

Evaluation of the effectiveness of a prevention program on the risk of injury during military physical activities

Context: Physical and sports activities play an important role in the military environment to develop and optimize the capabilities necessary for soldiers to carry out their missions. The prevalence of injuries is high during the selection course of Special Forces, and identifying risk factors that are accessible to preventive measures is a major issue for protecting the health of military personnel. Epidemiological data show that most injuries during selection course are acute trauma from falls following a loss of balance. This data suggests the hypothesis that the quality of postural balance could influence the occurrence of injuries during the selection course. The high level of stress individuals are exposed to during the selection course could contribute to the degradation of postural balance quality. The POSITION study¹ conducted by the French Armed Forces Biomedical Research Institute (IRBA) aims to study the cognitive mechanism of postural awareness as a risk factor for fall injuries and as a target for a new prevention strategy aimed at reducing this risk. This prevention program aims to improve postural control and reduce the intensity of the psychobiological stress response, thereby reducing the incidence rate of fall injuries occurring during the selection course of Special Forces.

Objective: The objective of the internship is to evaluate the effectiveness and characterize the mechanisms of action of a prevention program aimed at reducing the risk of fall injuries during the selection course of French Special Forces.

Material: The evaluation of the prevention program will be based on an already constituted database of 500 individuals who participated in a selection course within 5 units of the French Special Forces. The data was collected between 2021 and 2023 as part of the POSITION study conducted by IRBA (ID-RCB: 2021-A02108-33). The database includes medical data and physiological, psychometric, and biological measures that were collected at the beginning, during, and at the end of the selection course. These data were collected in 2 distinct groups: a group 'Intervention' composed of individuals who benefited from the program aimed at improving postural awareness (n=231), and a group 'Active Control' composed of individuals who underwent cognitive training with no effect on postural awareness (n=269).

Method: The effectiveness of the prevention program will be evaluated using survival analysis comparing the risk of injury occurrence between the group benefiting from the prevention program and the active control group. The mechanisms of action of the prevention program will be characterized by evaluating the impact of the program on several specific measures of physiological nature (postural signal from static posturography), psychometric nature (postural awareness scale and perceived stress questionnaire), and biological nature (biomarkers of the hypothalamic-pituitary-adrenal axis and the autonomic nervous system) using classical statistical models (repeated measures ANOVA and linear mixed-effect model) and more sophisticated models including Machine Learning techniques (variable selection, predictive model such as artificial neural network).

Supervision: The supervision will be conducted jointly by the principal investigator of the study (Anaïs Duffaud PhD) and a military physician and neuroscientist (Charles Verdonk MD PhD) working at the Unit Neurophysiology of stress of IRBA.

¹ Obligi, L. et al. Position: A study protocol for the prevention of fall injuries in french special forces selection courses using a body-centered intervention. PLOS ONE 18, e0290241, [doi:10.1371/journal.pone.0290241](https://doi.org/10.1371/journal.pone.0290241) (2023).

Aims of the internship

1. Pre-processing of already collected data (aggregation and homogenization).
2. Implementation of statistical models (Cox model, repeated measures ANOVA, linear mixed-effect model, and Machine Learning techniques) and conducting statistical analyses.
3. Participation in the scientific valorization actions of the work, particularly through active contribution to the writing of scientific articles.

Profile

We are seeking a talented, creative, and highly motivated student in the fields of statistics and Machine Learning. The ideal candidate should have a very good level of programming in R (and/or Matlab), which will be used for data processing and analysis. Knowledge in medicine and neuroscience is a plus that will be considered during the recruitment process. The candidate must be able to work in a team and collaborate with colleagues from other disciplines.

Recruitment criteria

- Must be enrolled in a Master's program (Master 2 level)
- Selection will be based on the evaluation of the application and interviews
- Candidates must successfully pass the primary security clearance required by the French Ministry of Army' primary security clearance

Practical aspects

- Duration: 6 months
- Starting date: according to the curriculum of the Master
- Gratification: according to legal standards
- Internship place: French Armed Forces Biomedical Research Institute, Brétigny-sur-Orge (91), accessible by public transport (RER C to Brétigny station, followed shuttle service)

Application process

Please send your CV (up to 2 pages), Master 1 transcripts, first-semester Master 2 transcript (if available), and a motivation letter via email to the two supervisors (see contact details below).

The application deadline is December 1, 2024.

Supervisors' contact information

Anais DUFFAUD (anais.duffaud@gmail.com)

Charles VERDONK (verdonk.charles@gmail.com) - [Personal Website](#)

French Armed Forces Biomedical Research Institute (IRBA) - [Website of IRBA \(in French\)](#)

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