



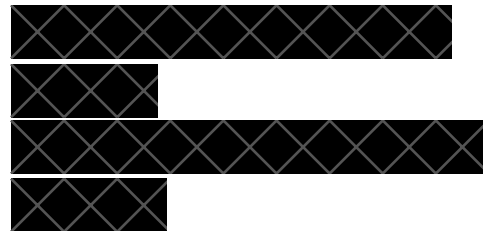
MINISTÈRE
DES ARMÉES

*Liberté
Égalité
Fraternité*

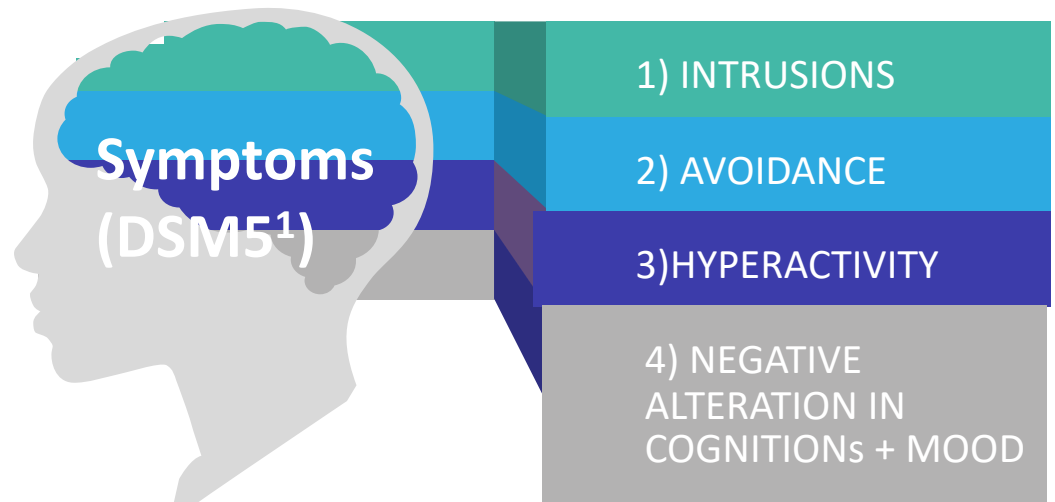
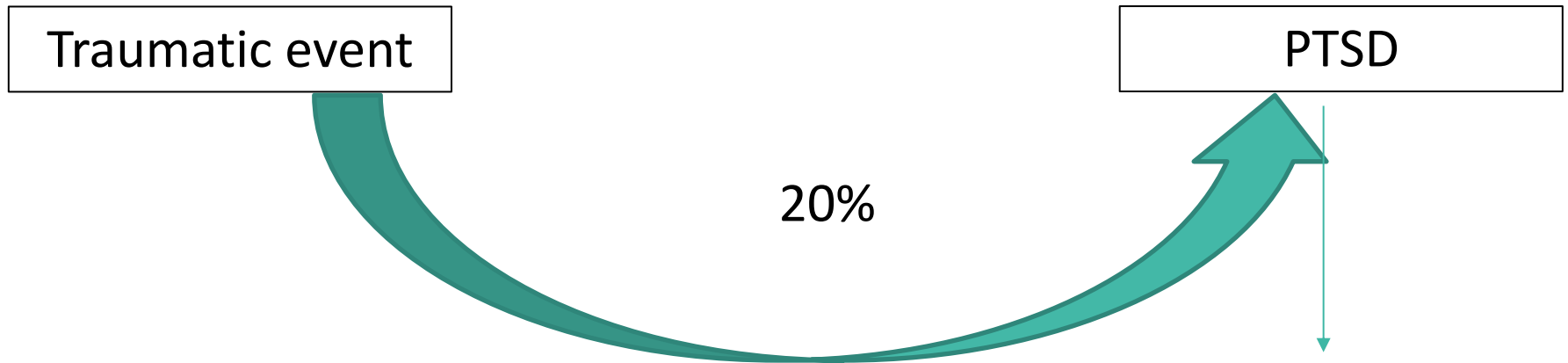


EVALUATION OF A POST TRAUMATIC STRESS DISORDER SCREENING SCORE D STRESS PROJECT

21th October 2022



The post-traumatic stress disorder (PTSD), a remaining fear with no danger anymore



1: Diagnostic and Statistical Manual;

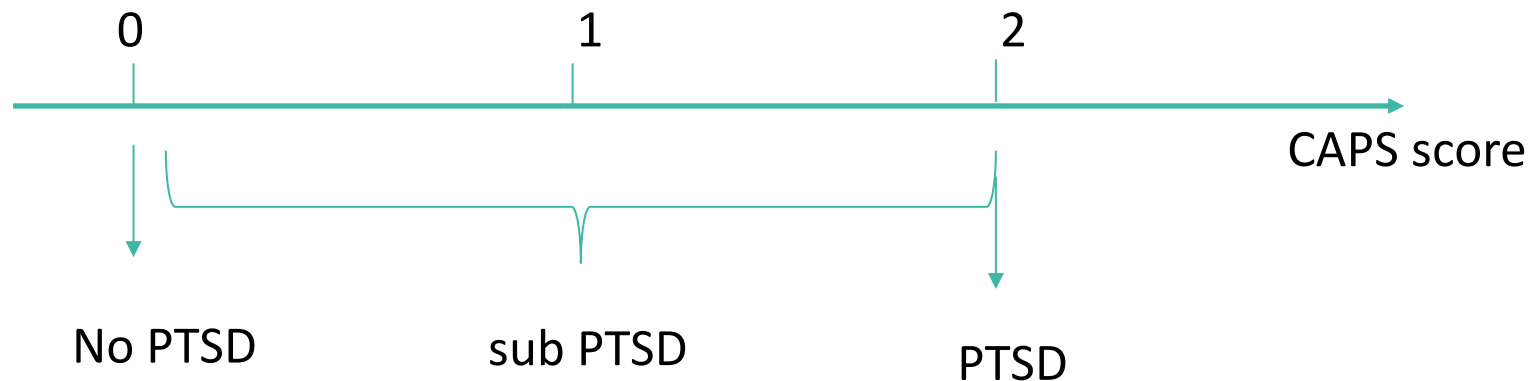
PTSD, risk of severe complications

- 80% of PTSD without treatment -> chronic ¹
- Psychiatric complications
 - Addiction
 - Depression
 - Suicide
 - 21% of the deaths in the military population ¹
- Non psychiatric complications (CVD, chronic pain, neuro degenerative disease, ...)



A clinical diagnosis

- Psychiatrist
- Hetero evaluation : Clinical Administration PTSD Scale (CAPS)¹
 - Training needed
 - Score



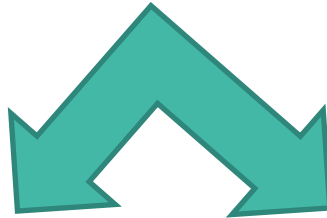
PTSD early detection, a multi level challenge in the military population

- Frequency
 - 35% in the military population ¹
 - 30 000 soldiers OpEx /year
- Individual: health
- Collective : operationality



A subjective diagnosis

FEAR OF STIGMATIZATION + INABILITY



**FEW SPONTANEOUS
APPLICATIONS**

23 -40% of soldiers consult
in case of difficulties ¹

CLINICAL DIAGNOSIS

A tool to answer to the issues induced by the subjectivity diagnosis

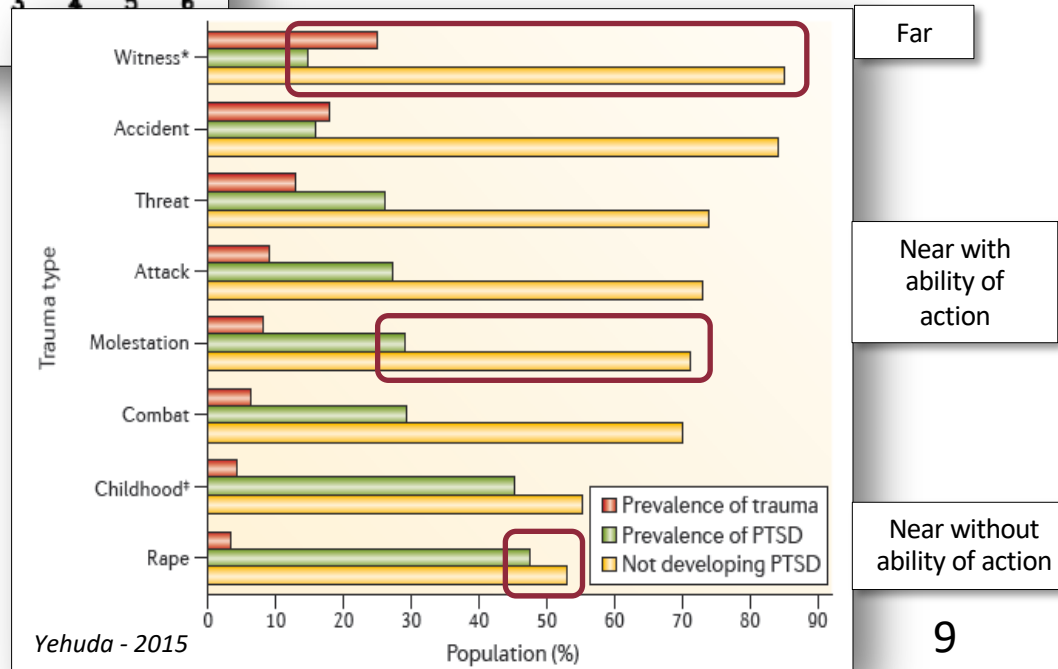
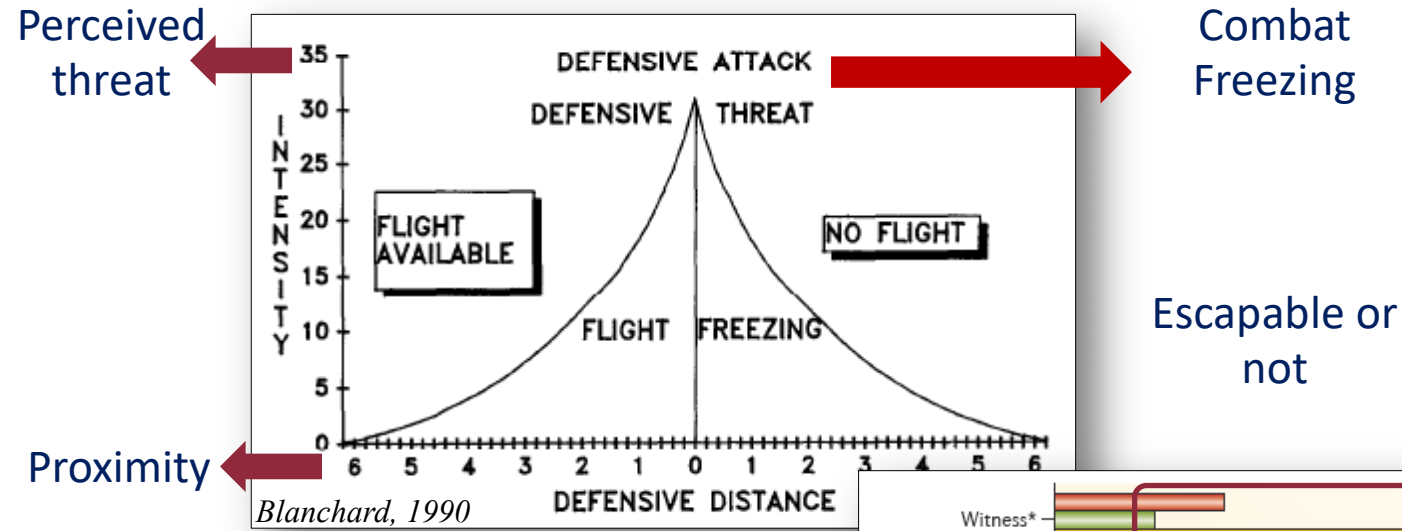
- 1) Efficient
- 2) Objective
- 3) Expandable
- 4) Acceptable
- 5) No spontaneous application

PTSD

sub PTSD

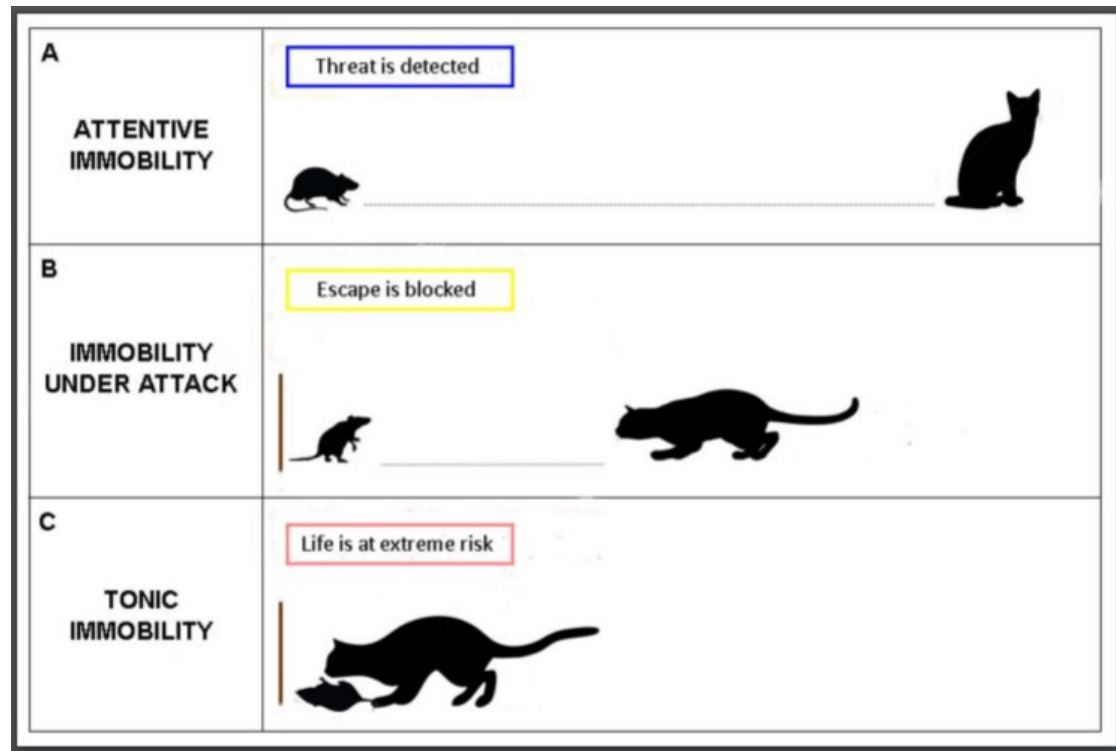
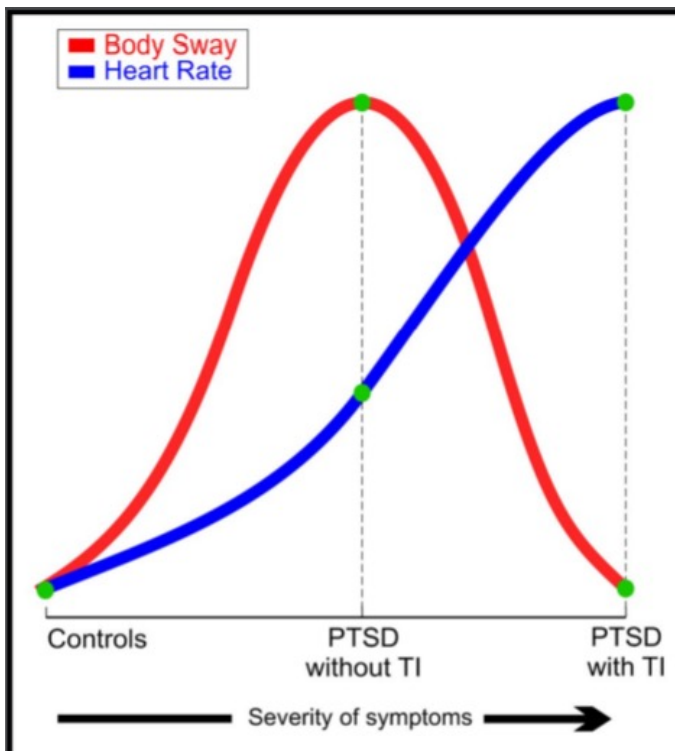
PTSD, a fear reaction ?

What is a fear reaction ?






What is a fear reaction ?

- Freezing behavior : the defensive behavior when the danger is inescapable



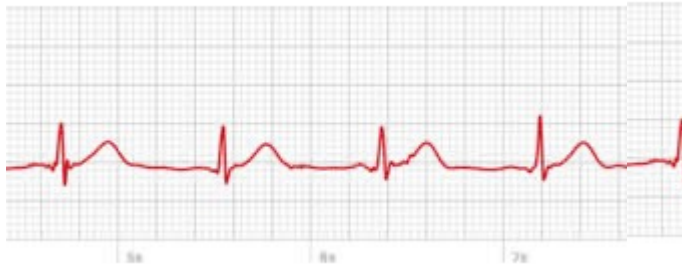
What is a fear reaction ?

<p>A</p> <p>ATTENTIVE IMMOBILITY</p>		<p>BRADYCARDIA</p> <p>REDUCED BODY SWAY (mainly in X axis)</p>
<p>B</p> <p>IMMOBILITY UNDER ATTACK</p>		<p>BRADYCARDIA</p> <p>REDUCED BODY SWAY (mainly in Y axis)</p>
<p>C</p> <p>TONIC IMMOBILITY</p>		<p>TACHYCARDIA</p> <p>REDUCED BODY SWAY</p>

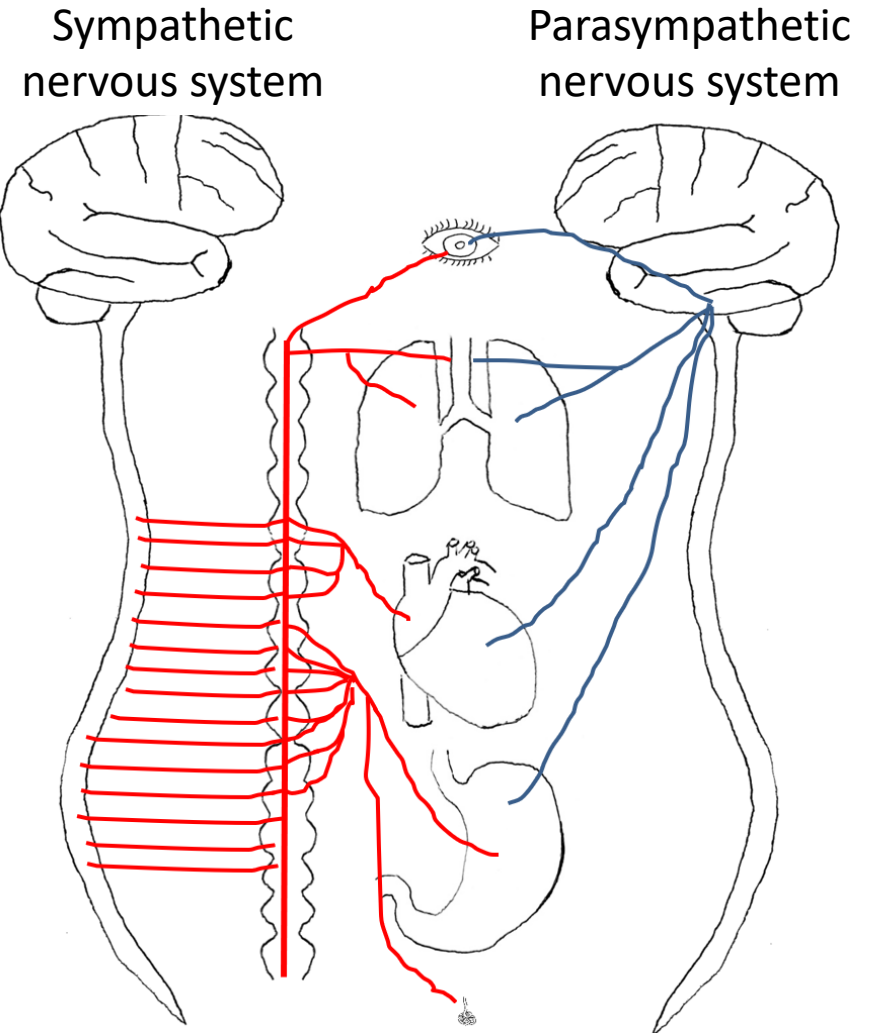
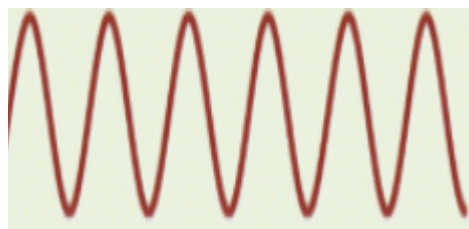
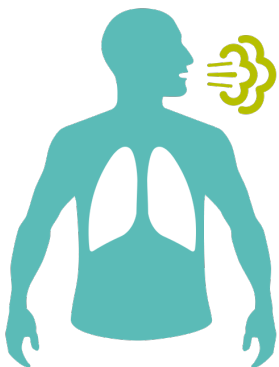
How do we measure sympathetic activation ?

- Sympathetic activation :

- Heart rate variability

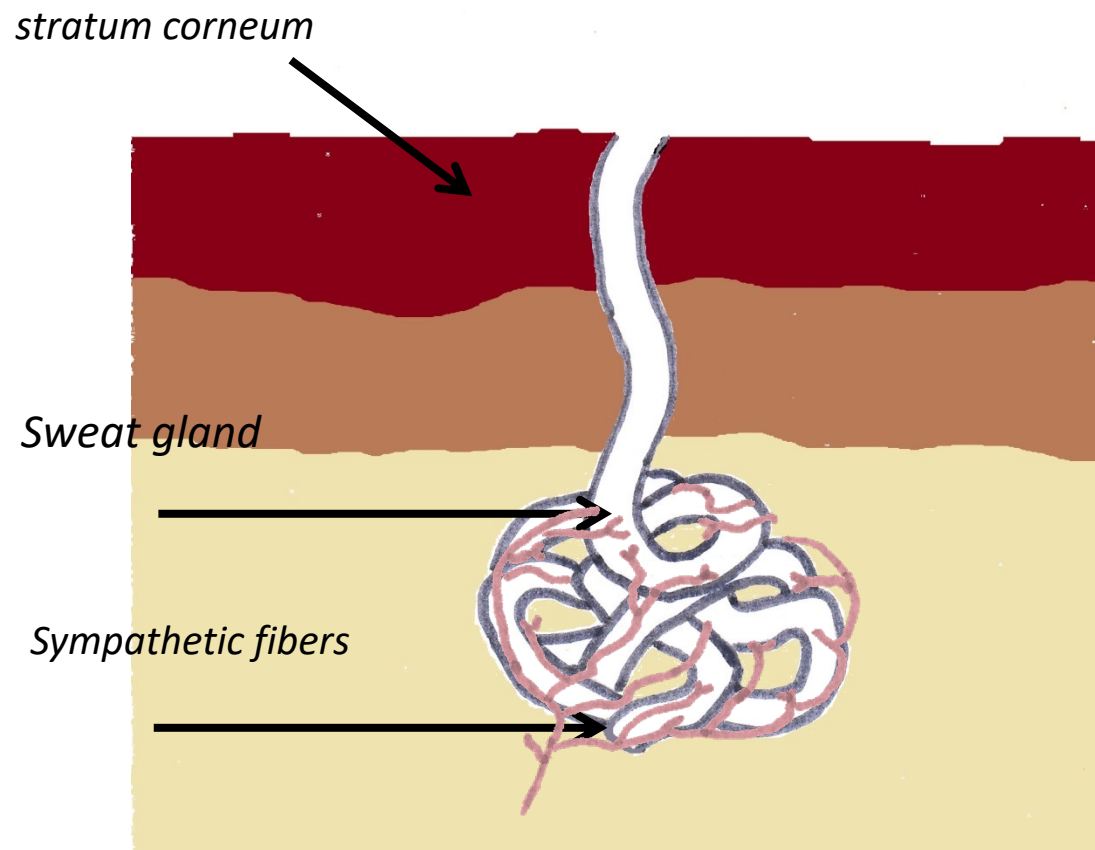


- Respiratory rate



How do we measure sympathetic activation ?

- Sympathetic activation :



Artificial Intelligence (AI) a new help for automated mass detection

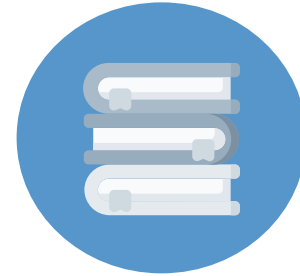
- Artificial Intelligence construction :



Electrophysiological signals



IA model training and validation



Model deployment

PTSD =
specific **fear reaction**

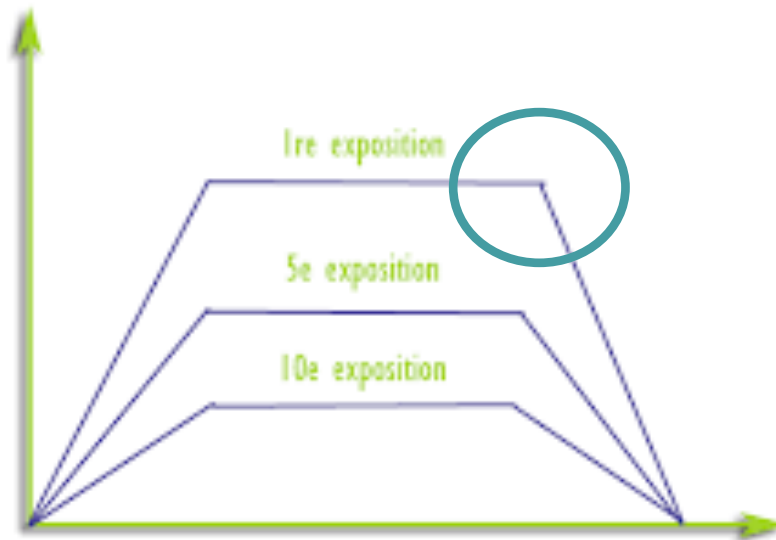
Characterize this fear
reaction with
physiological and
behavioral measures
=> objective PTSD
detection

How **induce** a fear
reaction?

Exposure therapy, first line treatment for PTSD

EXPOSURE

Anxiety level



Exposition duration



APA, 2017;
International Society for Traumatic Stress Studies
[ISTSS], 201

Virtual reality, an alternative exposure modality

- Interaction
- Multi sensory cue
- Advantages
 - Control over stimuli
 - Possibility to repeat exposure infinitely



Virtual reality, an efficient PTSD therapy

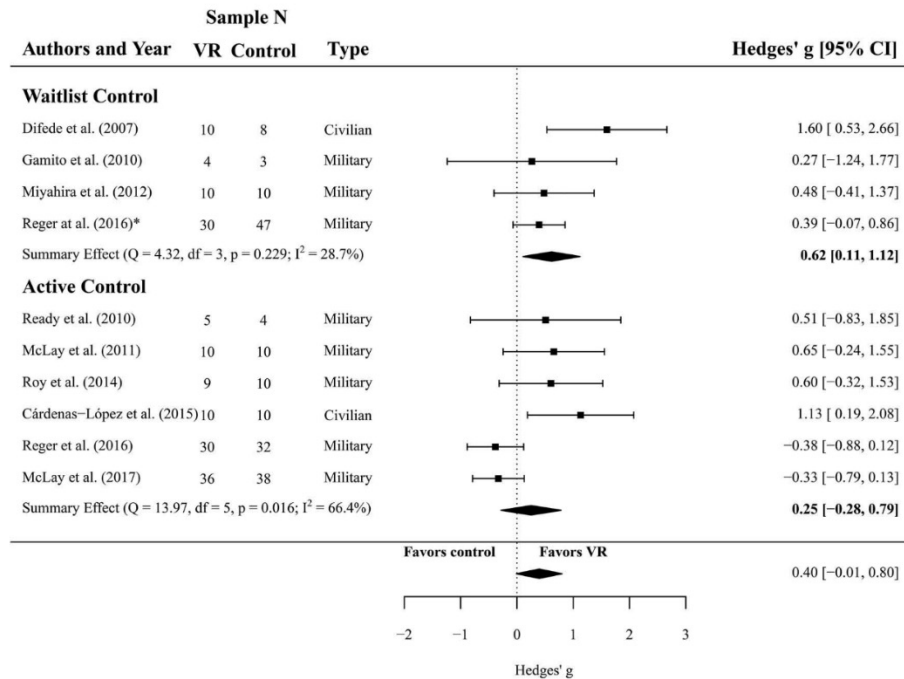


Figure 2. Forest plot of the standardized mean difference (Hedges' g) in post-treatment CAPS scores of VR treatments compared to control conditions (waitlist and active control). A positive effect size indicates that the outcome was in favour of VR treatment. Average effect was calculated using a random-effects model.

Virtual Iraq, to treat PTSD

*Virtual Iraq/Afghanistan:
View from Inside the Headset*

Virtual reality, from treatment to detection

Stimuli presentation modality to induce specific fear reaction

- Efficiency
- Standardization
- No stigmatization

PTSD =
specific **fear reaction**

Characterize this fear
reaction with
physiological and
behavioral measures
=> objective PTSD
detection

Induce fear reation
with the
presentation of
emotional stimuli
using **virtual reality**

D STRESS objective

To develop and evaluate a PTSD and sub PTSD screening score build from the physiological and behavioral measures characterizing the emotionnal reaction induced by stimuli presented using virtual reality



AGENCE
INNOVATION
DÉFENSE



le cnam



Material & Methods: population (n= 87)

CAPS =0
No PTSD

$0 < CAP < 2$
Sub PTSD

$CAP \geq 2$
PTSD

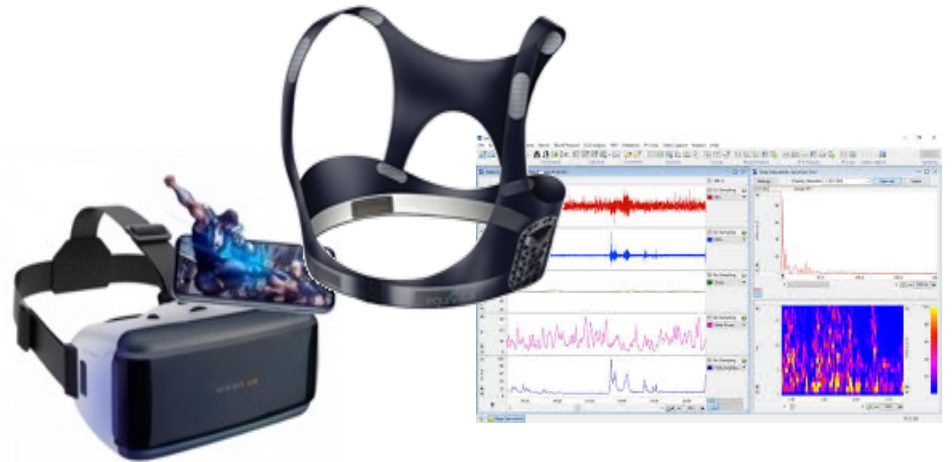


Material and methods: virtual reality to induce fear reaction



Material & methods: measures to characterize fear reaction => objective score detection

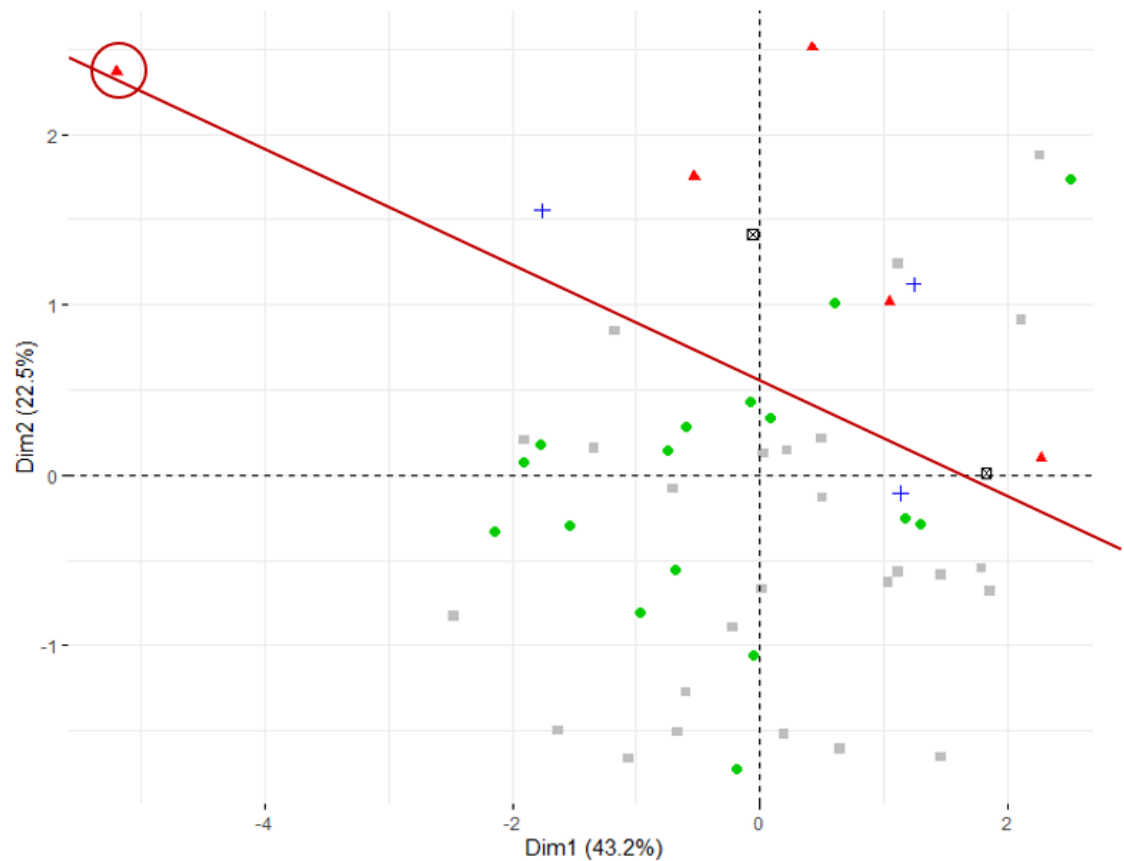
- Heart rate
- Skin conductance
- Temperature
- Respiratory rate
- EEG
- Eye tracking



Results : preliminary results

- Very good separation in a principal component analysis

- Controls
- Light sub-PTSD
- ⊠ Moderate sub-PTSD
- + Severe sub-PTSD
- ▲ PTSD



To be continued...

... for the next combat medical care
conference...



MINISTÈRE
DES ARMÉES

*Liberté
Égalité
Fraternité*



Thank you for attention



le **cnam**

