

MCQ exam

Mark your answers on the answer sheet (page 2 of the second document)

1. In depressed patients, systemic low-grade inflammation was associated with the severity of several clinical symptoms including:
 - a) loss of interest
 - b) sadness
 - c) fatigue
 - d) anhedonia
 - e) anxiety

2. In depressed patients, systemic low-grade inflammation was associated with an activation of the IDO pathway, as evidenced by:
 - a) an increased peripheral kynurenine/tryptophan ratio
 - b) decreased peripheral concentrations of serotonin
 - c) decreased peripheral concentrations of tyrosine
 - d) enhanced peripheral concentrations of serotonin
 - e) enhanced peripheral concentrations of tyrosine

3. In interferon-alpha treated patients, disrupted GTP-CH1 enzymatic pathway was found, as evidenced by:
 - a) decreased CSF concentrations of BH4
 - b) an increased peripheral kynurenic acid/quinolinic acid ratio
 - c) an increased peripheral phenylalanine/tyrosine ratio
 - d) increased peripheral concentrations of homovanillic acid
 - e) decreased CSF concentrations of dopamine

4. In depressed patients, systemic low-grade inflammation-driven deregulation of brain glutamate function was associated with the severity of several clinical symptoms including:
 - a) anhedonia
 - b) anorexia
 - c) insomnia
 - d) motor retardation
 - e) interpersonal sensitivity

5. In depressed patients, the peripheral kynurenic acid/quinolinic acid ratio, as indicative of inflammation-induced IDO pathway activation, was associated with neuroanatomical abnormalities, as evidenced by:
 - a) a reduced volume of hippocampus
 - b) an increased volume of orbitofrontal cortex
 - c) an increased volume of ventral striatum
 - d) an increased volume of insula
 - e) a reduced volume of amygdala

6. Which of the following category/ies belong to the main criteria of PTSD (DSM-5)?
- a) amnesia
 - b) hallucinations
 - c) avoidance
 - d) eating disorders
 - e) alterations in arousal and reactivity
7. Regarding neurobiological theories of brain circuits implicated in PTSD, which of the following are supported by consistent structural MRI data from subjects affected by the disorder?
- a) hippocampal atrophy
 - b) hippocampal hypertrophy
 - c) parietal atrophy
 - d) parietal hypertrophy
 - e) none of the above
8. Regarding neurobiological theories of brain circuits implicated in PTSD, which of the following are supported by fMRI data from subjects affected by the disorder?
- a) prefrontal hyperactivity
 - b) prefrontal hypoactivity
 - c) hippocampal hyperactivity
 - d) hippocampal hypoactivity
 - e) none of the above
9. Regarding neurobiological theories of biological alterations implicated in PTSD, which of the following are supported by blood sample data from subjects affected by the disorder?
- a) elevated cortisol levels
 - b) decreased cortisol levels
 - c) decreased negative feedback by cortisol on the hypothalamic-pituitary-adrenal axis
 - d) increased negative feedback by cortisol on the hypothalamic-pituitary-adrenal axis
 - e) none of the above
10. Which psychotherapeutic options are recommended in PTSD?
- a) Prolonged exposure therapy
 - b) Eye movement desensitization and reprocessing
 - c) Cognitive therapy
 - d) Antidepressants
 - e) Integrative therapy
11. Which of the following are the main validity criteria (categories) to assess animal models of psychiatric disorders?
- a) face validity
 - b) treatment validity
 - c) predictive validity
 - d) biological validity
 - e) genetic validity

12. The pathophysiology of Parkinson's disease can involve all these mechanisms except:

- a) The loss of dopaminergic neurons of the *pars compacta* of substantia nigra
- b) The loss of dopamine fibers in the striatum
- c) The loss of glutamatergic neurons in the subthalamic nucleus
- d) The loss of GABA neurons of the globus pallidus
- e) The loss of serotonergic neurons of the raphe nucleus

13. Among the following propositions, select the correct proposition(s). Parkinson's disease is characterized by:

- a) Bradykinesia
- b) Essential tremor
- c) Tremor at rest
- d) Dyskinesias characterized by involuntary abnormal movements
- e) myoclonus

14. Among the following propositions, select the correct proposition(s):

- a) L-Dopa induces a stable improvement of motor symptoms in all the stages of Parkinson's disease
- b) Deep brain stimulation of the subthalamic nucleus leads to an improvement of motor symptoms accompanied by dyskinesias
- c) Deep brain stimulation of the subthalamic nucleus improves the motor symptoms by inhibiting the majority of subthalamic neurons
- d) Deep brain stimulation of the subthalamic nucleus increases the tissue level of glutamate in the pars reticulata of substantia nigra of 6-OHDA rats
- e) Deep brain stimulation of the subthalamic nucleus decreases the neuronal activity of the pars reticulata of substantia nigra of 6-OHDA rats

15. Among the following propositions, select the correct proposition(s):

- a) In the striatum, dopamine D1 receptors are located on the projection neurons of the indirect pathway
- b) Dopamine D2 receptors of the striatum are located on the projection neurons of the direct pathway
- c) Activation of dopamine D1 receptors exerts an excitatory effect on striatal projection neurons
- d) Activation of dopamine D2 receptors exerts an excitatory effect on striatal projection neurons
- e) The D1 and D5 receptors belong to the same family of dopaminergic receptors

16. Among the following propositions, select the correct proposition(s):

- a) Dopamine neurons of the *pars compacta* of substantia nigra project predominantly on the striatum
- b) Dopamine depletion into the striatum results in an unbalance in the output structures of the basal ganglia
- c) The tonic activity of subthalamic nucleus neurons play a key role in the inhibition of abnormal involuntary movement
- d) Lesioning the subthalamic nucleus induces dramatic improvement of parkinsonian motor symptoms without abnormal involuntary movements
- e) High frequency stimulation of the subthalamic nucleus induces the same positive and negative effects as L-Dopa in Parkinson's disease patients

17. Among the following propositions, select the correct proposition(s):

- a) The internal part of the globus pallidus is the exclusive output structure of the basal ganglia
- b) The subthalamic nucleus sends glutamatergic projections to the output structures of the basal ganglia
- c) The external part of the globus pallidus is one of the input structure of the basal ganglia
- d) Tonic activity of subthalamic nucleus neurons is the pathological signature in animal models of Parkinson's disease as well as in parkinsonian patients
- e) Bursty activity of subthalamic nucleus neurons is the pathological signature in animal models of Parkinson's disease as well as in parkinsonian patients

18. Concerning multiple sclerosis (MS):

- a) It mainly affects young men.
- b) The clinical evolution is relapsing remitting for most of the patients.
- c) It is more prevalent in Southern countries than in Northern ones.
- d) Opening of the blood brain barrier related to multiple sclerosis can be assessed in vivo in patients.
- e) Normal appearing brain tissue is a terminology used to refer to the parenchyma outside focal lesions because subtle histological modifications not seen on standard FLAIR imaging are known to be histologically present in most of the patients.

19. Concerning glial-neurons interactions in multiple sclerosis (MS):

- a) Microglial cells can be activated diffusely in MS which can induce neuronal consequences.
- b) Oligodendrocytes can be activated diffusely in MS which can induce neuronal consequences.
- c) Astrocytes can be activated diffusely in MS which can induce neuronal consequences.
- d) The consequences of glia cell activation can be differential from one brain area to another.
- e) The cross-talk between glial cell and neuron is specific to MS.

20. Diffusion weighted imaging (DWI) and diffusion tensor imaging (DTI) of the brain with magnetic resonance imaging (MRI):

- a) Are based on the same general principle.
- b) The apparent diffusion coefficient (ADC) is a quantitative measure of signal loss induced by the diffusion of water molecules.
- c) The scan time is inversely proportional to the number of diffusion encoding directions.
- d) Fractional anisotropy values are biased in voxels that include major crossing of fibers.
- e) Fractional anisotropy is lower in white matter than in grey matter.

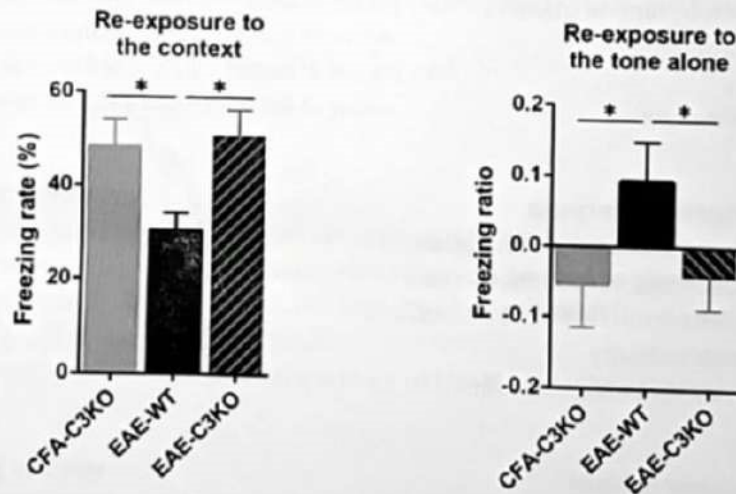
21. Concerning diffusion tensor imaging (DTI) and multiple sclerosis:

- a) Diffusivity can be increased because of microglia activation.
- b) Diffusivity can be increased because of dendritic and axonal damages.
- c) DTI can capture microstructural alterations outside the focal lesions.
- d) DTI provides information sensitive to the blood flow.
- e) Fiber tracking can show disruption of network induced by focal lesions.

22. Concerning cognitive impairment in multiple sclerosis (MS):

- It is observed mainly at the late-stage of the disease.
- It has been mainly related to focal inflammatory plaques targeting the hippocampus.
- Some cognitive tests are more sensitive than others because MS affects differentially the cognitive domains.
- Memory deficit in MS patients can be associated with reduced hippocampus volume on MRI.
- Information processing speed is one of the cognitive domain frequently altered.

23. In order to test the role of the complement C3 in multiple sclerosis, memory performances were quantified in animal models of multiple sclerosis. We performed a contextual fear condition paradigm in which a discrete tone was also presented but with a pseudo random distribution (tone-footshock unpaired). EAE represents the group of mice with the experimental autoimmune encephalitis (the rodent model of multiple sclerosis); CFA represents the control group. C3KO is for C3 knock out and WT is for wild type. Based on the results below you can conclude that:



- EAE mice have improperly identified the tone as the predictor of the shock.
- EAE mice should have alterations within their amygdala.
- C3 is causally involved in the memory performances of EAE mice.
- The negative freezing ratio to the tone means that mice have correctly understood that the sound was not predictive of the shock.
- The C3KO fully restores the memory performance despite the induction of EAE.

24. Which intrinsic factors controls food intake ?

- Ghrelin
- Leptin
- Dopamine
- Neuropeptide Y
- Cocaine

25. Ghrelin can regulate food intake by interacting with receptors in

- a) AGRP neurons in the Arcuate nucleus
- b) POMC neurons in the Arcuate Nucleus
- c) NTS (Nucleus tractus solitarius)
- d) Ventro tegmental area
- e) Nucleus accumbens

26. The Dopamine rules

- a) Dopamine increases during food anticipation
- b) Dopamine mediates the food liking
- c) Dopamine mediates the food Wanting
- d) Dopamine mediates the learning for food
- e) Palatable food increases dopamine release in the NAc

27. Dopamine D2 receptors in the striatum decrease in

- a) Cocaine abusers
- b) Methamphetamine abusers
- c) Alcohol abusers
- d) Obesity
- e) Anorexia nervosa

28. Obesity and Anorexia Nervosa

- a) share increase in food motivation
- b) share decrease in food motivation
- c) share behavioral flexibility alterations
- d) share compulsivity
- e) are both psychiatric disorders

29. The Taq1A1 polymorphism

- a) Lead to a decrease in D2 Dopamine receptors in the Striatum
- b) Lead to an increase in D2 Dopamine receptors in the Striatum
- c) Lead to a decrease in D1 Dopamine receptors in the Striatum
- d) Lead to an increase in D1 Dopamine receptors in the Striatum
- e) Link to Higher body mass index and obesity

30. what are the main categories of extracellular vesicles (1 answer)

- a) exosomes, ectosomes, apoptotic bodies
- b) exosomes, microvesicles, probiotic bodies
- c) microvesicles, exosomes, apoptotic bodies
- d) endosomes, microvesicles, apoptotic bodies
- e) endosomes, microvesicles, apocalyptic bodies

31. choose the correct answers

- a) exosomes derive from multivesicular bodies
- b) exosomes derive from the mitochondria
- c) exosomes can derive from all mammalian cells
- d) exosomes derive from the nucleus membrane
- e) exosome's membrane is made of only one lipid layer

32. choose the correct answers

- a) exosomes can contain RNAs in their lumen
- b) exosomes can contain proteins
- c) exosomes can contain DNA fragments
- d) exosomes can contain mitochondria
- e) exosomes can contain cellular debris

33. choose the correct answers

- a) extracellular vesicles can be found in plasma
- b) extracellular vesicles can be found in cerebrospinal fluid
- c) extracellular vesicles can be found in urine
- d) extracellular vesicles can be found in breast milk
- e) extracellular vesicles can be found in saliva

34. choose the correct answers

- a) Only one method of isolation exists for extracellular vesicles
- b) After isolation, additional characterization steps are needed to confirm vesicle identity
- c) Only one marker exists to confirm the identity of exosomes
- d) We can't quantify extracellular vesicles
- e) isolation method will depend on the nature of the biospecimen (tissue, biofluid..)

35. choose the wrong answer

- a) extracellular vesicles are not useful to detect tau protein in Alzheimer's disease
- b) extracellular vesicles play a role in health and disease
- c) extracellular vesicles can play a role in physiology and pathology
- d) extracellular vesicles can be used to identify biomarkers
- e) blockade of extracellular vesicles release can delay Alzheimer's disease progression in rodent

36. Attention Deficit Hyperactivity Disorder:

- a) Is an heterogeneous disorder
- b) Is characterized by hyperactivity-impulsivity
- c) Is characterized by stereotypies
- d) Is never present during adulthood
- e) Is often comorbid with other disorders

37. Attention Deficit Hyperactivity Disorder:

- a) Is a neurodevelopmental disorder
- b) Has a genetic component
- c) Has an environmental component
- d) Is a social construct
- e) Can be diagnosed through neuroimaging

38. The following comorbidities can associate with Attention Deficit Hyperactivity Disorder:

- a) Emotional dysregulation
- b) Oppositional Defiant Disorder
- c) Depression
- d) Motor disorder
- e) Sleep disorder

39. Evolution with age of Attention Deficit Hyperactivity Disorder:

- a) can lead to higher rates of addictions
- b) can lead to higher rates of obesity
- c) can be associated with other neurodevelopmental disorders
- d) can be associated with higher rates of psychopathological problems
- e) Always get worse

40. The link between Attention Deficit Hyperactivity Disorder and addictions:

- a) Can be due to a common vulnerability
- b) Can result from reverse causality
- c) Is present only in the case of comorbid behavioral disorders
- d) Is present only in females
- e) Is rare

Describe the results of the below figure in a context of subconcussive repeated traumatic brain injury (the number of alternations in the arms of the Y-maze is used here as a measure of spatial working memory). One of the claims of this article is that the model triggers chronic traumatic encephalopathy (CTE). What additional experiments would you propose to support that hypothesis (please define the purpose of each proposed experiment)? Finally, discuss which parameters of the heterogeneity of traumatic brain injuries can be modeled in this context.

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Discoveries

ORIGINAL RESEARCH COMMUNICATION

Uncoupled Endothelial Nitric Oxide Synthase Enhances p-Tau in Chronic Traumatic Encephalopathy Mouse Model

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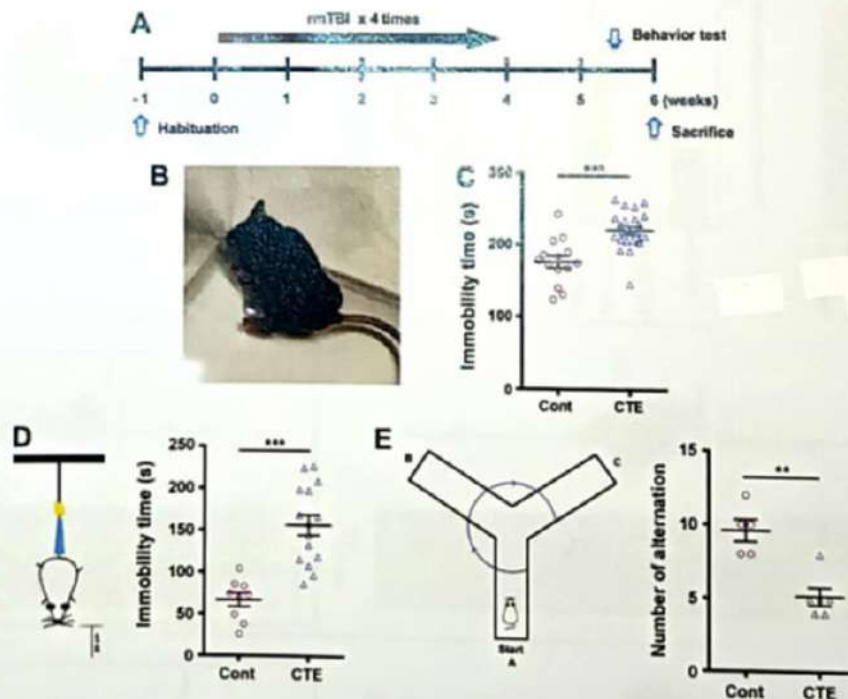


FIG. 1. Experimental design and behavioral testing. (A) Summary of the experimental design. rmTBI was applied to the mice four times per week for 4 weeks. Behavior tests were performed at 1.5 weeks after the final insult, and mice were sacrificed at 2 weeks after the final insult. (B) Concussional behavior was observed after rmTBI on week 5. (C) Depressive-like behavior was significantly elevated in the forced swim test in CTE mice after rmTBI ($n = 14$ for control, $n = 21$ for CTE). (D) The time of immobility in the tail suspension test was longer for rmTBI mice compared with control ($n = 9$ for control, $n = 15$ for CTE). (E) rmTBI-model showed significantly ($p < 0.05$, data are shown as mean \pm SEM. $**p < 0.01$, $***p < 0.001$ versus control. CTE, chronic traumatic encephalopathy; rmTBI, repetitive mild traumatic brain injury; SEM, standard error of the mean.

Based on the results below from Levesques et al 2019 explain why fast-spiking interneurons could play a key role in seizure initiation.

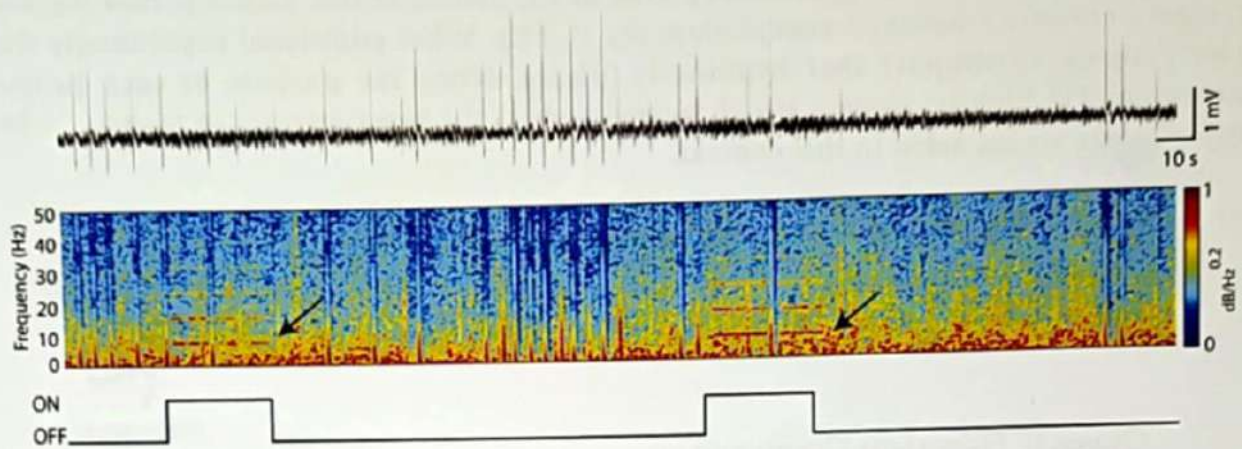


Figure 1 : EEG recording obtained from the hippocampus of a pilocarpine-treated PV-ChR2 animal 1 day after SE shows that optogenetic stimulation of PV-interneurons at 8Hz was still effective in triggering field oscillations at a similar frequency. OFF = time without stimulation; ON = during optogenetic stimulation ; SE = status epilepticus.

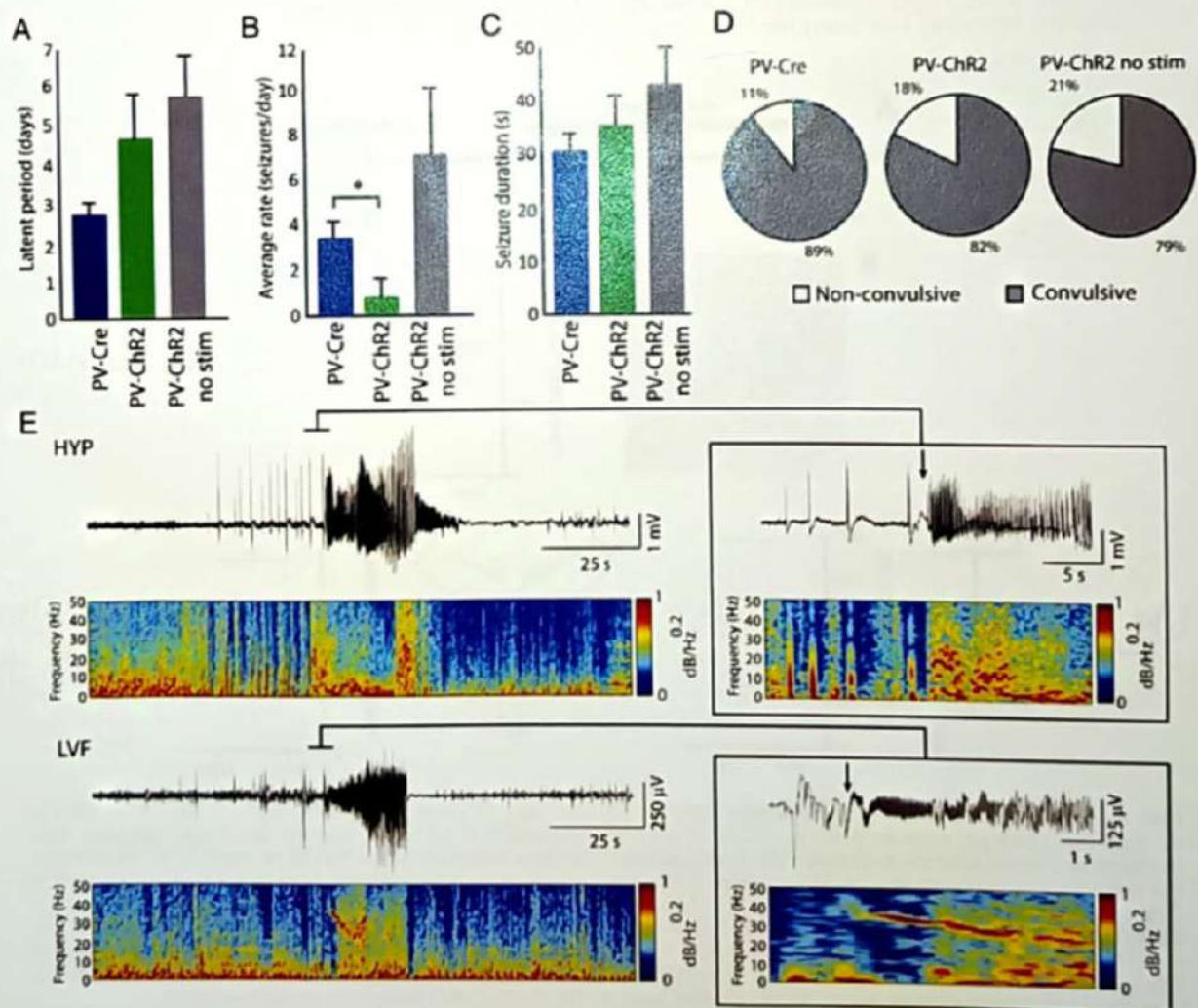


Figure 2 : (A) Average duration of the latent period in PV-Cre, stimulated PV-ChR2, and unstimulated PV-ChR2 animals. No significant differences were observed. (B) Bar graph showing the average rate of seizures in all groups; note that seizure rates were significantly lower in PV-ChR2-stimulated animals compared to PV-Cre (*p < 0.01). No significant differences were observed between PV-Cre and unstimulated PV-ChR2 animals. (C) Bar graph showing the average duration of seizures; note that significant differences were not observed. (D) Pie charts showing the proportion of convulsive and nonconvulsive seizures; no significant differences were observed between PV-Cre and PV-ChR2-stimulated animals. However, PV-ChR2 unstimulated animals showed a higher proportion of nonconvulsive seizures compared to PV-Cre animals. (E) Representative example of a HYP spontaneous seizure in a PV-ChR2 animal 10 days after SE. An LVF seizure from another PV-ChR2 animal, recorded 13 days after SE, is also shown. Note in both insets that seizure onset was associated with activity between 10 and 40Hz (arrows). HYP = hypersynchronous onset; LVF = low voltage, fast onset; PV = parvalbumin; SE = status epilepticus.