ISRCTN96598281 https://doi.org/10.1186/ISRCTN96598281

Do we activate our real lips and eardrums during dream speech? Evidence from lucid dreamers

Submission date 11/01/2024	**Recruitment status** Recruiting	[X] Prospectively registered [_] Protocol [_] Statistical analysis plan [_] Results [_] Individual participant data [_] Record updated in last year
Registration date 12/01/2024	**Overall study status** Ongoing	
Last Edited 12/01/2024	**Condition category** Other	

Plain English summary of protocol

Background and study aims
The aim of this study is to identify markers of verbal speech and listening in rapid eye movement (REM)sleep with the help of lucid dreamers. During REM sleep dreams, we often converse with other people. In sleepers awakened at the moment of dream-talk, there was EEG activation in the area of Wernicke's cortex (the part of the brain which controls speech) just before awakening, suggesting that we use this area to talk both when we are awake and in our dreams. We don't produce audible speech during normal REM sleep (because we're paralyzed), but we do have brief "subclinical" contractions of the larynx and lips (as in silent reading) as well as tympanic muscles. However, we don't know whether or not these contractions are objective markers of speech or hearing production in dreams, respectively. This study will use the lucid dreaming model (sleepers who are aware of dreaming during REM sleep and can directly signal their mental experience through facial muscle contractions) to study markers of speech production and word hearing during REM sleep. Indeed, patients with narcolepsy have the ability to take repeated naps during the day, to quickly reach REM and to be great lucid dreamers. To this end, 20 narcoleptic lucid dreamers will sleep one night and take five naps during the day, equipped with conventional video-polysomnography, as well as surface EMG on the corrugator muscle (to indicate when they are dream-talking) and the zygomatic muscle (to indicate when they are listening to someone). In addition, the researchers will measure laryngeal and lip movements during sleep using electromyograms and eardrum movements using ear pressure sensors. 15 healthy volunteers without lucid dreaming will be monitored during night and daytime naps with the same sensors to measure the normal frequency of tympanic and lip/larynx movements during REM sleep. This work will enable the researchers to determine what is activated at behavioural and cerebral levels when we speak or listen to words in our dreams. If these markers (tympanic and laryngeal/lips movements) indeed correspond to verbal exchanges, they will then be valid for studying language during sleep in the normal (non-lucid) population: in particular in children learning to speak (do they speak more in dreams to practice?), as well as in aphasic patients and those suffering from consciousness disorders.

Who can participate?
Proficient lucid dreamers (more than one lucid dream per week) with or without narcolepsy, and

healthy volunteers, all right-handed, French-speaking, and insured at French national health insurance

What does the study involve?
Participants attend a first visit to the hospital with a physician and an audioprosthetist to mould an ear pressure sensor individually for each participant.
At the second visit to the hospital participants sleep a whole night followed by 1 to 5 daytime naps, with classic sleep sensors (EEG on the scalp, eye monitoring through sensors stuck on the face, muscle activity monitoring via sensors sticks on the chin, the face and the neck, breathing monitored via a nasal sensor pressure, and bands placed on the chest, surface electrocardiogram via two sensors stuck on the chest, and two ear inserted moulded sensors similar to personally moulded headphones or earplugs). In addition, those who are lucid dreamers will be instructed to signal with different codes (frowning, smiling, sniffing) when they start to speak and when they hear sounds in their dreams. Before sleeping, every participant will hear speeches, speak, overtly and then silently read a text, overtly and then silently sing (in their head).

What are the possible benefits and risks of participating?
The benefit is just for science (altruism) and monetary compensation (150 euros for one night and one nap; 200 euros for lucid dreams spending one night and five naps). There are no risks in participating,

Where is the study run from?
Pitié-Salpetriere Hospital (France)

When is the study starting and how long is it expected to run for?`
October 2023 to February 2027

Who is funding the study?
Paris Public Hospital Foundation (France)

Who is the main contact?
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Contact information

Type(s)
Public, Scientific, Principal investigator

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Additional identifiers

Clinical Trials Information System (CTIS)
2023-A02129-36

ClinicalTrials.gov (NCT)
Nil known

Protocol serial number
IRAS 1

Study information

Scientific Title
Decoding language in REM sleep with lucid dreamers

Acronym
LUSPEAK

Study objectives
To identify whether there are objective markers of speech and listening during rapid eye movement (REM) sleep dreams. The researchers will use the lucid dreaming model (sleepers who are aware of dreaming during REM and can directly signal their inner experience through brief facial muscle contractions) to search for behavioral (laryngeal and tympanic movements) and EEG (Broca's and Wernicke's area activation) markers of speech production and hearing during REM.

Ethics approval required
Ethics approval required

Ethics approval(s)
approved 20/10/2023, Comité de Protection des Personnes OUEST III (CHU La Milétrie - Bâtiment Vie la Santé - Entrée n° 4 1er étage, - 2 rue de la milétrie CS 90577, Poitiers, 86021, France; +33 (0)516604227; cpp-ouest3@chu-poitiers.fr), ref: 23.03509.000240

Study design
Observational single-center physiological (cognitive neuroscience) study

Primary study design
Observational

Study type(s)
Other

Health condition(s) or problem(s) studied
Lucid dreaming

Interventions
Subjects:
Group 1: pilot, non-lucid dreamers (n = 10)
Group 2: non-lucid dreamers (n = 10)
Group 3: lucid dreamer participants (with or without narcolepsy) (n = 20)

Intervention:
Group 1: pilot, one morning nap (i.e. 4 hours)
Group 2: one night and a morning nap (non-lucid dreamer participants), i.e. 16 hours
Group 3: one night and a day with 5 naps (lucid dreamer participants), i.e. 24 hours

Methods:
1. Videopolysomnography (electroencephalogram [EEG], electrooculogram [EOG], electromyogram [EMG], chin, nasal flow, thoraco-abdominal efforts, electrocardiogram [ECG]): determines sleep-wake states
2. Extended 64-channel EEG: looks for activation of Broca's or Wernicke's area
3. Labial and laryngeal surface EMGs: detect infra-verbal or verbal movements
4. Middle-ear muscle activity (MEMA): measurement of intraaural pressure: detects spontaneous tympanic movements (or those provoked by loud noises)
5. EMG of corrugator and zygomatic muscles: enables lucid dreamers in MS to code whether they are hearing someone or talking to themselves in their dreams

Intervention Type
Other

Primary outcome(s)
Index of middle ear muscle activity (MEMA) during REM sleep, in conjunction with a code of hearing in dreams provided by the lucid dreamers vs a code of silence. Measured via ear pressure sensors, reported on the general polysomnography.

Key secondary outcome(s))
1. Index of laryngeal, labial and chin twitches (short twitches <500 ms) during speech in lucid dreaming in REM sleep (coded) vs silence in lucid dreaming in REM sleep (coded). Measured by surface electromyography on the lip muscles and using pre larynx surface EMG sensors.
2. MEMA index during listening to speech in lucid dreaming in REM sleep (coded) vs listening to imagined speech in wakefulness. Measured via ear pressure sensors, reported on the general polysomnography.
3. MEMA index during song listening in REM lucid dream (coded) vs song listening imagined in mind while awake. Measured via ear pressure sensors, reported on the general polysomnography.
4. MEMA index during song listening in REM lucid dream (coded) vs real song listening in wakefulness. Measured via ear pressure sensors, reported on the general polysomnography.
5. MEMA index during dream speech listening (coded) vs waking imagined speech listening. Measured via ear pressure sensors, reported on the general polysomnography.
6. Index of laryngeal, labial and chin twitches (short twitches <500 ms) during speech performed in lucid dream REM sleep (coded) vs speech imagined in wakefulness (coded). Measured by surface electromyography on the lip muscles and using pre larynx surface EMG sensors.
7. Index of laryngeal, labial and chin twitches (short twitches <500 ms) during speech in lucid dreaming REM sleep (coded) vs silent reading in wakefulness (coded). Measured by surface electromyography on the lip muscles and using pre larynx surface EMG sensors.
8. Index of laryngeal, labial and chin twitches (short twitches <500 ms) during speech in lucid

dream REM sleep (coded) vs speech aloud in wakefulness (coded). Measured by surface electromyography on the lip muscles and using pre larynx surface EMG sensors.
9. Inspiratory time/total respiratory time of the various respiratory cycles observed during speech performed in lucid dreaming in REM sleep (coded) vs speech performed in waking imagination (coded), measured on inductance plethysmography
10. Inspiratory time/total respiratory time of different respiratory cycles observed during dream speech (coded lucid REM sleep) vs waking speech (coded), measured on inductance plethysmography
11. Inspiratory time/total respiratory time of different respiratory cycles observed during lucid dream speech in REM sleep (coded) vs coded lucid dream silence in REM sleep, measured on inductance plethysmography
12. EEG power in the fast beta band (20-50 Hz) over the left vs right temporal region during dreamed, imagined and performed speech, measured by electroencephalography

Completion date
15/02/2027

Eligibility

Key inclusion criteria
1. Men or women
2. 18 years of age (no upper age limit)
3. Caisse Primaire d'Assurance Maladie (CPAM) insured
4. Recipients of Aide Médicale d'Etat may be included
5. In good health: free from sleep complaints, physical illness or mental disorder (apart from the possibility of narcolepsy)
6. Frequent lucid dreamers (>1 lucid dream per week, defined by questionnaire)
7. Right-handed people
8. They may be "healthy" or not, suffering from narcolepsy type 1 or 2 according to the international definition

Participant type(s)
Healthy volunteer, Patient

Healthy volunteers allowed
No

Age group
Adult

Lower age limit
18 years

Sex
All

Key exclusion criteria
1. Minors
2. Legally protected persons (under guardianship)
3. Protected persons, as defined in articles L. 1121-5 to L. 1121-8 of the French Public Health

Code (particularly pregnant women)
4. Non-French speakers: this is a language-based study in French
5. People regularly taking antidepressant, neuroleptic or benzodiazepine medication (this disrupts REM sleep recording)
6. People taking toxic substances, drugs or psychodysleptics
7. People who cannot tolerate sleeping with a foam plug in their ear
8. People who are left-handed: since right-handed people's language brain areas are highly lateralized to the left, including left-handed people will overly complicate EEG analyses, which are heavily based on right-left comparisons
9. People who are deaf or hard of hearing: they won't be able to do the tests where speech is heard

Date of first enrolment
01/02/2024

Date of final enrolment
01/02/2027

Locations

Countries of recruitment
France

Study participating centre
Hôpital Pitié Salpêtrière
Service des pathologies du sommeil
85 boulevard de l'Hôpital
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Sponsor information

Organisation
Association for the Development and Organization of Research in Pneumology and Sleep (ADOREPS)

Funder(s)

Funder type
Charity

Funder Name
Paris Public Hospital Foundation

Results and Publications

Individual participant data (IPD) sharing plan
The datasets generated during and/or analysed during the current study are not expected to be made available. The dataset consists of EEG and polygraphic complex recordings on specific devices and cannot be shared, first for confidentiality of research (first 5 years), and second, because one needs a specific similar device to read them (including ear sensor pressure).

IPD sharing plan summary
Not expected to be made available

Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
Participant information sheet	Participant information sheet	11/11/2025	11/11/2025	No	Yes