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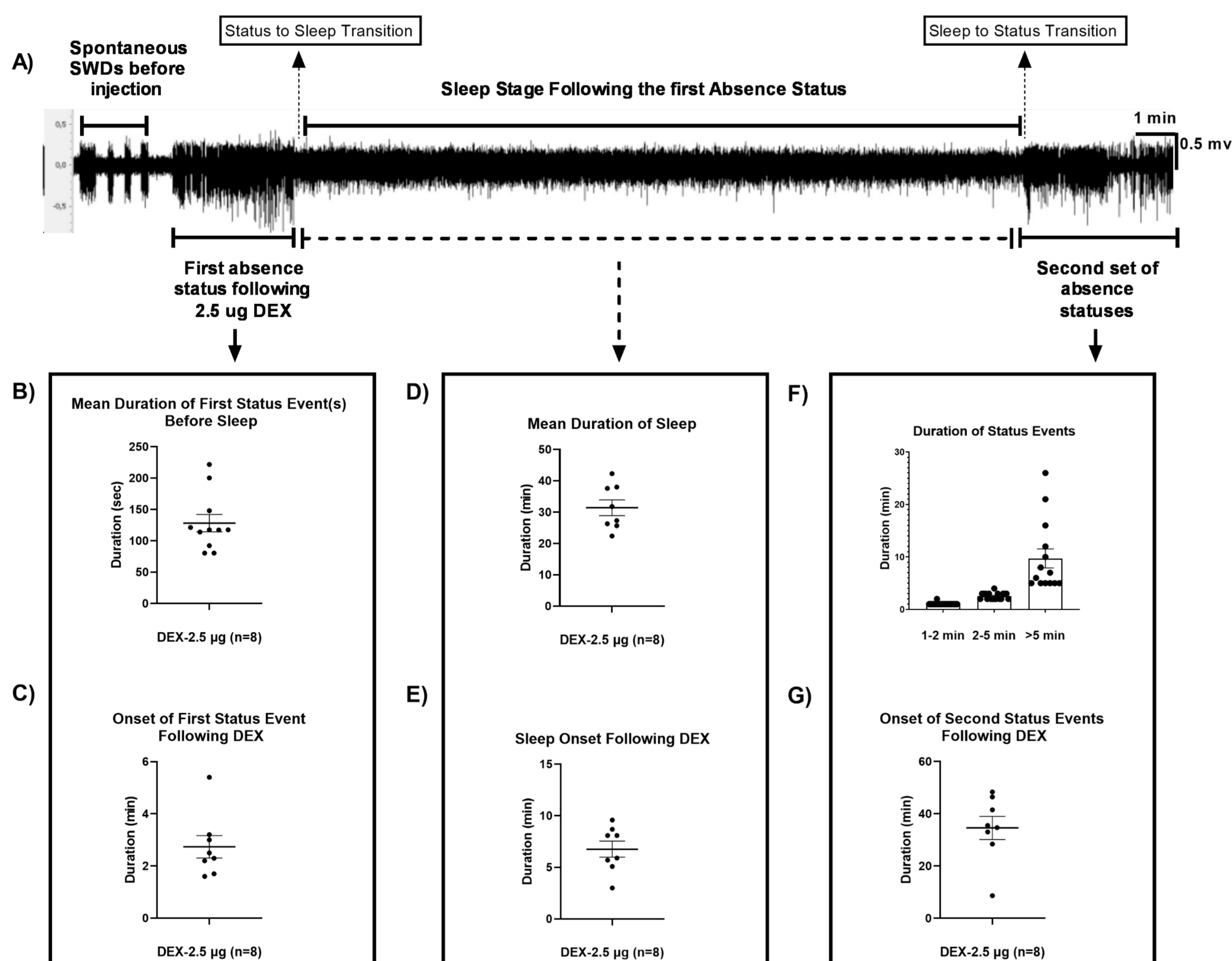
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### INTRODUCTION

- Dexmedetomidine induces non-rapid-eye-movement (NREM)-like sleep and high-power delta oscillations.
- Absence epilepsy has especially been associated alpha 2 adrenergic receptors ( $\alpha_{2AR}$ ) and NREM sleep due to shared physiological pathways.
- We conducted this study to explore the activation of  $\alpha_{2AR}$  in Genetic Absence Epilepsy Rats from Strasbourg (GAERS).**

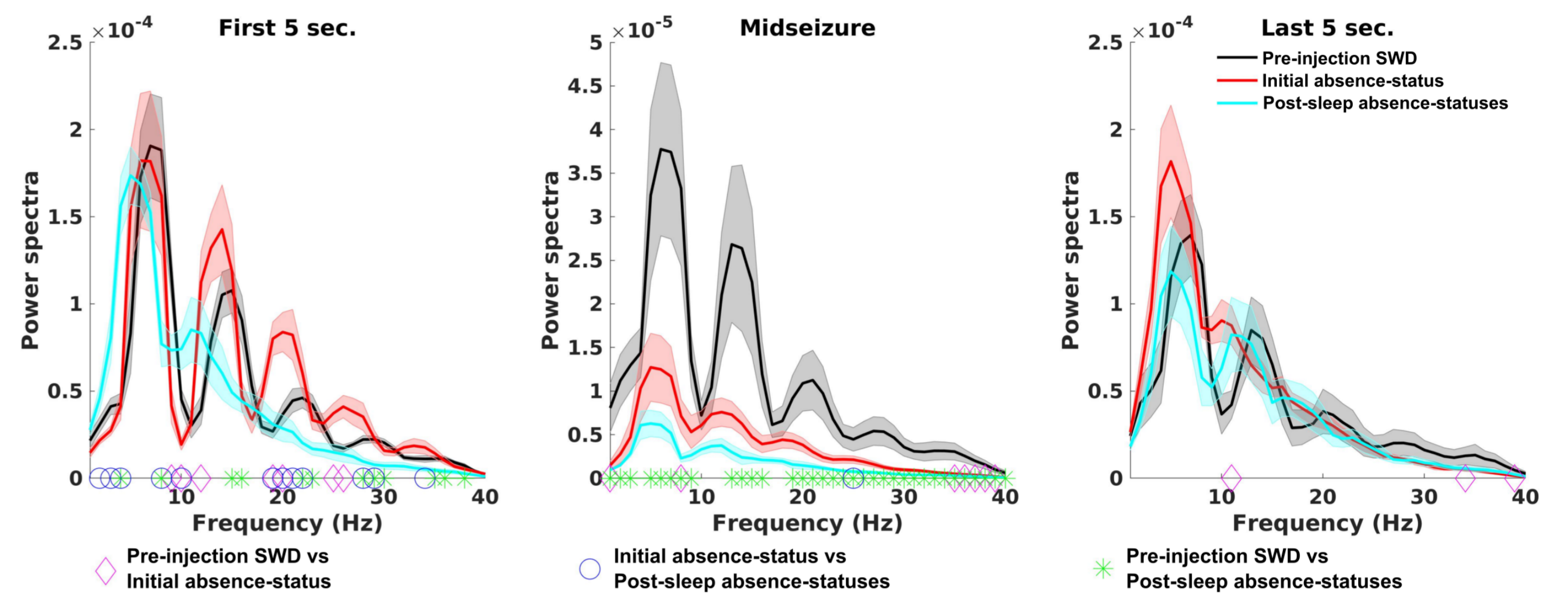
### RESULTS

- Following dexmedetomidine injection in adult GAERS, a prolonged SWD activity with a duration of  $128 \pm 13.74$  min that abruptly converts to a sleep-anesthesia was triggered.
- As long as the  $31.43 \pm 2.53$  long sleep anesthesia was over, the activity abruptly switched to prolonged chain of SWDs in 100% of the animals (Figure 1).



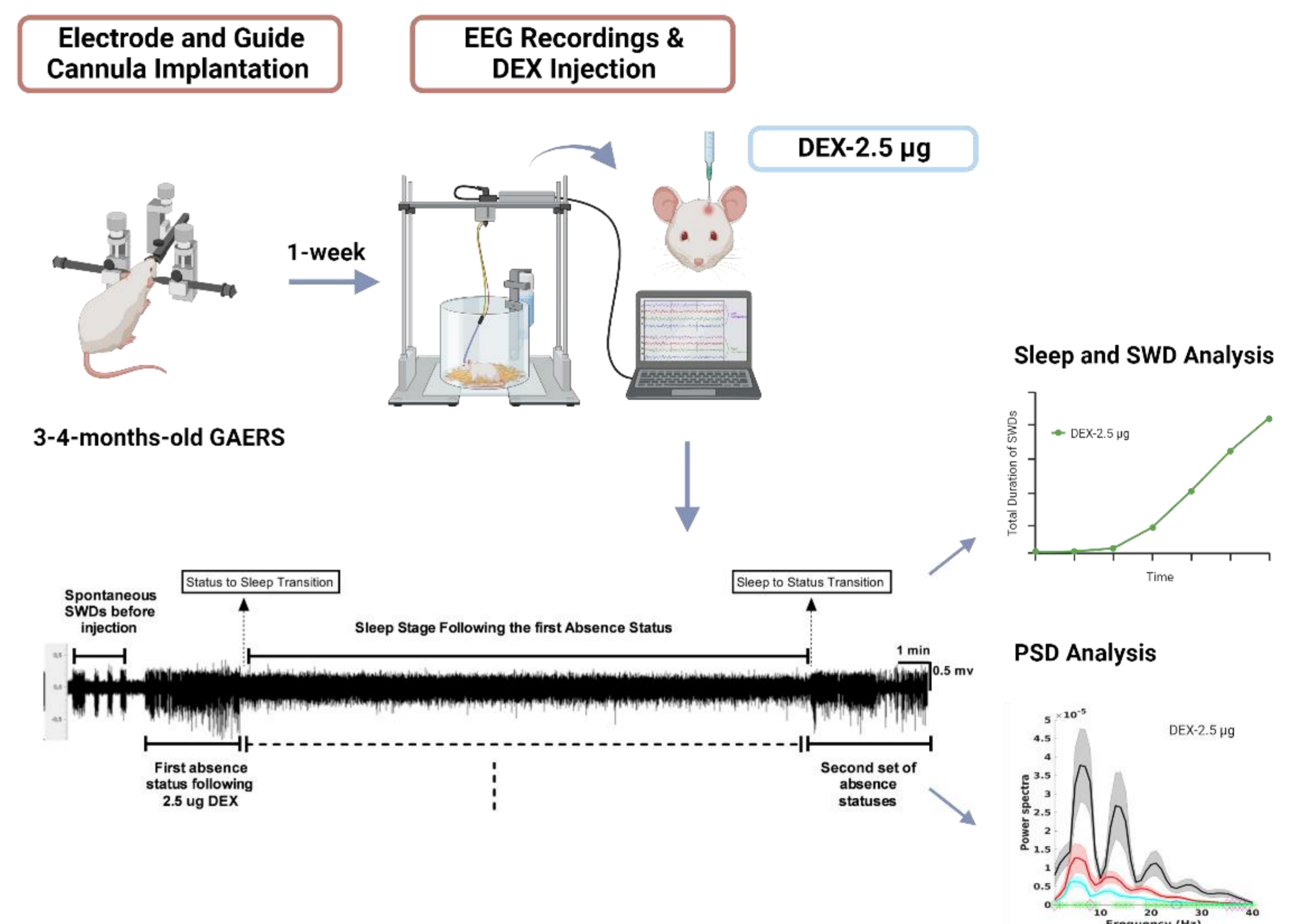
**FIGURE 1: The activation of a switch between the states of absence status and sleep.** Events after the DEX injection: The first absence status(es)–sleep–second set of absence statuses. (A) The EEG pattern before and after the 2.5 µg DEX injection. Before the injection, 5–20 s of the SWD activity is observed on EEG. Seconds after the injection, an absence status epilepticus event is observed, followed by approximately 40 min of sleep. After the sleep stage, multiple and continuous absence status epilepticus events, namely, the second set of absence statuses, occur. The second set of absence statuses varies between 1 and 26 min. (B) The mean duration of the first absence status after injecting 2.5 µg of DEX, varies between 1 and 4 min. (C) The onset of the first absence status event shows the first absence status that occurs 1–5 min post-injection. (D) The mean duration of sleep induced by 2.5 µg DEX between 20 and 42 min. (E) The onset of sleep occurs immediately after the first absence status event. (F) The classification of the second set of absence status events. The events are classified as 1–2 min, 2–5 min, and >5 min. The mean duration can be observed in the chart. (G) The onset of the second set of absence status events after the DEX injection.

- The before and after sleep prolonged SWDs had lower power amplitude in 7 Hz and its harmonics (14 and 21 Hz) in comparison to baseline SWDs (FDR corrected  $p < .05$ ; Figure 2).
- PSD analyses also showed that after-sleep prolonged SWDs had higher power in delta frequency band (1-4 Hz) and attenuated power in 7 Hz harmonics (14 and 21 Hz) than the baseline SWDs.



**FIGURE 2: Power spectral density analysis.** We compared the power amplitudes in seizures from each animal, pre-injection seizure (basal SWD activities), initial induction of absence-status (post-DEX-injection), and post-sleep absence statuses (the second period of absence-status(es)), which were analyzed in three periods, the first 5 s (a), the last 5 s (c), and the mid-seizure phase (b). Signs show the frequencies where seizure types had statistical differences.

### METHOD



**FIGURE 3: Administration of specific  $\alpha_{2AR}$  agonist, dexmedetomidine (2.5 µg), via intracerebroventricular injection to adult GAERS (3-months old; n=8; Fig. 1).** Electroencephalography (EEG) recordings were obtained 30 minutes before and after the injections, with a total recording duration of 3.5 hours. The duration of anesthesia sleep between spike-and-wave discharges (SWDs) and the SWDs themselves were analyzed. SWDs were identified by a duration longer than 1 second, characterized by a train of sharp waves followed by a slow wave (7-11 Hz). Power spectral density (PSD) analysis was performed using Matlab software (R2019a, MathWorks, Natick MA, USA).

### CONCLUSION

- Activation of  $\alpha_{2AR}$  triggered a switch mechanism between prolonged SWDs, anesthesia sleep, and subsequent return to SWDs.
- This finding provides an animal model for studying switch mechanisms and the transitions of thalamo-cortical burst firings between NREM sleep and absence seizures.
- While NREM sleep typically facilitates the occurrence of SWDs compared to REM sleep, our study demonstrates the separate observation of sleep and seizure events.

### REFERENCES

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