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

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WHAT IS PARATRIATHLON?

paratriathlon

750m Swim- 20km Bike- 5km Run

CLASSIFICATION SYSTEM

paratriathlon

- 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

REVIEW PROCESS

- 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

GOALS & OBJECTIVES

paratriathlon

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

KEY BODY ELEMENTS

paratriathlon

AMBULANT ATHLETES

NECK	FLEXION -20 FL
	EXTENSION
	ROTATION
TRUNK	ROTATION
FINGERS	FLEXION
SHOULDER	FLEXION
	EXT. ROTAT.
	INT. ROTAT.
ELBOW	EXTENSION
	FLEXION
TRUNK	UPPER ABDOMIN FLEX
	LOWER ABDOMIN FLEX
HIP	FLEXION
	ABDUCTION
	ADDUCTION
SHOULDER	EXTENSION
TRUNK	UPPER ABDOMIN EXT
	LOWER ABDOMIN EXT
HIP	EXTENSION
KNEE	FLEXION
HIP	Ext ROTATION
	Int ROTATION
KNEE	EXTENSION
FOOT	DORSIFLEX
	Plantar FLEX
	Ext ROTATION-Eversion
	Int ROTATION-Inversion

PT2-PT4		SWIM IMP. SCORE	BIKE IMP. SCORE	RUN IMP. SCORE		SWIM IMP. SCORE	BIKE IMP. SCORE	RUN IMP. SCORE
		IMP	IMP	IMP		IMP	IMP	IMP
NECK	FLEXION -20 FL	3	2	1		0	0	0
	EXTENSION	3	2	1		2	2	1
	ROTATION	3	1	1		3	1	1
TRUNK	ROTATION	3	0	2		3	0	2
FINGERS	FLEXION	1	3	0		1	2	0
SHOULDER	FLEXION	3	3	2		3	1	1
	EXT. ROTAT.	3	0	0		3	0	0
	INT. ROTAT.	3	0	0		3	0	0
ELBOW	EXTENSION	3	2	3		3	2	0
	FLEXION	3	2	3		3	2	1
TRUNK	FLEXION	3	2	2		2	2	1
		3	2	2				
HIP	FLEXION	3	3	3		3	3	3
	ABDUCTION	3	0	3		1	0	2
	ADDUCTION	3	3	3		2	1	1
SHOULDER	EXTENSION	3	1	2		3	1	2
TRUNK	EXTENSION	3	2	2		3	2	2
		3	2	2				
HIP	EXTENSION	3	3	3		3	3	3
KNEE	FLEXION	2	3	3		2	3	3
HIP	Ext ROTATION	0	0	3		0	0	1
	Int ROTATION	0	0	3		0	0	1
KNEE	EXTENSION	2	3	3		2	3	3
FOOT	DORSIFLEX	0	3	3		0	2	3
	Plantar FLEX	1	3	3		2	3	3
	Ext ROTATION-Eversion	0	0	3		0	0	1
	Int ROTATION-Inversion	0	0	3		0	0	1

NEUROLOGICAL IMPAIRMENTS

paratriathlon

HYPERTONIA,ATAXIA,ATHETOSIS PROFILE

Family Name:	**First Name:**	**N F:**
Congenital:	**Type:** ~~Diplegia~~/Hemiplegic/Quadriplegia/Athetosis/Ataxia/Dystonia	
Acquired: **(Date):**	**Cause:**	

ELIGIBLE IMPAIRMENT (Must Show evidence in 1 or more Impairment Types)

(A) SPASTICITY:

Clonus Left ☐ Right ☐ Bilateral ☐ ~~No. of beats~~

Babinski Unilateral Left ☐ Right ☐ Bilateral ☐

SPACTICITY GRADE (ASHWORTH)* (*1 in one of these movements.)

Elbow (flexors)	(L)	(R)
Wrist (flexors)	(L)	(R)
Knee (quadriceps, sitting position)	(L)	(R)
Knee (rectus femoris, supine position, Knee over edge of bench)	(L)	(R)
Knee (hamstring, supine position)	(L)	(R)
Ankle (gastrocnemius, sitting position)	(L)	(R)

A clear difference between active and passive ROM (ankle and wrist mvt's.)*
Yes ☐ NO ☐ (* Velocity in passive would be rapid (RPM) and active ROM is likely to be slower.)

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 Yes☐ No ☐
Dysdiadochokinesia (signs of) Yes ☐ NO ☐

Comments:

(C) ATHETOSIS:
Facial Movement (involuntary mvt's around the mouth) Yes☐ No ☐
Involuntary movements of limbs Yes☐ No ☐
Inability to hold still Yes☐ No ☐

HYPOTHESIS TESTING

- 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.

SPORT SPECIFIC TESTS

paratriathlon

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 symetrical 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 sadle.
9	Able to have a functional grip with both hands on the handlebar.
10	Able to adopt an aero position on the bike or have the potential to do so
11	Able to run without the use of ITU approved assistive devices (ie. crutches/canes/prosthetic/orthosis)
12	Able to maintain a symmetrical and coordinated runing stride for 3 minutes at 10km/h
13	Able to perform a counter-movement jump with both feet

Counter Movement Jump

Figure 1. Countermovement Jump Technique

VARIABLES CORRELATION SUMMARY

variable	r pearson
poweraw	-0,544
power3seg	-0,315
power3seg%	-0,291
romraw	0,175
rom3seg	-0,095
rom3seg%	-0,1
powerom3seg	-0,631
powerom3seg%	-0,723
FMStrue	-0,231
FMSquad	-0,591
FMSstep	-0,473
FMSinline	-0,27
FMSshoulder	0,563
FMSlegrise	-0,102
FMSpushup	-0,043
FMSstability	-0,166
Time Up and Go (TUG)	0,813

Pearson Correlation:
r < 30 low correlation
0,3 ≤ r ≤ 0,70 moderate correlation
r > 0,70 strong correlation

WEIGHT IN EACH SEGMENT

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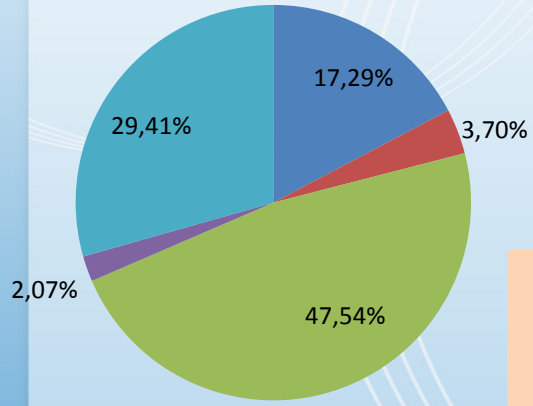
mPEUCH2011 TRI-1



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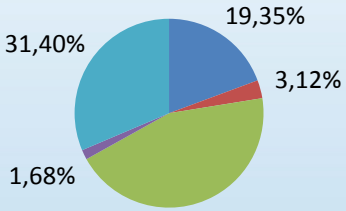

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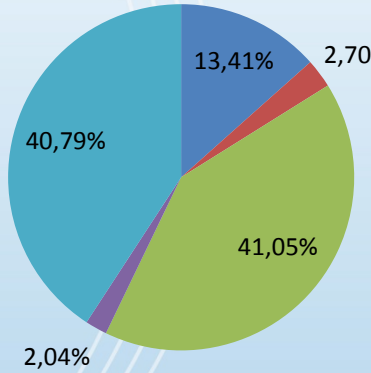

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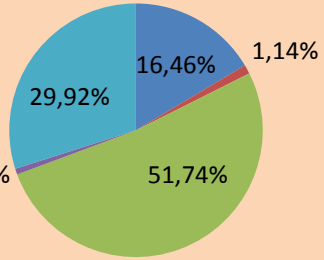

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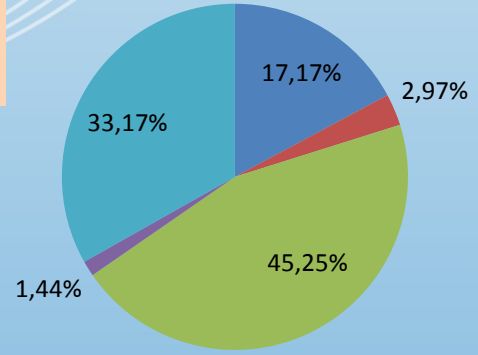

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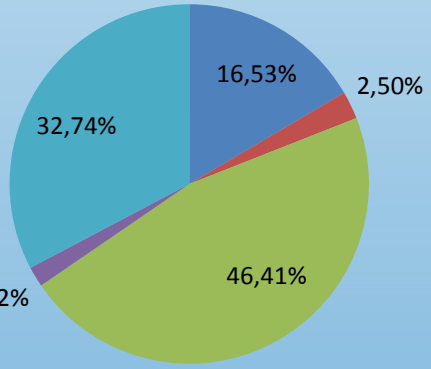

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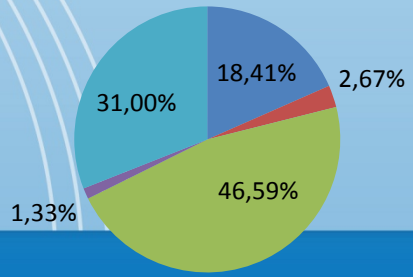

SCORECARD

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		M/POWER RAW SCORE 1-5		SWIM		BIKE		RUN	
		LEFT	RIGHT	MP VAL LEFT	MP VAL RIGHT	MP VAL LEFT	MP VAL RIGHT	MP VAL LEFT	MP VAL RIGHT
NECK	FLEXION -20 FL			0	0	0	0	0	0
	EXTENSION			0	0	0	0	0	0
	ROTATION			0	0	0	0	0	0
TRUNK	ROTATION			0	0	0	0	0	0
FINGERS	FLEXION			0	0	0	0	0	0
SHOULDER	FLEXION			0	0	0	0	0	0
	EXT. ROTAT.			0	0	0	0	0	0
	INT. ROTAT.			0	0	0	0	0	0
ELBOW	EXTENSION			0	0	0	0	0	0
	FLEXION			0	0	0	0	0	0
TRUNK	UPPER ABDOMIN FLEX			0	0	0	0	0	0
	LOWER ABDOMIN FLEX			0	0	0	0	0	0
HIP	FLEXION			0	0	0	0	0	0
	ABDUCTION			0	0	0	0	0	0
	ADDUCTION			0	0	0	0	0	0
SHOULDER	EXTENSION			0	0	0	0	0	0
TRUNK	UPPER ABDOMIN EXT			0	0	0	0	0	0
	LOWER ABDOMIN EXT			0	0	0	0	0	0
HIP	EXTENSION			0	0	0	0	0	0
KNEE	FLEXION			0	0	0	0	0	0
HIP	Ext ROTATION			0	0	0	0	0	0
	Int ROTATION			0	0	0	0	0	0
KNEE	EXTENSION			0	0	0	0	0	0
FOOT	DORSIFLEX			0	0	0	0	0	0
	Plantar FLEX			0	0	0	0	0	0
	Ext ROTATION-Eversion			0	0	0	0	0	0
	Int ROTATION-Inversion			0	0	0	0	0	0
				0	0	0	0	0	0
				0		0		0	

0	SWIM RAW POWER	POWER3SEG%	
0,164	SWIM WEIGHT	TOTAL	0
0	TOTAL SWIM VALUE	TOTAL ATHLETE SCORE	0
		CLASSIFIERS	Date (dd/mm/yyyy)
0	BIKE RAW POWER		
0,528	BIKE WEIGHT		M/T
0	TOTAL BIKE VALUE	Signature	
0	TOTAL POWER + ROM		M/T
0,294	RUN WEIGHT	Signature	
0	TOTAL RUN VALUE		

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 symetrical manner (needs a 1 in both propulsion and symmetry)	
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11	Able to run without the use of ITU approved assistive devices (ie. crutches/canes/prosthetic/orthosis)	
12	Able to maintain a symmetrical and coordinated runing stride for 3 minutes at 10km/h	
13	Able to perform a counter-movement jump with both feet	
	TOTAL	0
		0

MEDICAL INFORMATION

DIAGNOSIS/HEALTH CONDITION

CONGENITAL ACQUIRED DATE PROGRESSIVE FLUCTUATING

ATHLETES DESCRIPTION ON HOW IMPAIRMENT HAS AN IMPACT ON THE SPORT

OTHER FACTORS THAT MAY IMPACT CLASSIFICATION

SECONDARY CONDITIONS

EPILEPSY ASTHMA AUTONOMIC DYSREFLEXIA

CURRENT MEDICATIONS

WHEELCHAIR USE ALWAYS SOMETIMES NEVER

OUTCOME NEW SYSTEM

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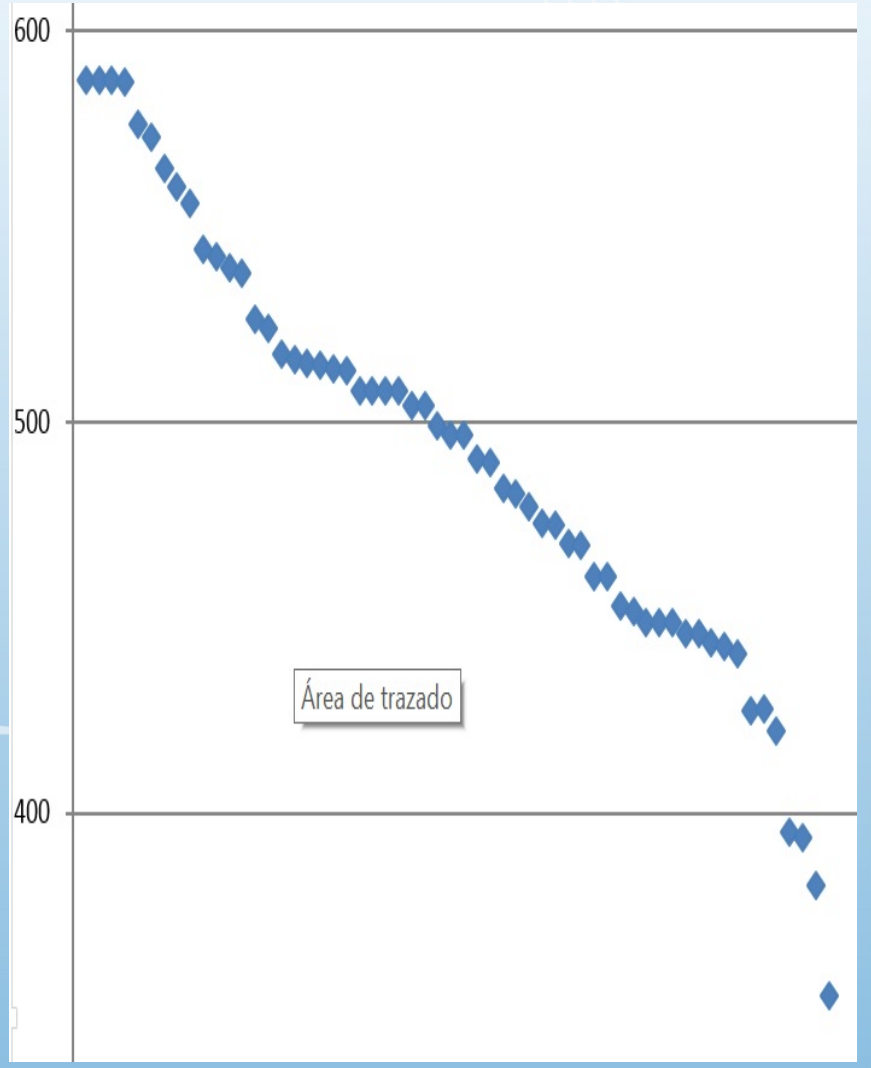
- **Establishing Cut Points in outcome graph to determine Sport classes**
- **Time in Competition used for correlations**
- **Trialing correlation vs impairment**



OUTCOME NEW SYSTEM

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- 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?

NEXT STEPS

- Review of the scorecard
- Increasing Sport Specific/NovelTests
- 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?

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Learn more at www.triathlon.org

THANK YOU!