

Virtual reality applications in mTBI; research in the pre-hospital and clinic environments

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Sid Watkins Scholar 2018

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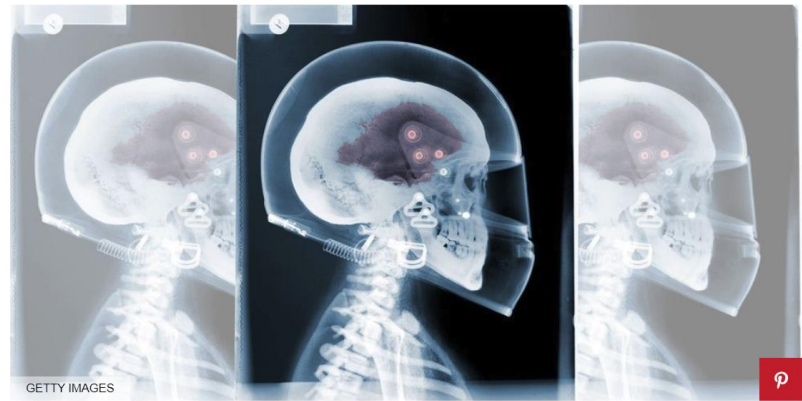
Presentation overview

1. The problem: **Concussion** in motorsport
2. The tool: I-PAS
3. The study: **RESCUE-RACER**
4. Future applications (pre-hospital and in clinic)

Concussion in motorsport

Racing's Inherent Brain Injury Risk

Examining the long-term consequences.



GETTY IMAGES



BY MAX PRINCE JUN 11, 2017

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THE PROBLEM

How common is concussion in motorsport?

Motorsport has a high rate of **concussion** compared to other sports

→ 25% of American Stock Car drivers experienced **concussion** during their career¹

→ Almost 10% of TOCA competitors are diagnosed with **concussion** every season²



Why does concussion matter in motorsport?

Concussion incidence is variable; increasing in certain championships

→ ‘Half of reported concussive episodes had not been discussed with a doctor’²

→ ‘70% of competitors “*did not feel completely normal*” when they attempted to return’²

Drivers with ongoing **concussion** risk losing control of a **high-speed, potentially lethal** vehicle

I-PAS

THE TOOL

RESCUE RACER

Research Evaluating Sports ConcUssion Events;
Rapid Assessment of Concussion and Evidence for Return

Background: UK management of motorsport concussion

- Competitor **removed from the event**
- Licence suspended
- Explanatory letter and proforma to competitor
- **Once recovered**, review by Doctor
- **If fit to return to race**, licence returned

Concussion in motor sport: A medical literature review and engineering perspective

Naomi D Deakin¹, Thomas Cronin, Paul Trafford, more...

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First Published October 6, 2017

Table 2. The first MSA concussion guidelines, published in the annual update of the Yearbook, on 1 March 2016.³⁶

A11.1. Concussive injury can be serious, especially if repeated within a short period or in the younger age group. For this reason, the MSA has introduced this policy restricting activity following this type of injury. Concussion is diagnosed following an accident including the following symptoms:

- Transient unconsciousness (not always present)
- Confusion/disorientation
- Amnesia
- Headache
- Dizziness/nausea

Following diagnosis of one or more of these symptoms, this policy must be instituted by the meeting/event Chief Medical Officer or equivalent.

A11.1.1. The competitor must not compete further in the meeting/event (including subsequent days).

A11.2. The competitor's licence should be suspended and retained by the Clerk of the Course, then forwarded to the Medical Department of the MSA, together with a note explaining the reason for return.

A11.3. Upon receiving the licence, the MSA will send the licence holder an explanatory letter with a pro forma for them to take to their GP or licence medical issuing doctor. This will ask the doctor to confirm the absence of symptoms.

A11.4. Upon receipt of the pro forma, certifying the absence of symptoms, the licence will be returned. Any concerns should be notified to the Chairman of the Medical Advisory Panel.

A11.5. It is important that the competitor is advised not to drive any vehicle until symptoms have resolved. They should also be advised to consider discussing their employment role with either their Occupational Health Department or General Practitioner.

A11.6. Professional racing series, where regular medical personnel attend, may institute their own policy, provided this policy is followed as a minimum.

A11.7. The duration of symptoms is variable, with most cases recovering within a period of two to three weeks. This policy should generally cover that period. Some cases have persistent symptoms, in these cases, expert opinion should be obtained.

A11.8. A second episode of concussion, occurring within a period of three months will require specialist referral prior to the return of the licence.

Source: MSA Yearbook 2016, reproduced with permission from the MSA, 28 February 2017.

MSA: Motor Sports Association.



Journal of Concussion

An example concussion protocol



Potentially
concussive
event

- Transport to Medical Centre for assessment
- Clinical assessment: **SCAT5**
- Concussion confirmed: licence suspended



Diagnosis of
concussion

- Head injury advice
- Onward referral

Cambridge University Hospitals **NHS**
NHS Foundation Trust

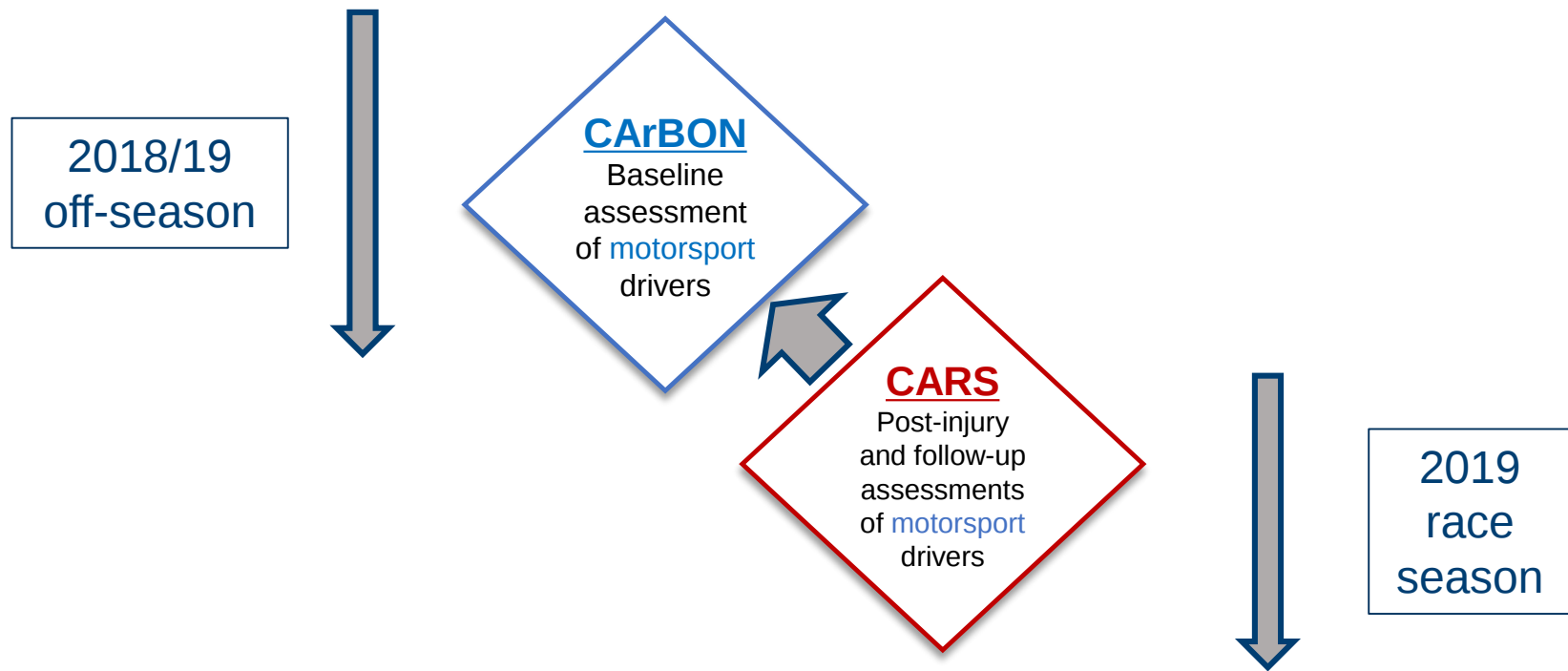
Return to
Race

- Repeat **SCAT5**, ImPACT
- Timeline for return

What does RESCUE-RACER hope to achieve?

1. To establish the **natural history of concussive symptoms and signs** sustained in motorsport activity using a comprehensive neuroscientific battery.
2. To investigate the assessment of **OVRT function as a diagnostic tool** for **concussion**.

How is the study designed?



How often are drivers assessed?

Assessments in use; **SCAT5**, **ImPACT**

Research tools:

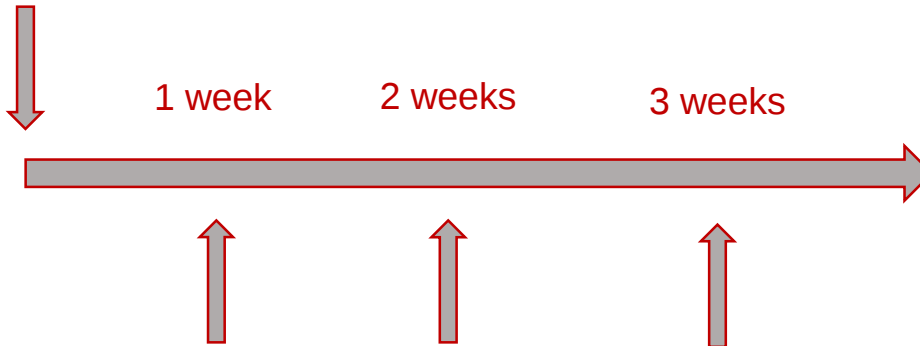
- Diagnosis – OVRT (**I-PAS**), salivary biomarkers (**NFL**, **tau**, **S100B**)
- Prognosis – neuropsychology (**CANTAB**), fMRI at 7T

CARBON

Baseline
assessment
of **motorsport**
drivers

CARS

Post-injury
and follow-up
assessments
of **motorsport**
drivers



What other data will RESCUE-RACER collect?

Clinical data

PMHx
Previous incidents

Cameras

In-car (high-speed)
Circuit



Force data

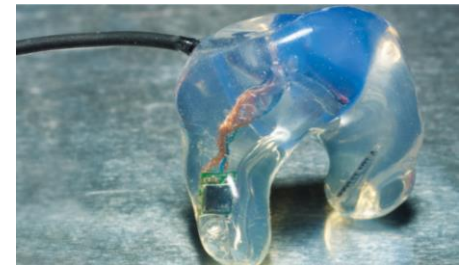
ADRs
In-ear accelerometers



RESCUE-RACER; creating a neuroscientific profile



Accident Data Recorders (ADRs) are set to be used in the development of increasingly affordable versions of Foundation.



Future applications

Pre-hospital and in clinic

What other environments are amenable to A/VR?

- Current:
 - Race circuit medical centres
 - Pitchside assessments
 - Outpatient clinics
- Future:
 - Intensive Care
 - Acute ward-based rehabilitation
 - Long-term rehabilitation units
 - Outpatient/home-based therapy

 - Athlete performance

Presentation summary

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3. The study: 

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- Sponsors
- Drivers



www.rescueracer.org

@RESCUE_RACER

#RRstudy



Research Evaluating Sports Concussion Events;
Rapid Assessment of Concussion and Evidence for Return

References

1. Ebben WP and Suchomel TJ. Physical demands, injuries, and conditioning practices of stock car drivers. J Strength Cond Res 2012; 26: 1188–1198.
2. Trafford P, Hutchinson P. Survey on Concussion. Auto+ Medical https://issuu.com/fia-auto/docs/auto_medical_6_issuu (accessed 18 February 2017)