



2025 CISG Symposium

"From Consensus to Clinic: Advances and Practical Applications of the Amsterdam International Consensus."



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Heart rate recovery changes following repetitive head impacts in Canadian football athletes

Podium Research Abstract

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Head impact exposure (HIE) in contact sports



Prospective observational follow-up of varsity Canadian Football players

Objective: characterize effects of HIE on heart rate kinetics

- Monitoring of HIE through Prevent instrumented mouthguard
- Monitoring of heart rate through Catapult vest



n = 72 male players (23 ± 2 y.o.)
32 games (169 ± 27 min)

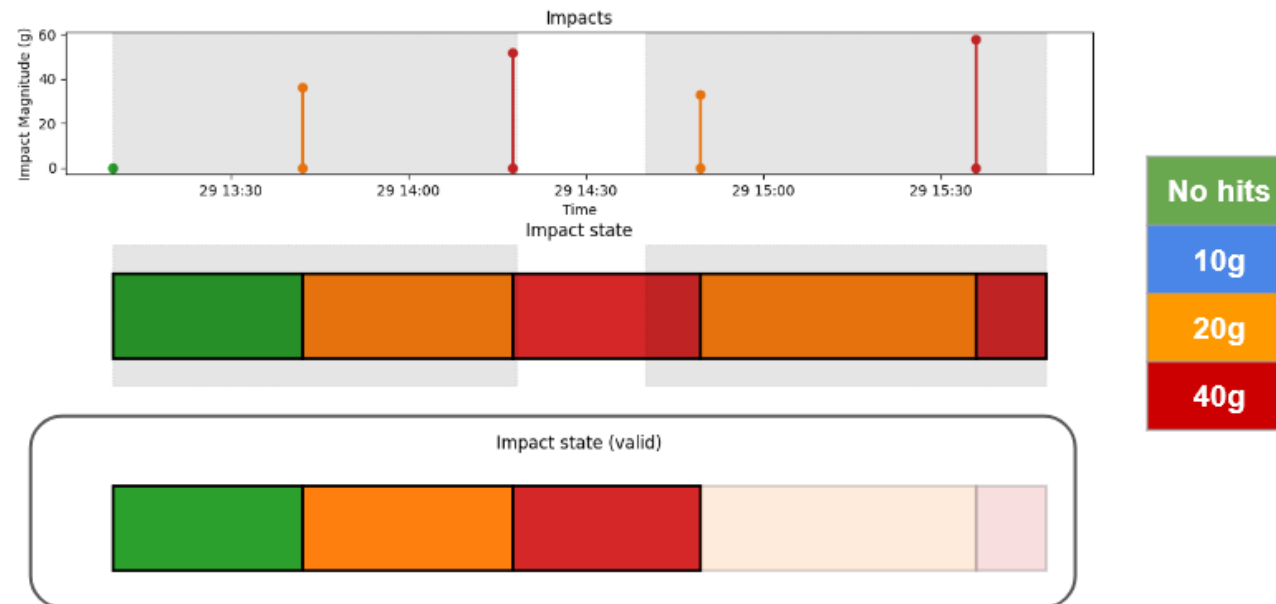
Head impacts profiling



Athletes sustain **42 ± 25 impacts** per game with an average magnitude of **20 ± 3 g**¹
→ how to isolate the effects of an impact on heart rate?



Categorization of impact « states » by magnitude

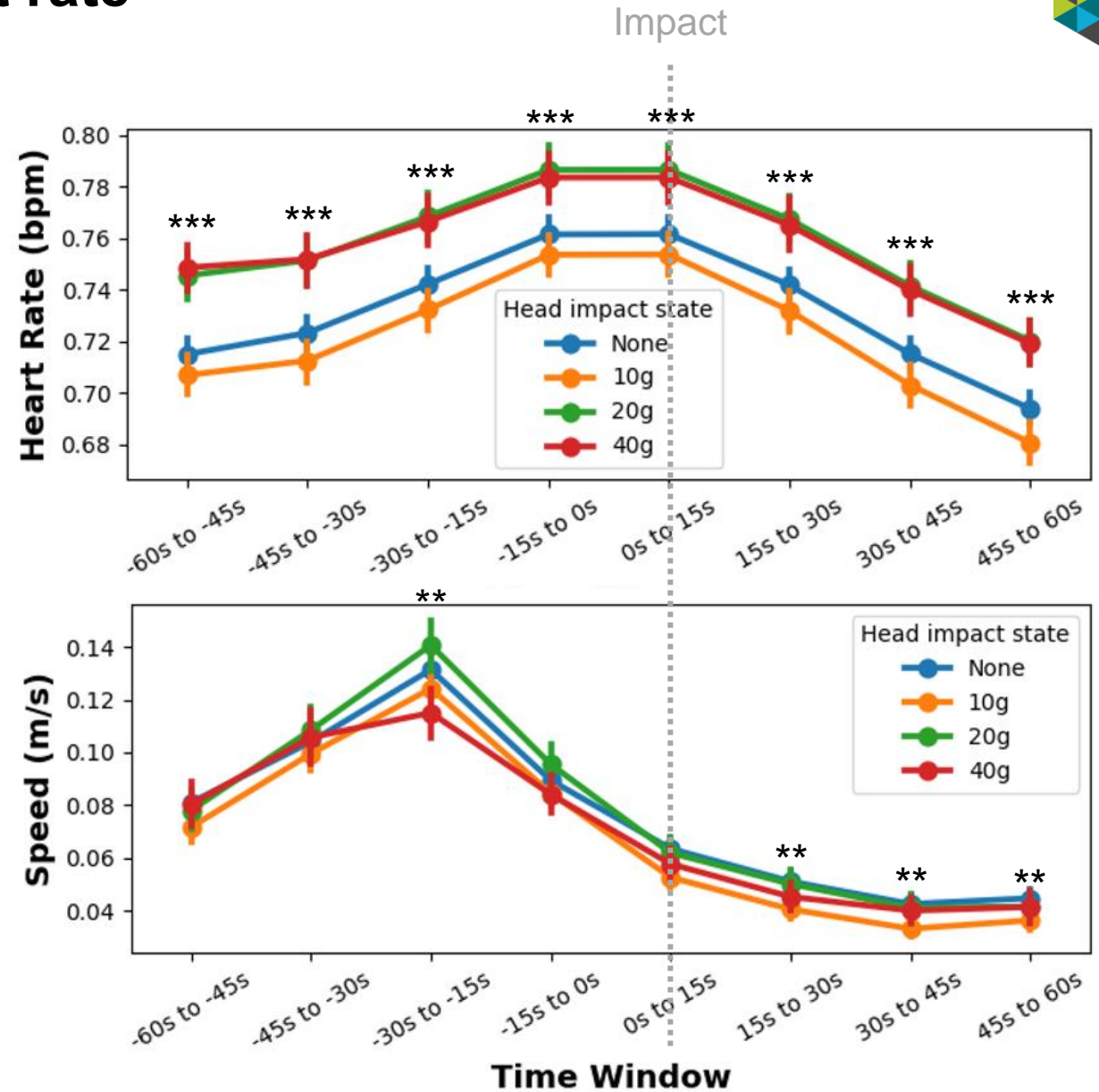


¹ Corbin-Berrigan et al, *Concussion*, 2021

Results: head impact state x heart rate



Impact state	N segments
None	2135
10 g	1388
20 g	677
40 g	632
Total	4832

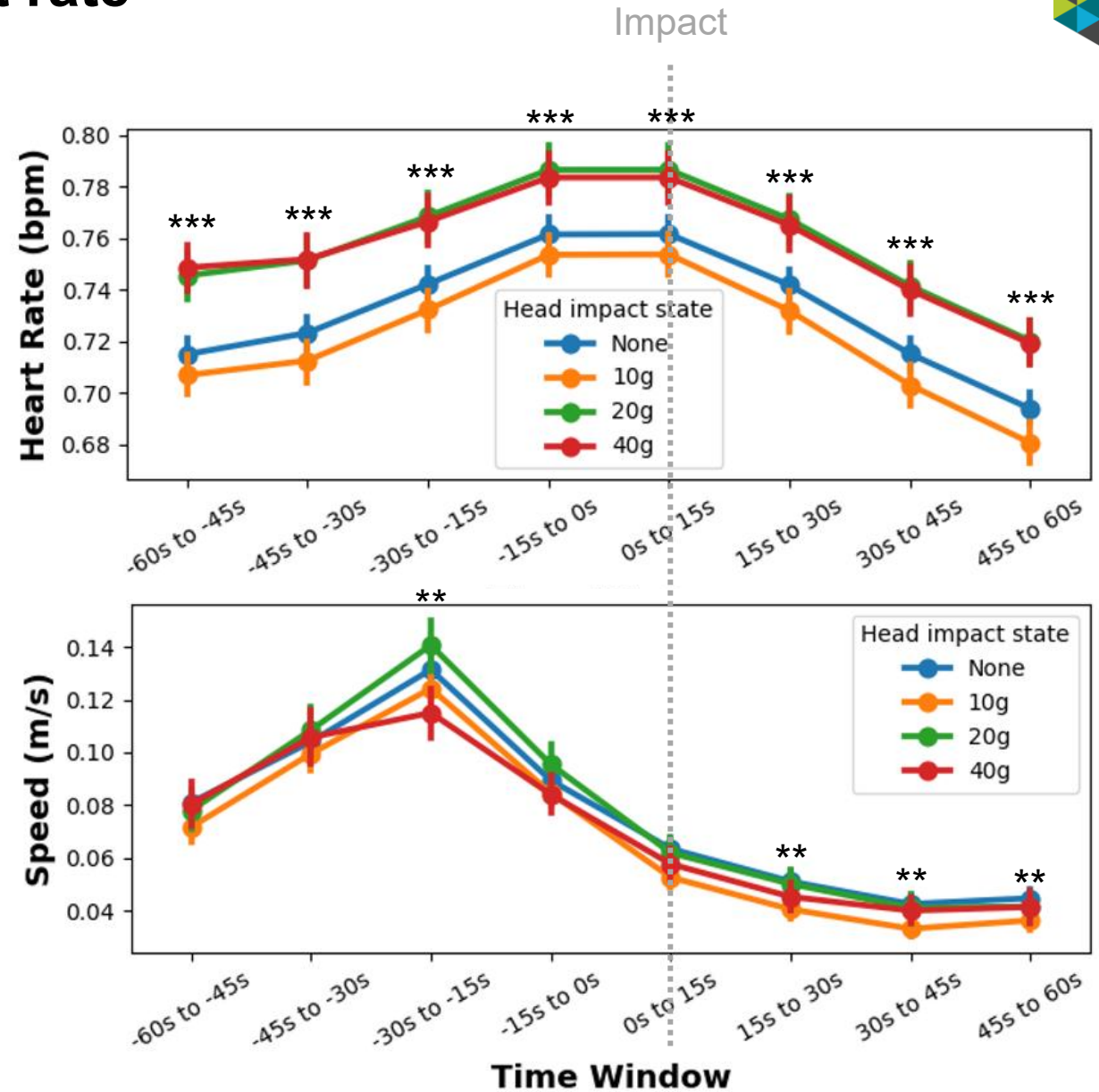


Results: head impact state x heart rate

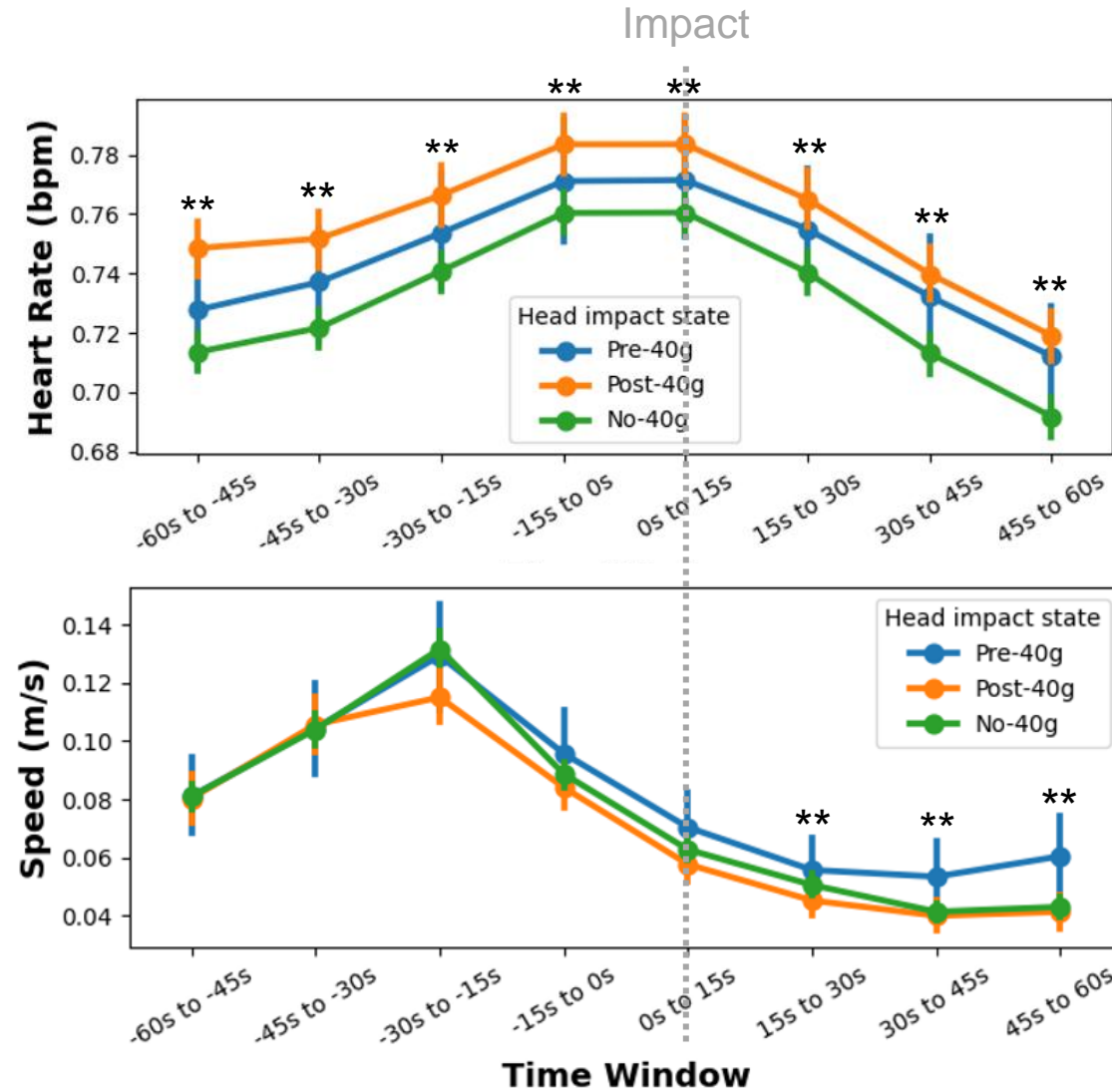


Higher HR for greater impact magnitude states

Speed changes not related to HR changes



Results: high magnitude impacts (≥ 40 g) x heart rate





The “impact state” of an athlete does affect his heart rate

The higher the magnitude of impact, the higher the heart rate elevation

Head impact exposure can alter cardiac kinetics

Autonomic nervous system dysregulations could explain these changes

→ Shared mechanisms with neurometabolic cascade of concussion ?

Take home messages



Brain changes vs. systemic changes

- More research needed on physiological / systemic effects beyond brain-related changes
- How to explore brain-heart interactions in online monitoring of contact sports athletes ?

Injury prevention opportunities

- Detection of windows of vulnerability **before** concussive impacts
- Removal from play until normalization?

Implications on performance

- Durably elevated HR impairs athletic performance
- Might further increase exposure to impacts



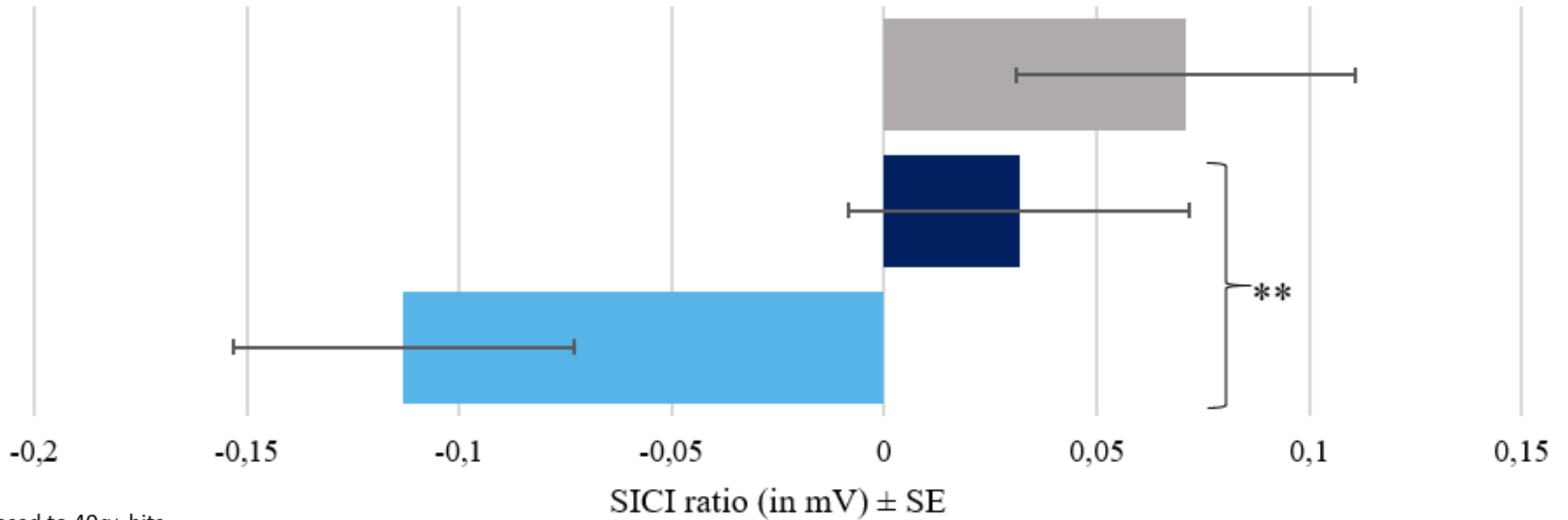
Thank you for your attention!

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Physiological changes following head impacts ?



SICI ratio 40g+ hits versus non 40g+ hits



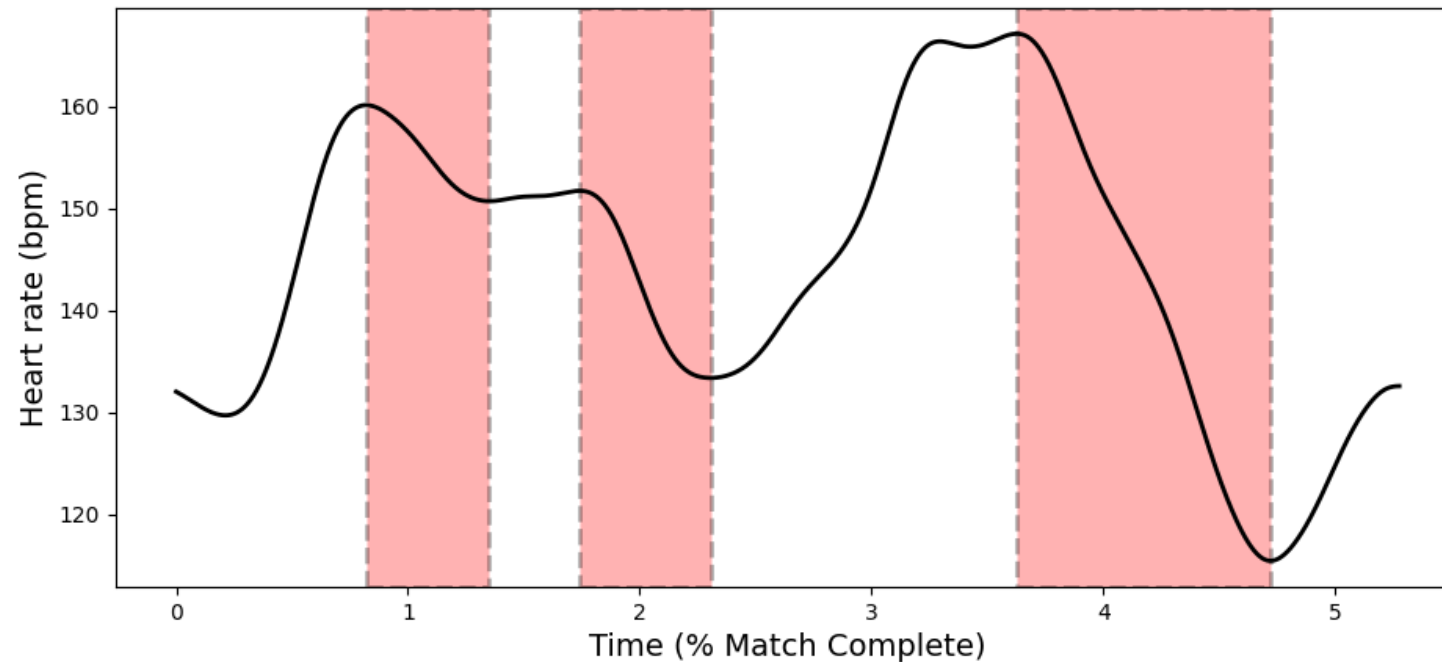
- Players exposed to 40g+ hits
- Players not exposed to 40g+ hits
- Control group

Determination of heart rate recovery periods

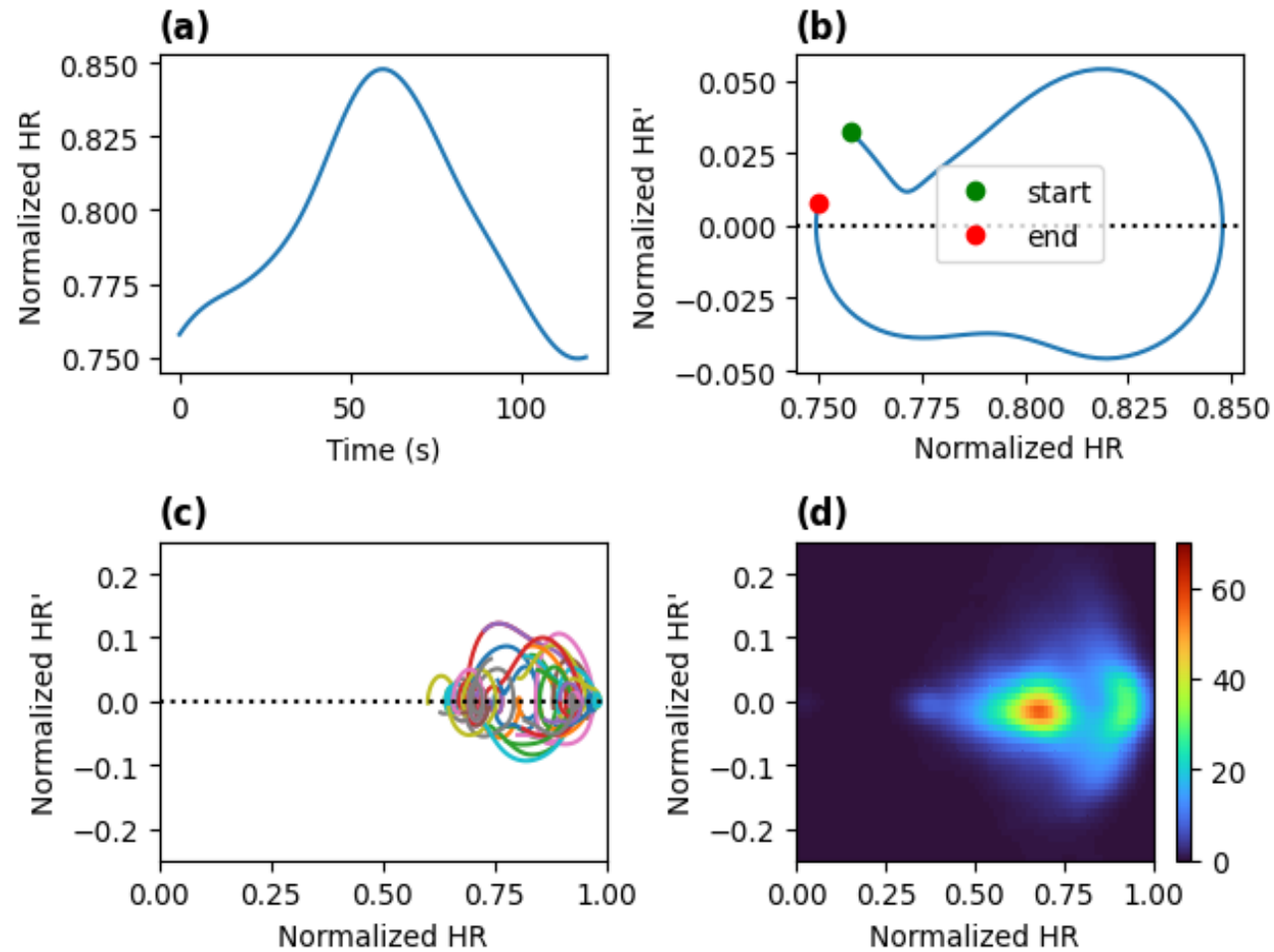


HR recovery period = time from monotonous decrease up to subsequent increase

> 15 sec



Results: Heart rate phase space



Results: Heart rate phase space

