



Post-concussive clinical and neuroimaging alterations specific to female, woman and girl athletes

A case series

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Female, Woman, and Girl Athlete Health and Safety Summit

Tuesday Sept 23 – Thursday Sept 25 (University of Calgary)



Objectives:

5. To discuss research gaps (in Canada and the world) in promoting athlete health and safety in sport for females, women, and girls.

Clinical and neuroimaging characteristics of FWG athletes to refine management and return-to-sport decisions



Management of SRC: the situation in Belgium



- No nation-wide guidelines, no standardized management of SRC
- Some policies in specific sports federations & clubs (e.g., soccer, rugby)
- Paucity of research and labs dedicated to mild TBI/concussion (let alone sport-related concussion)
- Opportunities for research ↔ clinical implementation

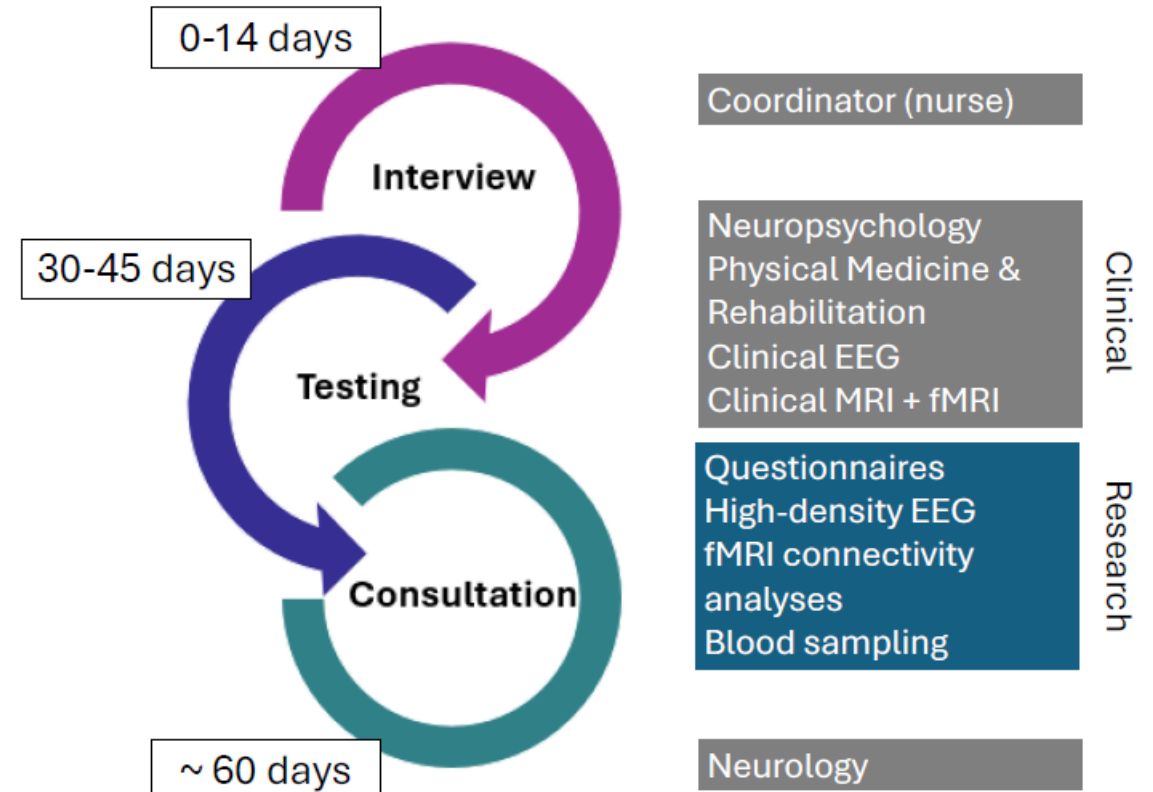
Our current local solution



An institutional care pathway to improve medical management following a concussion and to allow clinical data collection for research projects

Civilian population, some athletes
(individually referred)

Ongoing efforts to involve sports
clubs and schools

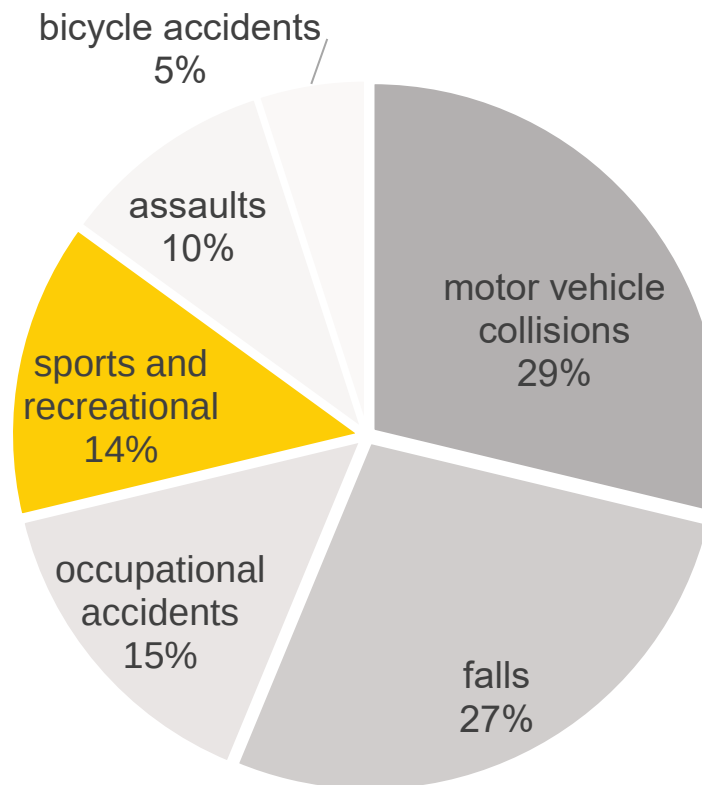


Early opportunity to identify FWG specificities



Current database (september 25)	
N patients included clinical care pathway	179
N patients consented data use for research	80
Age	38,5 ± 11,5 years
Sex	54 F / 26 M
Time since injury	4,3 ± 2,9 months
Etiology	23 motor vehicle collisions 22 falls 12 occupational accidents 11 sports and recreational 8 assaults 4 bicycle accidents

Early opportunity to identify FWG specificities



Early opportunity to identify FWG specificities



SRC only (n=11)	FWG (n=4)	MMB (n=7)	p value
Age (years)	35,0 ± 12,2	25,6 ± 4,2	0,29
Time since injury (months)	3,2 ± 2,9	2,0 ± 0,9	0,85
PPCS (RPQ)	34,5 ± 10,5	24,7 ± 7,9	0,17
Depression (BDI)	15,8 ± 9,5	8,9 ± 4,0	0,25
Sleep quality (PQSI)	9,3 ± 4,2	8,6 ± 4,3	0,81

Preliminary findings: high-density EEG



EEG spectral power

	Decreased	Normal
FWG	4	0
MMB	1	6

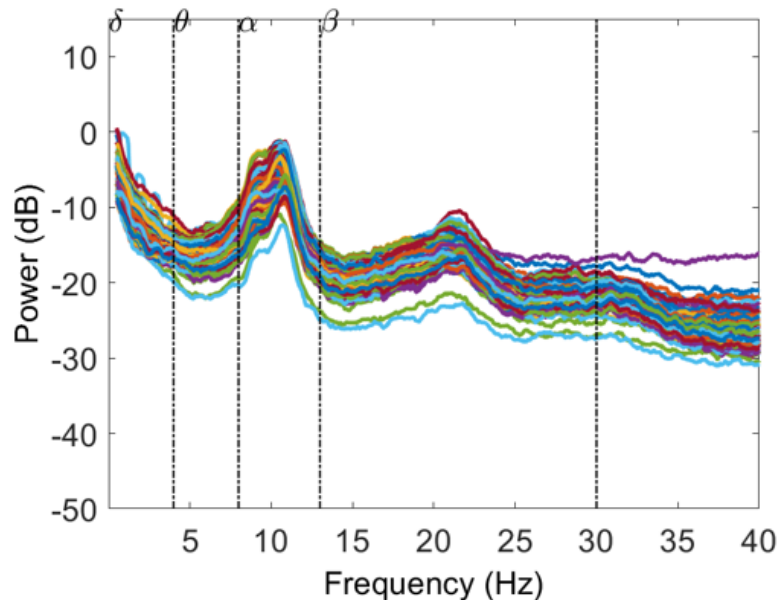
p=0.02

EEG alpha connectivity (dwPLI)

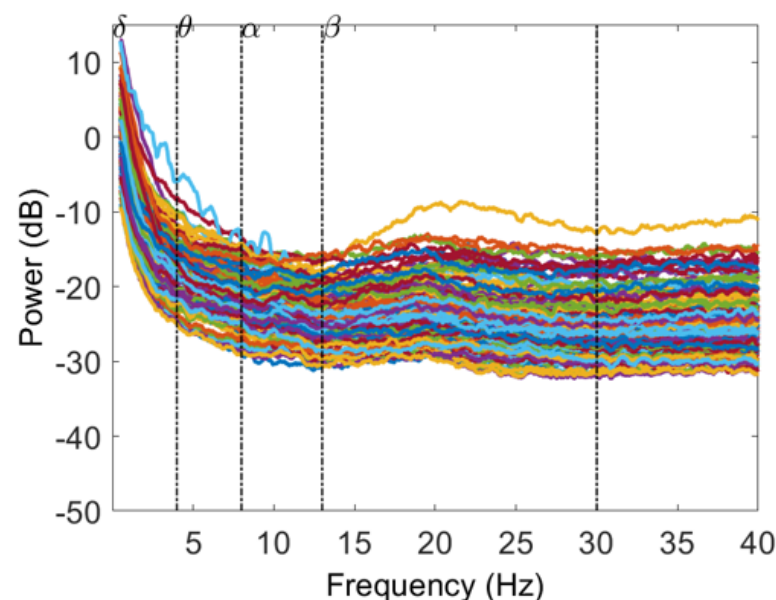
	Decreased	Normal
FWG	2	2
MMB	4	3

p=0.20

Controls



1 FWG athlete



Related to disruption of thalamo-cortical networks and reduced efficiency of cortical processing

Brain's « slowed down » state



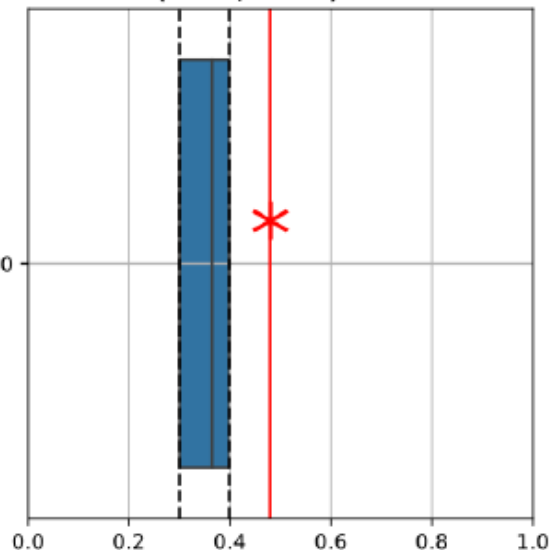
Preliminary findings: fMRI connectivity

DMN connectivity

	Hypo	Normal	Hyper
FWG	0	1	3
MMB	2	2	5

$p=0.36$

DAN (0.3, 0.4) -> 0.48



DAN connectivity

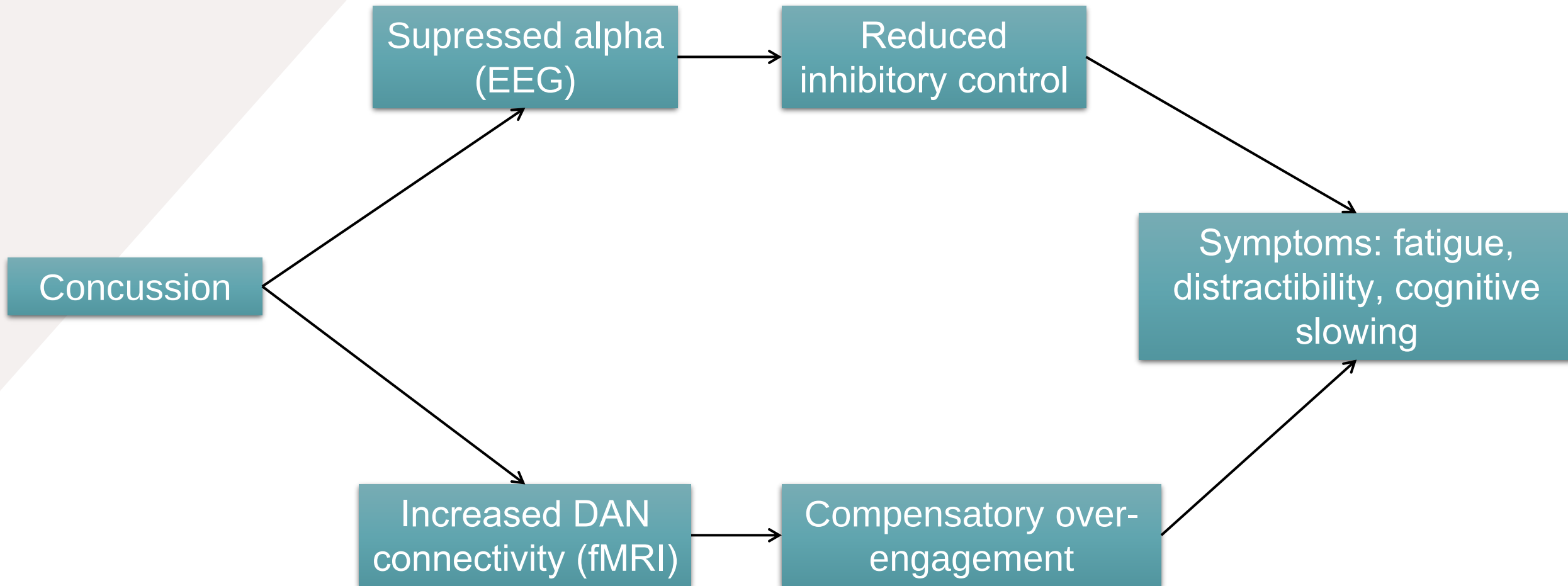
	Normal	Hyper
FWG	1	3
MMB	7	0

$p=0.007$

Related to abnormal attentional engagement at rest and imbalance in the DMN/DAN switching

Compensatory recovery mechanism contributing to cognitive fatigue and sensory overload

Conceptual hypothesis



Conclusions



Neuroimaging sensitivity

- FWG athletes demonstrated similar clinical profiles than MMB
- But presented distinct reduced alpha power and DAN hyperconnectivity

Clinical symptomatology

- The neuroimaging specificities of FWG athletes did not translate into conventional clinical questionnaires
- Neuropsychological evaluation analyses underway

Next steps

- FWG neuroimaging alterations suggest a disruption in thalamocortical circuits and maladaptive network reorganization
- Further investigation in larger samples needed

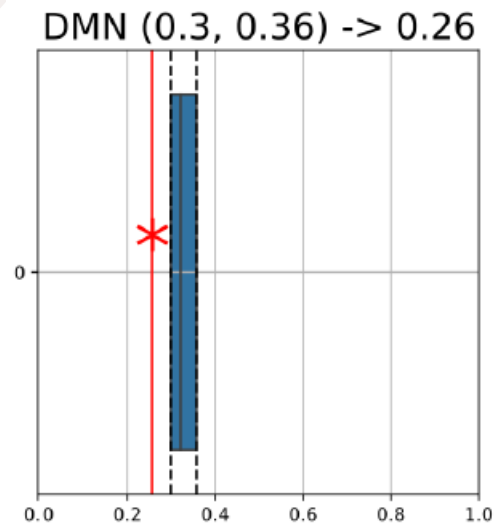


Thank you for your attention!

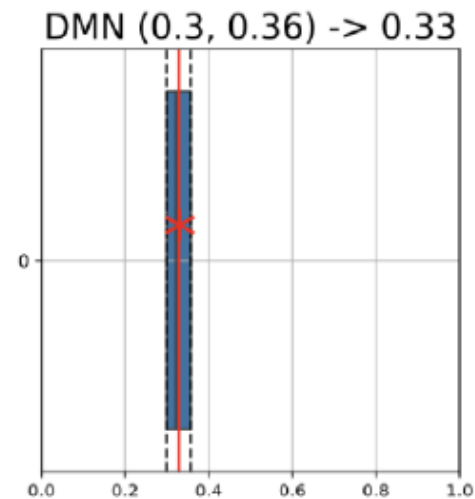
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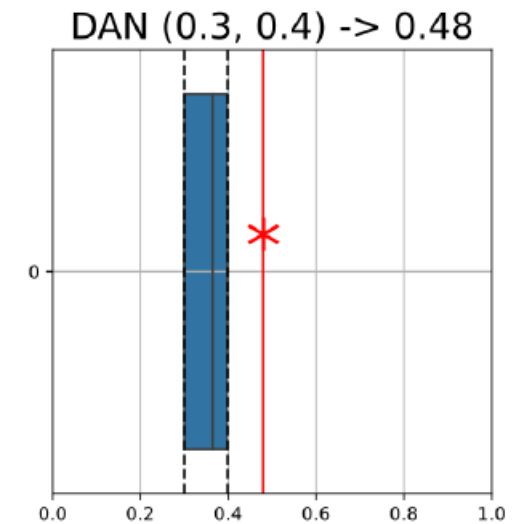
Hypoconnectivity



Normal



Hyperconnectivity



Comparison with a cohort of 40 healthy controls