk Upper Abdomen Ext | Lower Abdomen Ext | Kneec Flexion | Kneec Extension | Foot Dorsiflex | Plantar Flex | Gait Rotation | Inversion | Gait Rotation-Eversion | Int Rotation-Inversion | Total Score |
|--------------|----------------|----------------|----------------|-----------------|-------------------|-----------------|--------------------------|-------------------|-------------|---------------|---------------|----------------------|-----------------|----------------|----------------|----------------|--------------|----------------|---------------|----------------|--------|
| 0            | 0              | 0              | 0              | 0               | 0                 | 0               | 0                        | 0                 | 0           | 0             | 0             | 0                    | 0               | 0              | 0             | 0              | 0           | 0              | 0              | 0       |
| 0            | 0              | 0              | 0              | 0               | 0                 | 0               | 0                        | 0                 | 0           | 0             | 0             | 0                    | 0               | 0              | 0             | 0              | 0           | 0              | 0              | 0       |
| 0            | 0              | 0              | 0              | 0               | 0                 | 0               | 0                        | 0                 | 0           | 0             | 0             | 0                    | 0               | 0              | 0             | 0              | 0           | 0              | 0              | 0       |

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#### Current Medications

- **Wheelchair Use:**
  - Always
  - Sometimes
  - Never

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### Scorecard

<table>
<thead>
<tr>
<th>Swimmer Raw Power</th>
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### Classifiers

- **Date:**
  - (dd/mm/yyyy)

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### Signature

- **M/T:**
  - Signature
• Establishing Cut Points in outcome graph to determine Sport classes
• Time in Competition used for correlations
• Trialing correlation vs impairment
PT1 (handbike and racing wheelchair users)
PT2 (score up to 455)
PT3 (score from 455 to 495)
PT4 (Score from 495 to 557)
NE (Score above 557)
PT5 (Vision Impairment)

Is there a clear profile of impairments in each class?
- Review of the scorecard
- Increasing Sport Specific/Novel Tests
- Mathematical adjustments
- Correcting “errors”
- Use of inertia sensors for the assessment in the swim, bike and run → Current Agitos Foundation funded Research
- Specific Tests for PT1 athletes (SCI specific analysis)
- Sport Specific Research on Vision Impairment
QUESTIONS?

Learn more at www.triathlon.org

THANK YOU!