





(Nieuwenhuys, 2015)

Excessive use of force

(Kop and Euwema, 2001; Burke and Mikkelsen, 2005; Verhage et al., 2018)

Long term mental health

(Carlier, Lamberts & Gersons, 1997; Van der Meer et al., 2017)



HRV TRAINING IMPROVES:



PERFORMANCE UNDER THREAT



COGNITIVE CONTROL



STRESS MANAGEMENT



DECISION-MAKING IN MILITARY/ POLICE SCENARIOS



ANXIETY & DEPRESSIVE SYMPTOMS

Hansen ea 2009

Laborde ea 2021

De Witte ea 2019

Anderson ea 2024

Goessl ea 2017; Pizzoli ea 2021









A VR GAME FOR CONTEXTUALISED REAL-TIME HRV BIOFEEDBACK

Problem

1.Training appeal lacking & stigma

2. Training/ application context mismatch

3. No direct feedback



Theory

1. Maximize engagement

2. Contextualized learning under high arousal

3. ANS feedback in the moment



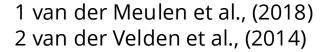
Solution

1. Co-design/ gamification

2. Immersive arousing virtual reality context

3. Integrated realtime HRV biofeedback



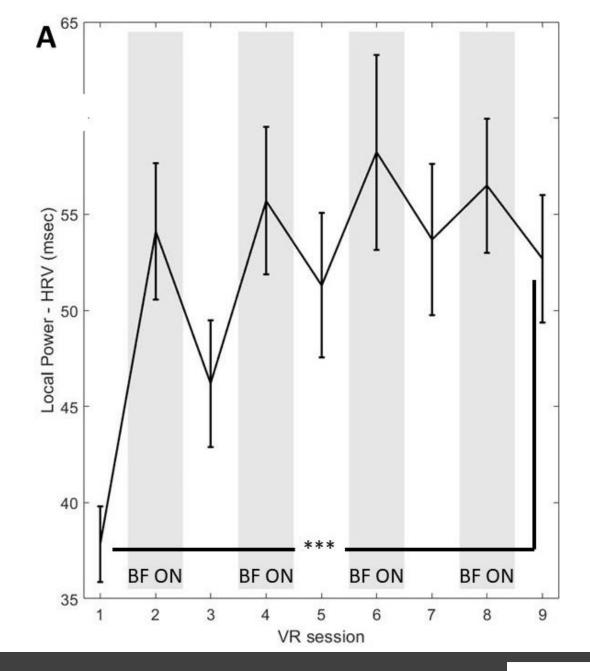


RESULTS (N=57 POLICE TRAINERS)

- Successful upregulation of HRV
- HRV also up during gameplay without feedback
- HR increases substantially when playing
- Parrallel increases in performance



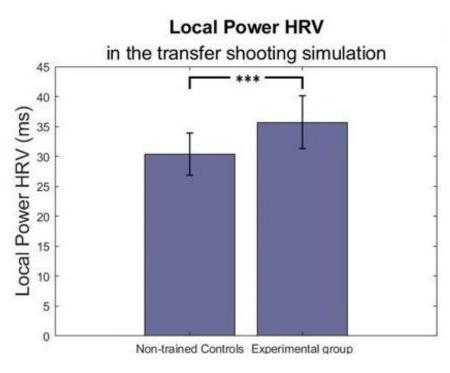
Abele Michela





TRANSFER OF HRV CONTROL TO A SHOOTING TEST OUTSIDE VR



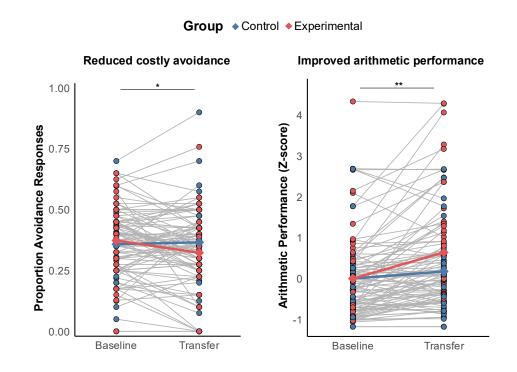


$$N = 49$$
 $N = 50$

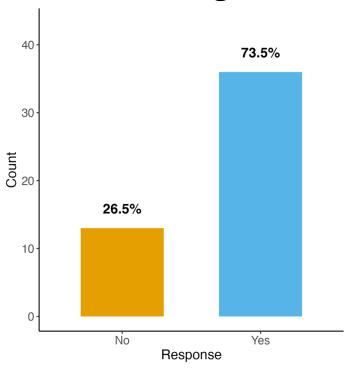
BEYOND POLICE, BEHAVIOURAL TRANSFER & LONG TERM EFFECTS?

Student population (N = 109)

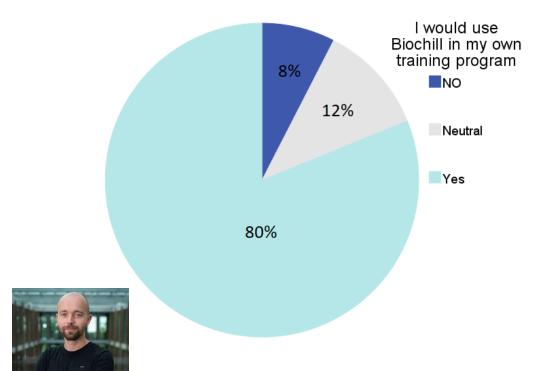
Jonathan Posthuma



1 month follow-up
Did the training help
you get better at daily
life stress regulation?



POLICE TRAINER PERCEPTION (AFTER PARTICIPATION OF +/- 25% POLICE TRAINERS IN NETHERLANDS)





Next step: implementation research in police curriculum

Teun-Pieter de Snoo



ACKNOWLEDGEMENTS

Science team:

Abele Michela, Jacobien M. van Peer, Jan C. Brammer, Teun-Pieter de Snoo, Marieke M. J. W. van Rooij, Jonathan Posthuma, Robert Oostenveld, Wendy Dorrestijn, Annika S. Smit, Isabela Granic, Karin Roelofs

Funding & Support:

- Netherlands Organization for Scientific Research (NWO)
- CbusineZ
- Politie Zorg Polis
- Dutch National Police
- Dutch Police Academy

Game Design:

Ken Koontz, Erik van den Berg, Thijs Doornbos













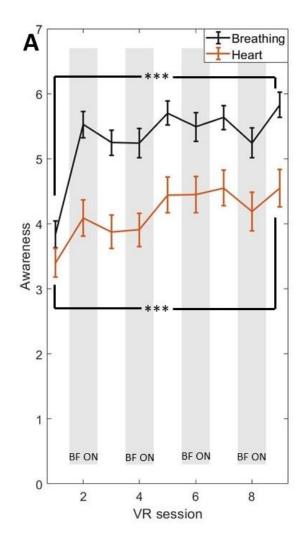


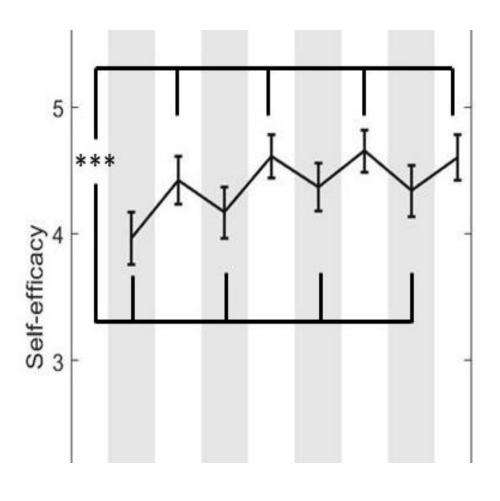
COMING SOON....





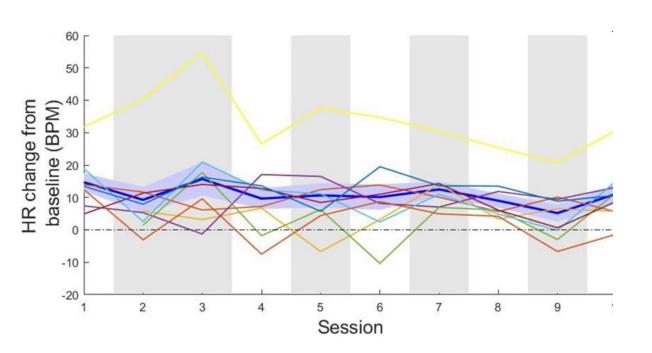
PHYSIOLOGICAL SELF AWARENESS

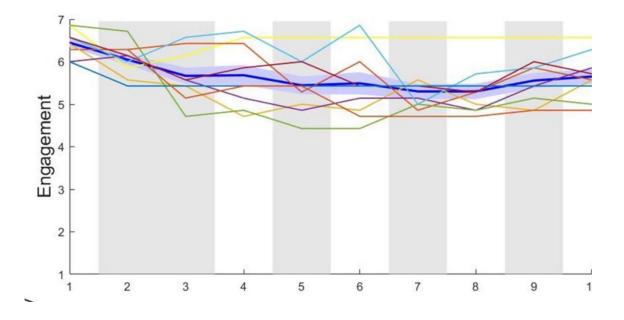






HR AND ENGAGEMENT OVER SESSIONS







CAUSAL EFFECT OF BIOFEEDBACK ON HRV

