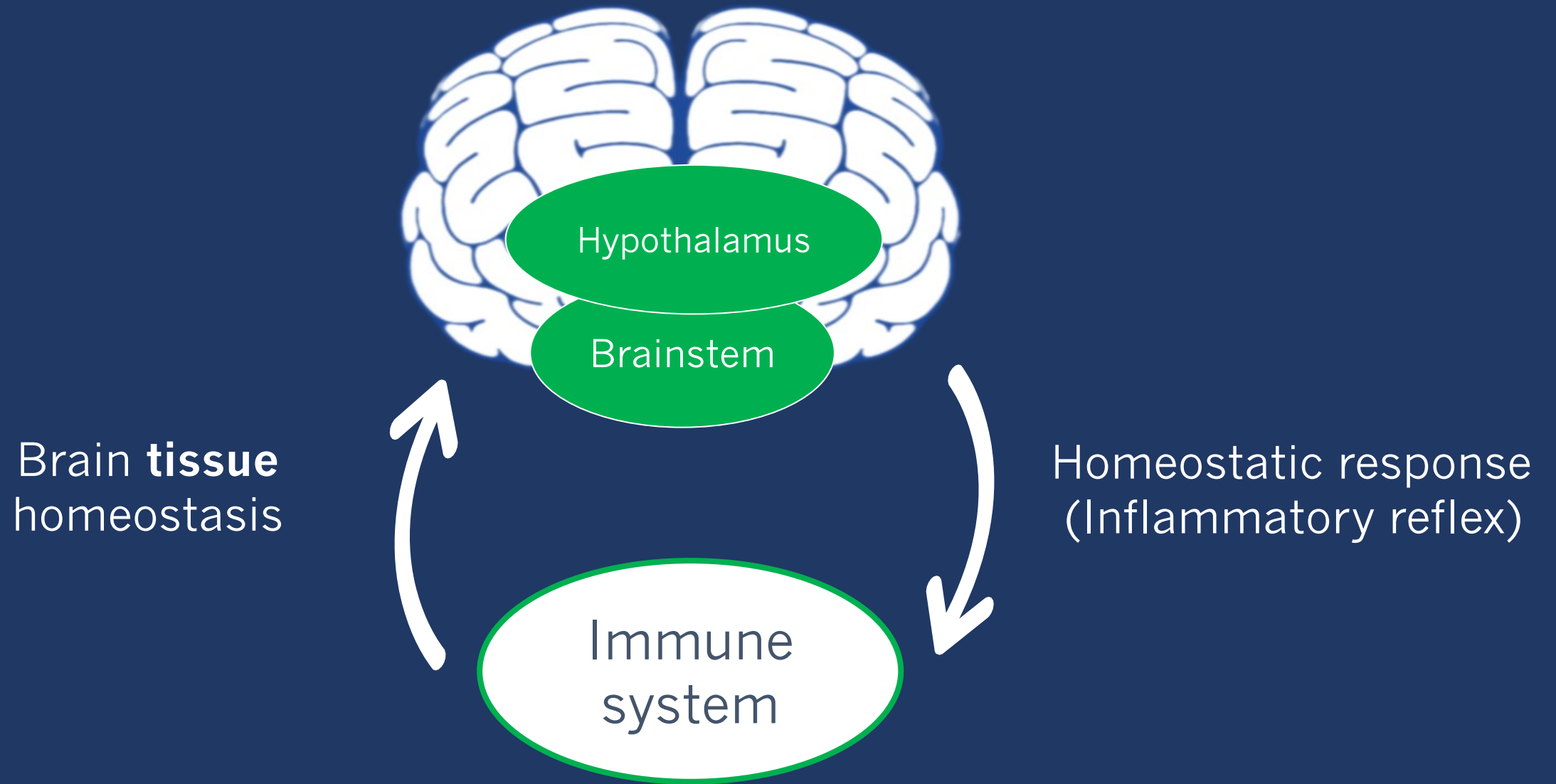




Immunoception: A dialog between the brain and immunity

Rolls Asya, PhD
Tel Aviv University, Israel



Integration-interoception

Prediction

Motivation-hope

Control



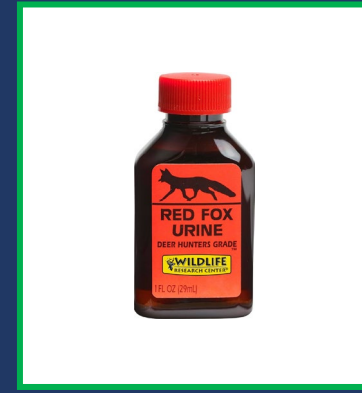
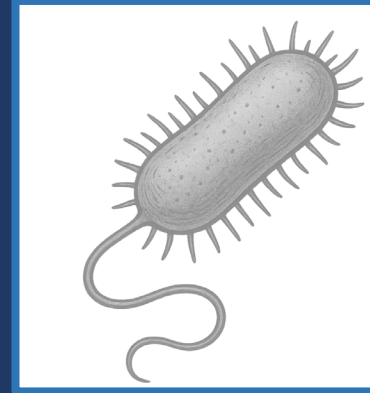
ChatGPT

Immune
system

Predictions

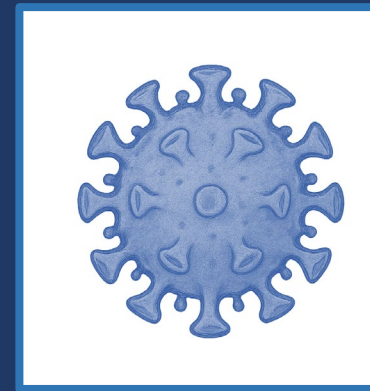
Evolution

Innate



Life experience

Adaptive



Brain-immune predictions

Evolution

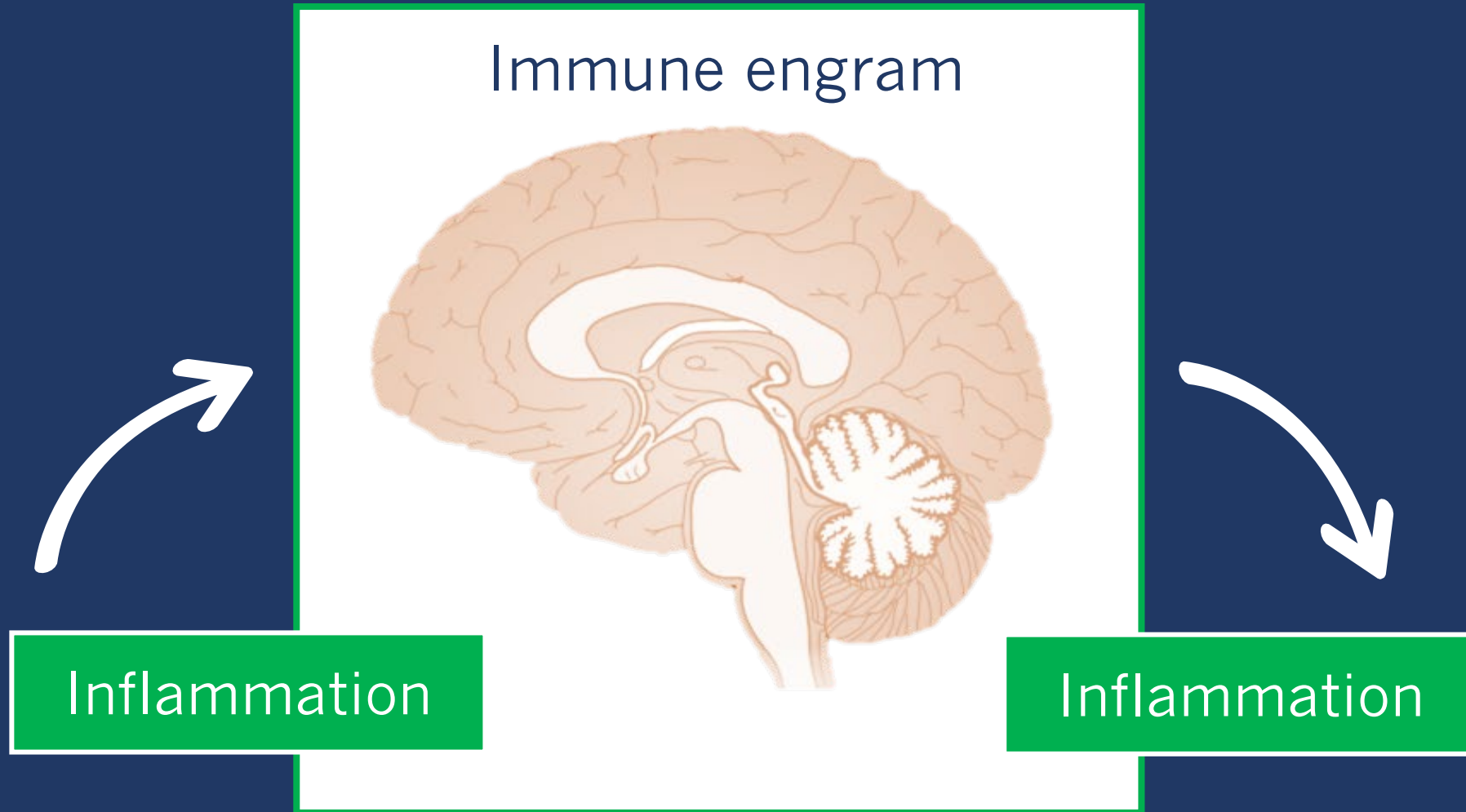
Innate

Life experience

Adaptive



Immune conditioning (1920)

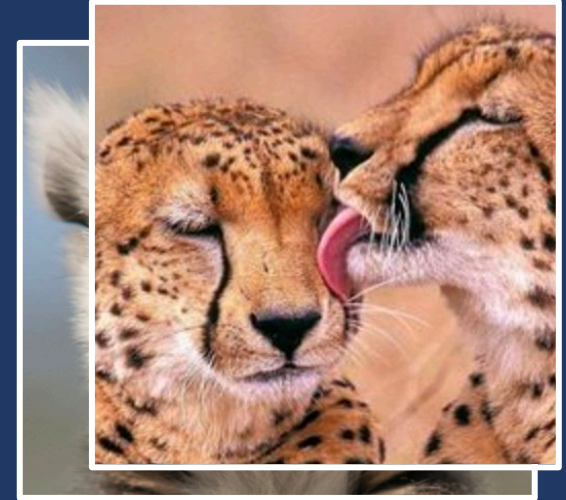


Koren et al; Cell 2021
(Collaboration: Koby Rosenblum)

Brain-immune predictions

Evolution

Innate



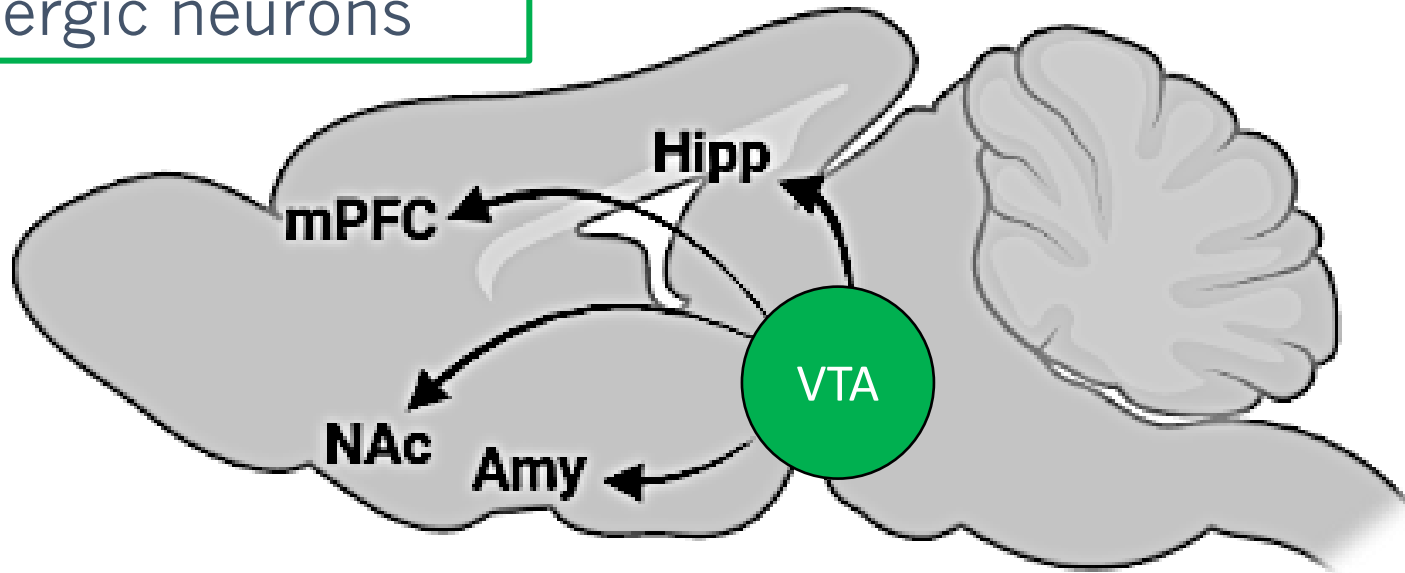
Life experience

Adaptive

The reward system

Positive expectations- hope
Motivated behaviours

VTA- Ventral tegmental area
Dopaminergic neurons





Reward
system



Immune
system

Chemogenetic activation of VTA
dopaminergic neurons



Sham
control



VTA
activation

Bacteria

Cancer

Heart
attack

Anti bacterial:

Ben Shannan; 2016
Nature Medicine

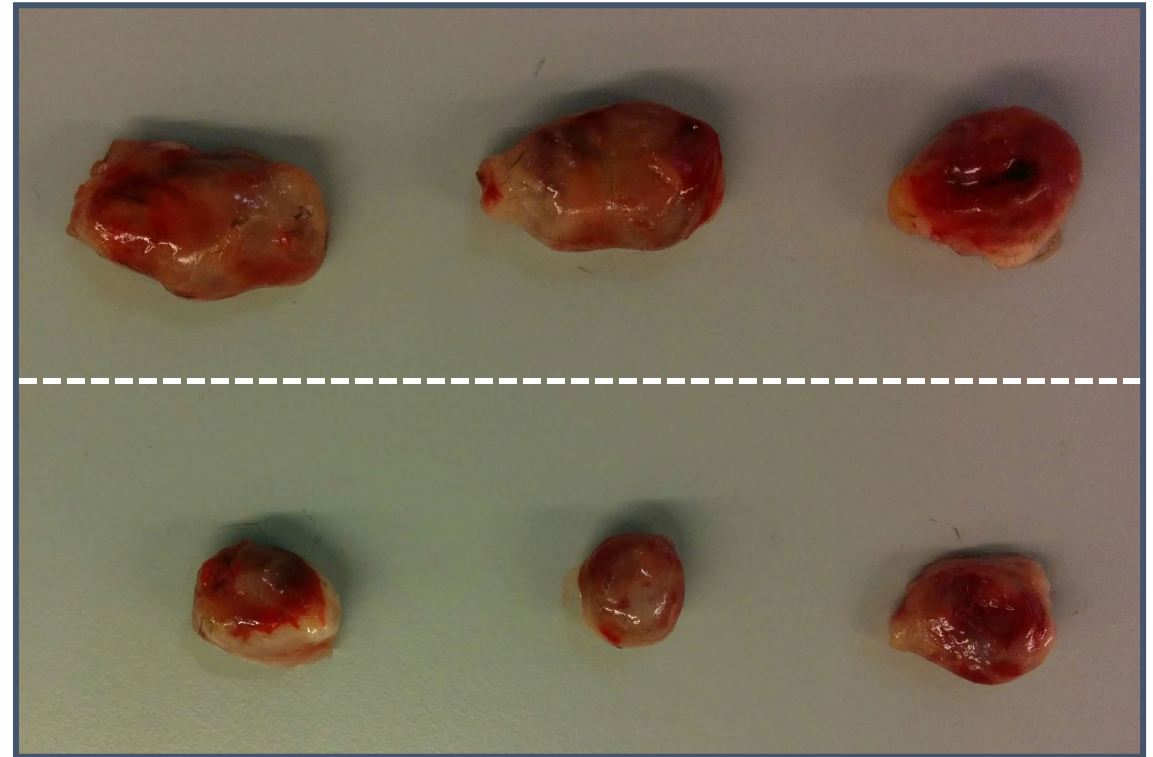
Anti Tumor:

Ben Shannan; 2018;
Nature Comm.

Recovery from AMI :

Haykin; 2024
Nature Cardi. Res.

Control

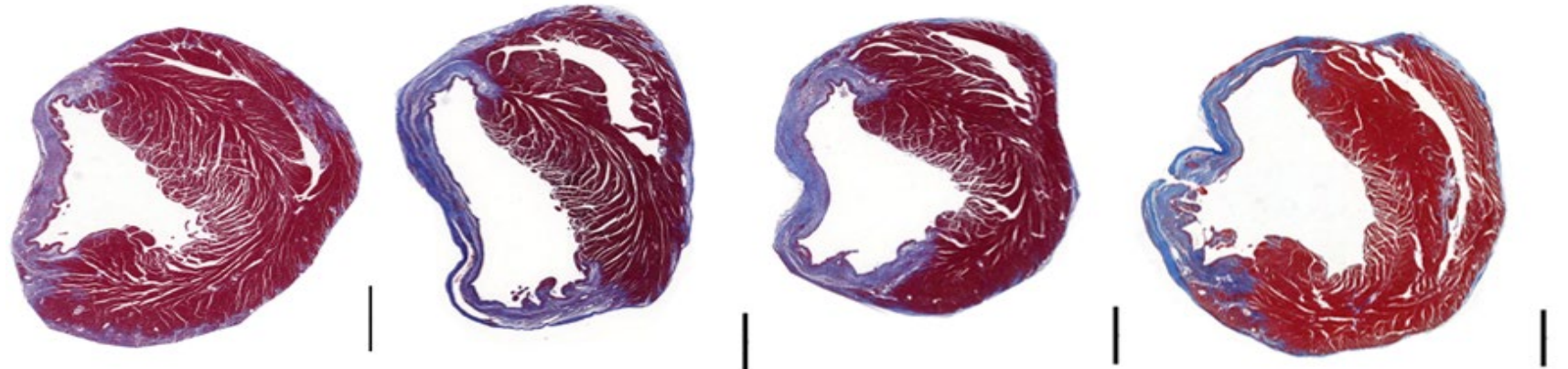


VTA activated

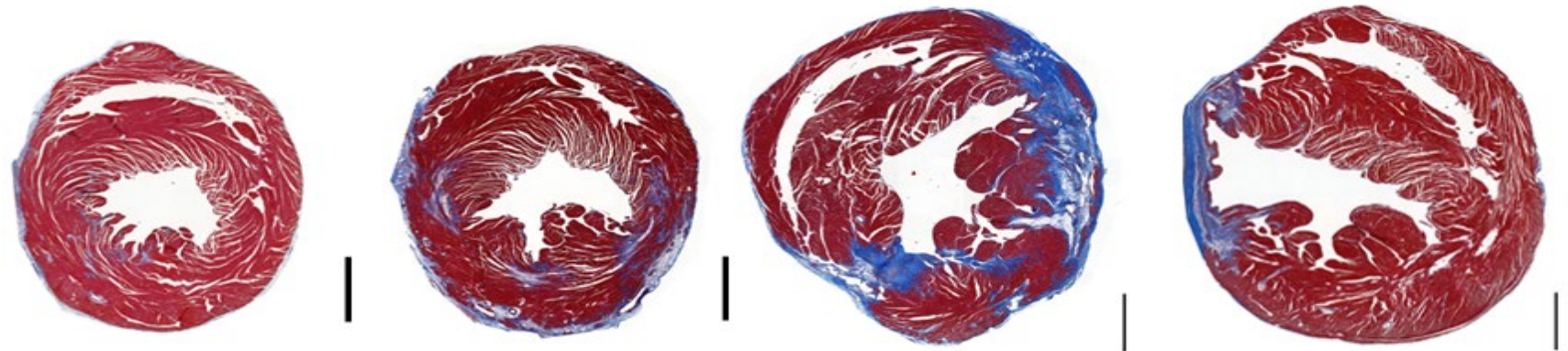
Normal



Control (MI)



VTA-activation (MI)



Haykin et al, *Nature Cardiovascular Research* 2024
(Collaboration: Gepshtien)

Anti bacterial:

Ben Shannan; 2016
Nature Medicine

Spleen

Anti Tumor:

Ben Shannan; 2018;
Nature Comm.

Bone
marrow

Recovery from AMI :

Haykin; 2024
Nature Cardi. Res.

Liver



Sympathetic nervous
system

Immune
system

What does it mean?

Immunoception



Sensory information
(pain)

Immune cells as
sensory indicators of
physiology



Mental-physical
synchronization

Tuning or control?

Translation?



Immune
system



Prof. Talma Hendler
Sagol center, TAU



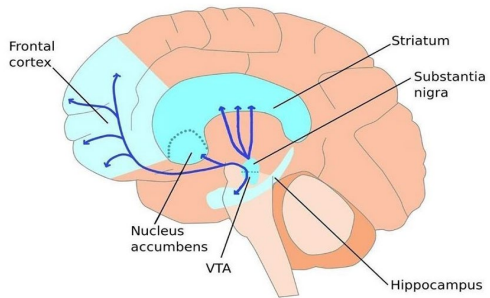
Dr. Nitzan
Lubianiker



Dr. Tamar
Koren

Rationale:

Induce reward activation



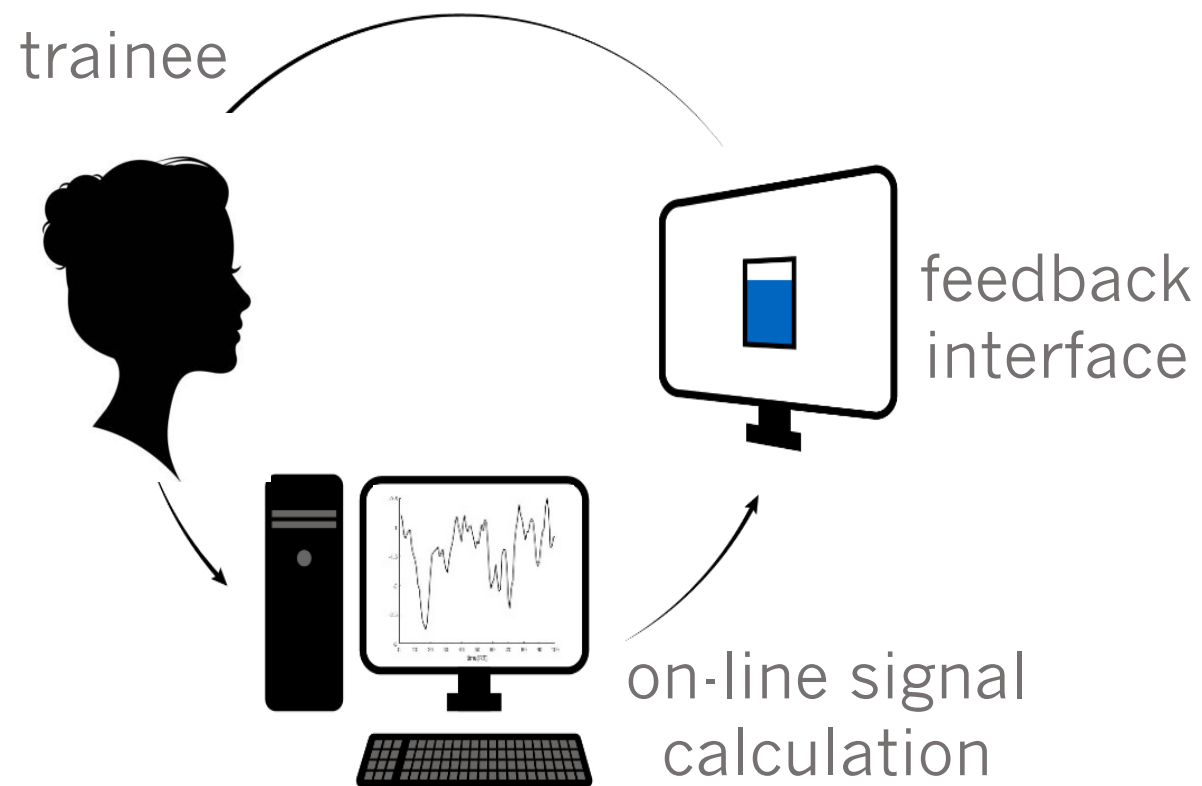
Time-lock to an immunological challenge



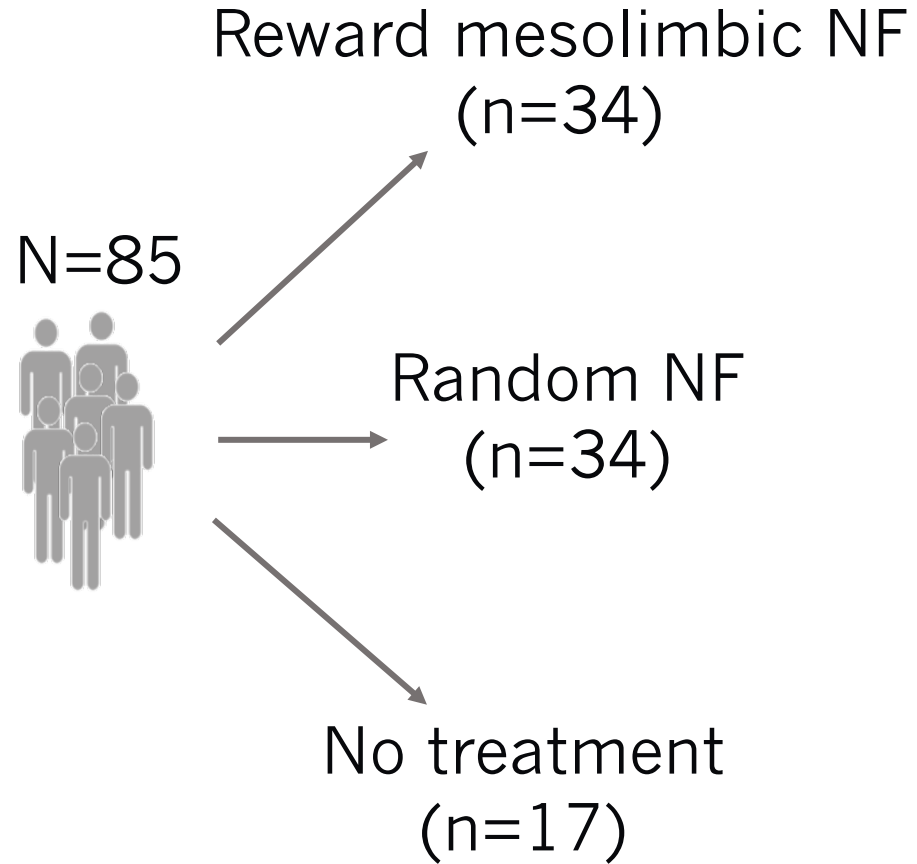
Immune assessment



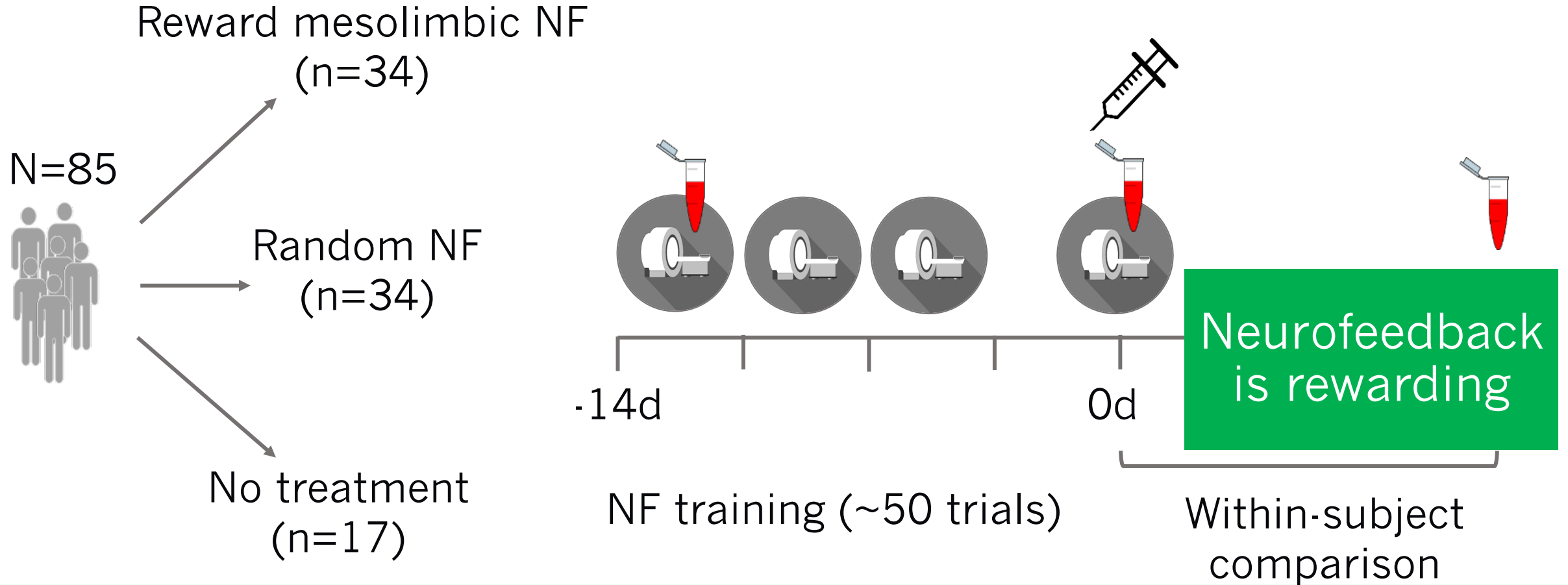
The neurofeedback



Experimental Protocol



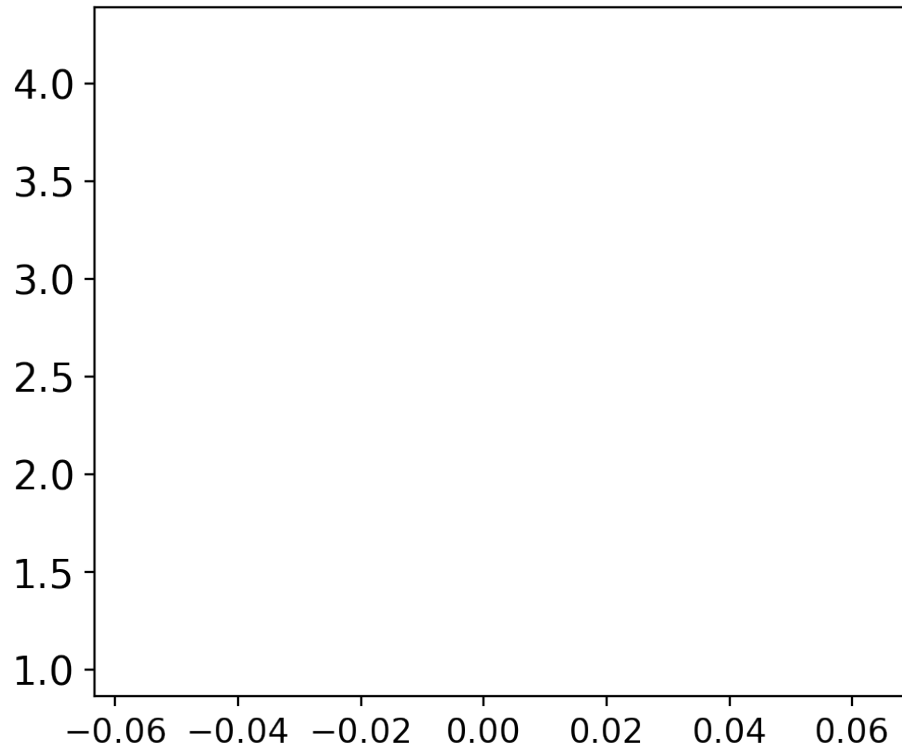
Experimental Protocol



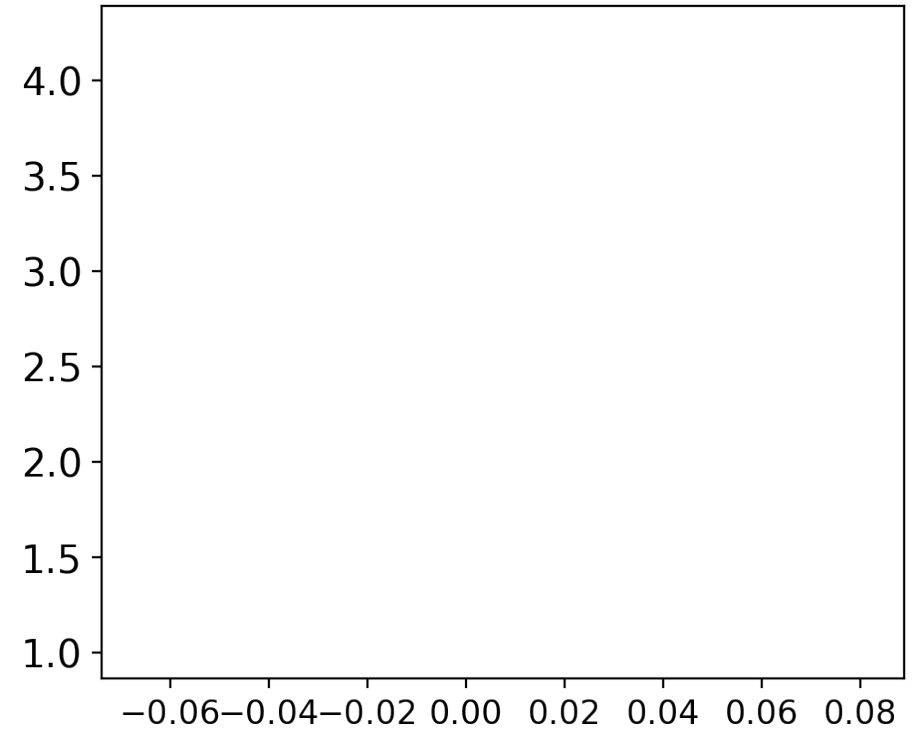
Brain-Immune correlations: Reward ML activation and Ab titer

Antibody titer
(Mean log
postvac HBVab
change)

$r = 0.31$
 $p = 0.018$
 $N = 60$

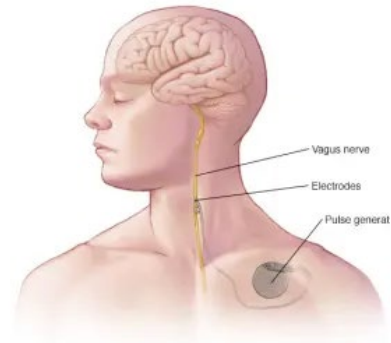


VTA activity



NAc activity

$r = 0.02$; $p = 0.887$

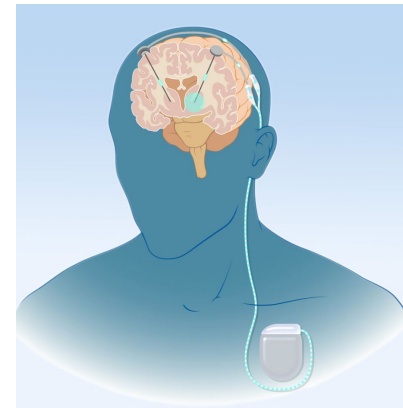


Vagal stimulation

Kevin Tracey

Intracranial electrodes

Dr. Ben Shofty
Utah U.



Dr. Hilla Azulay-Debbi

Ree'e Yife
Itay Zlayat
Megan Sammons
Tom Haran
Rita Sirotkin
Gilad Goldhirsh
Rotem Yam Shahor
Tehila marom
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Eden Avishai
Nadia Bushnak
Hedva Haykin
Dorit Frafara



Technion, our home
2012-2025



Collaborators on presented work:

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Fahed Hakim
Kobi Rosenblum

Eli Pikarsky
Lior Gepshtien
Talma Hendler

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ERC CON NEUROFASCIA
ERC POC