

# Field study for evaluation of sound-masking systems in open-plan offices

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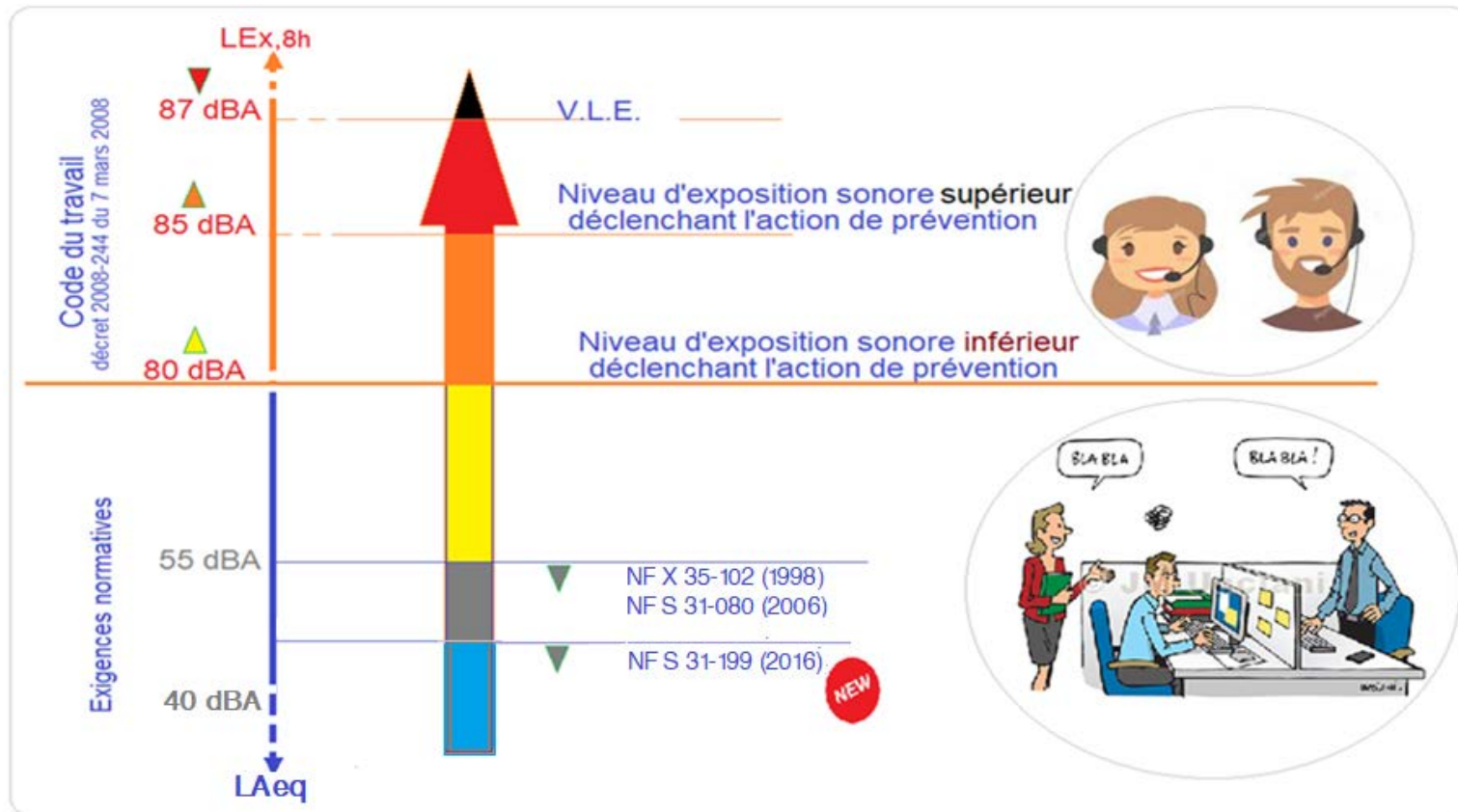
# Impact of noise in open-plan offices - Overview

1. Roughly 1/3 of French employees work in open-plan offices
2. 56 % of employees say they are disturbed or annoyed, by ambient noise in the office (INRS survey on  $\approx 1000$  persons working in open-plan)
3. Intelligible conversations are the top disturbance
4. Noise as a significant effect on disturbance and performances
5. Solutions manufacturers are strongly pushing the companies to try « **innovative solutions to improve performance and well being** »
  - Ex1 : Individual Active Noise Control solutions (level and directivity)
  - Ex2 : Office Layout solutions
  - Ex3 : Collective Sound Masking Systems solutions

Some laboratory studies but no existing field validation

Technological watch, evaluation and advice : strength of CARSAT/CRAMIF and INRS

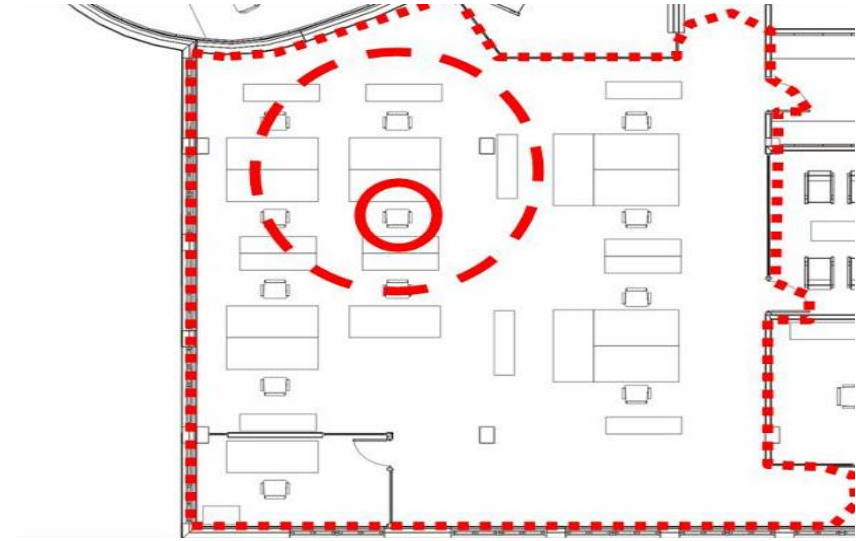
# Regulatory and normative context



An international standard in the making @ ISO/TC43/SC1/WG 65 based on the French standard NF S31-199

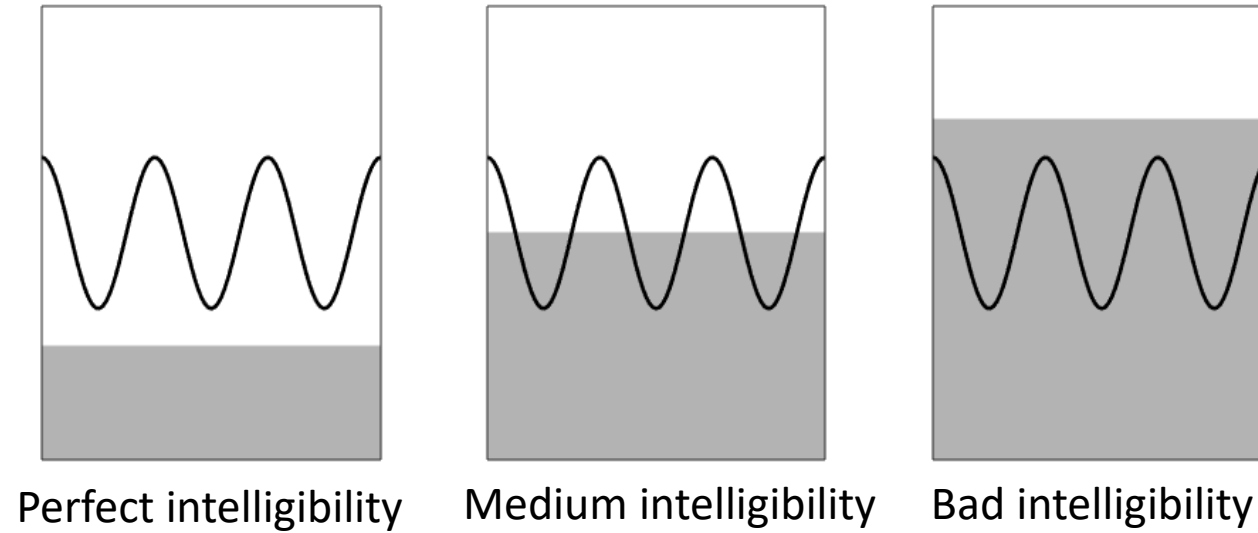
# NF S31-199 Standard – Approach and Guidelines

- 4 types of space in the open plan
  - Activity based on outside calls
  - Activity based on collaborative work
  - Activity based on low level of collaborative work
  - Activity based on receiving the public
- 3 levels of assessment
  - At the workstation
  - From one Workstation to another
  - On the platform
- Indicates satisfaction challenges regarding acoustic quality with single values
  - Acoustic challenge and criterion
  - Indicators
  - Target values or required values
- ➔ Gives an approach and analytical tools (flow chart, questionnaire/survey, measuring guide) Also gives some fitting guidance (Office layout)
- ➔ Recommends not to use sound masking systems (precautionary principle)



# Sound masking working principle

Adding noise in the office in order to reduce the intelligibility of the conversations



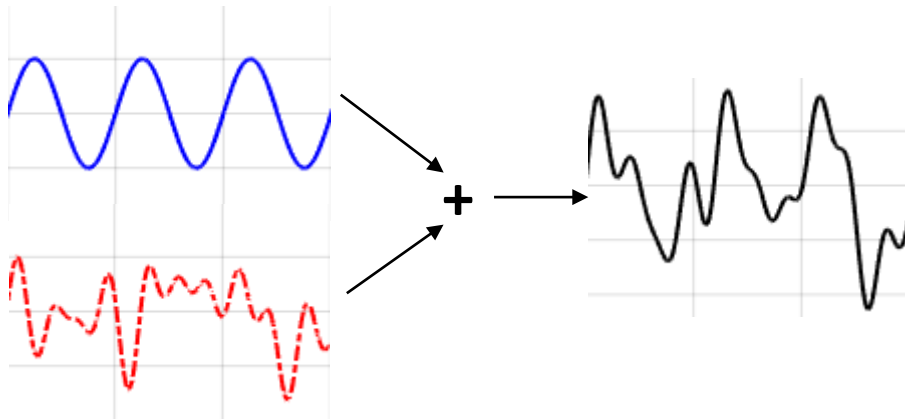
Many laboratory experiments have shown that it works, but :

1. The sound conditions were far from general office conditions,
2. The durations of the experiments were very short (less than one hour),
3. The tasks chosen were far from real office work (short term memory tasks)

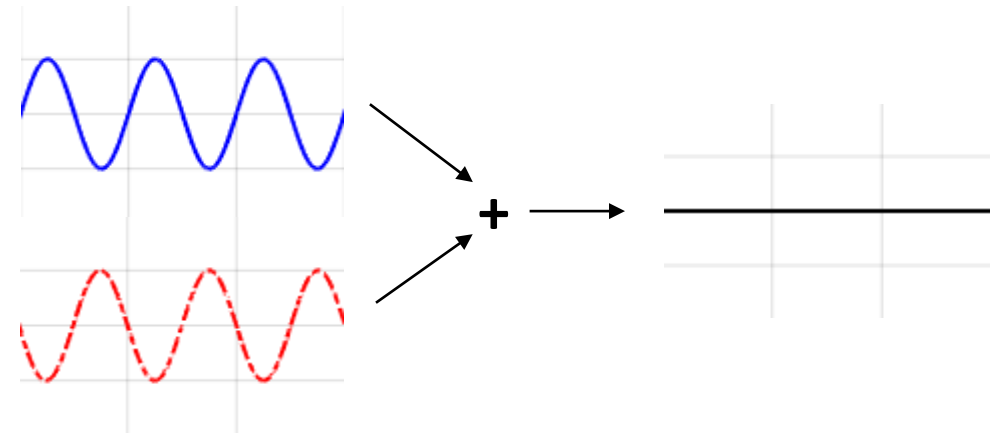
# Marketing claims

- Increase in productivity from 10% up to 25%
  - Creation of « Silence bubbles »
  - Emission of « counter-noises»
- } Confusion with ANC (Active Noise Cancelling)

Sound Masking



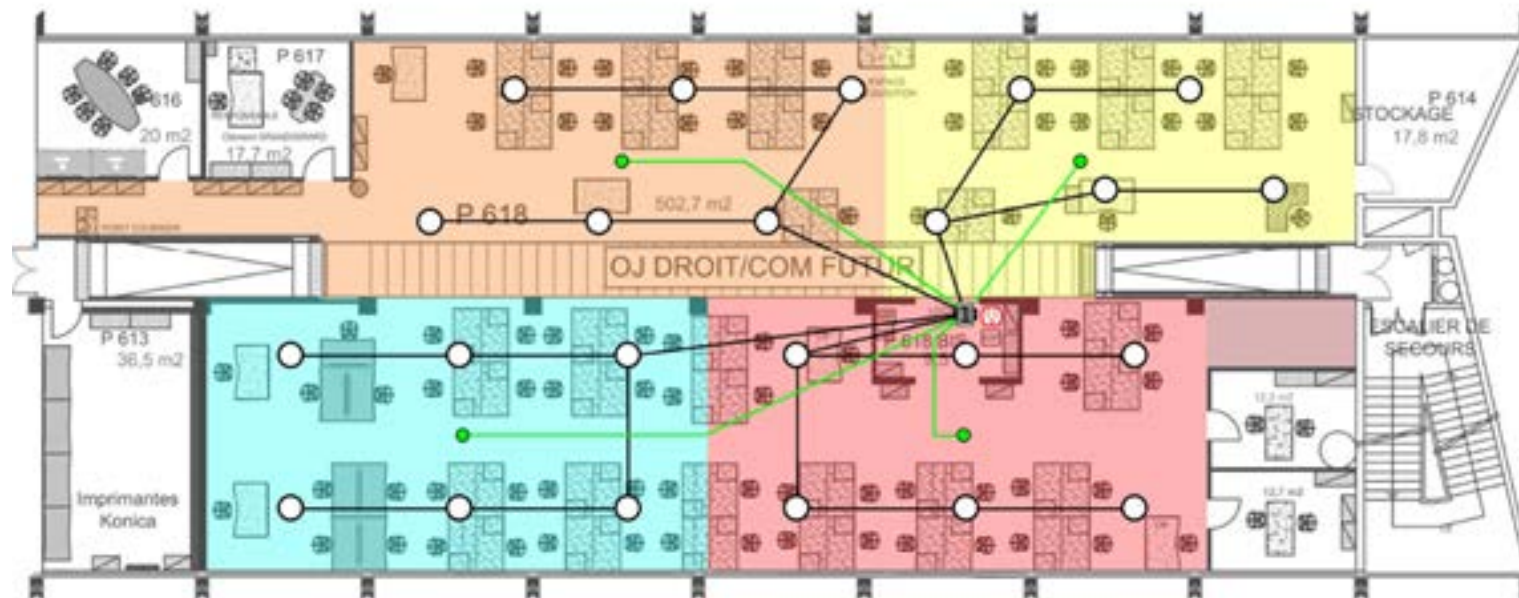
ANC



# Aim of the study

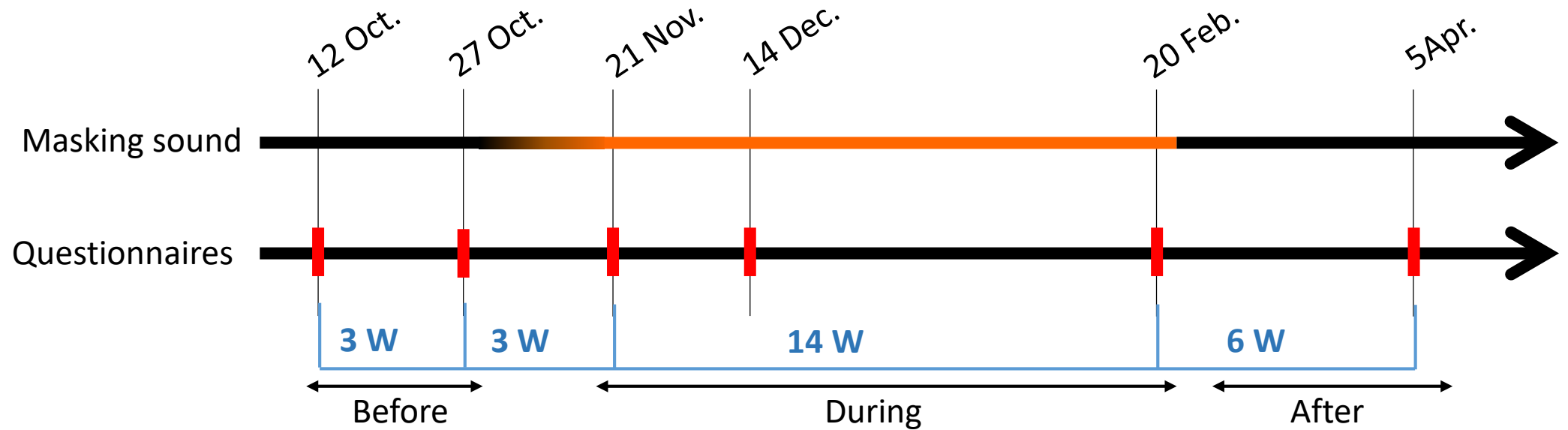
To highlight the effects of using a sound masking system in an open office under real conditions and over a long period of time

- Field study
- Over several months
- Effects on various psychological factors (fatigue, mental workload) and on the discomfort felt





# The protocol

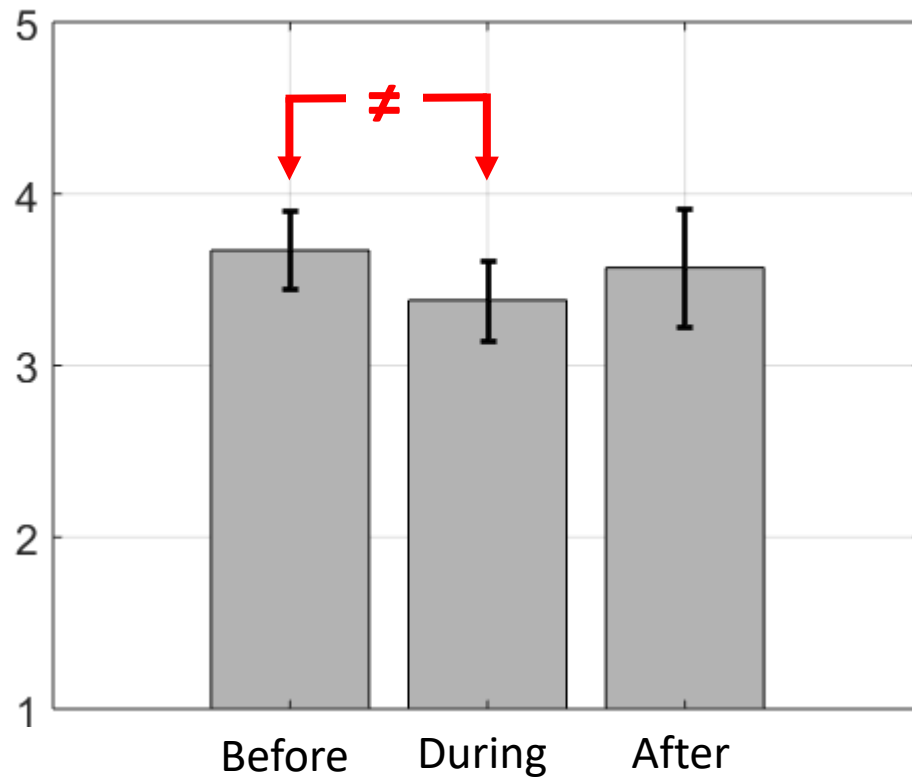


## Questionnaires from the psychological literature

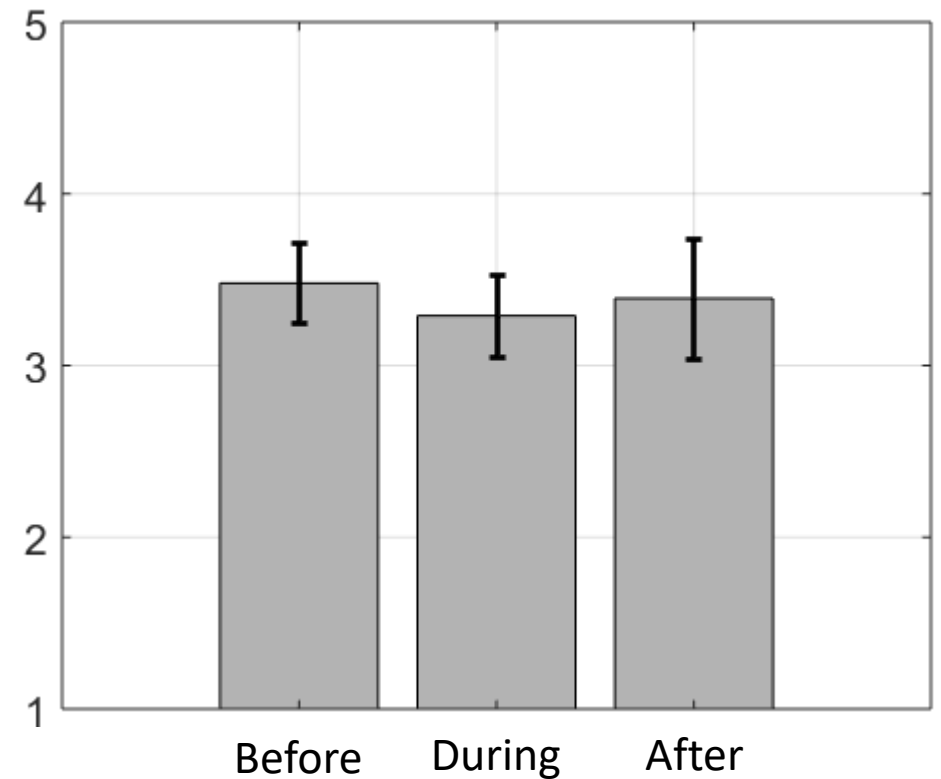
- MFI20: Fatigue - twice a day
- GABO: Discomfort, perceived level and satisfaction - twice a day
- IWA: Mental workload - once a day



## Results - Overall noise environment

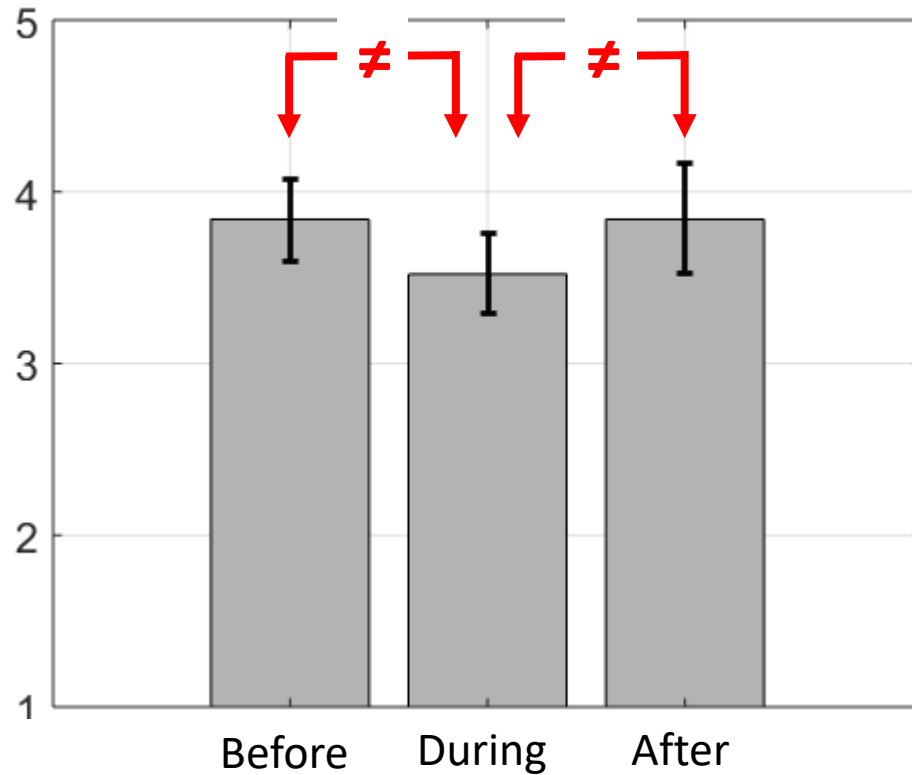


Perceived noise level

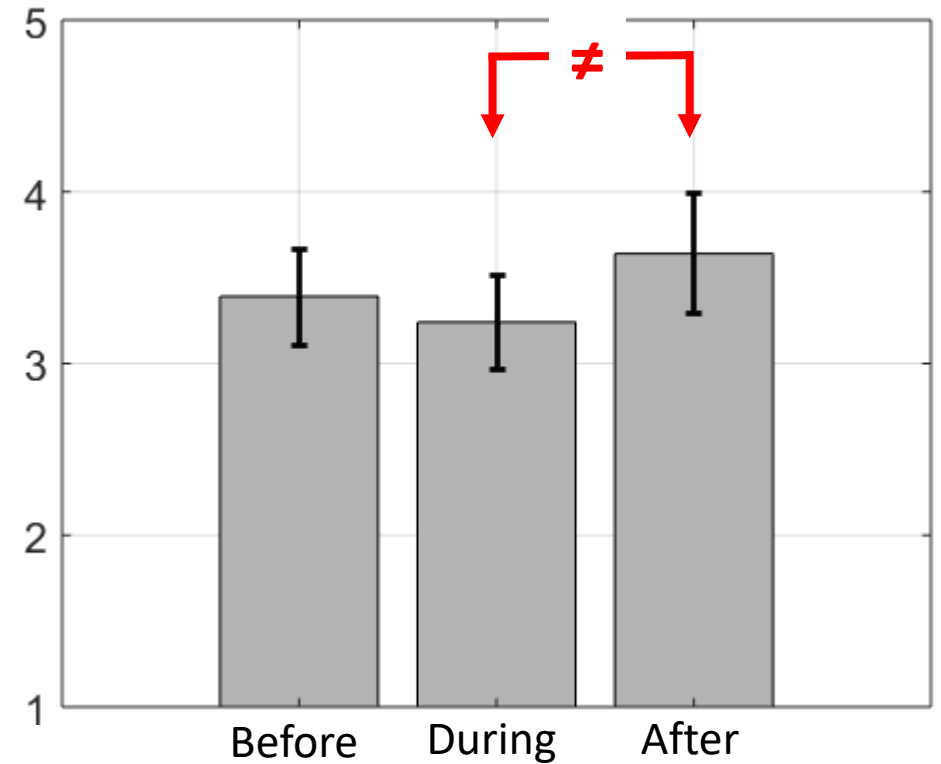


Perceived noise annoyance

## Results –Intelligible conversations

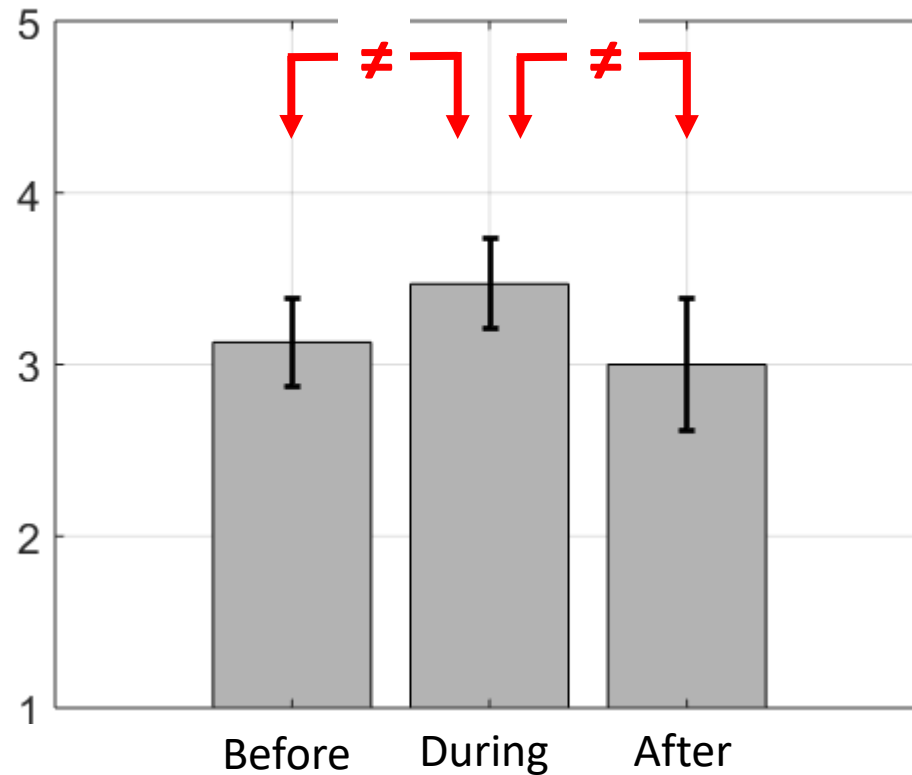


Perceived noise level

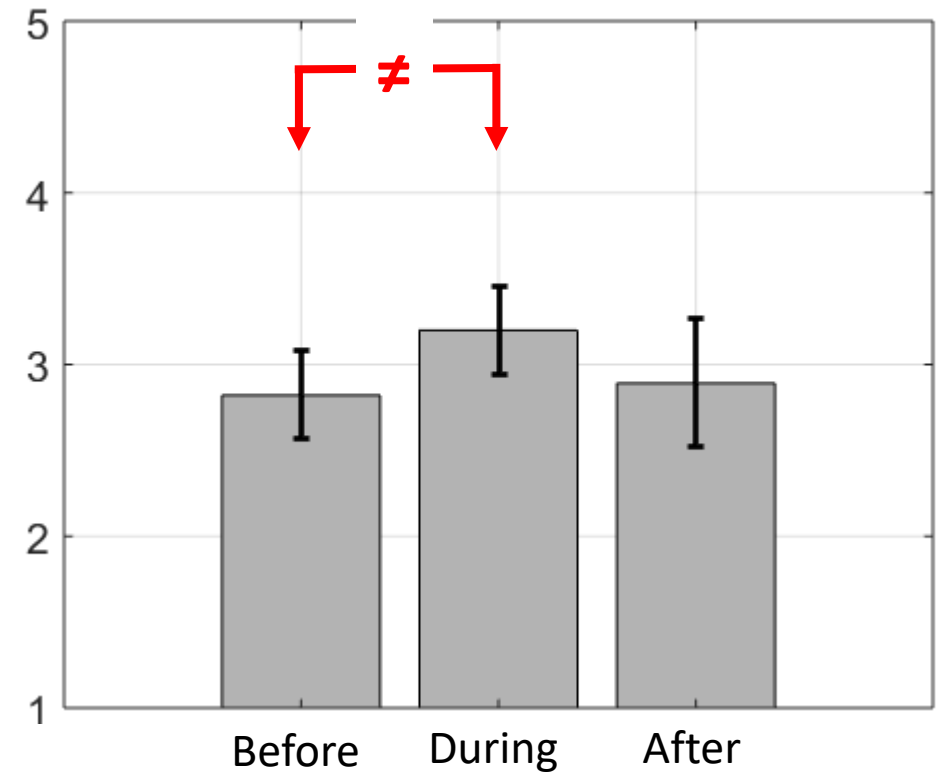


Perceived noise annoyance

## Results – Noise equipment (ventilation, printers,...)

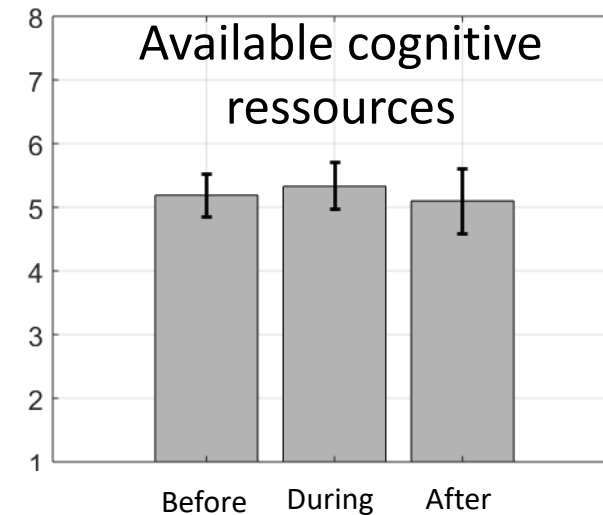
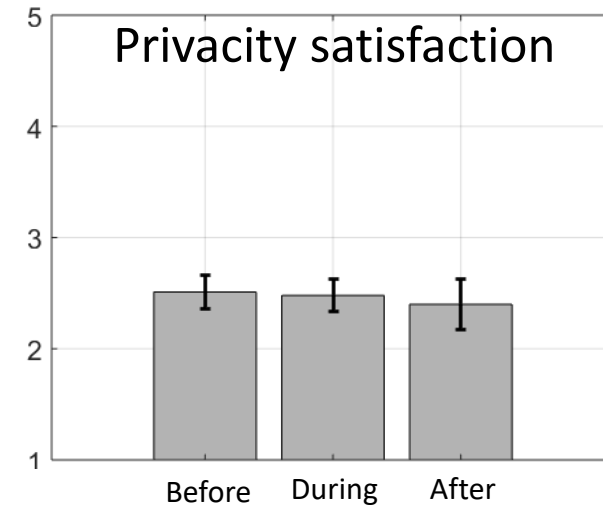
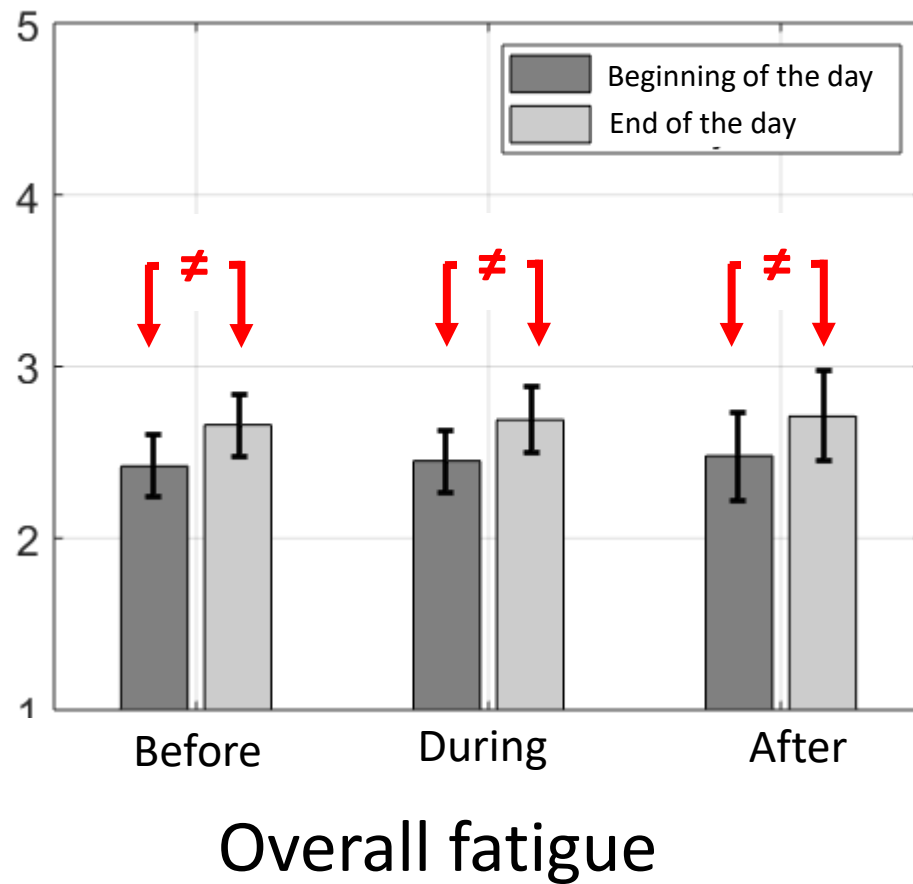


Perceived noise level



Perceived noise annoyance

# Results – Fatigue and satisfaction



# Conclusions

- No positive effect of sound masking on fatigue, mental workload or satisfaction
- Perception of overall noise reduction, but no reduction of discomfort
- Perception of intelligible conversations level reduction, but no reduction in discomfort
- Perception of a higher level of machine noise (unidentified), generating discomfort

Sound masking is not the solution to reduce noise discomfort in open-plan offices

## INRS recommendations:

- Reduce the level of ambient noise by the methods recommended in NF S31-199 (2016) standard
- Install acoustic ceiling and possibly acoustic treatments on the floor and on the walls
- Install acoustic partitions between workstations and between clusters
- Isolate noisy equipment
- Conduct an activity analysis to guide the office layout



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Merci de votre attention



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