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Improving training with physiological monitoring

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What It Monitors

Blood Pressure

Blood Oxygen Levels

Skin Temperature

Heart Rate and Electrical Activity (Electrocardiogram)

Activity Level

Breathing Rate and Volume

ASTROSKIN

Zephyr

LED   Detector

Topograph ® _fnirSoft
Front View

15 13 11 9   7 5 3 1
16 14 12 10   8 6 4 2

Zephyr BioHarness™

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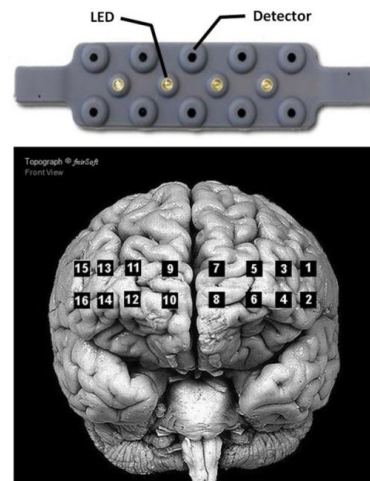
How can we use similar technology in training context?
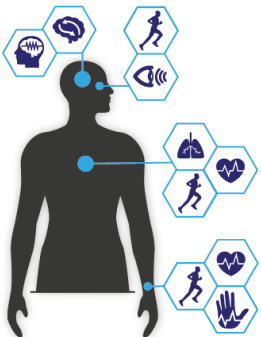
Measure engagement

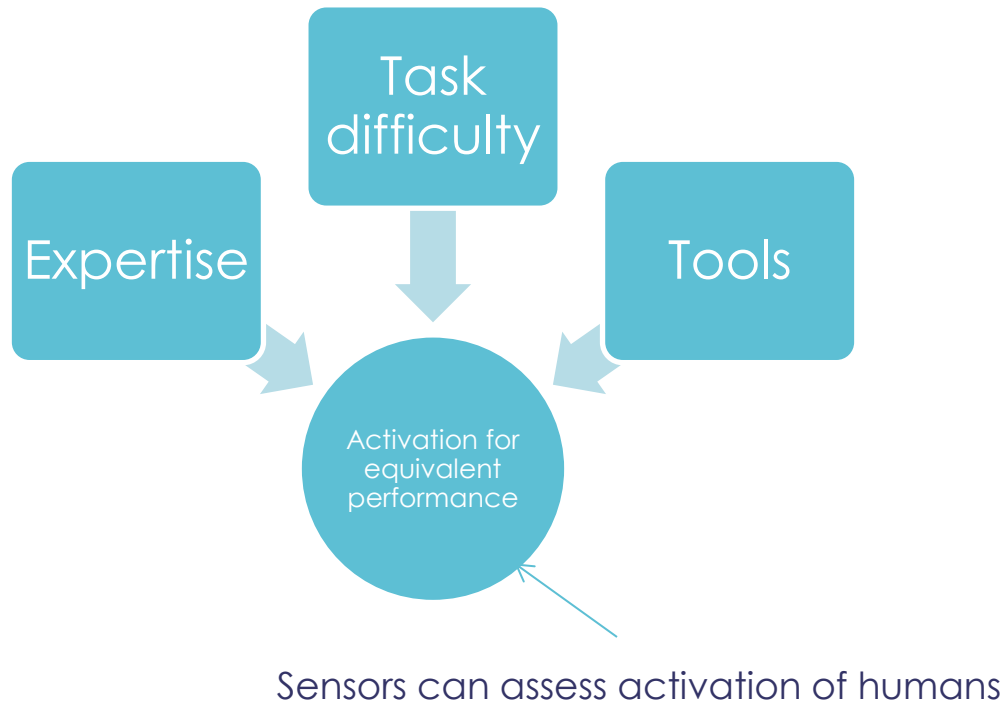> Ensure trainees are engaged in all contexts, including simulations

Validate scenarios

> Quantify the effect of various scenarios

Characterize individual profiles

> Track progress of trainees with stress management skills
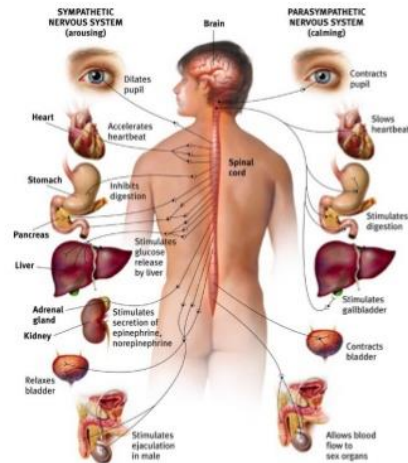
> Link profiles with outcomes

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Theory

Task difficulty

Expertise

Tools

Activation for equivalent performance

Sensors can assess activation of humans

Autonomic Nervous System (ANS)

SYMPATHETIC NERVOUS SYSTEM (arousing)

PARASYMPATHETIC NERVOUS SYSTEM (calming)

Sympathetic NS
"Arouses"
(fight-or-flight)

Parasympathetic NS
"Calms"
(rest and digest)

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Practice

Task difficulty

> Parallel parking

Tool

> Jeep

Expertise

> Teen (low)
> Adult (high)

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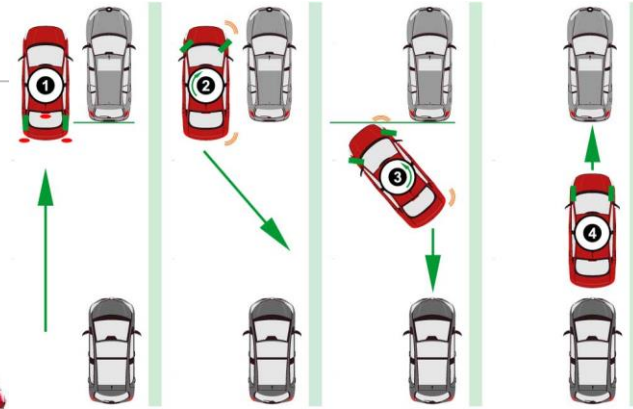
Initial Pilot In-Flight Training

Platform & Pilots Protection

Performance Readiness Dashboard Longitudinal
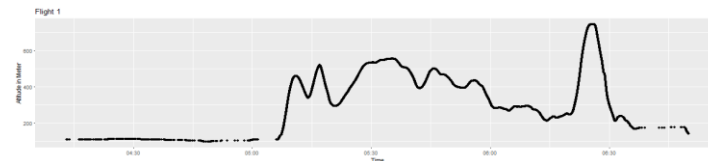
"Ease in flight" model

Method

> 6 acrobatic flights
> (~1 hr, GROB 120)

> 5 Tandems (Instructor/Cadet) + 1
> instructor

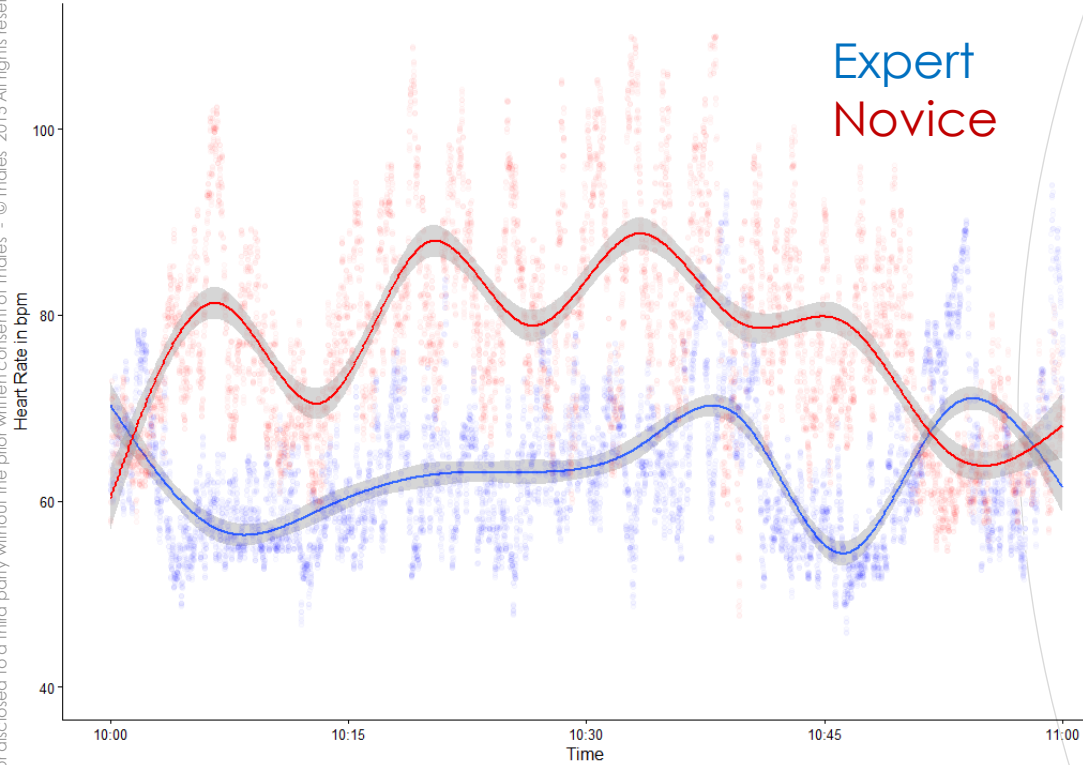> Cadet reproduces the maneuver
> performed by the instructor

Data

> ECG (Bio Harness)

> Contextual
> (altitude, velocity..)
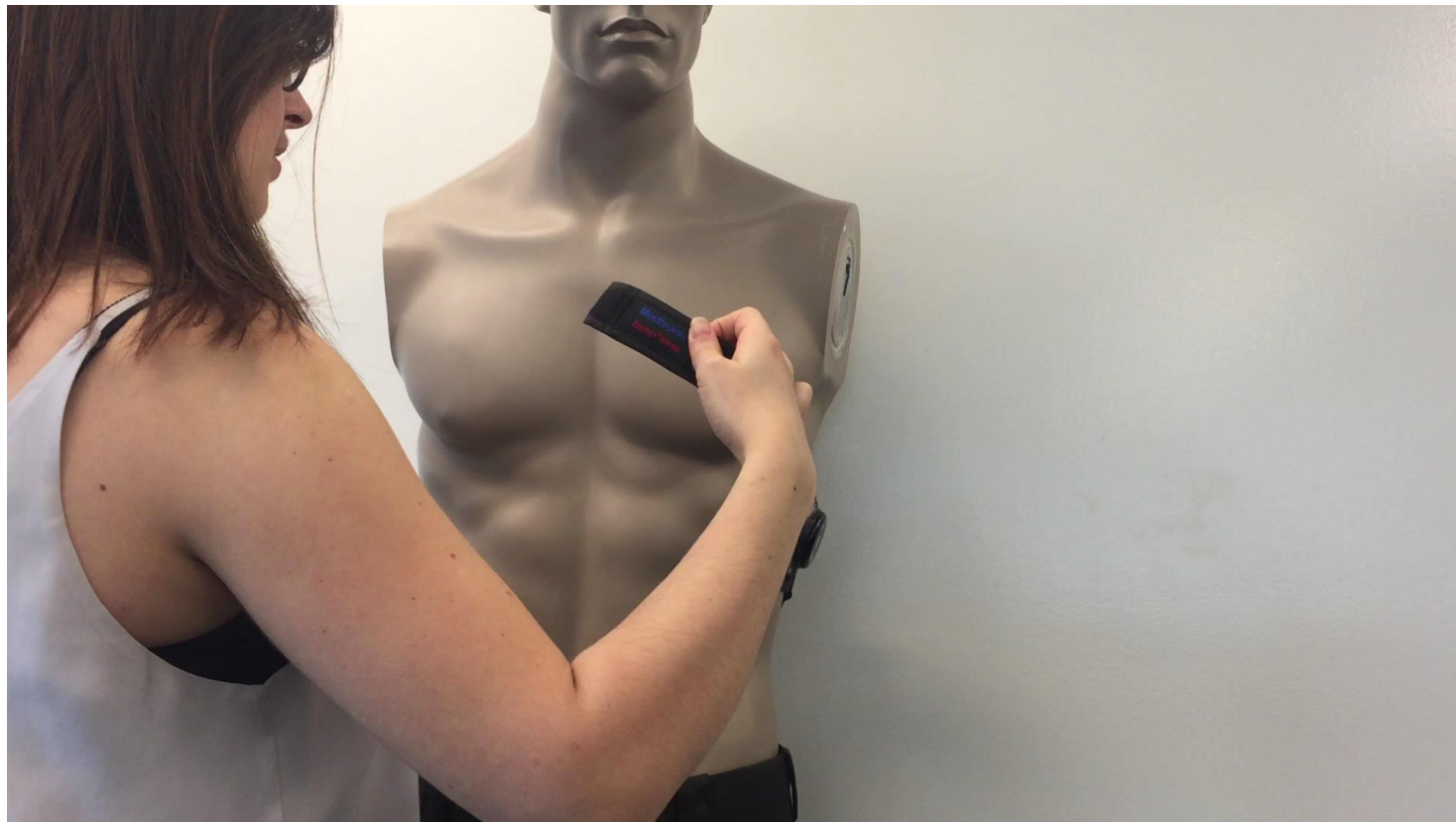

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Results

Instructor vs Trainee Heart Rate in bpm

Expert
Novice

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Aggregating data from multiple instructors to create an expert reference model.

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Performance en vol

https://easeinflight.com/#/login?returnUrl=%2Fhome

Nom d'utilisateur
instructor

Mot de passe
•••••••••

CONNEXION

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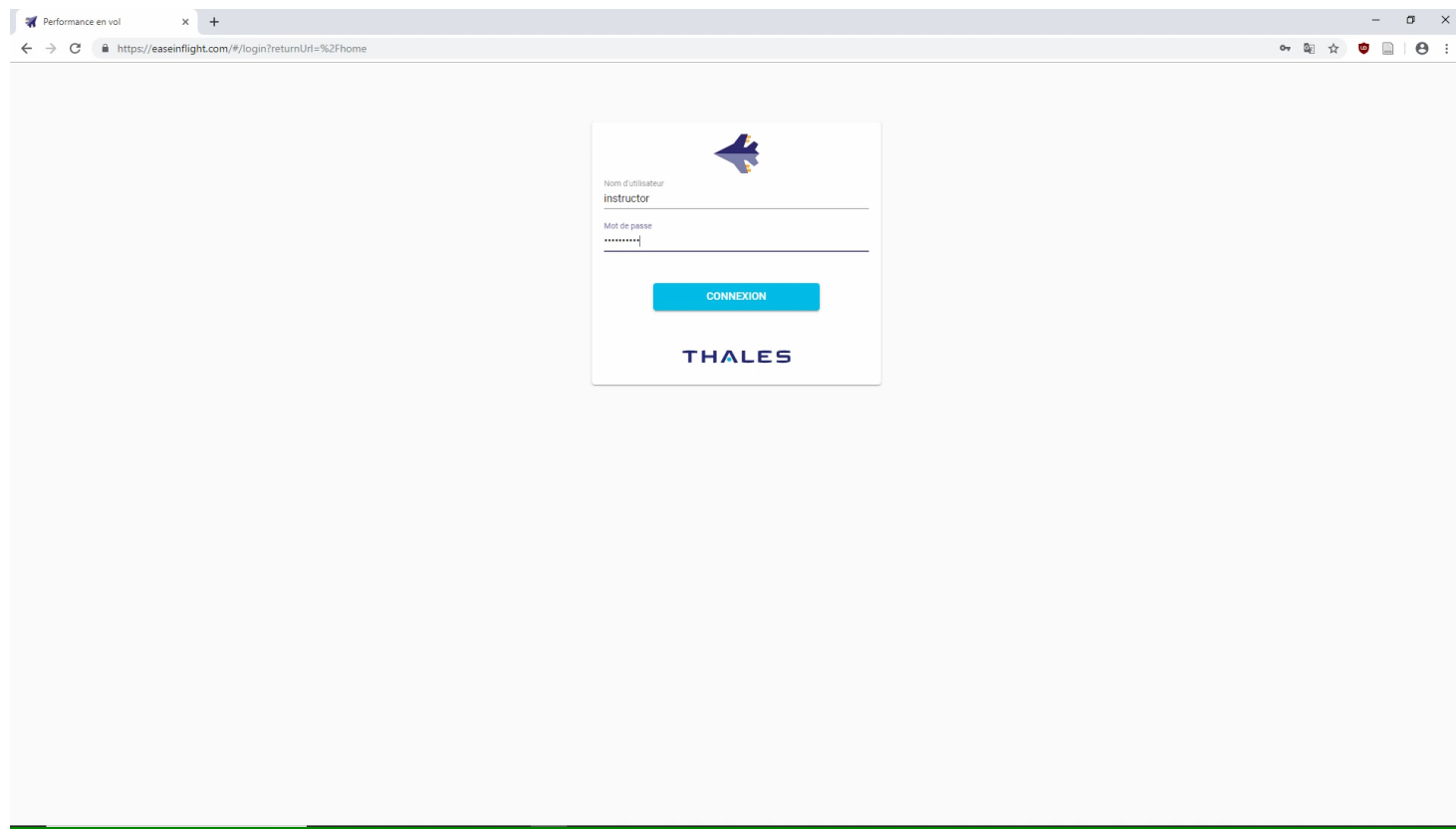Name of the company/ Template : 87204467-DOC-GRP-EN-002

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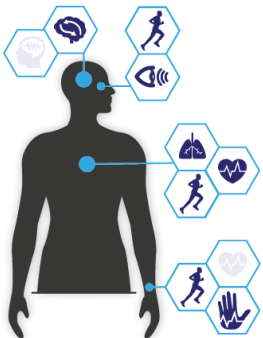
How can we use similar technology in this context? (reminder)

Measure engagement

> Ensure trainees are engaged in all contexts, including simulations

Validate scenarios

> Quantify the effect of various scenarios

Characterize individual profiles

> Track progress of trainees with stress management skills

> Link profiles with outcomes

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Method

> 27 trainees

> SAIR (simulator) vs real shooting

Data

> ECG/respiration (Bio Harness)

> Fitbit for baseline

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ENPQ - Engagement

Heart rate in Real vs Simulated contexts
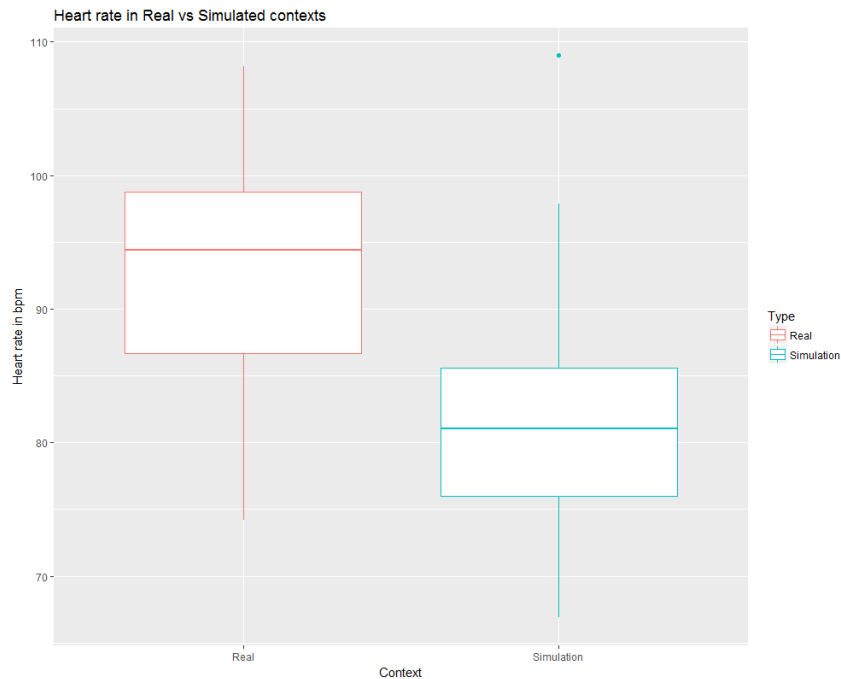
t(36) = 3.795, *p* < .001
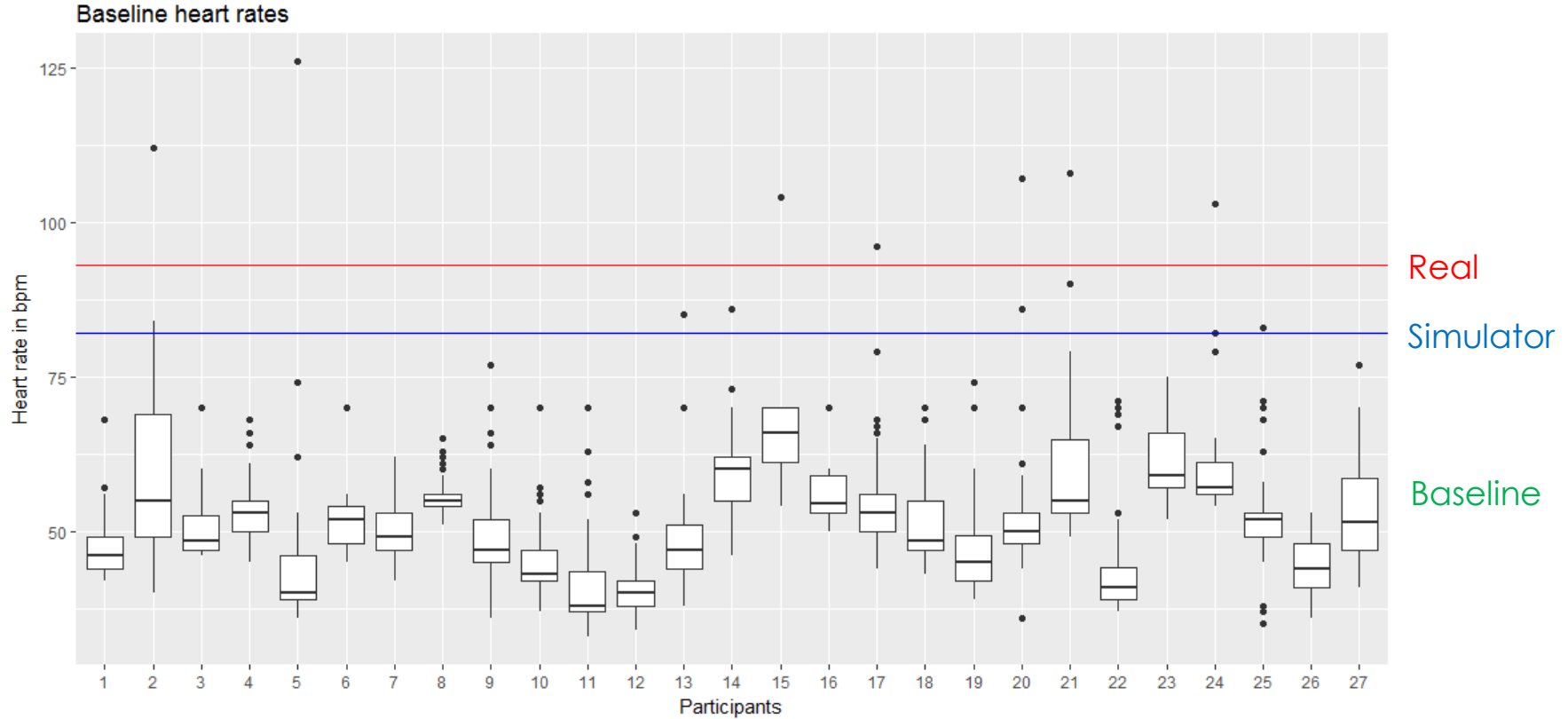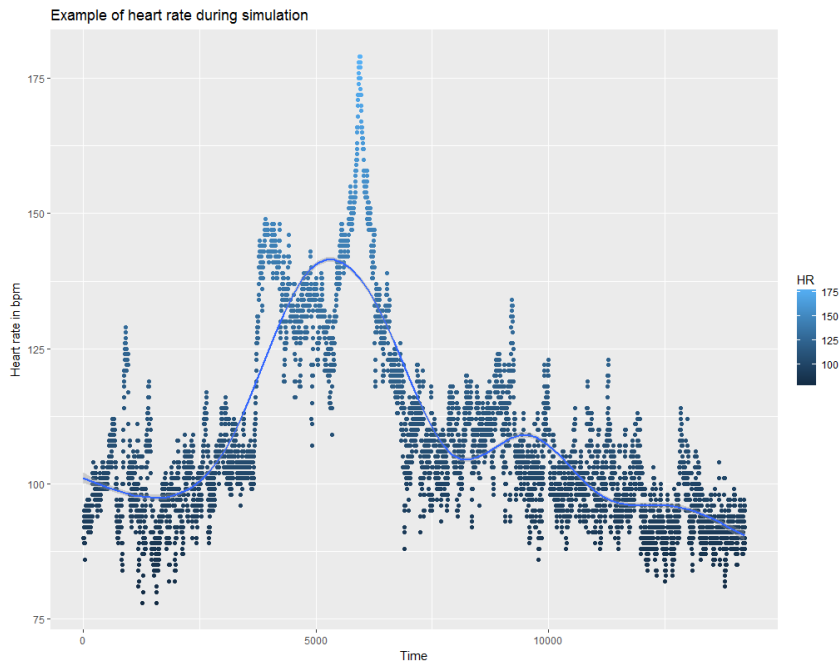mean of real 93 bpm
mean of simulated 82 bpm

Real vs simulated

> Real context significantly more « stressful »

> Is simulation engaging enough?

- Compare with baseline

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ENPQ - Engagement

Baseline heart rates

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ENPQ – Scenario validation

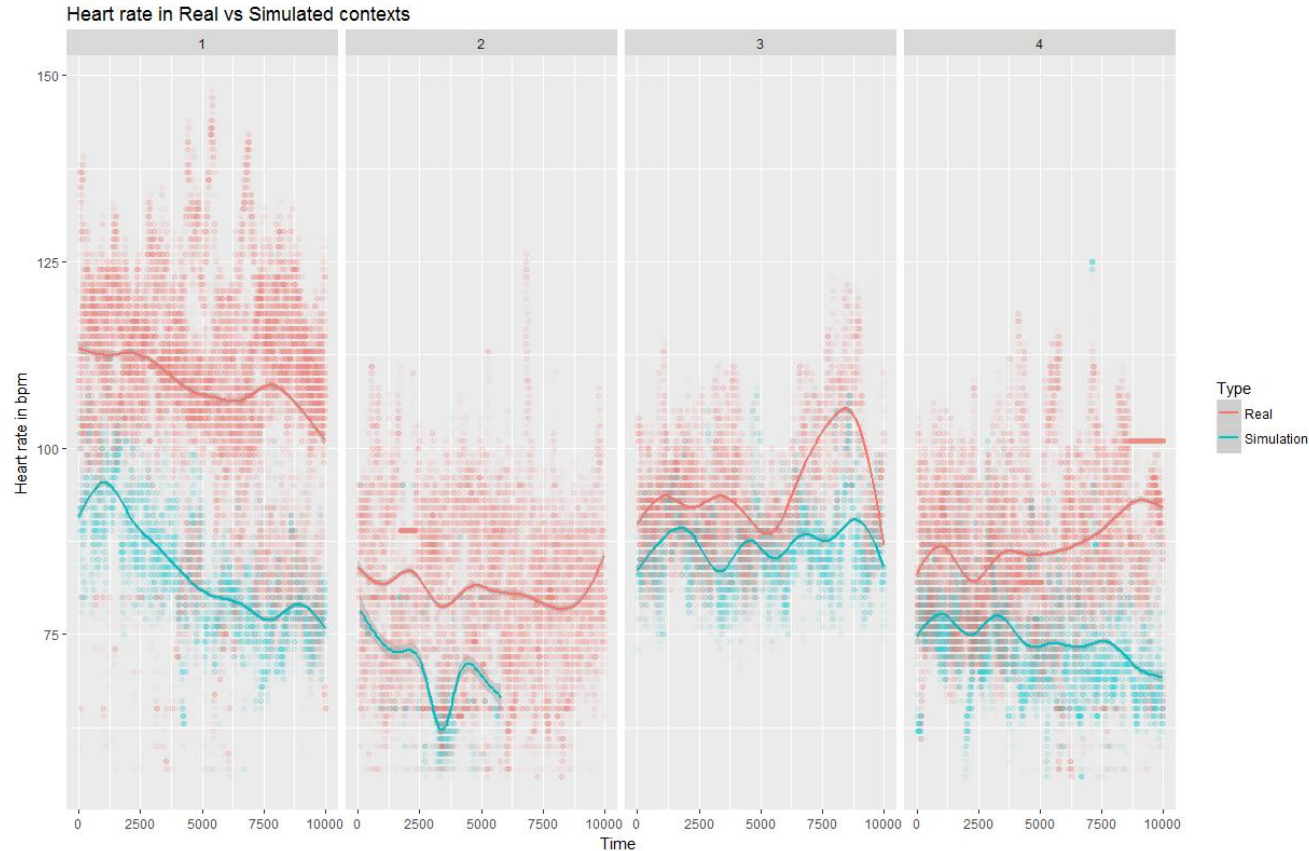Example of heart rate during simulation

Simulation

> Can generate significant levels of activation

Sources of activation

> Emotionally loaded scenarios

> Peers are observing

> Realism increases engagement

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ENPQ – Individual profiles

Heart rate in Real vs Simulated contexts

Different profiles

> Linked with performance?

> Can this information be used for individualization?

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Without individualization

With individualization

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To be continued

Research

> Evaluate the impact of

- Changes in cursus
- Other technologies
    - VR, AR, etc.

> Evaluate benefits of individualization

Technology

> Sensors

> Data management

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