



Body-Centered Intervention to Reduce Fall Injuries in Special Forces Selection Course

Results from the POSITION Study

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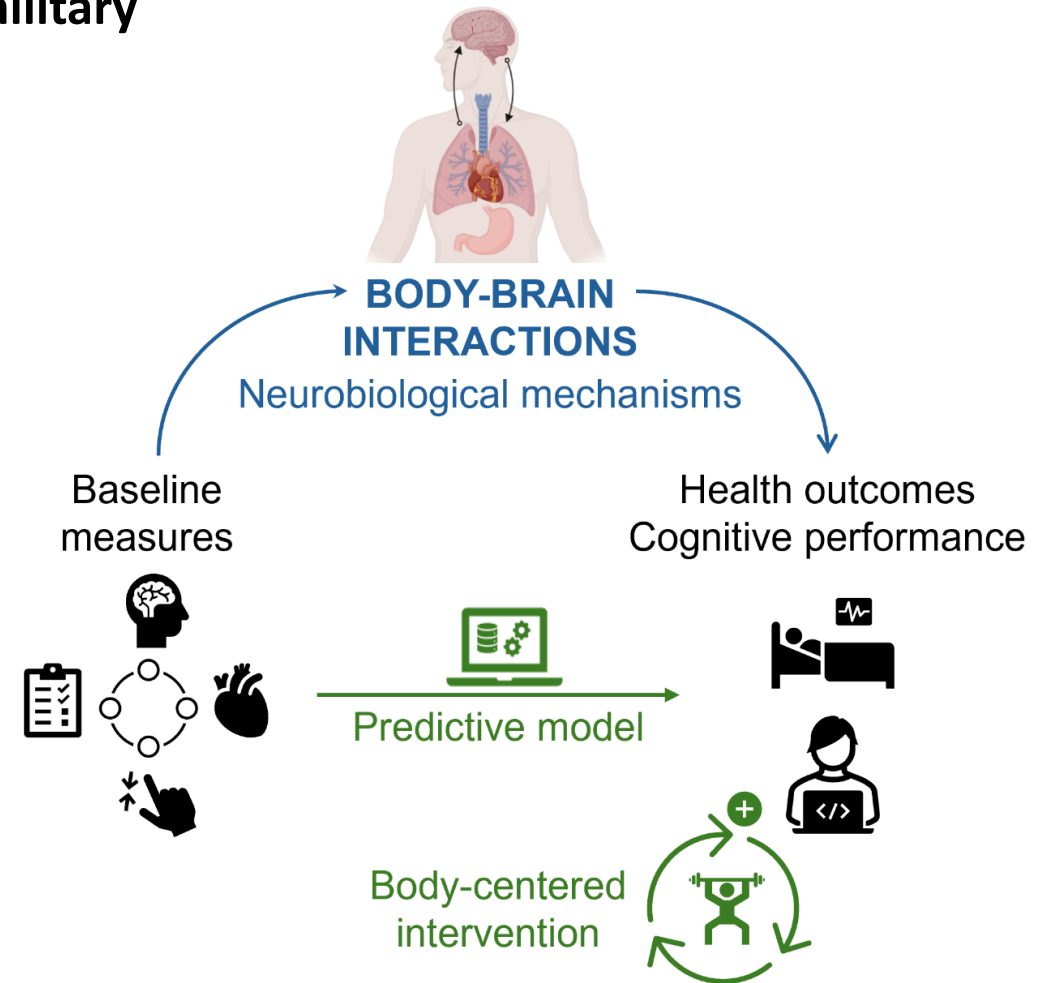
Disclosures

- No financial disclosures pertaining to this presentation.
- The views I express today are my own, and do not necessarily reflect the official position of the institutions with which I am affiliated.

Introduction

Body-brain interactions research in the French military

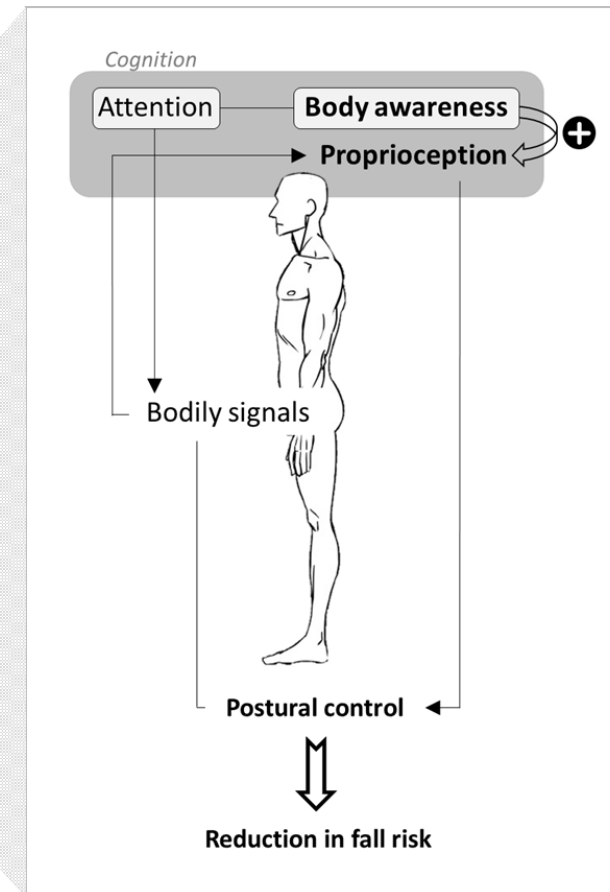
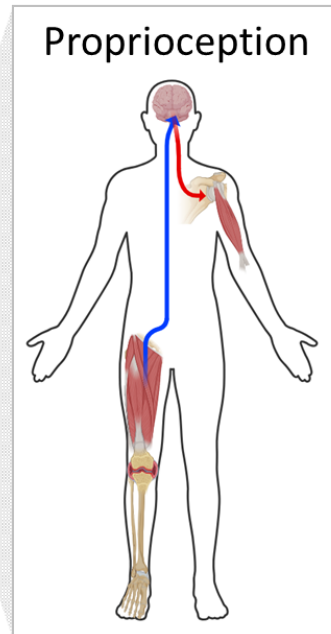
- Proposed experimental approaches^[1]



Introduction

- Proposed model linking proprioception and fall-related injury risk^[1]

Body-brain
communication axis



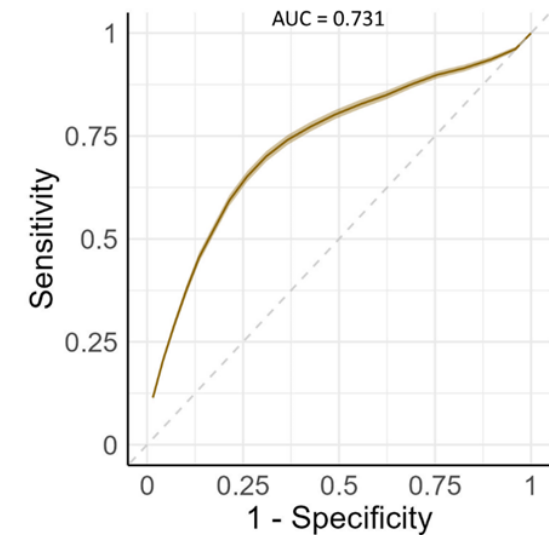
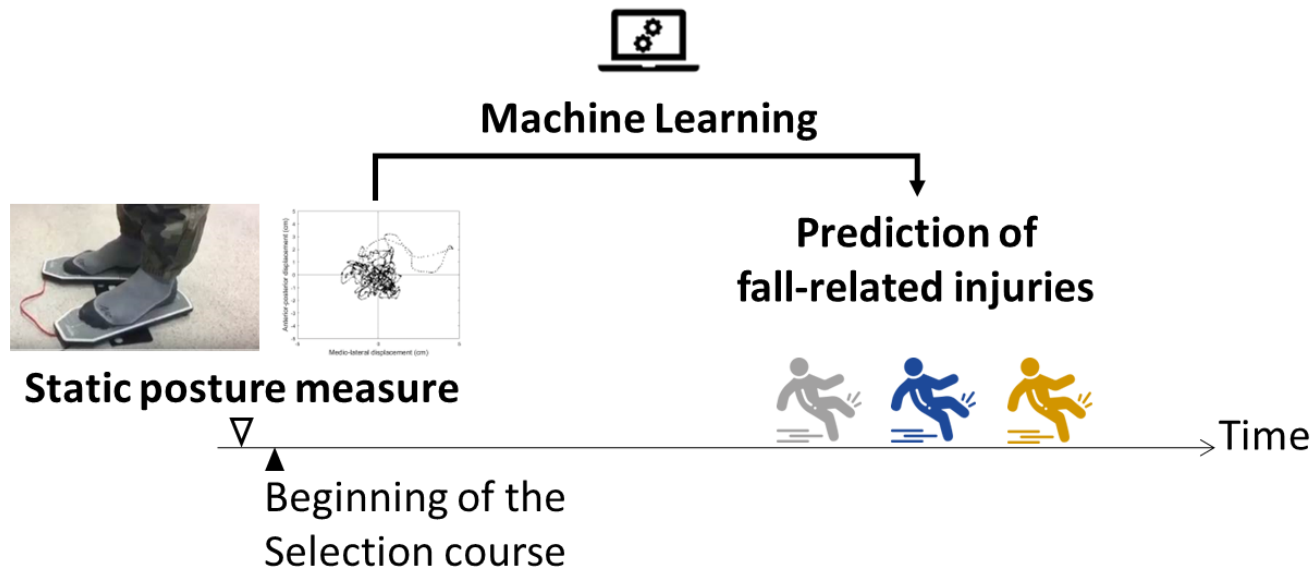
1. Obligi, ..., Verdonk, and Duffaud (2023) *PLOS ONE*

Figure adapted from [1]

Introduction

➤ Preliminary evidence from previous research conducted in the French Navy Special Forces^[1]

- 30% selection course failures due to fall-related injuries
- Artificial neural network predicts fall-related injury event with 70% accuracy

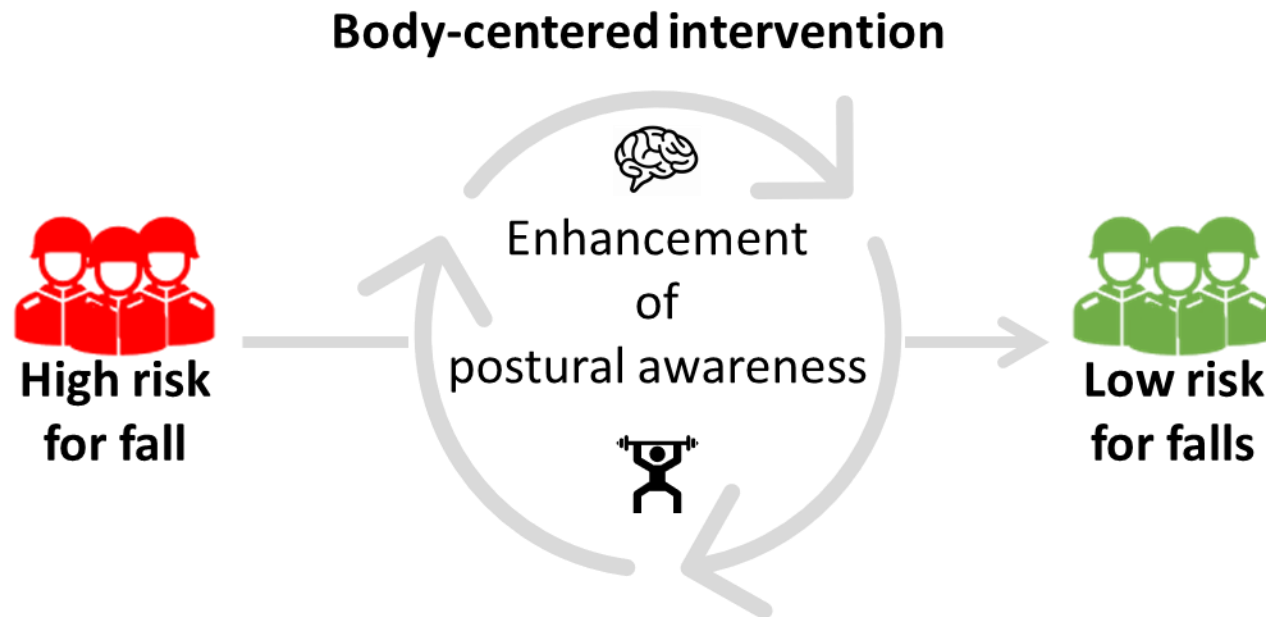


The POSITION Study



Principal Investigator: A. Duffaud

Primary objective^[1]



Intervention content

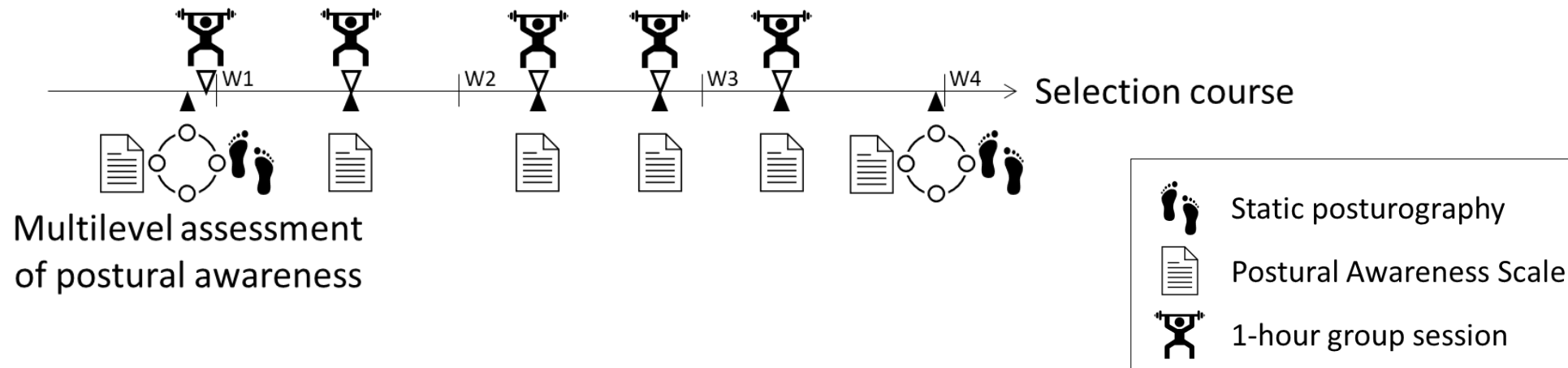
- Whole-body awareness
- Postural relaxation
- Mental imagery (before obstacle course)

1. Obligi, ..., Verdonk, and Duffaud (2023) *PLOS ONE*

The POSITION Study

Population & Methods^[1]

- 500 participants from five Special Forces units
- 2 arms: Intervention (n=231) and Active control group (n=269)
- **Primary endpoint: incidence of fall-related injuries during the selection course**



1. Obligi, ..., Verdonk, and Duffaud (2023) *PLOS ONE*

The POSITION Study

Results^[1]

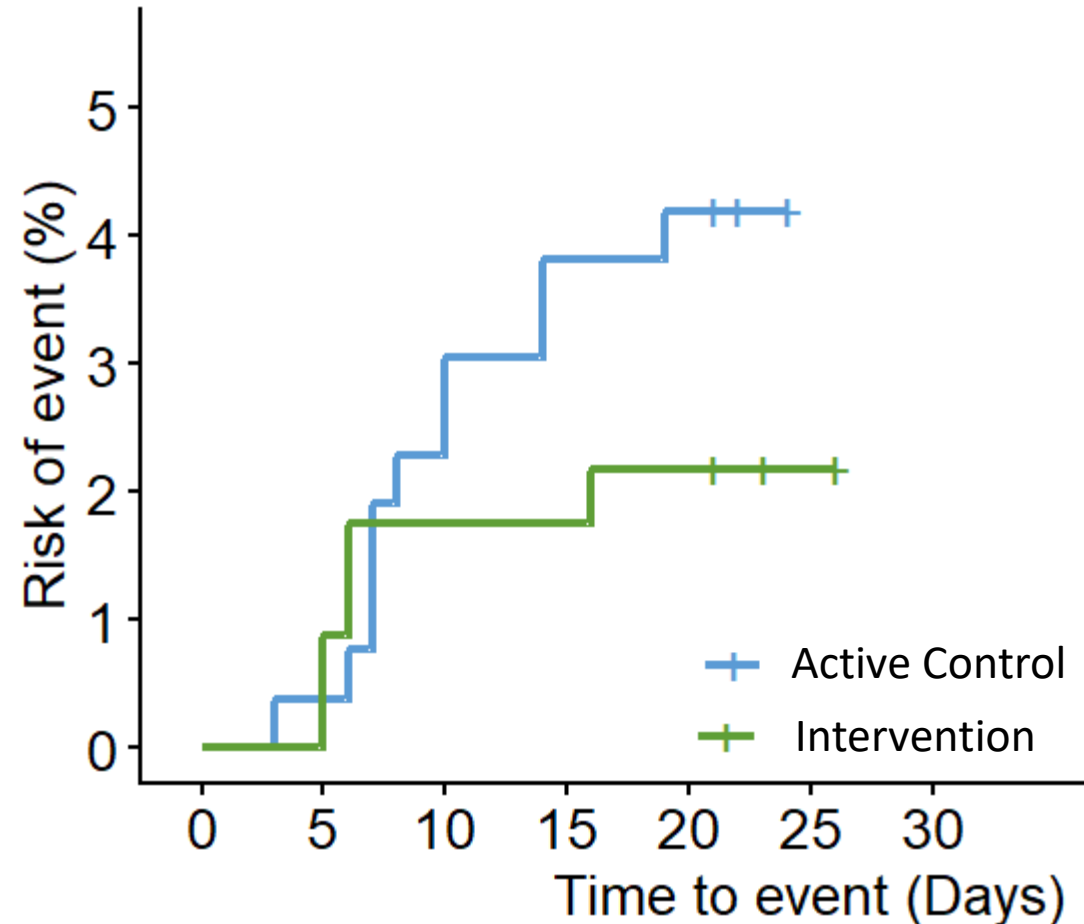
Active Control			Intervention		
Sample size	Number of events	Event occurrence M [Min-Max] in days*	Sample size	Number of events	Event occurrence M [Min-Max] in days*
N=269	12	12 [3-33]	N=231	5	7.6 [5-16]

M: Mean; * From the beginning of the POSITION study

The POSITION Study

Results^[1]

Reduced, non-significant, hazard of fall-related injury with Intervention vs Active Control (HR = 0.50; 95% CI 0.17–1.41; $p = 0.19$)



1. Verdonk et al (in preparation)

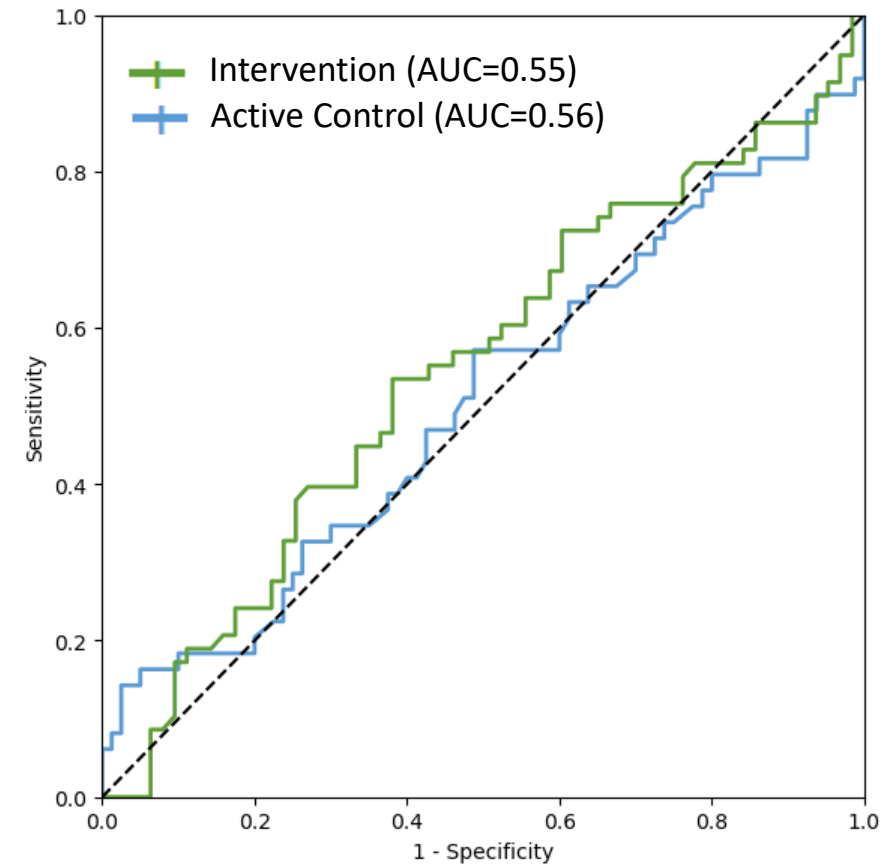
The POSITION Study



J. Guérin (Master 2 student)

Results^[1]

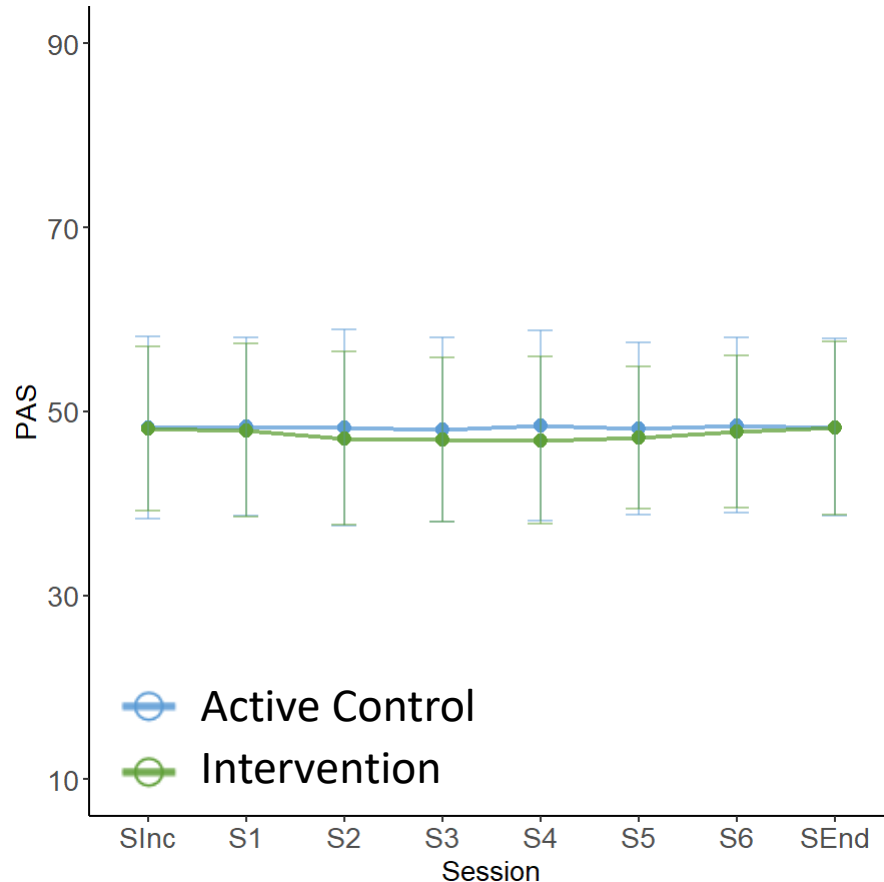
- Machine learning classification of postural features (pre- vs post-intervention)
 - Classifier performance close to chance level in either group: 57% (Control) vs 55% (Intervention)
- **No evidence of intervention-related effect on physiological signal of posture**



1. Verdonk et al (in preparation)

The POSITION Study

Results ^[1]



- Postural Awareness Scale (PAS)^[2] measured longitudinally (baseline, sessions, post-intervention)
 - No significant group effect on PAS scores over time
- **No evidence of intervention-related effect on self-reported postural awareness**

1. Verdonk et al (in preparation)
2. Da Costa Silva, ..., Verdonk, and Duffaud. (2022) *Frontiers in psychology*

Discussion

- **No effect of intervention on injury risk, postural control, or postural awareness**
- **Low incidence of fall-related injuries** in this cohort (3.5%) compared to prior data (35%) → Limited statistical power and potential contextual influences
- **Intervention limitations:**
 - Insufficient intensity and specificity to target postural mechanisms
 - Timing too close to exposure during selection
- **Implementation constraints:**
 - No pre-selection assessment
 - Limited feasibility of individualized prevention strategies

Next analysis steps^[1]

- **Psychobiological stress response**
 - Repeated measures of Perceived Stress Scale and salivary markers (ChromoA, AA, DHEAs, Cortisol)
 - Assess whether ORAF modulates stress response during selection
 - Test its role as a potential mediator of injury risk
- **Additional machine Learning analyses**
 - Aim: Predict fall-related injuries from baseline postural signal
 - Challenges: Low number of injury events (n=17); severe class imbalance (3.5% injury vs 96.5% non-injury); limited performance of resampling methods

1. Obligi, ..., Verdonk, and Duffaud (2023) *PLOS ONE*

Conclusion

- **No evidence of effectiveness of the prevention program on fall-related injury risk**
- **Ongoing research framework:** Investigate brain–body interactions (proprioception, interoception) as determinants of health and performance
- **Operational implication:**
 - Provide **evidence-based recommendations** to military leadership
 - Inform decisions at the interface of **readiness and health**



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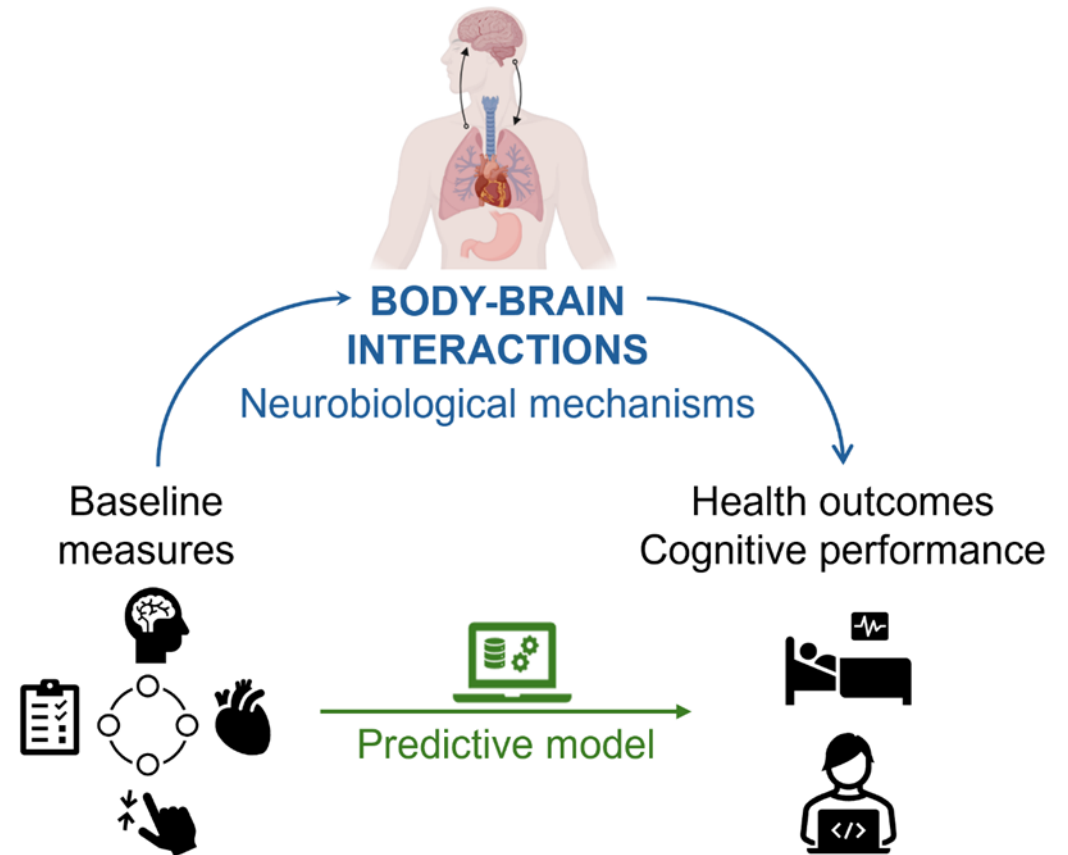
Learn more about
my research



Body-brain interactions research in the military

Questions & Approaches

1. How does the quality of interactions between the body and brain influence the expression of mental and physical disorders, as well as cognitive performance?



Body-brain interactions research in the military

Questions & Approaches

1. How does the quality of interactions between the body and brain influence the expression of mental and physical disorders, as well as cognitive performance?
2. How do changes in body signals from our organs' cyclic activity affect the brain's performance?



1. Personal Website

The paradox of combat operations

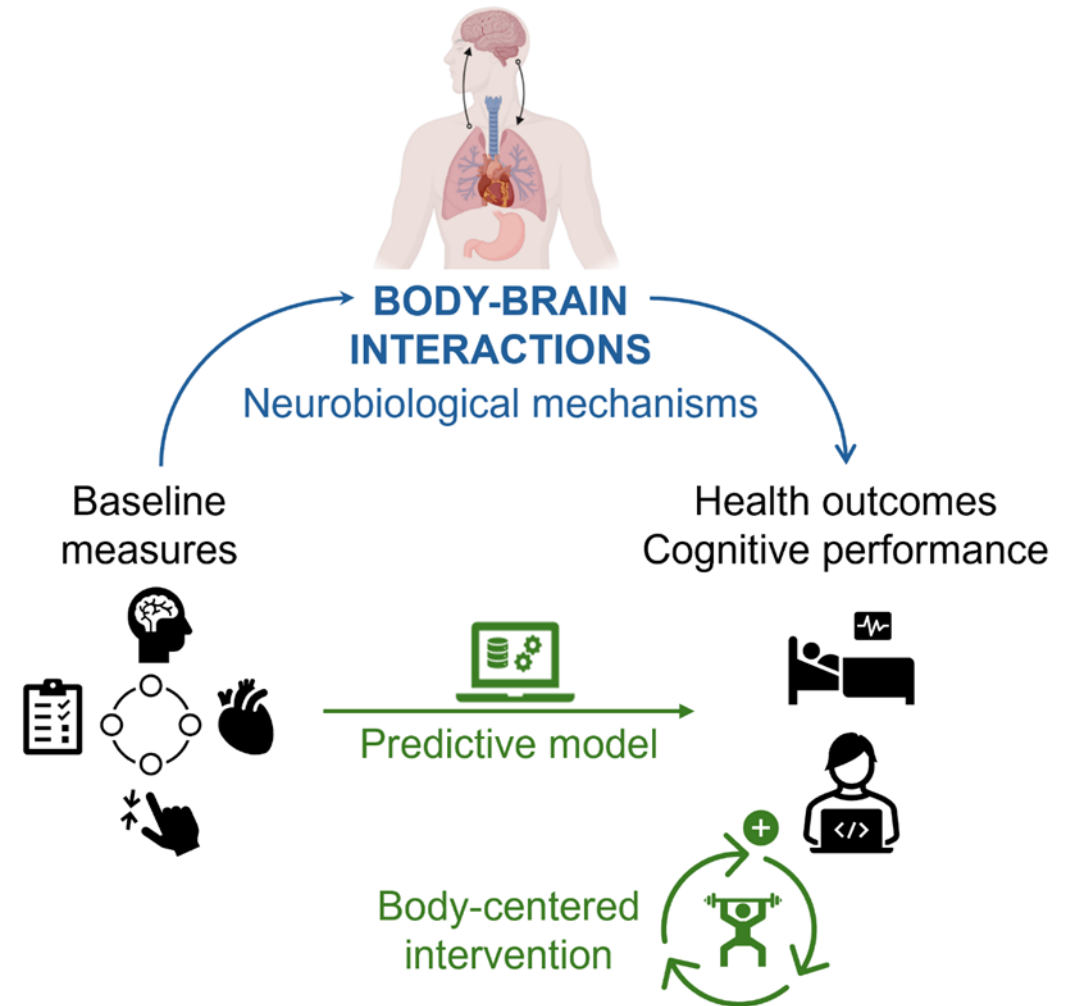
- ✓ High level of cognitive performance required
- ✓ Body faces strong physiological & psychological constraints



Body-brain interactions research in the military

Questions & Approaches

1. How does the quality of interactions between the body and brain influence the expression of mental and physical disorders, as well as cognitive performance?
2. How do changes in body signals from our organs' cyclic activity affect the brain's performance?
3. Can body-centered interventions aimed at improving the connection between the body and brain enhance physical and mental health, as well as cognitive performance?



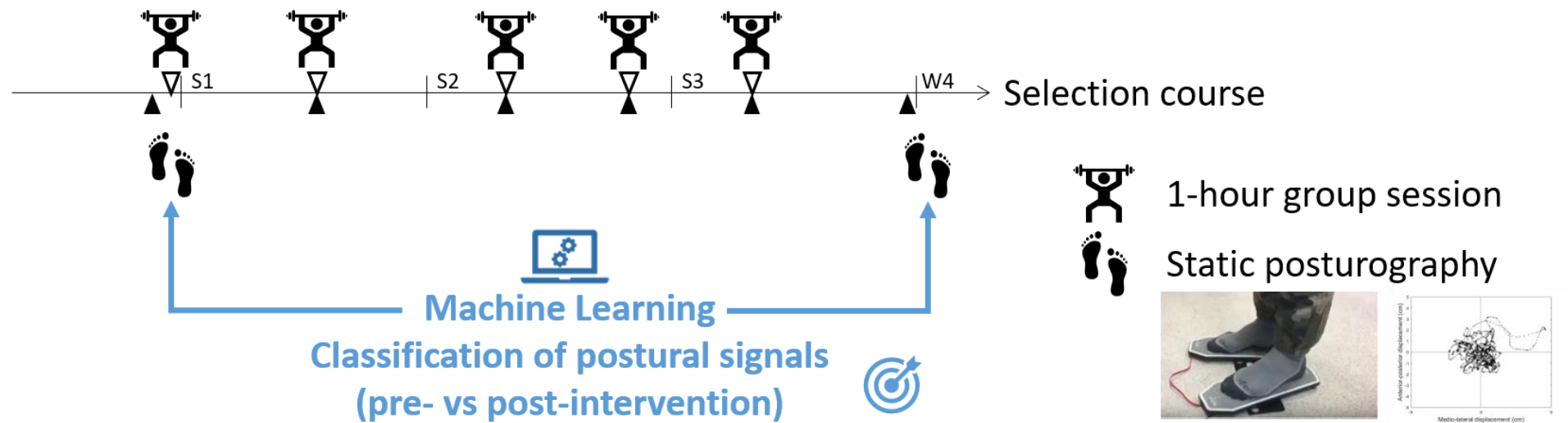
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	Active Control			Intervention		
	Sample	Number of events	Event occurrence M [Min-Max] in days*	Sample	Number of events	Event occurrence M [Min-Max] in days*
CPA 10	16	0	-	21	0	-
ECOFUS	79	7	8.5 [3-14]	82	4	5.5 [5-6]
GIGN	53	0	-	30	0	-
13eme RDP	44	4	15 [7-33]	33	0	-
1er RPIMA	67	1	19	63	1	16

M: Mean; Min: Minimum; Max: Maximum; * From the beginning of the POSITION study

The POSITION Study

➤ Machine Learning analysis ^[1]



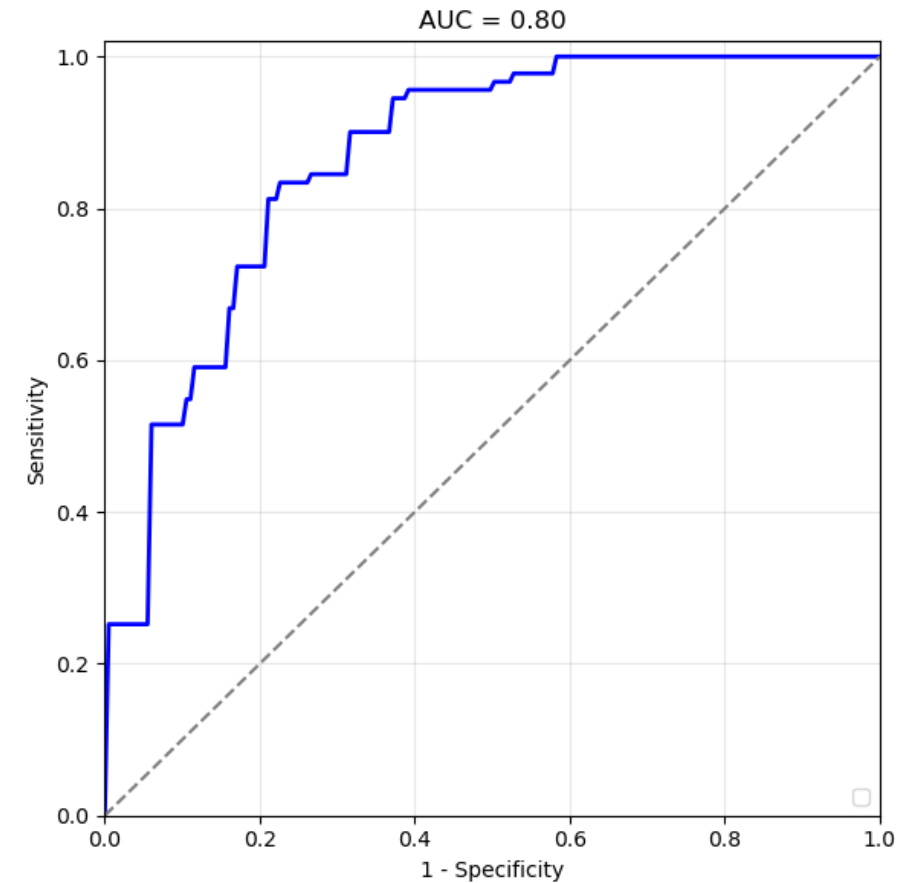
- Methodology: 136 postural features (16 individual-specific ^[2] + pairwise products), 50 selected using scFSNN ^[3], Random Forest classifier

The OCS Study



B. Nindl, University of Pittsburgh

- **Goal:** Predict individual risk of fall-related injury from baseline postural features
- **Dataset:** Postural data collected pre-selection in a U.S. Army Officer Candidates School cohort (n=143)^[1]
- **Neural network performance: Predicting risk of fall-related injury, with accuracy up to 79%**^[2]



1. Bird *et al.* (2023) *Frontiers in physiology*
2. Verdonk *et al* (in preparation)