How the cognitive-motor dual-task paradigm can contribute to the development of evidence-based classification systems for athletes with intellectual impairments

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Evidence-based classification

Develop valid measures of impairment (A)

Develop standardized measures of key determinants of performance (B)

Assess the relative strength of the association between A and B

- Processing speed
- Memory
- Pattern recognition
- Fluid reasoning
- Attention/concentration
- ...
Impact of cognition on sport performance
Other II-sports on the Paralympic program
Not included: 100m sprint
Cognitive-motor dual-task paradigm

Never attack a problem without also presenting a solution.

— Jim Rohn —
Multitasking

“The ability to do several things at the same time”

Source: Merriam-Webster’s Learner’s dictionary
Dual-tasking

“The simultaneous performance of two tasks with distinct goals”

McIsaac, Lamberg, & Muratori, 2015
Sport is a multitasking environment

Elite athletes are able to:
⇒ Successfully combine the motor and cognitive demands of the sport to optimize performance
⇒ II-athletes: limited resources available => DUAL-TASK COSTS!
Method – pilot study

**COGNITION**

Multiple object tracking

**MOTOR**

Single leg stance

*KU LEUVEN*
Motor task - One leg stance eyes open

- Static balance
- On the balance beam
- 60 seconds (6 x 10 seconds)
Cognitive task - Multiple object tracking
Multiple Object Tracking (MOT)

- Tracking targets (1-4)
- Distractors (1-4)
- Velocity (2°/sec – 10°/sec)
- 10 sec/trial, 15 trials, difficulty index↑

DYNAMIC VISUAL SEARCH

VISUAL PROCESSING CAPACITY

SELECTIVE AND DIVIDED ATTENTION
Dual-task pilot study - sample

II-athletes
- INAS Global Games (Ecuador)
- n = 103 (33♀, 70♂)
- IQ = 61 ± 9
- Age = 22 ± 2.4

Comparison (non-II)
- KU Leuven (Belgium)
- n = 103 (33♀, 70♂)
- Matched for age, gender, sport, training volume

No Down-syndrome
No physical comorbidities
Procedure

1. SLS (EO)
2. MOT
3. SLS + MOT

Both legs
6 x 10sec

Max. 15 stages

Combined

Results DUAL-TASK costs

- Cognitive Task (MOT):
  - DTC = -1.34%
  - DTC = -8.28%

- Motor Task (Balance):
  - DTC = -12.89%
  - DTC = -33.13%
Conclusion

• Cognitive-motor dual-task paradigm is an ecologically valid way to investigate the relation between cognitive function and motor performance of elite athletes with II
• Poor balance control in people with II => (impaired) cognition related to balance control
• Athletes with II have difficulties to successfully combine cog and motor task demands
• Higher DT costs for II-athletes compared to non-II athletes, higher DT costs for balance compared to cog task

⇒ Cognitive-motor dual-task paradigm to be considered a potential method to demonstrate the impact of II on performance, even in sports with relatively low cognitive load.
Implications for future research

- **Assessment of cognitive function**
  - Difficulty level adjusted to participant (tailored)
  - Various cognitive factors relevant to sport (reaction time, memory, pattern recognition, …)
  - Executive functions

- **Assessment of postural control**
  - Posturography – static & dynamic
  - Balance movement & timing action lab

- **Assessment of KPI’s (sport specific)**

- **Control samples (4)**
  - II vs non-II/athletes vs non-sportive controls

- **Design**
  - Training/RCT
  - Field test vs lab conditions
Thank you

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