

Rationale and implementation of vagal nerve biofeedback for mental and physical health of Ukrainian forced migrants

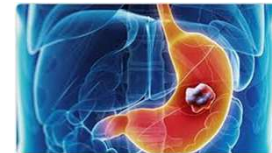
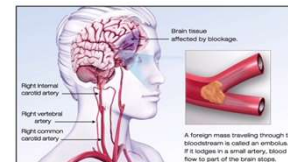
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Global burden of diseases - GBD

Beyond communicable diseases, GBD include chronic non-communicable diseases, causing many deaths and disability:

- Ischemic heart disease
- Stroke
- Cancer
- COPD



Adding chronic pain, anxiety and depression covers major DALYs

(GBD 2016 Causes of Death Collaborators, 2017)

Medical problems of Ukrainian refugees

Our initial Natan missions reported about these health problems:

- High blood pressure
- Injuries
- Gastrointestinal infections and pain
- Diabetes
- URTI + Covid-19
- Psychological distress and depression



Can we help these conditions with no costs?

(Jankowski & Gujski, 2022)

Is there anybody out there..?

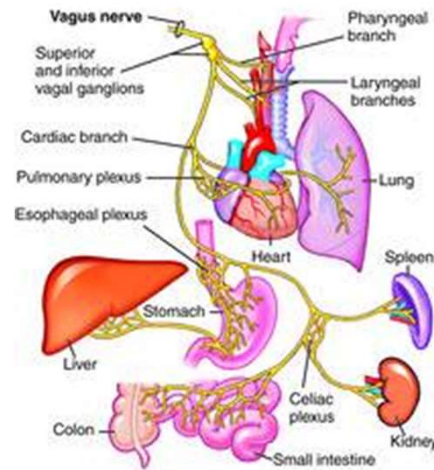
It there one common protective factor which:

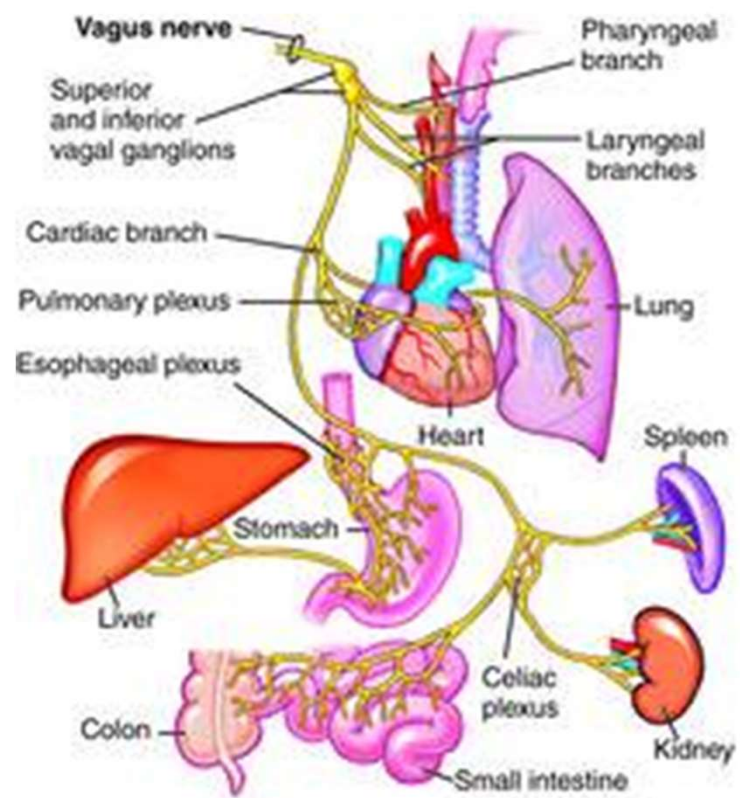
1. Predicts a lower risk of these diseases
2. Predicts better prognosis in these diseases
3. Inhibits the pathophysiological causes of these conditions
4. When activated, has positive clinical impact on these conditions

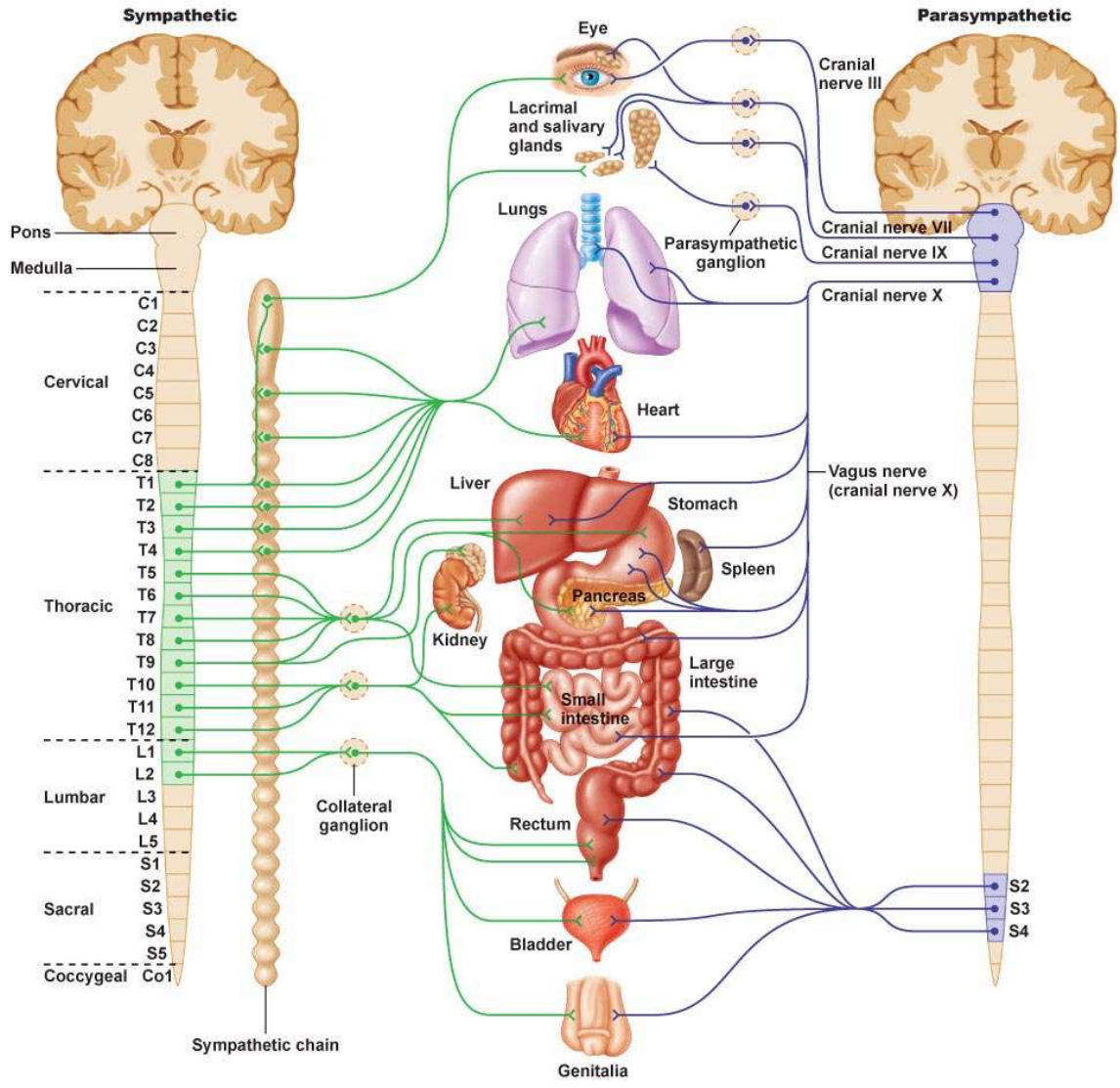
Our proposed resilience factor is: The vagal nerve

We hereby present:

The **vagal nerve hypothesis** for global public health





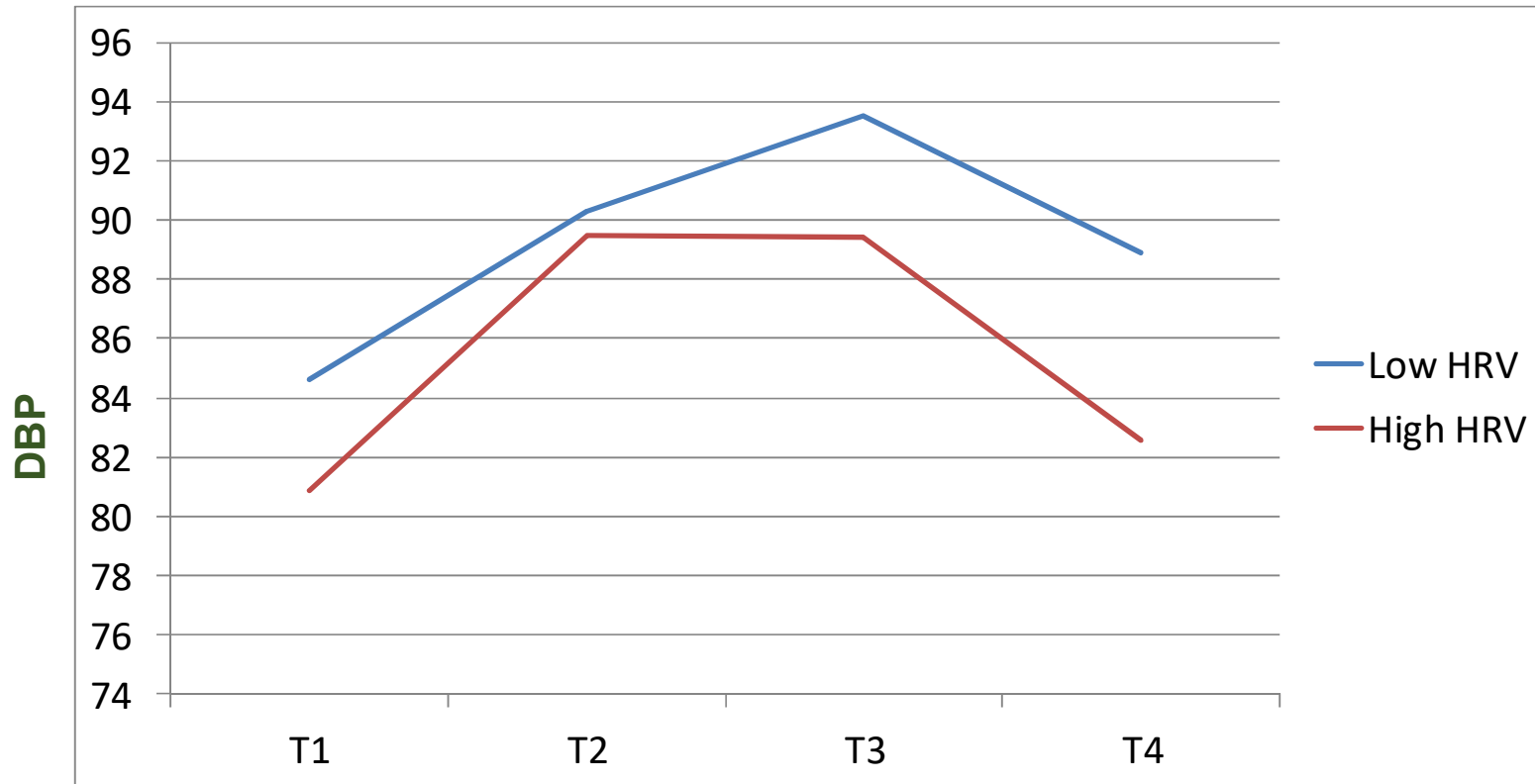


Heart rate variability – HRV a non-invasive vagal index



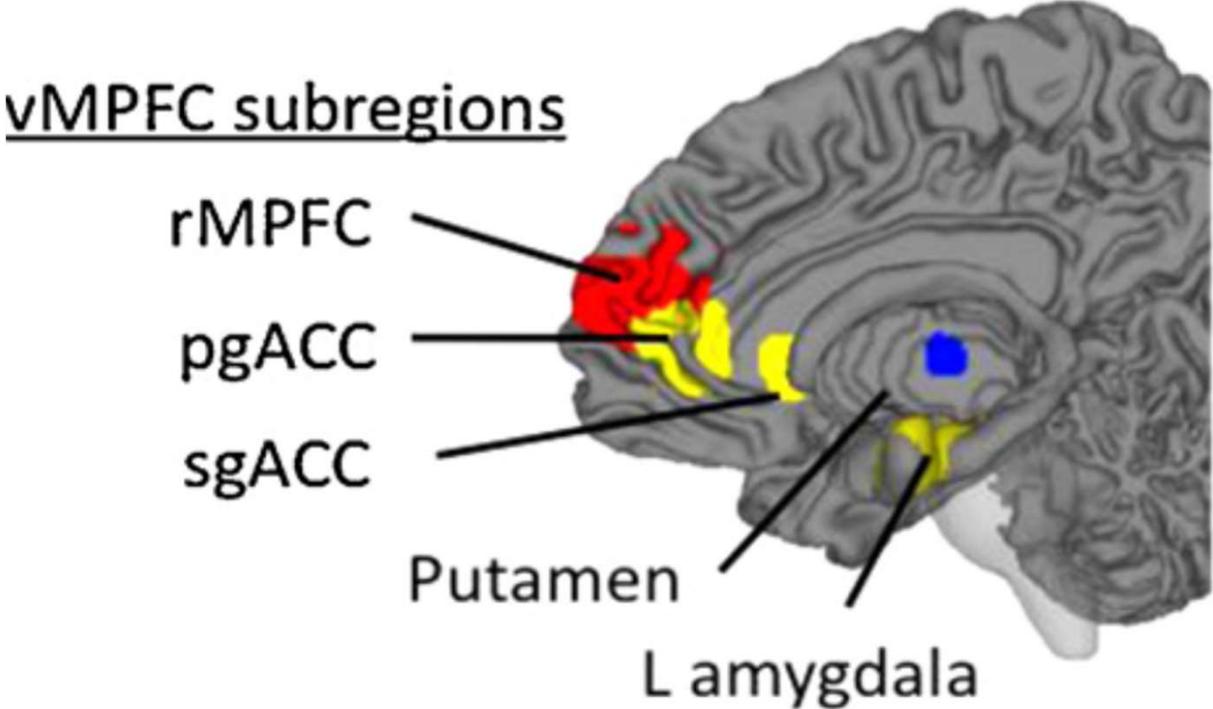
$r = 0.88$; (Kuo et al., 2005)

The role of the vagus in neuroimmune relations



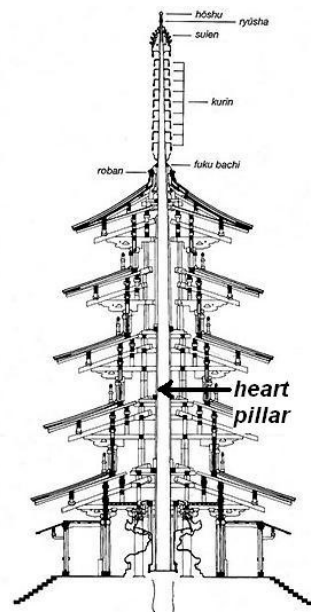
Weber et al., 2010

Thayer et al (2012)



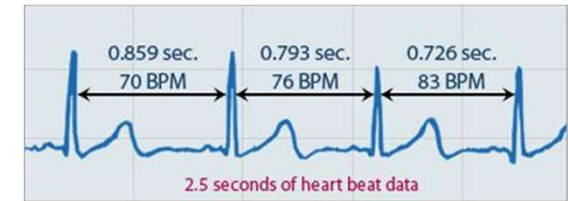
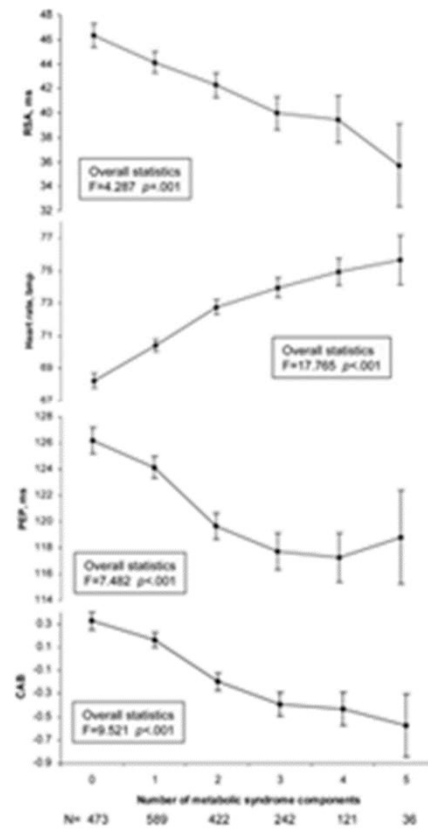
Summary till here: The vagus is our pagoda..

The vagus nerve may be a marker of psycho-physiological and adaptability and resilience



Epidemiological evidence linking HRV to diseases

HRV and the metabolic syndrome

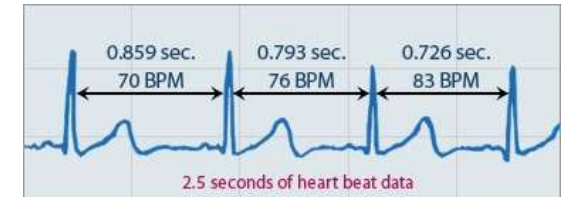


HRV is low in type-2 diabetes

- In a meta-analysis of 25 studies:
- Many HRV parameters were significantly lower in DM than controls

(Benichou et al., 2018)

HRV predicts post-MI prognosis



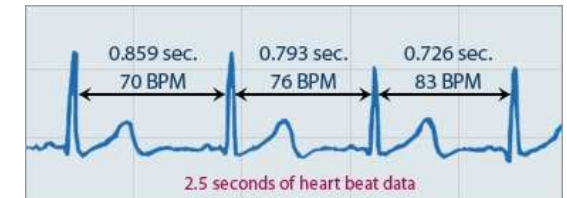
A review of 21 studies found that MI patients with low HRV had approximately 4 X the risk of mortality compared to high HRV!!

It may be unethical to disregard these findings!

(Buccelletti et al., 2009)



HRV predicts cancer prognosis

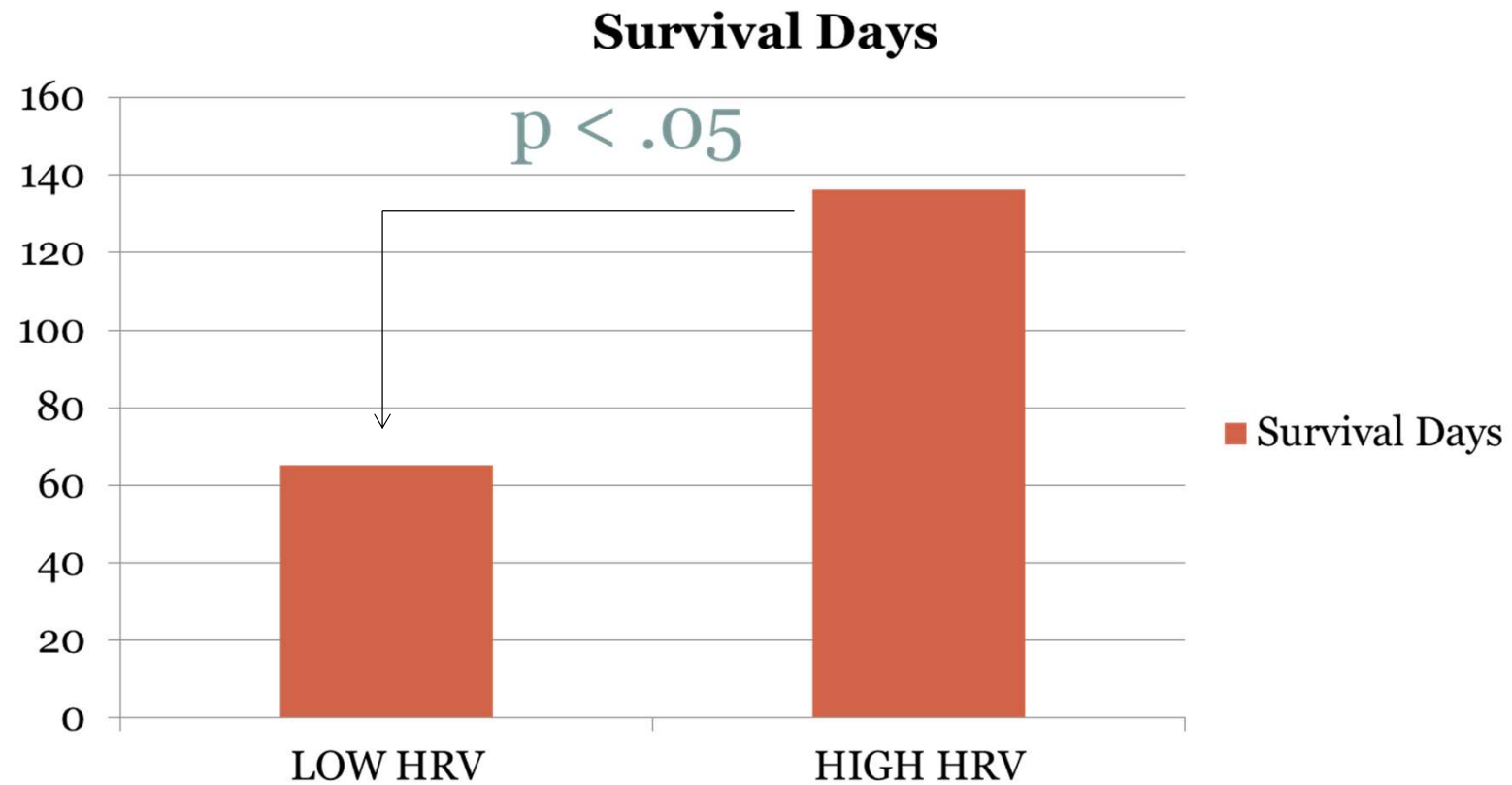


A meta-analysis found that higher HRV significantly predicted longer survival in cancer

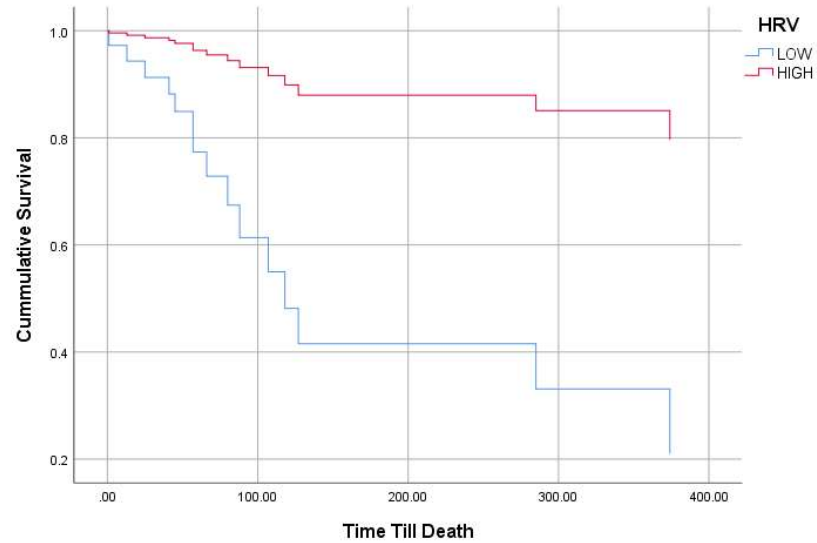
HRV predicted longer survival via less inflammation

(De Couck et al., 2016; Zhou, Ma, Zhang, Zhou, Wang, Wang & Fu, 2016)

HRV & prognosis in metastatic pancreatic cancer



Relationship between HRV and survival in Lymphoma (Atar et al., under review)



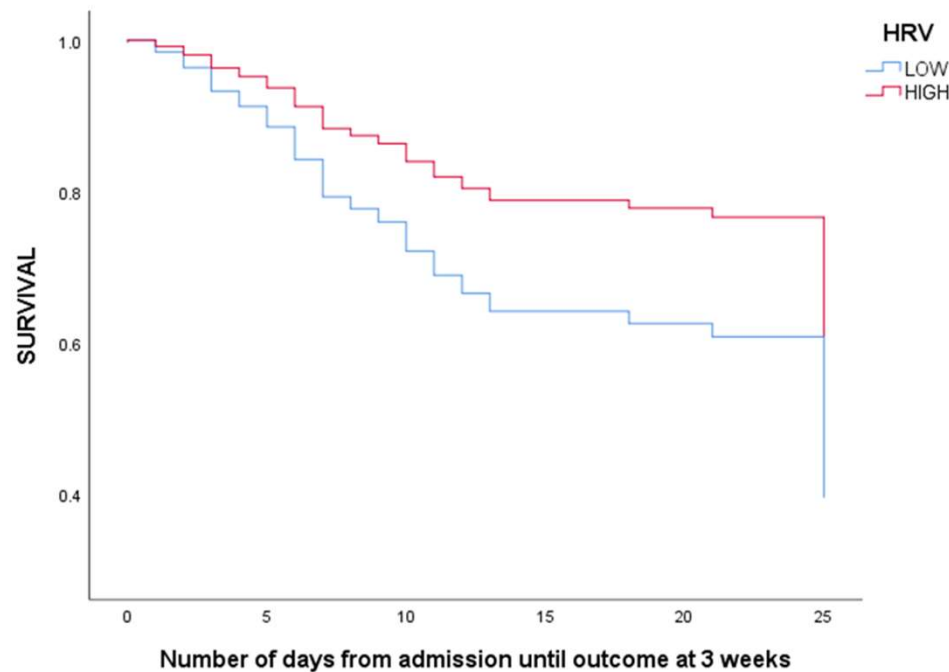
HRV and pain (Tan et al., 2009)

- In a study on American war veterans:

The correlation between SDNN and pain was:

$$\mathbf{r = -0.46, p < 0.05}$$

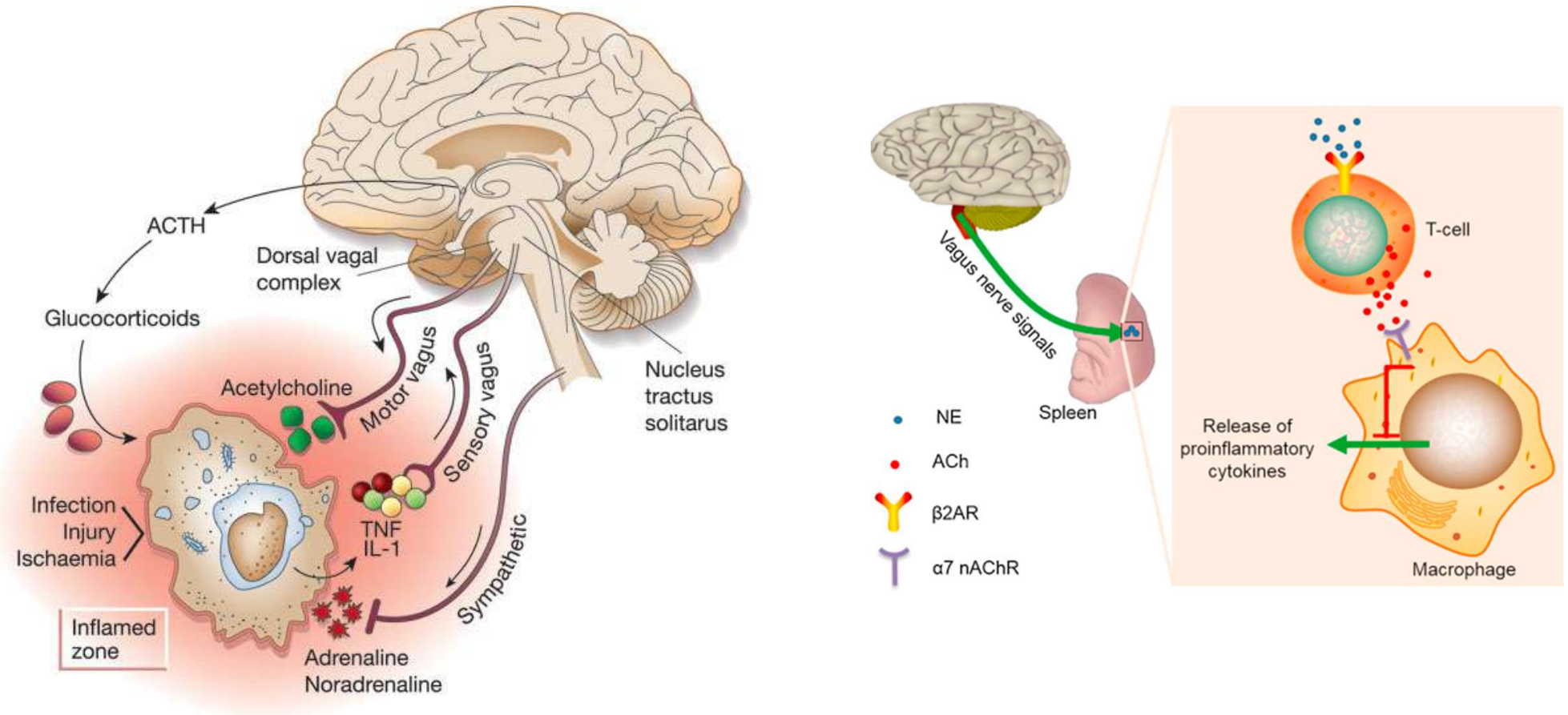
Relationship between HRV and survival from Covid-19: A multivariate Cox-regression



Mol...Gidron,
2021. **Plos One**

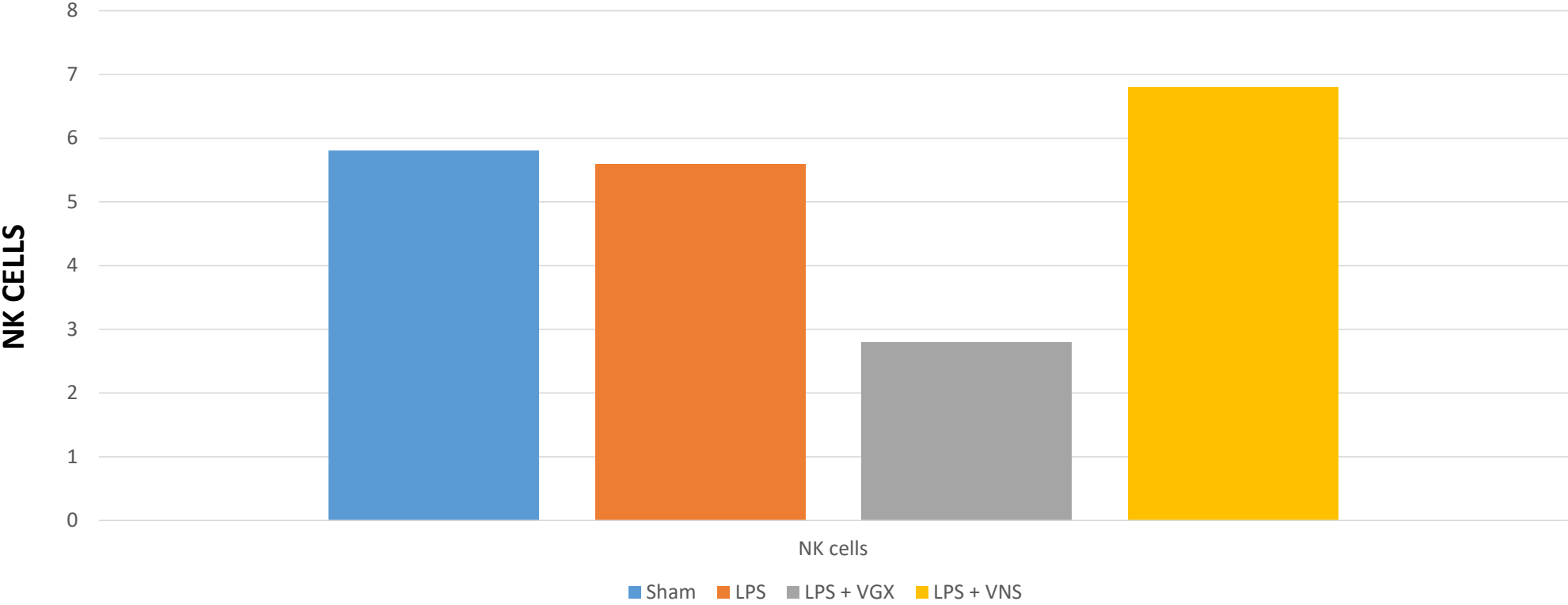
How does the vagus prevent diseases?
The pathophysiological path

How may the vagus modulate inflammation?

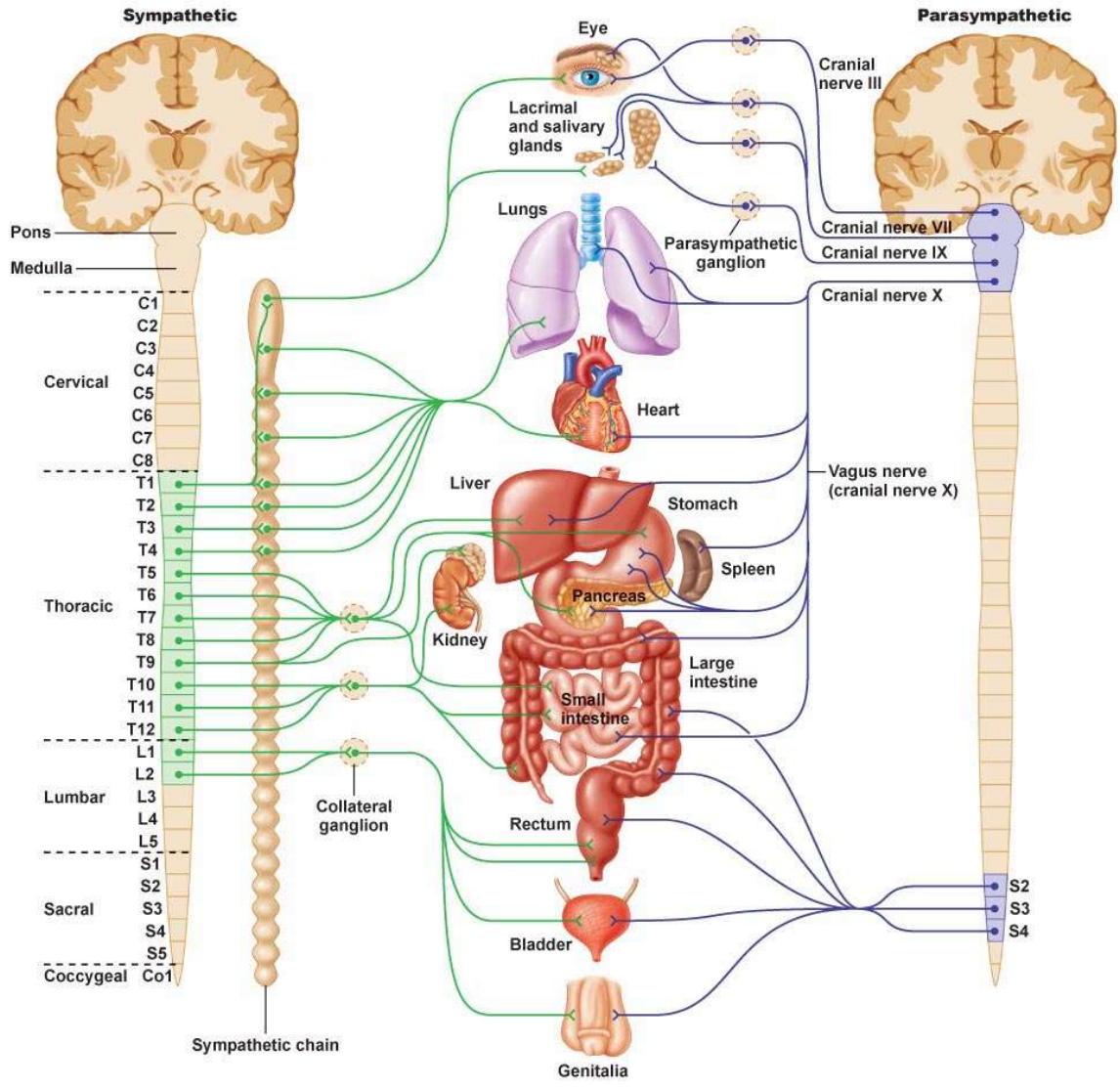


Tracey, 2002. *Nature*; Rosas-Ballina et al., 2011; *Science*

The role of the vagus in anti-viral immunity



(Mihaylova et al., 2014)



The behavioral path

Healthy diets predict better prognosis in diseases

Smoking is a major disease risk factor

Physical activity dramatically reduces risk of diseases

(GBD 2015 Risk Factors Collaborators, 2016; Weigl et al., 2018)

HRV and health behaviors

- HRV decreases after smoking



- HRV is inversely related to obesity



(e.g., Rodr et al., 2010; Sjoberg & Saint, 2011)

Mediterranean diet & HRV

- An increase in a score on mediterranean diet increases HRV
(Dai et al., 2010)
- Aerobic and exercise training increase HRV
(Mohammed et al., 2018)



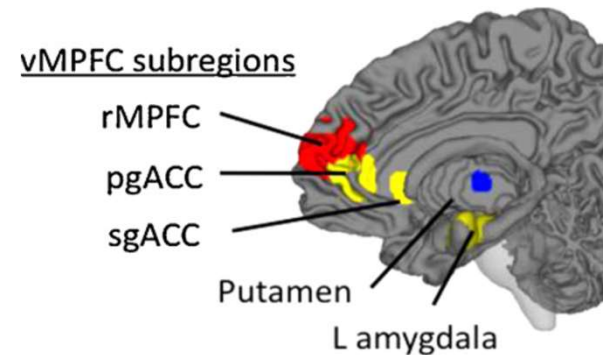
**Come to Israel
to have great
hummus..**

HRV, executive functioning & health behaviors

EF: Self-regulation, inhibition, memory

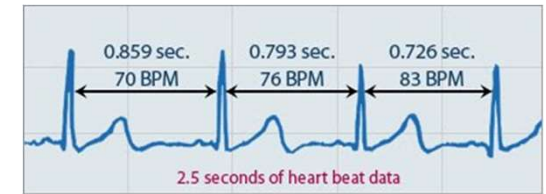
- HRV is positively related to EF
- EF is negatively correlated with unhealthy behavioral risk factors

(Holzman & Bridgett, 2017; Riggs et al., 2012)



Does activating the vagus reduce unhealthy behaviors?

- In people who were high on food craving:
=> HRV-biofeedback **reduced food craving**

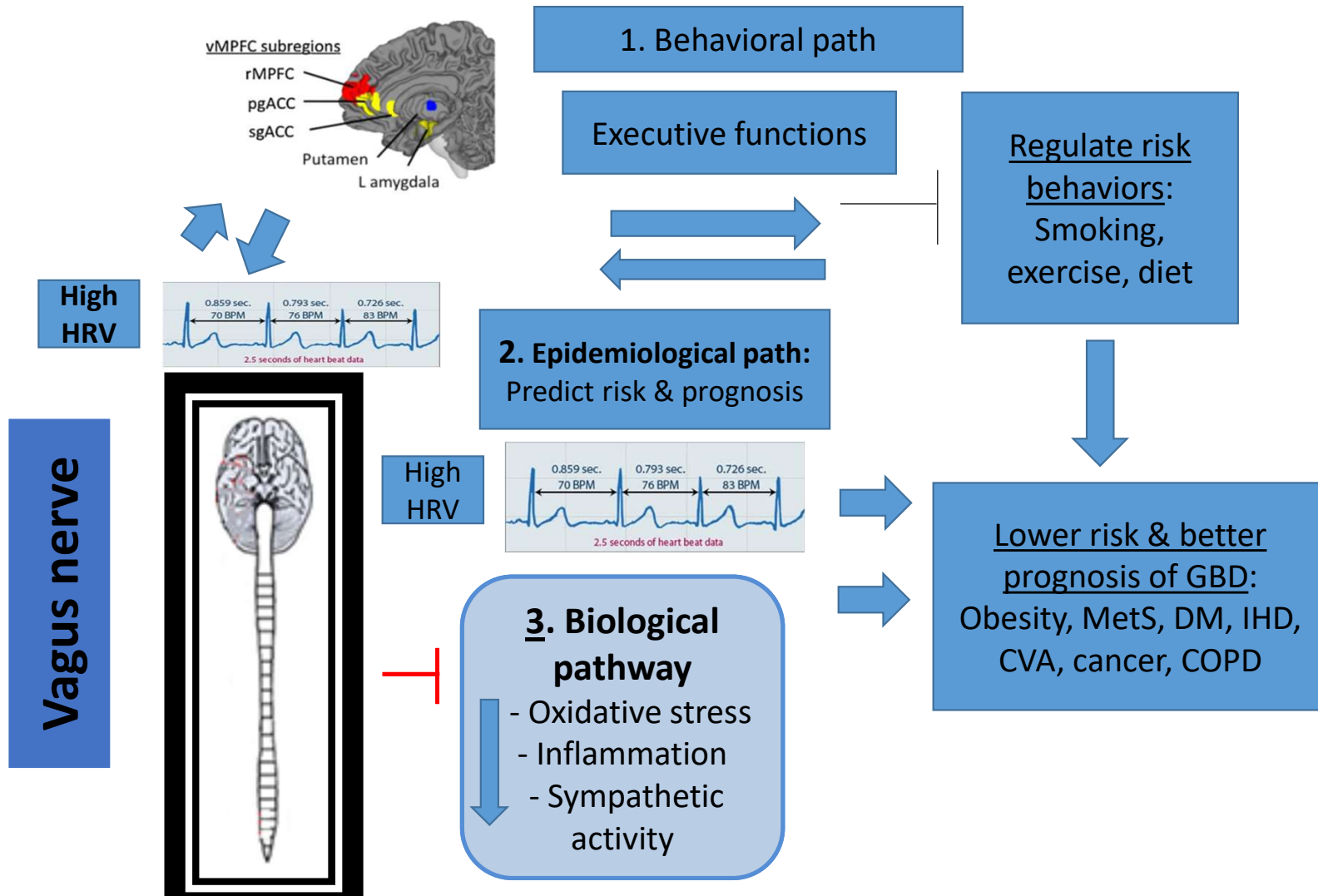


VNS led obese rats to **consume less food and lose weight**

(Meule et al., 2012; Ziomber et al., 2009)



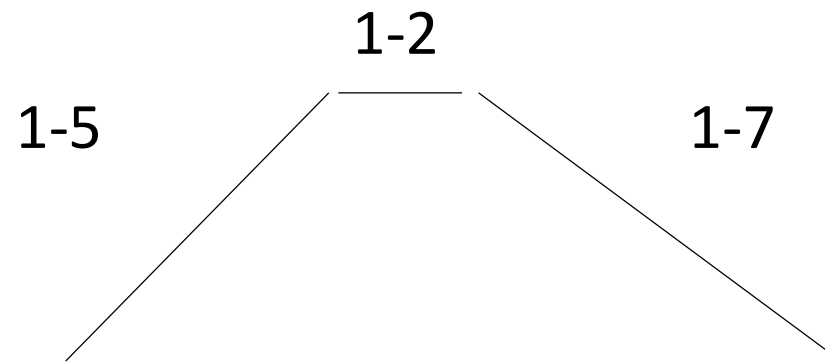
Vagal neuromodulation model for global burden of diseases



(Gidron et al., 2018)
J. Clinical Medicine

Effects of vagal nerve activation

Performing paced vagal breathing



Effects of HRV biofeedback on stress and anxiety

A review of 24 studies worldwide found large reductions in stress and anxiety following HRV-Biofeedback

(Goessl et al. 2017)



Effects of daily vagal self-activation on health

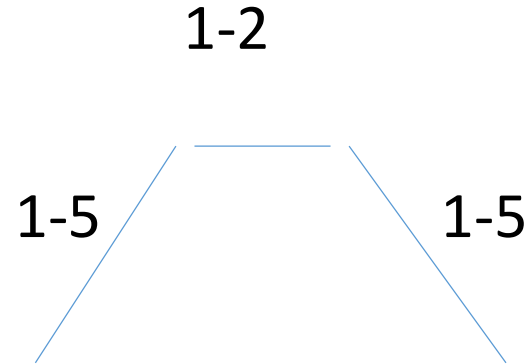
(Menuet, Giangreco & Gidron, in preparation)

N = 50 French people were randomized to:

- Experimental group: 3 x 2min/Day for a week
- Control group: 3/day of stress awareness

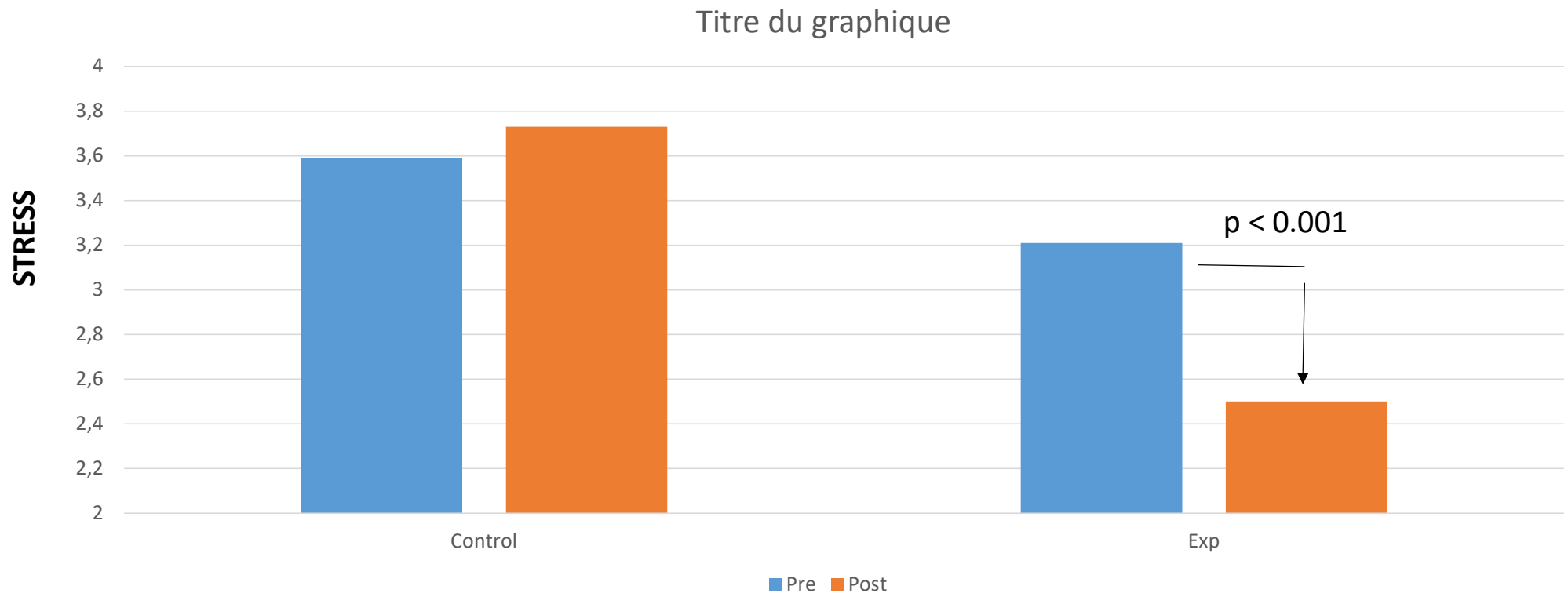
Outcomes:

- Perceived stress
- Physical symptoms
- Decision making



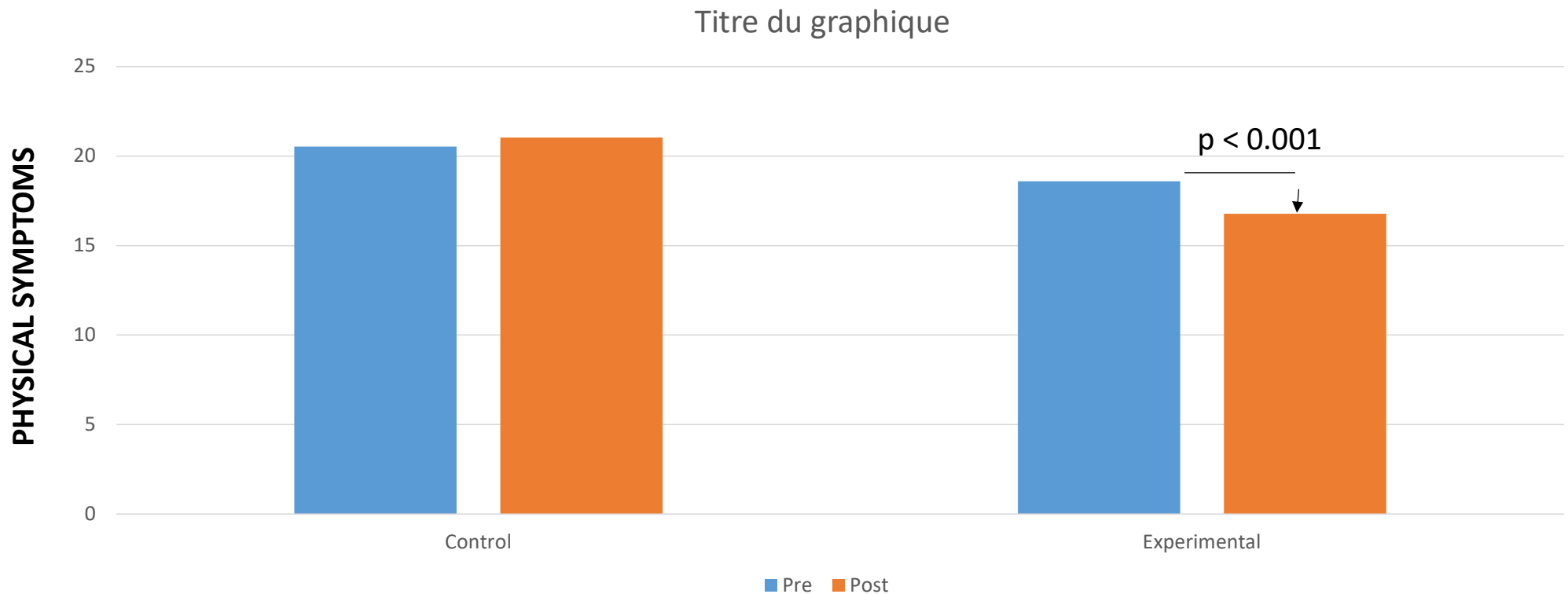
Effects of vagal self-activation on health

(Menuet, Giangreco & Gidron, in preparation)

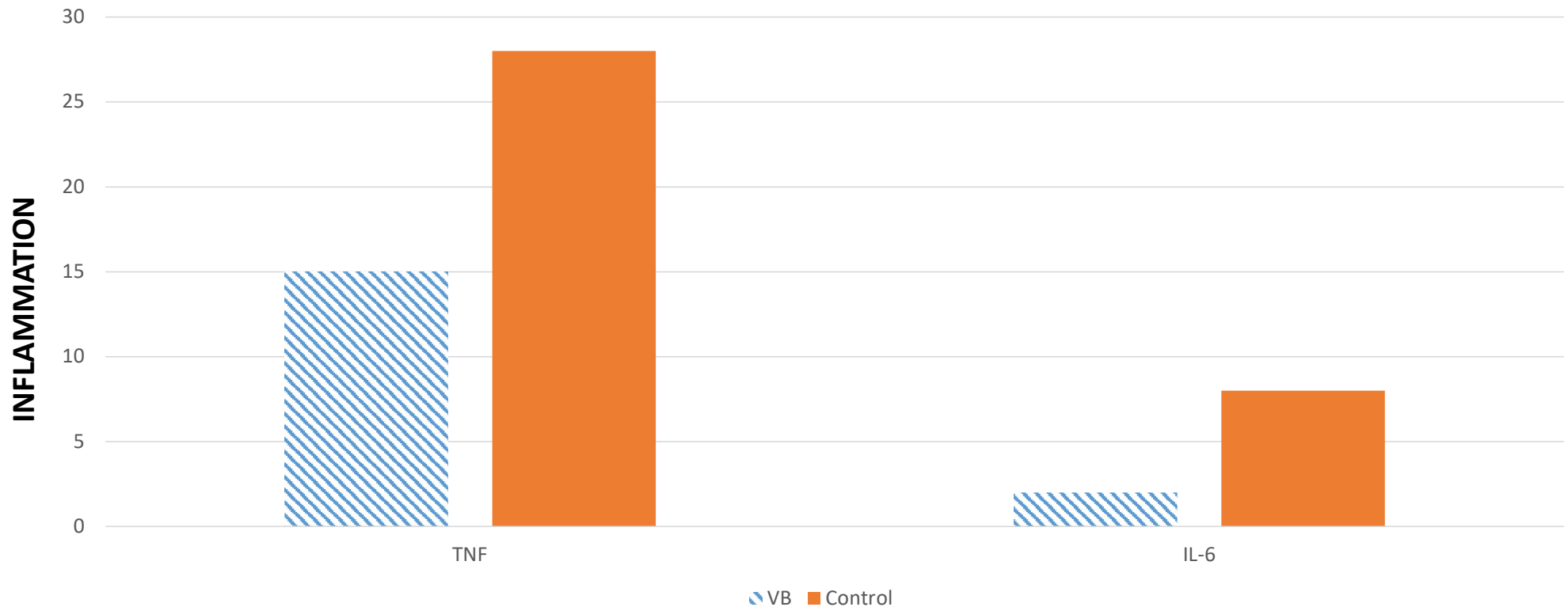


Effects of vagal self-activation on health

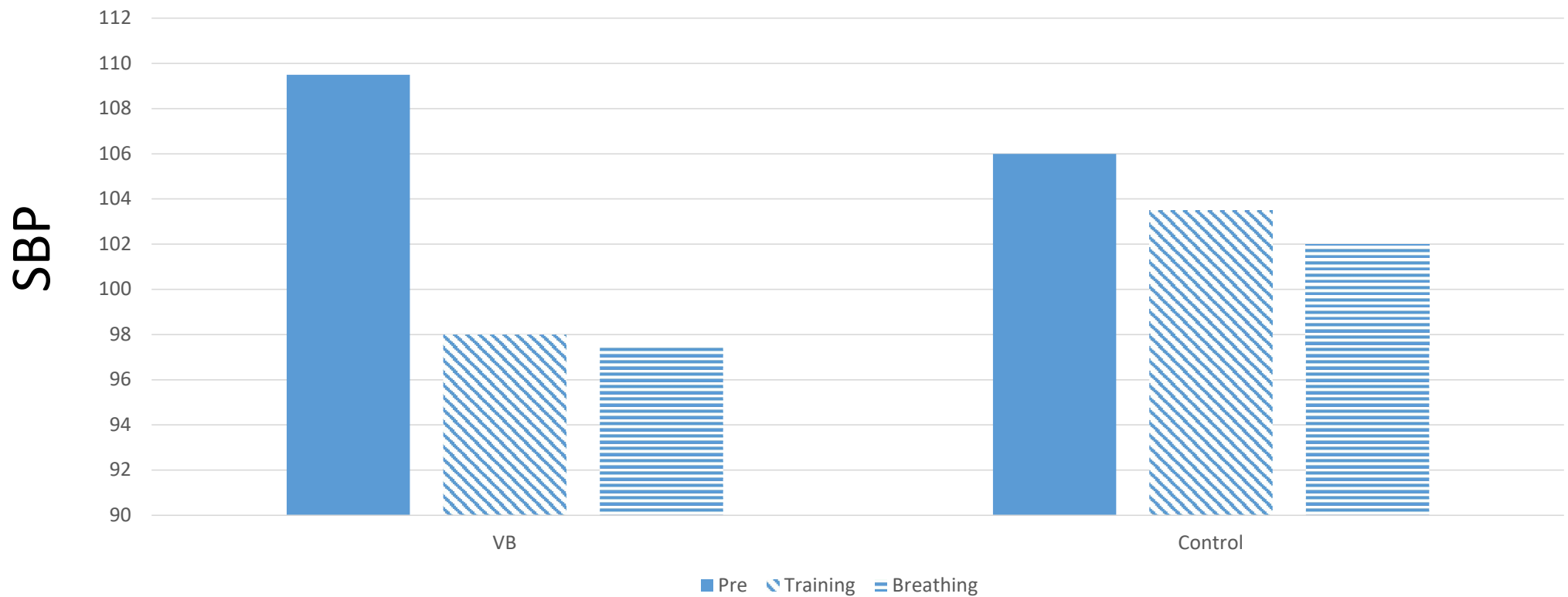
(Menuet, Giangreco & Gidron, in preparation)



Effects of deep breathing & meditation on inflammation

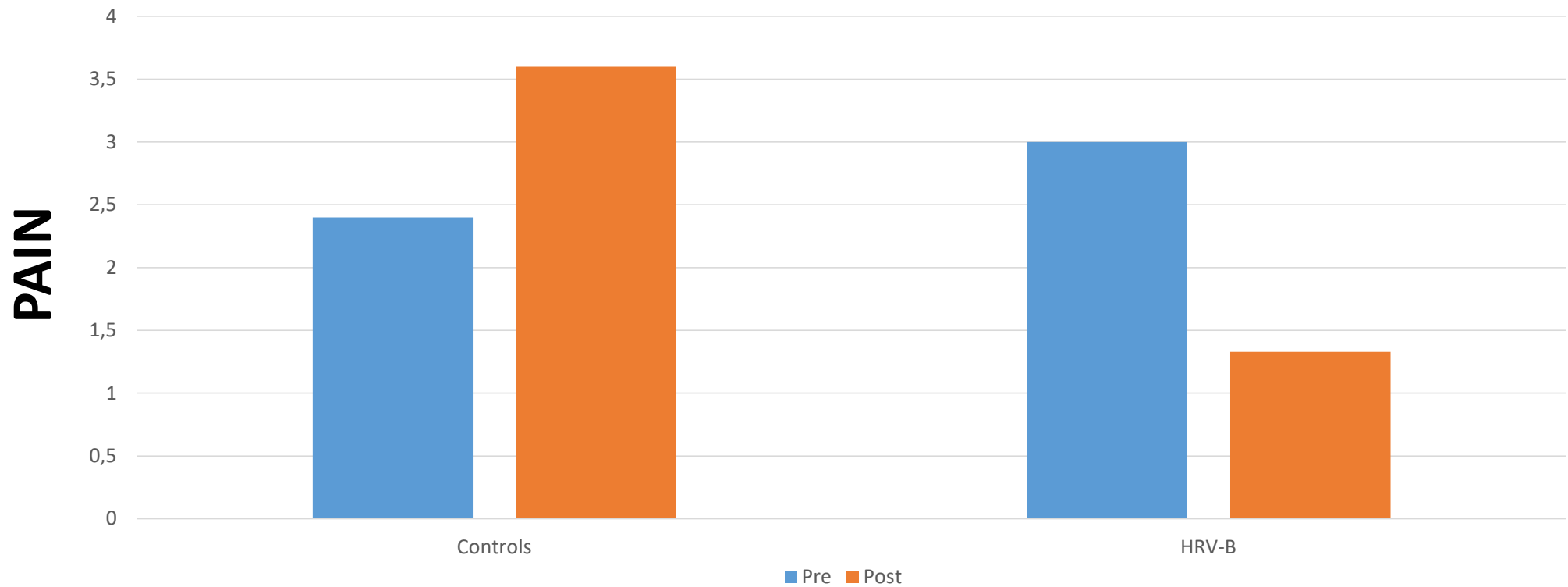


Effects of deep breathing on blood-pressure



Effects of HRV-B on pain in children

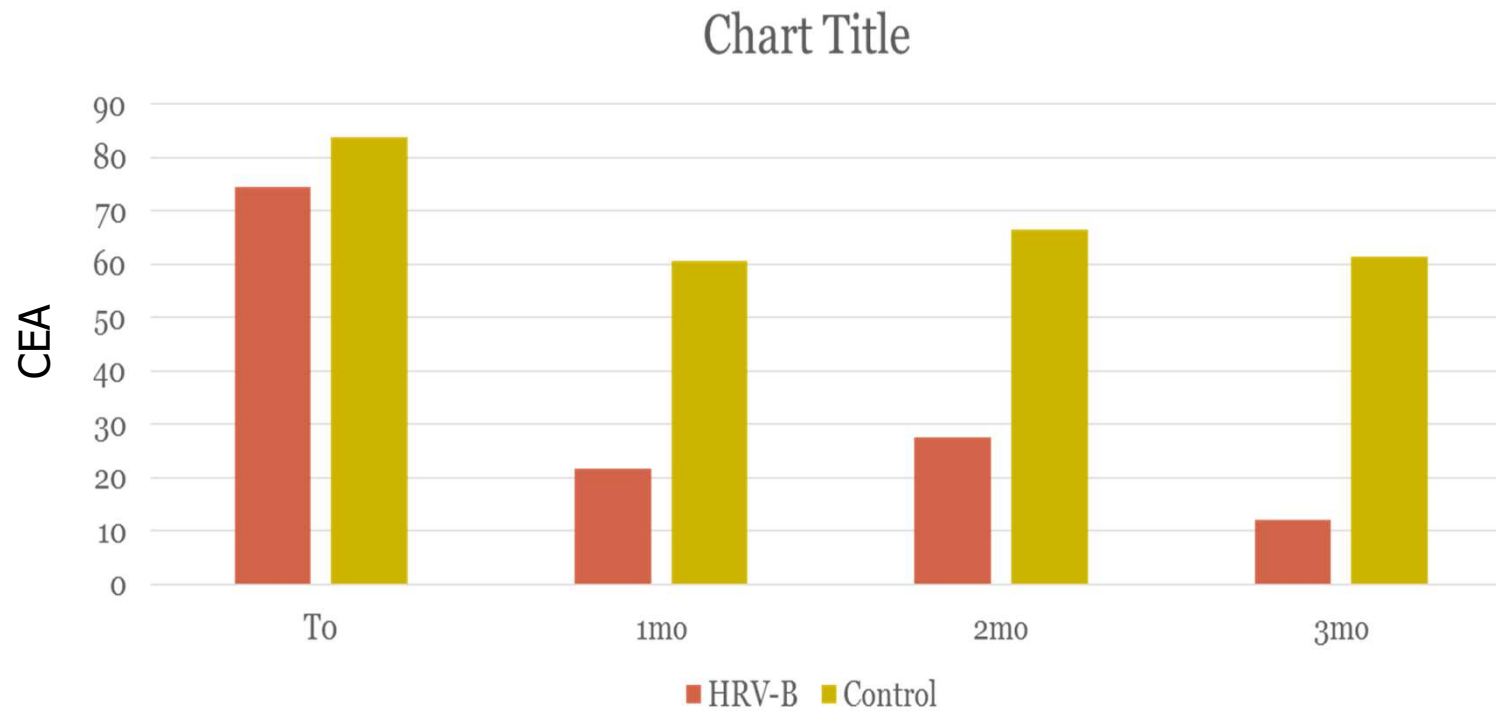
(Yetwin et al., 2022)



Design: Matched case-control pre-post study

- Three patients did HRV-Biofeedback for 3 months
- They were retroactively matched to 3 controls on:
 - Cancer type (colon)
 - Cancer stage (4)
 - Treatment
 - Baseline CEA as close as possible

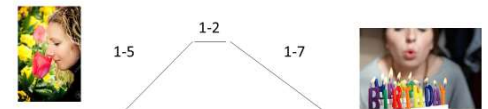
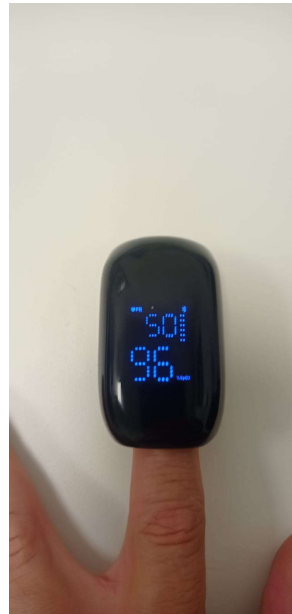
CEA levels over time in HRV-Biofeedback and controls with CLC



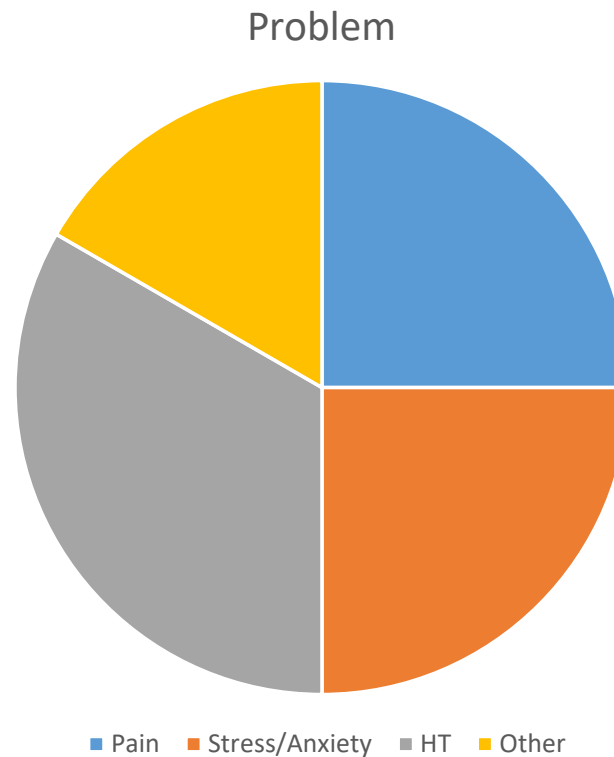
(Gitler... Gidron, 2023)

Our project in Poland for Ukrainians?

- **We aimed to Identify Ukrainian patients in Przemyśl with:**
Inflammatory pain, infections, hypertension, anxiety, CHD
- **Assessed** their HRV, BP, pain and distress
- **Taught** them deep vagal breathing + biofeedback
- **Assessed** their HRV, BP, pain and distress again



Health problems treated by neuromodulation clinic in Ukrainian refugees





1-5

1-2

1-7



Исследования показали, что стимуляция блуждающего нерва снижает повышенное давление, воспаление, состояние тревожности, а так же успокаивает боль.

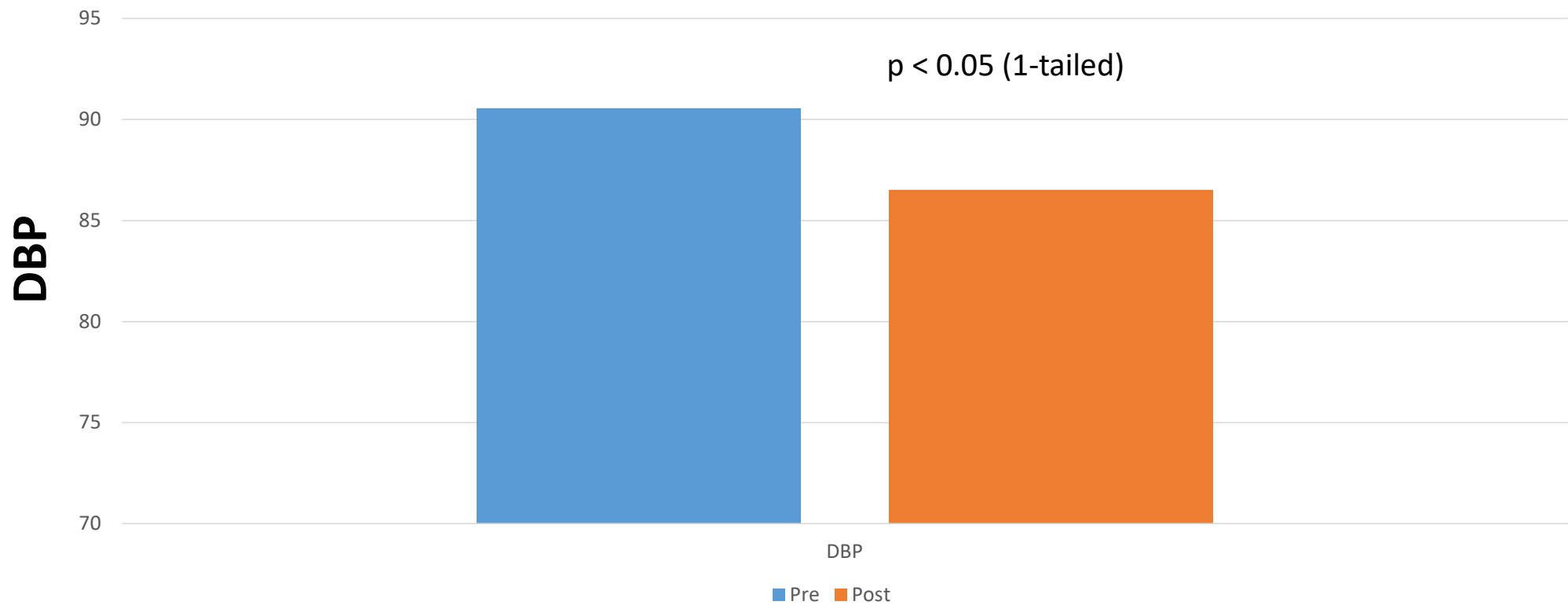
Активация блуждающего нерва происходит следующим образом:

- вдох через нос (как будто вы вдыхаете аромат цветов) на счёт от 1 до 5.
- задержка дыхания на счёт 1-2
- выдох на счёт от 1 до 7, как будто вы задуваете свечу.

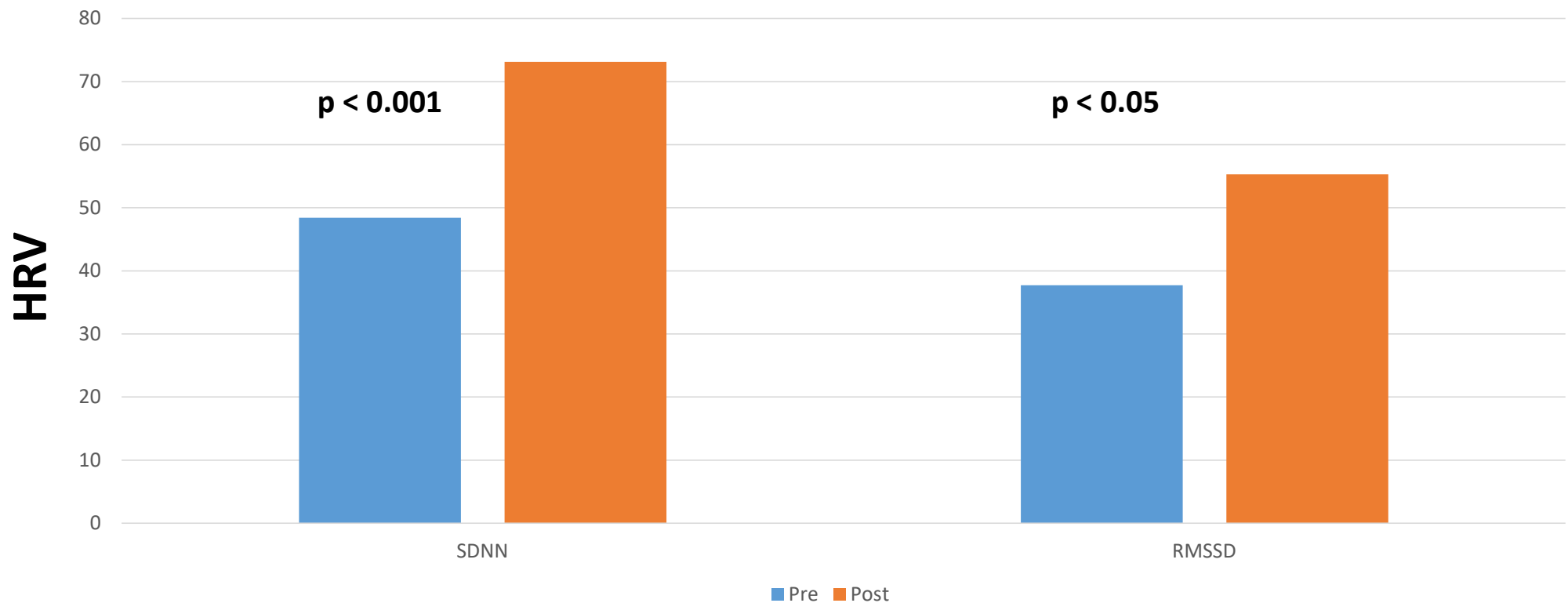
Повторяйте в течении 3-5 минут три раза в день.

Будьте здоровы!

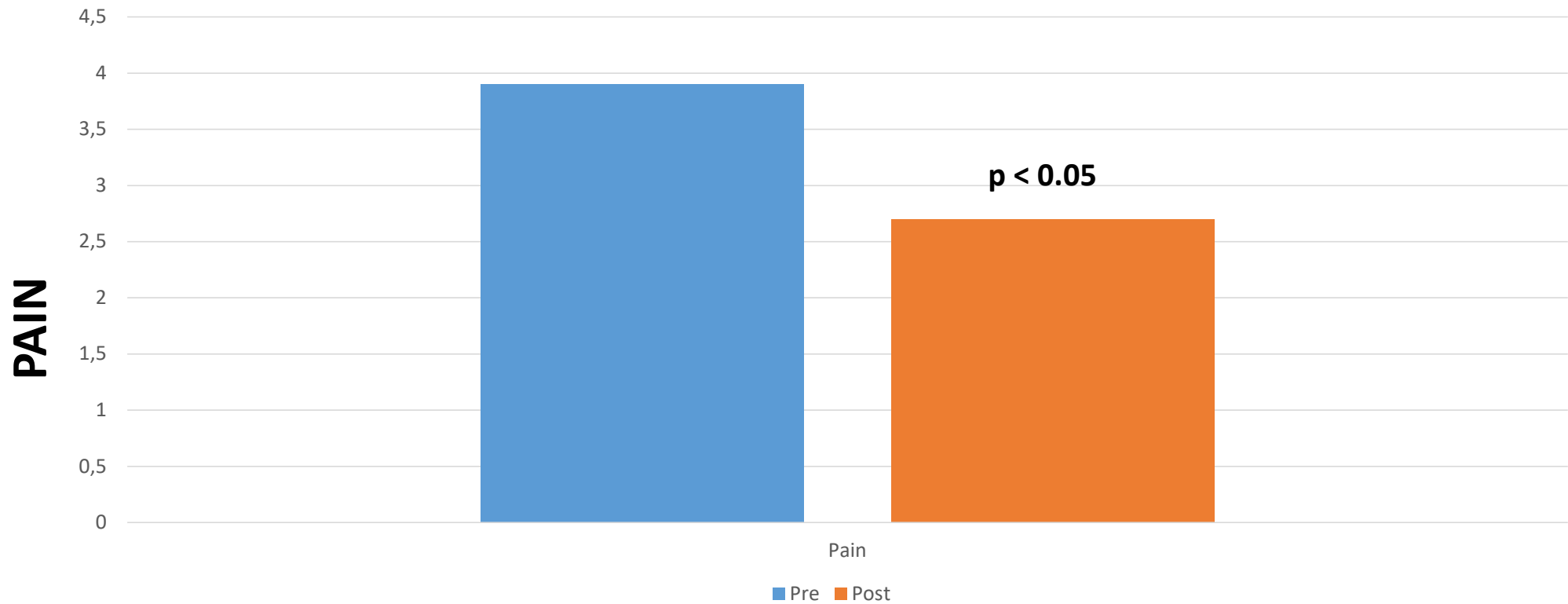
Effects of HRV-B in Ukrainian refugees - DBP



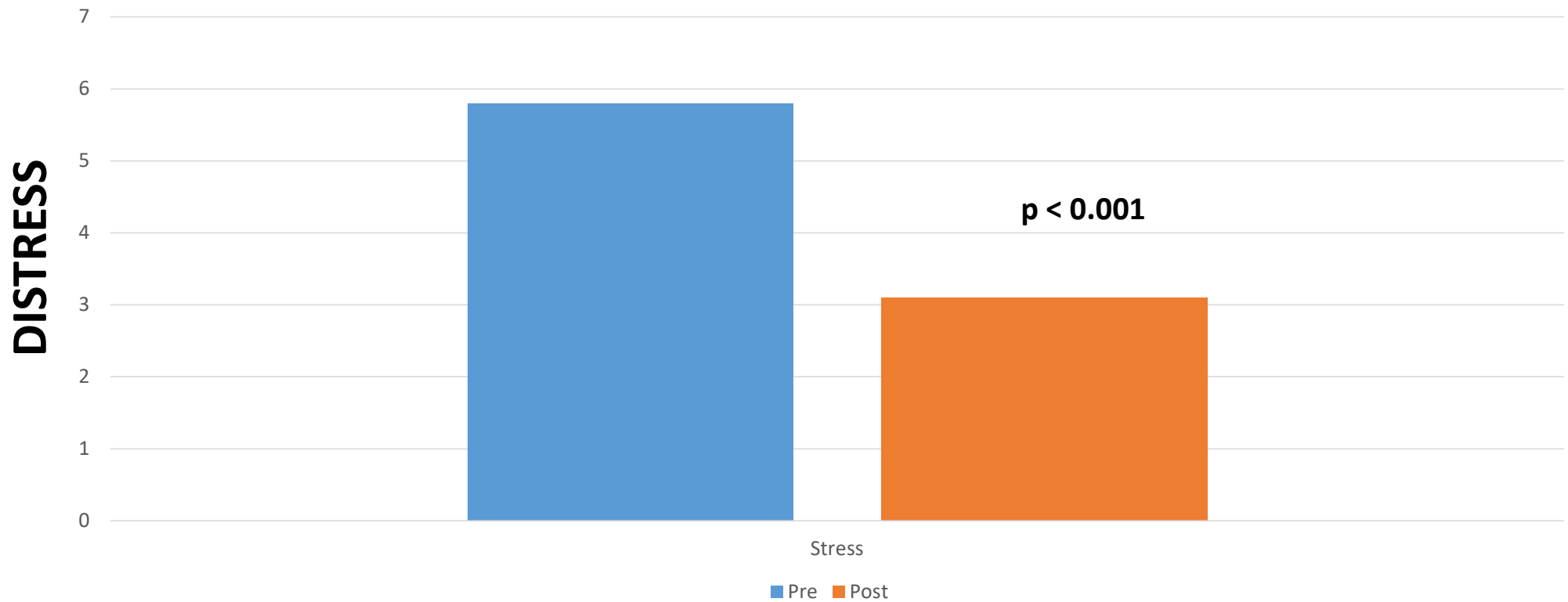
Effects of HRV-B on HRV in Ukrainian refugees

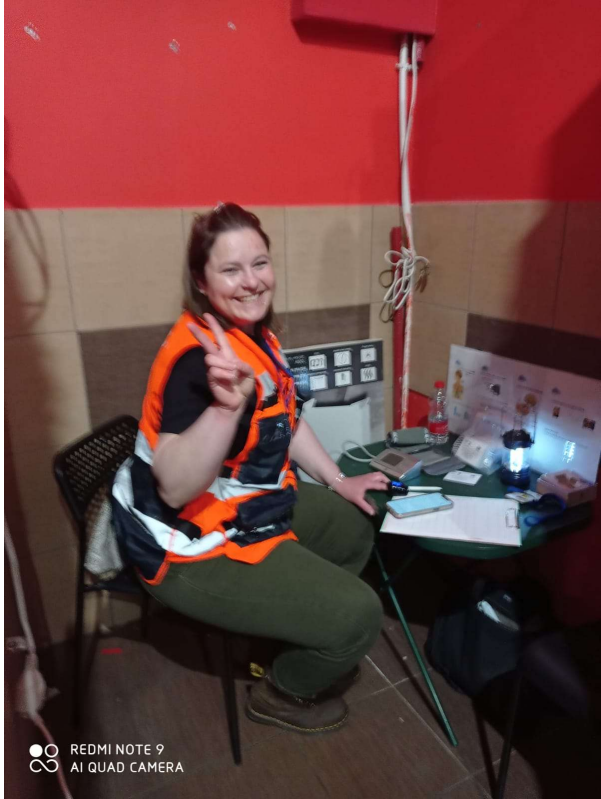
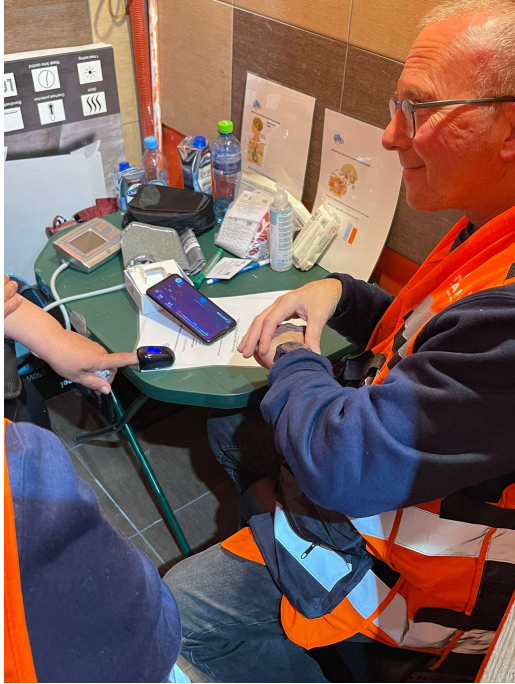


Effects of HRV-B in Ukrainian refugees – pain



Effects of HRV-B in Ukrainian refugees - distress





A few words about PTSD prevention

- PTSD occurs after exposure to a physically threatening event
- In a recent survey in Ukraine, 76% met the criteria for PTSD!!

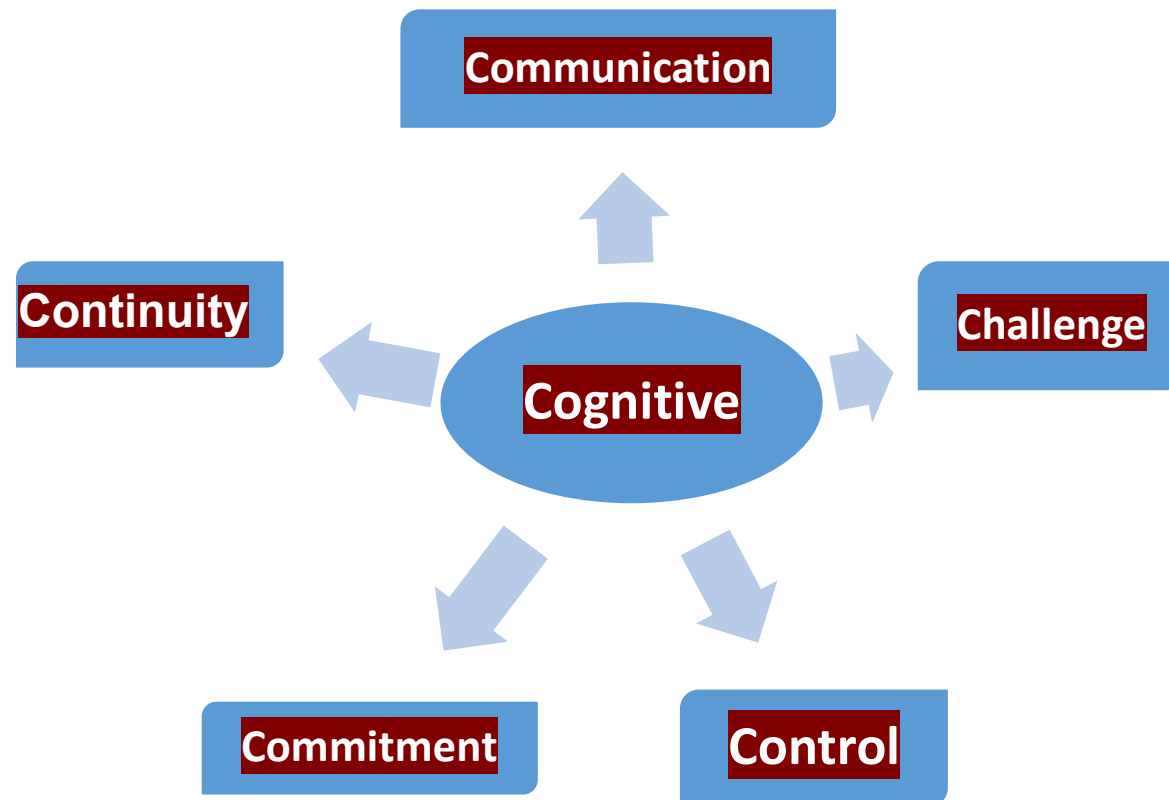
(Zasiekina et al., 2023)

Previous attempts to prevent PTSD..

Debriefing:

- going over the event's details
- normalizing reactions
- giving legitimacy to reactions
- providing support & empathy
- allowing to express thoughts & feelings

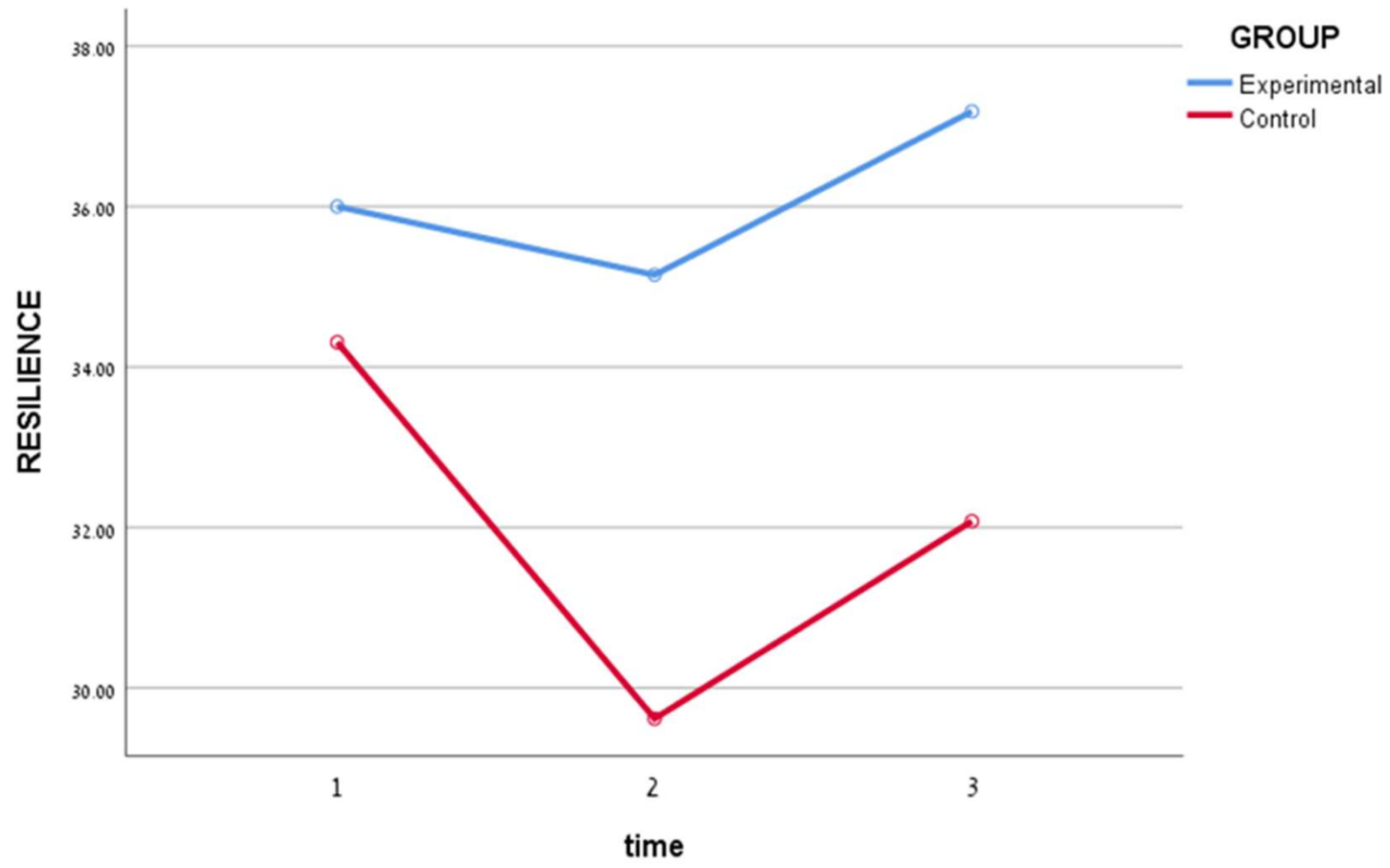
The 6 c`s model

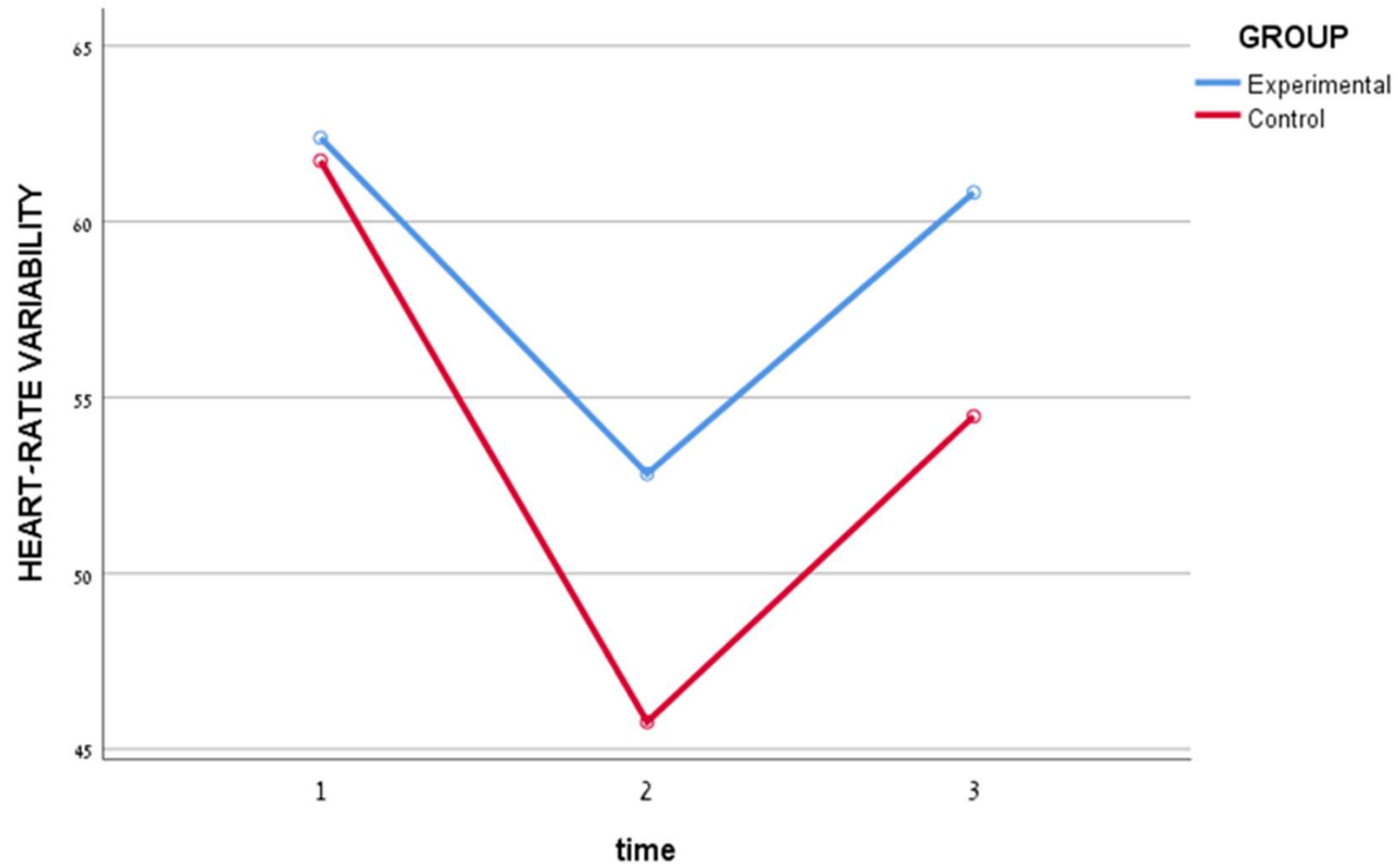


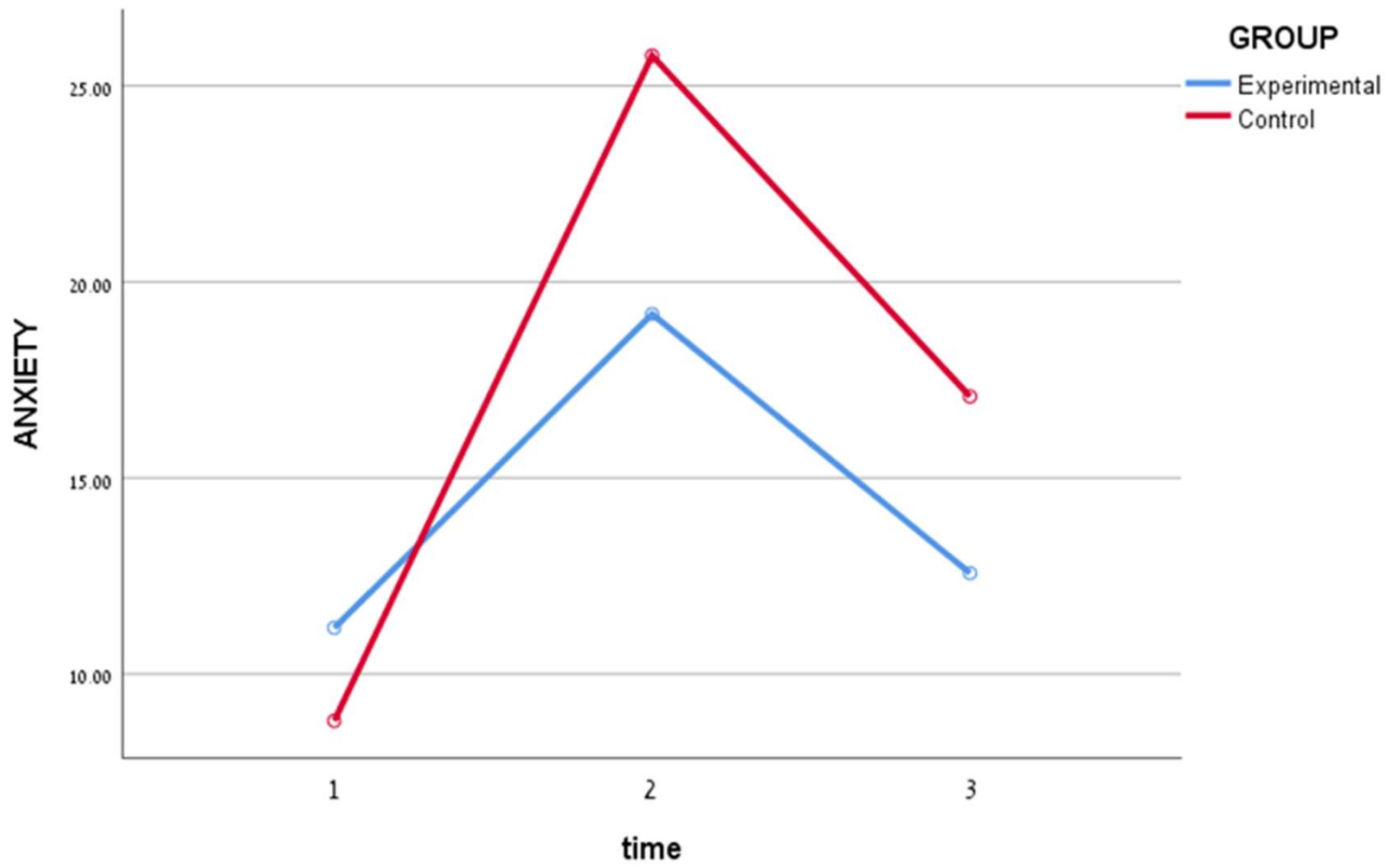
Effects of the SIX Cs vs. emotional expression

- 63 people heard an 8-year old girl calling 911 about family violence
- Half were asked to connect to her feelings and to express their own
- Half were given tasks, commitment, and focused on facts – 6Cs

Anxiety, resilience and HRV were measured before, after at 7min later







Previous attempts to prevent PTSD

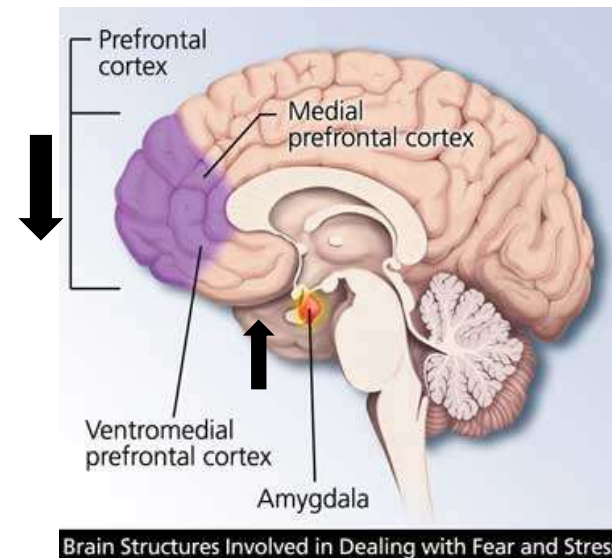
5 meta-analyses conducted on all RCTs testing debriefing, concluded that this intervention is NOT effective, and that is compulsory provision must cease!

(Suzanna et al, 2002; van Emmerik et al., 2002; Kenadey, 2000)

Brain profiles of people with PTSD

- Hyperactivity in the amygdala
- Hypoactivity in the PFC

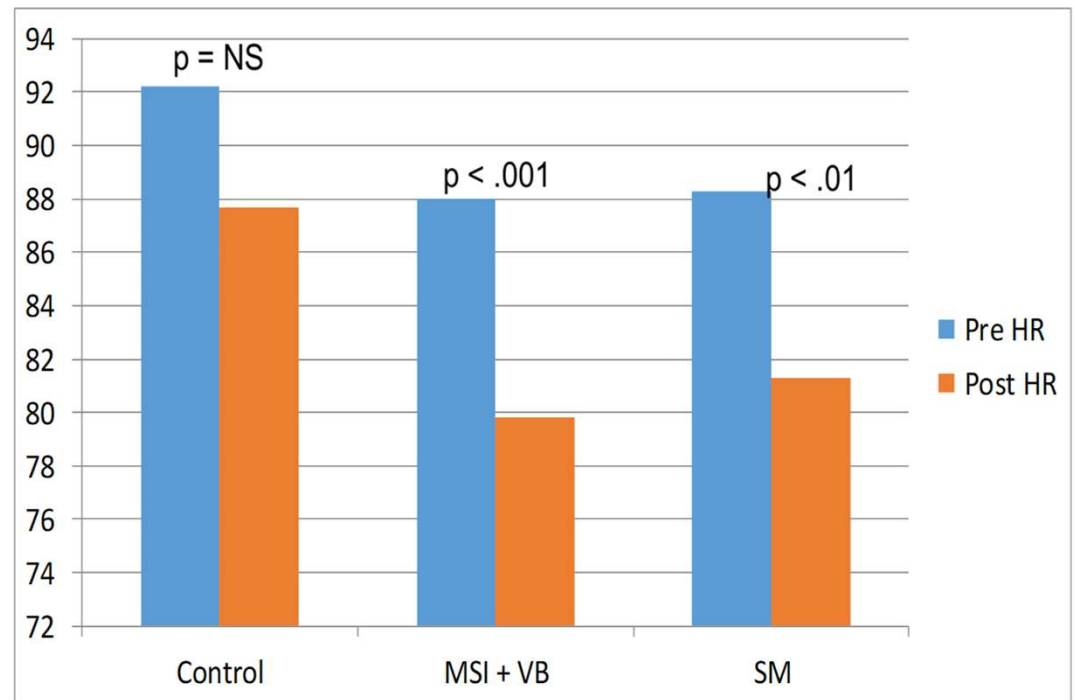
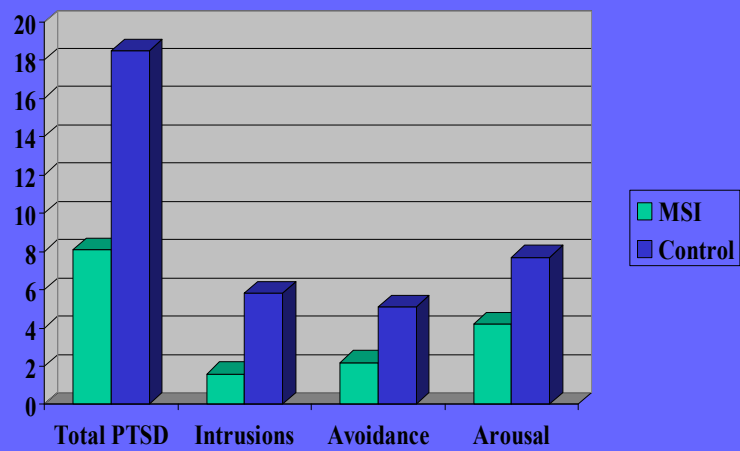
(Bremner et al., 1999;
Shin et al., 2004)



The memory structuring intervention - MSI

1. Paced slow vagal breathing – 1min
2. Patient describes the event. Each time he/she says a feeling or a somatic sensation, therapist asks to elaborate verbally and give a reason.
3. Therapist repeats the story, chronologically organized, with causal links between the event's segments, using verbal labels of emotions/sensations
4. Patient repeats the story the way the therapist did
5. Paced slow vagal breathing – 1min

Effects of MSI vs. control on PTSD-symptoms (Y-axis; Gidron et al., 2001)



The memory structuring intervention - MSI

- One Ukrainian soldier asked for help, having seen his unit friend burn in front of him..
- We gave him the MSI + VB
- The next days he came to offer “What can I do to help you?”!!



Activating the vagus may help wandering people..



Thanks to

- Dr. Einav Levy
- Rita Sirota, BN
- Dr. Sharon Shaul
- Dr. Eitan Shachar

- NATAN NGO



Thank you

Tussen Takk



Israel, the source of my inspiration