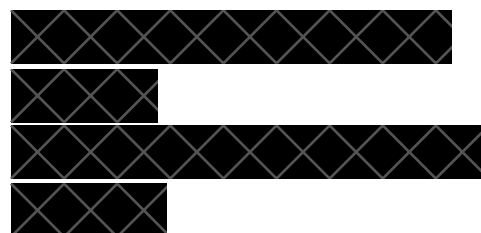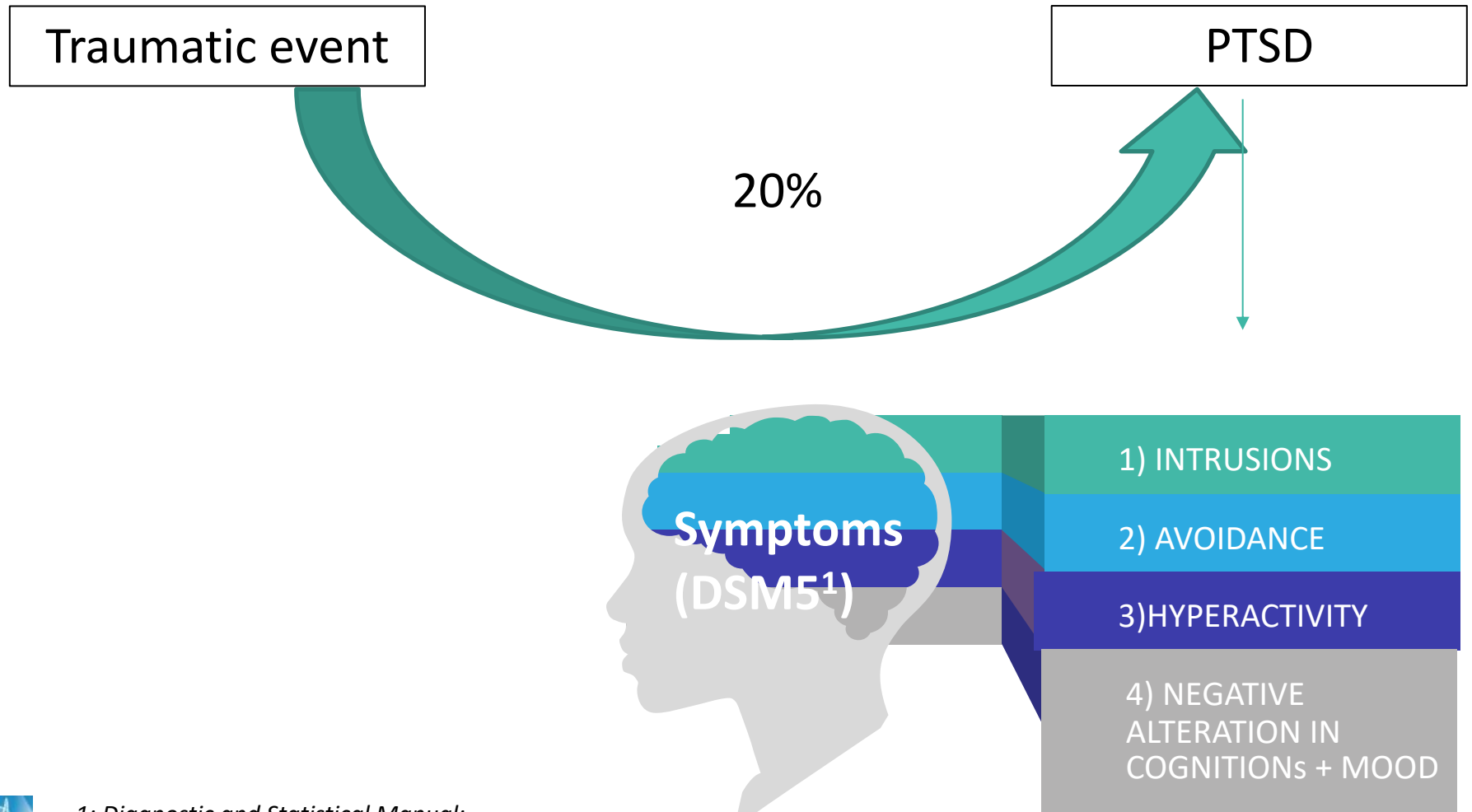# EVALUATION OF
A POST TRAUMATIC STRESS DISORDER
SCREENING SCORE

D STRESS PROJECT

21th October 2022

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

Traumatic event

PTSD

20%

Symptoms
(DSM5[1])

1) INTRUSIONS

2) AVOIDANCE

3) HYPERACTIVITY

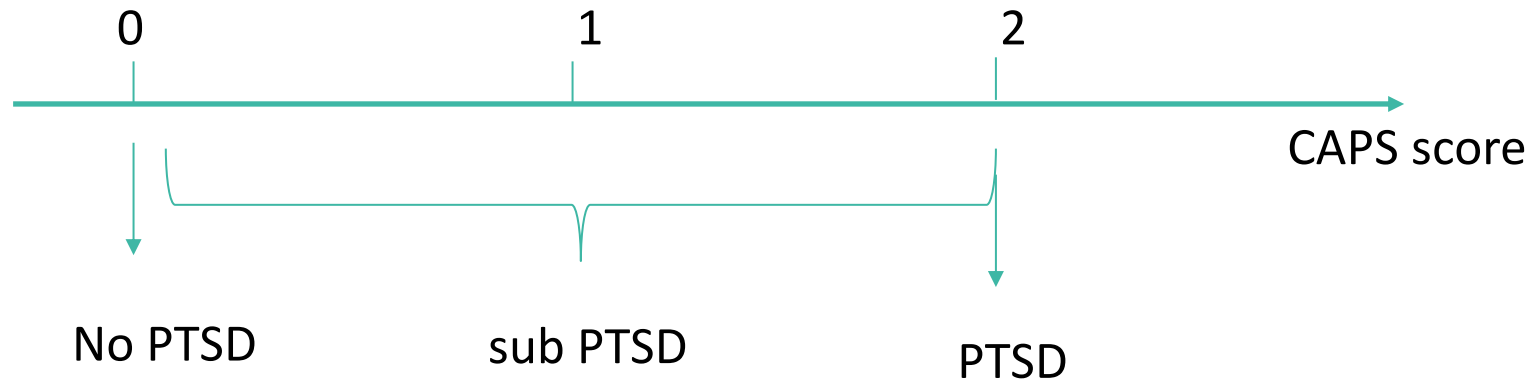4) NEGATIVE ALTERATION IN COGNITIONs + MOOD

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, …)

1: HAUS CHEYMOL et al., 2009

3

A clinical diagnosis

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

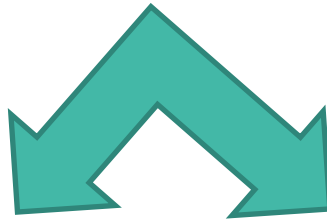1: Weathers et al, 2018

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

1: Sundin et al., 2010;

A subjective diagnosis

FEAR OF STIGMATIZATION + INABILITY

FEW SPONTANEAOUS APPLICATIONS

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

CLINICAL DIAGNOSIS

1: Hoge et al. 2004

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

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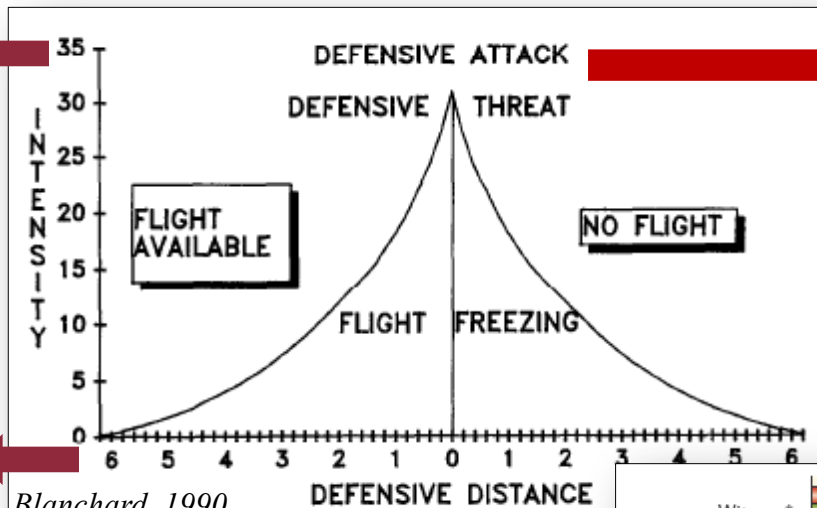5) No spontaneaous application

PTSD

sub PTSD
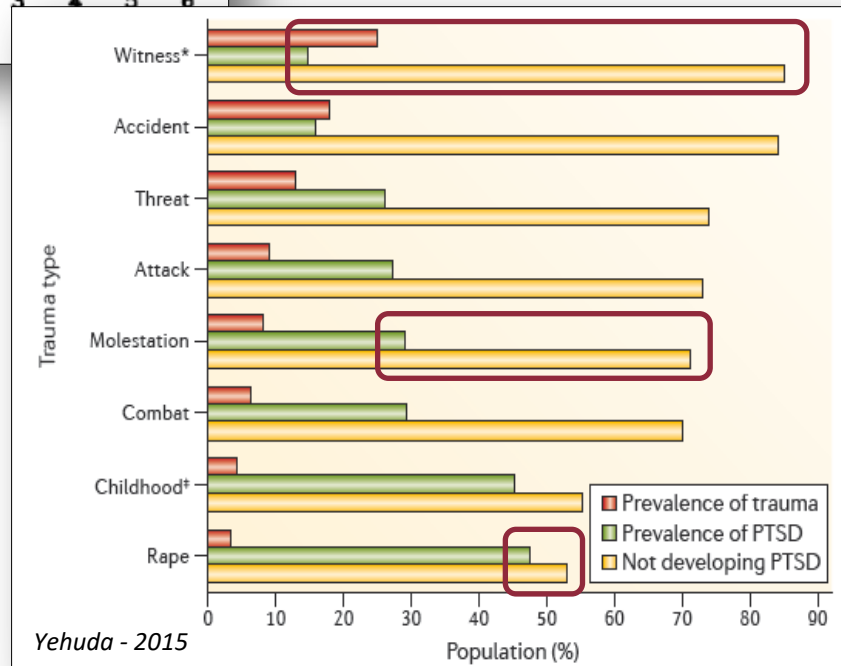
PTSD, a fear reaction ?

What is a fear reaction ?
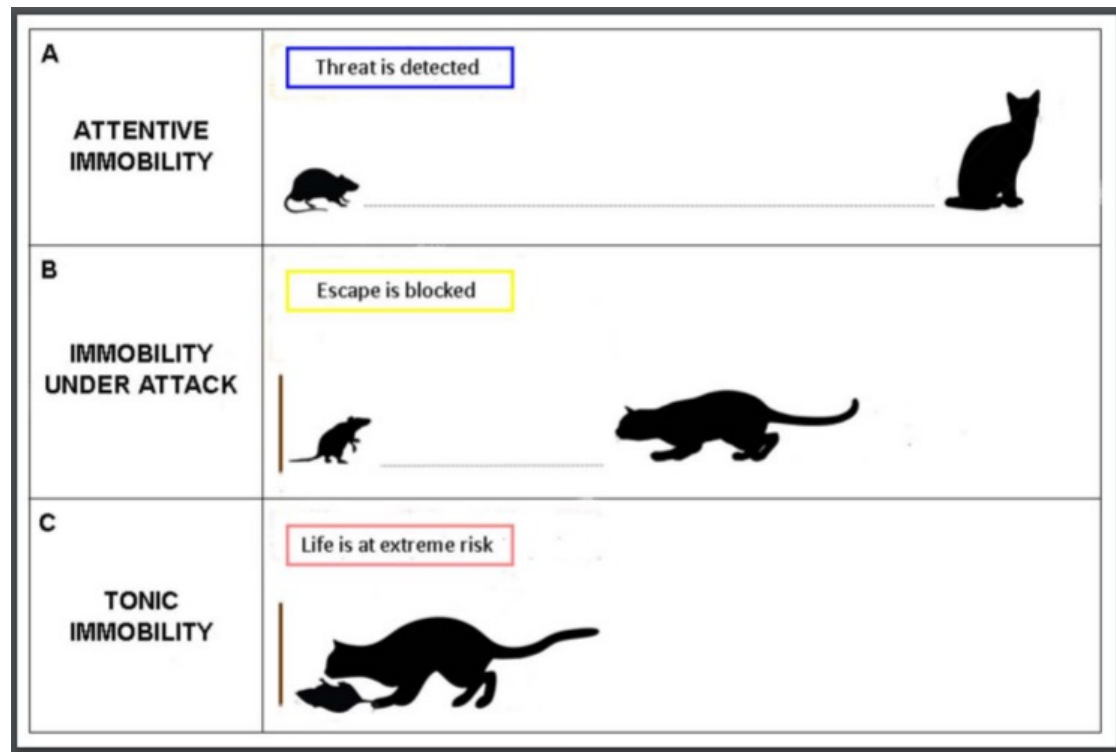
Perceived threat

Combat Freezing

Escapable or not

Proximity

Blanchard, 1990
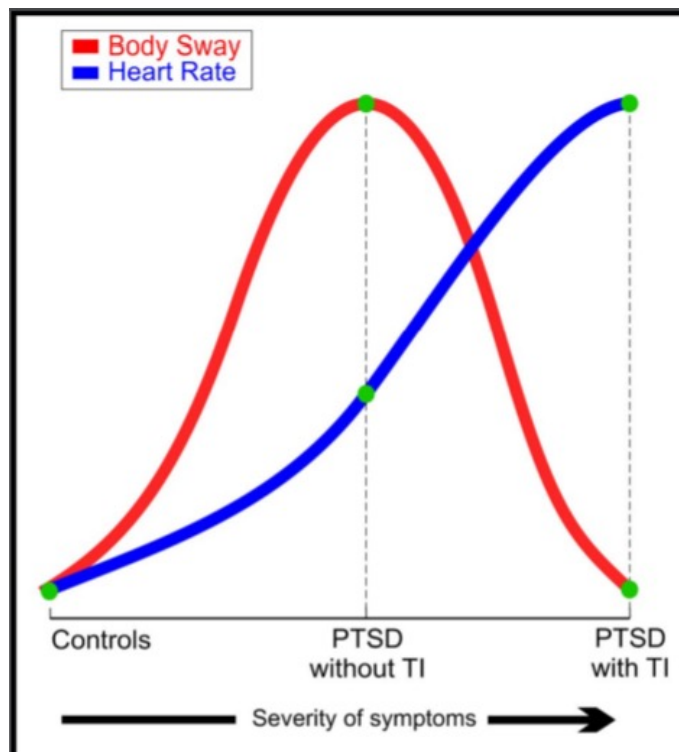
Far

Near with ability of action

Near without ability of action

Yehuda - 2015
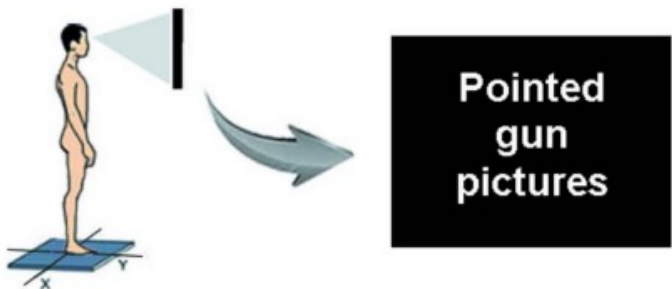
9

What is a fear reaction ?

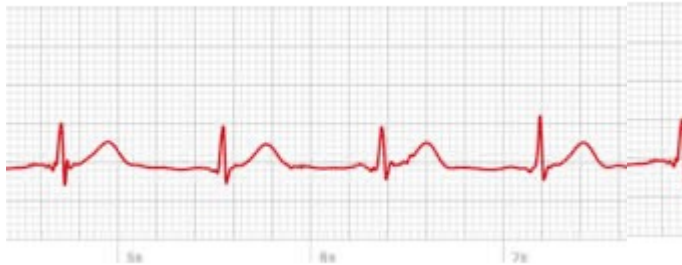- Freezing behavior : the defensive behavior when the danger is inescapable

(Volchan et al. 2017)

What is a fear reaction ?

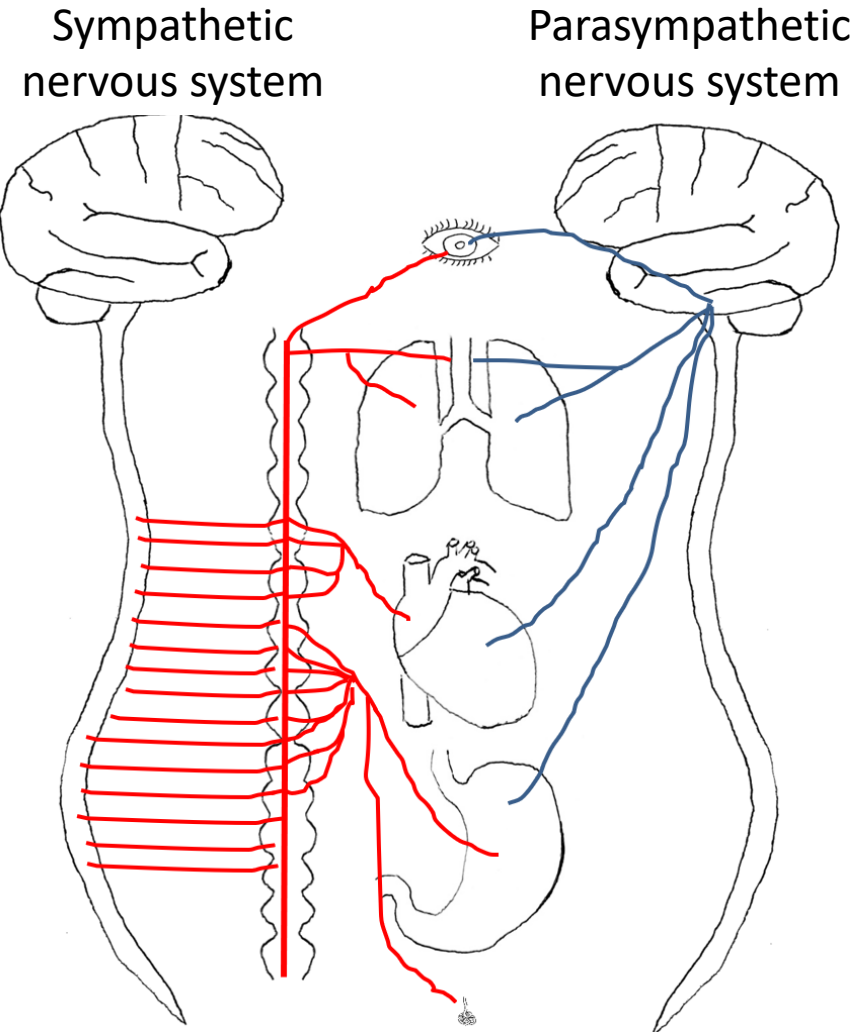|		
A ATTENTIVE IMMOBILITY	Mutilation pictures	BRADYCARDIA REDUCED BODY SWAY (mainly in X axis)
B IMMOBILITY UNDER ATTACK	Pointed gun pictures	BRADYCARDIA REDUCED BODY SWAY (mainly in Y axis)
C TONIC IMMOBILITY	personal trauma	TACHYCARDIA REDUCED BODY SWAY

(Volchan et al. 2017)

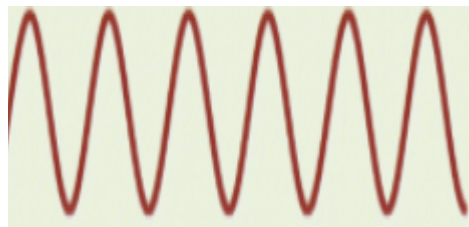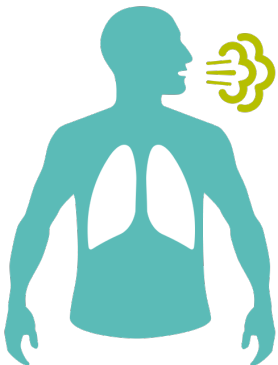# How do we measure sympathetic activation ?

Sympathetic activation :

- **Heart rate variability**

- **Respiratory rate**

Sympathetic nervous system

Parasympathetic nervous system

How do we measure sympathetic activation ?
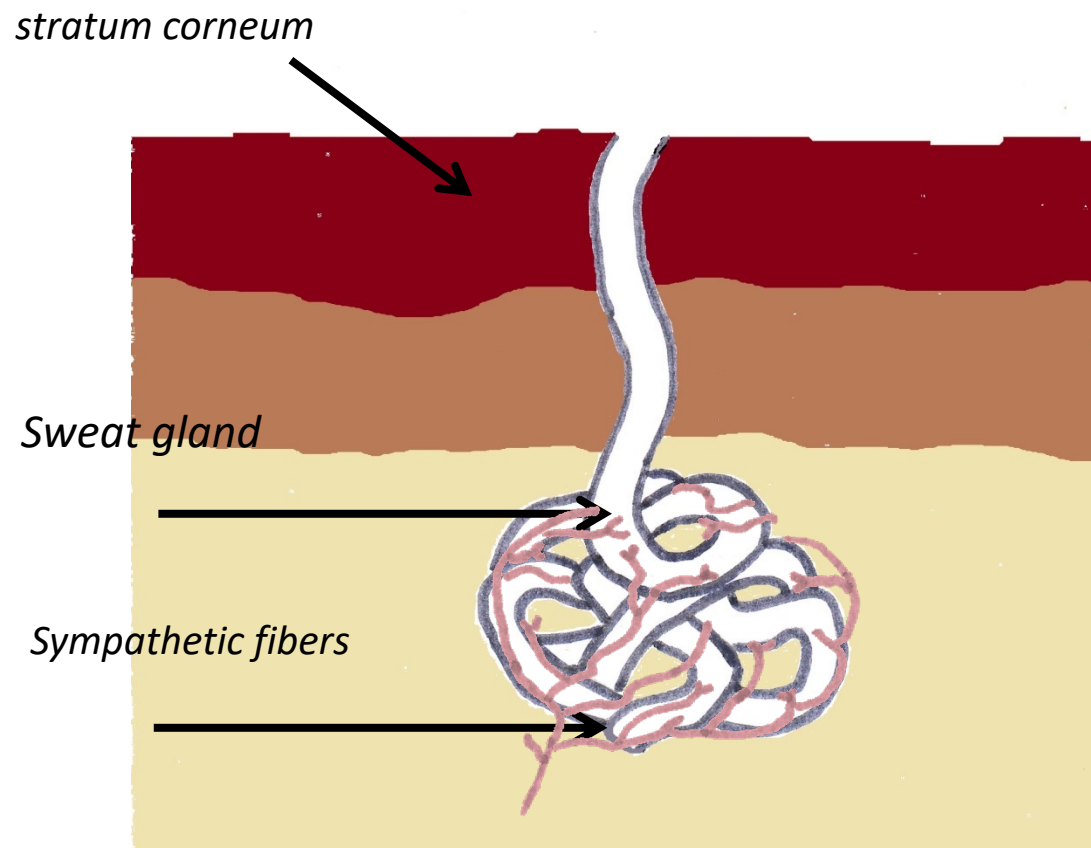
● Sympathetic activation :

stratum corneum

Sweat gland

Sympathetic fibers

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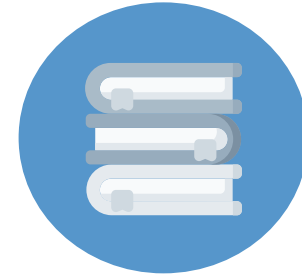
- Artificial Intelligence construction :

Electrophysiological signals → IA model training and validation → Model deployment

PTSD =
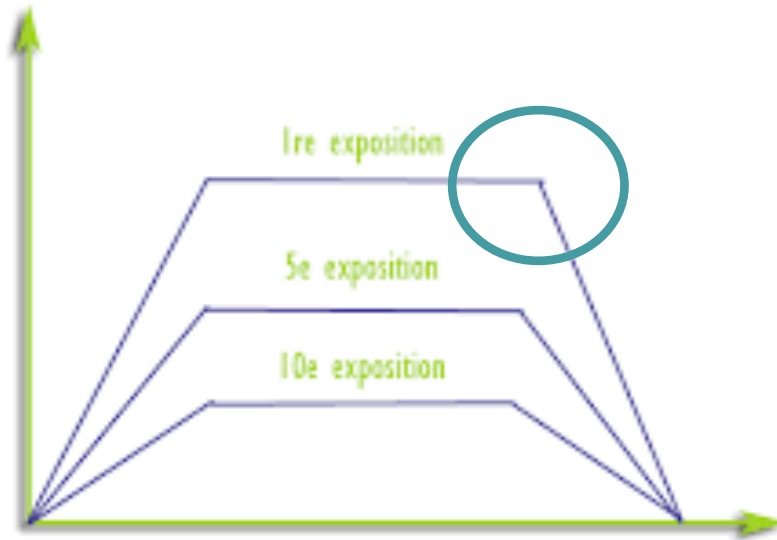specific **fear reaction**

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

Ire exposition

5e exposition

10e exposition

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 infinetly
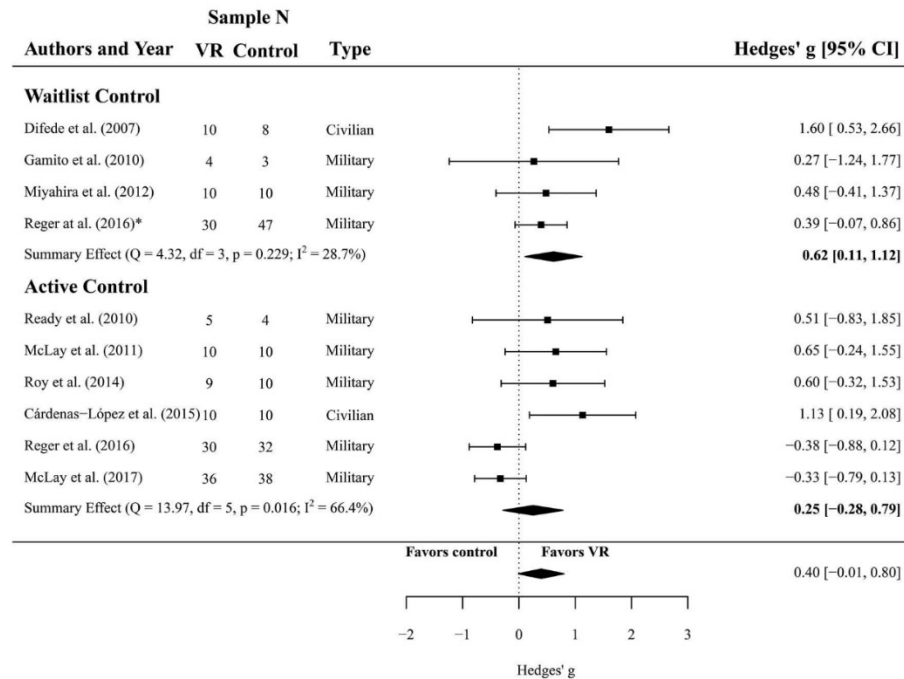
Virtual reality, an efficient PTSD therapy

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

Material & Methods: population (n= 87)

CAPS =0
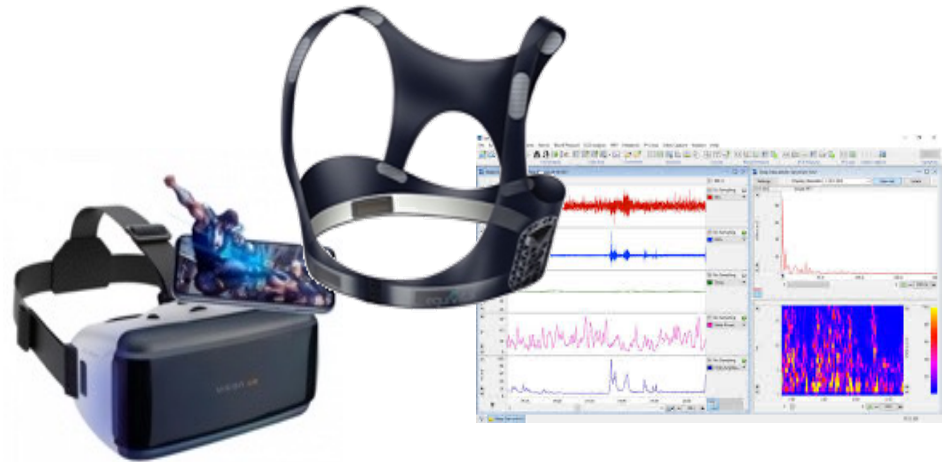No PTSD

0< CAP<2
Sub PTSD

CAP ≥2
PTSD

Material and methods: virtual reality to induce fear reaction

Material & methods: measures to characterize fear reaction => objective score detection
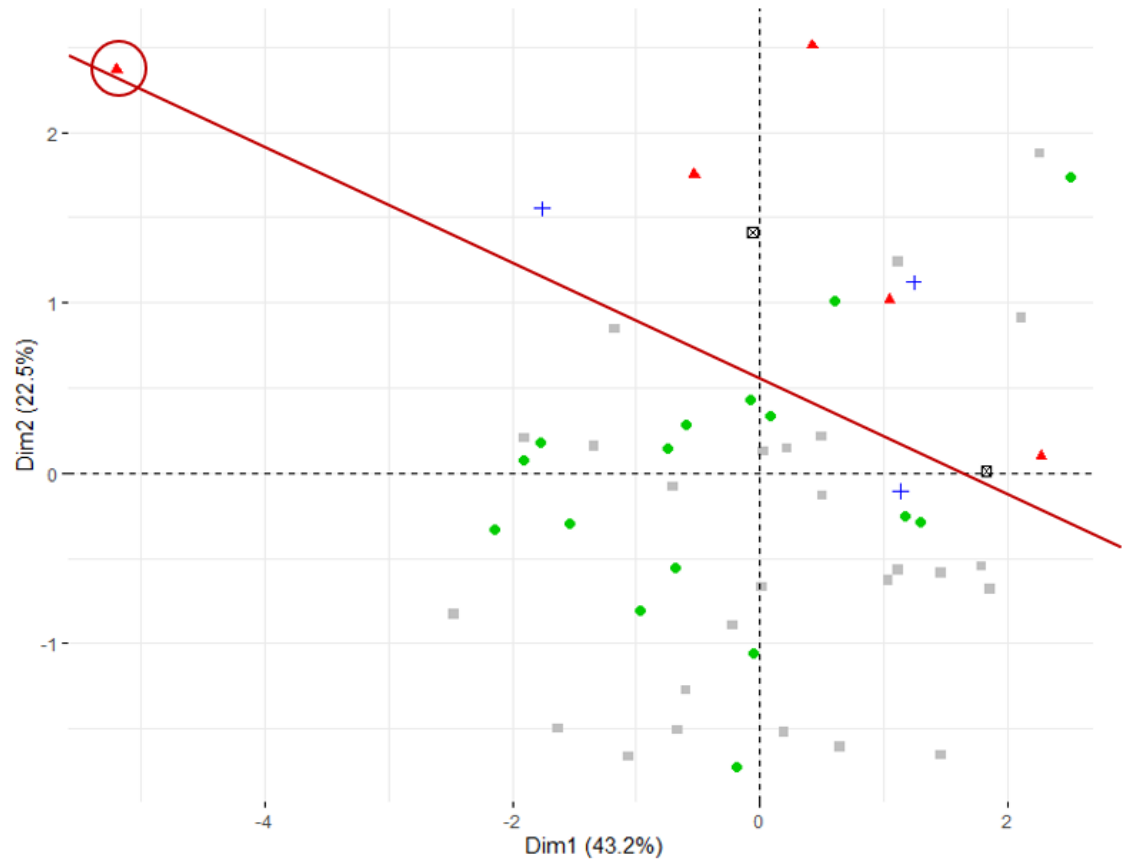
- Heart rate
- Skin conductance
- Temperature
- Respiratory rate
- EEG
- Eye tracking

Results : preliminary results

- Very good separation in a principal component analysis

Legend:
- Controls (green dots)
- Light sub-PTSD (grey squares)
- Moderate sub-PTSD
- Severe sub-PTSD (blue plus)
- PTSD (red triangles)

Axes: Dim1 (43.2%), Dim2 (22.5%)

To be continued…

… for the next combat medical care conference…

Thank you for attention