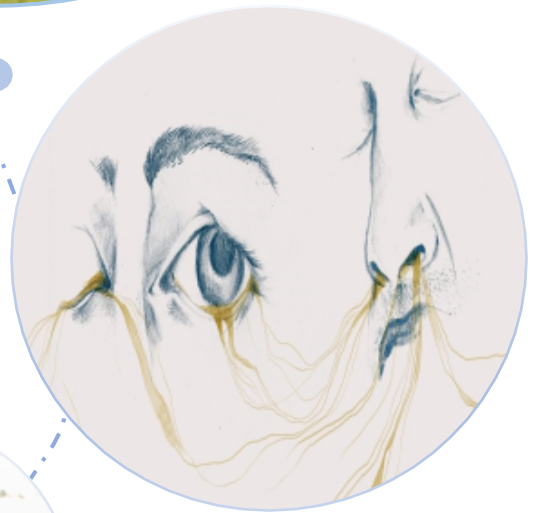
Sheep perceive and discriminate human emotional olfactory cues

I Larrigaldie[1], F Damon[1], S Mousqué[1,3], B Patris[1], L Lansade[2], B Schaal[1], A Destrez[1,3]



74th EAAP Annual Meeting

[1] UMR Centre des Sciences du Goût, CNRS, Institut Agro, INRAE, Univ. Bourgogne, Dijon, France
[2] UMR Physiologie de la Reproduction et des Comportements, CNRS, IFCE, INRAE, Univ. Tours, Nouzilly, France
[3] Institut Agro, Dijon, France

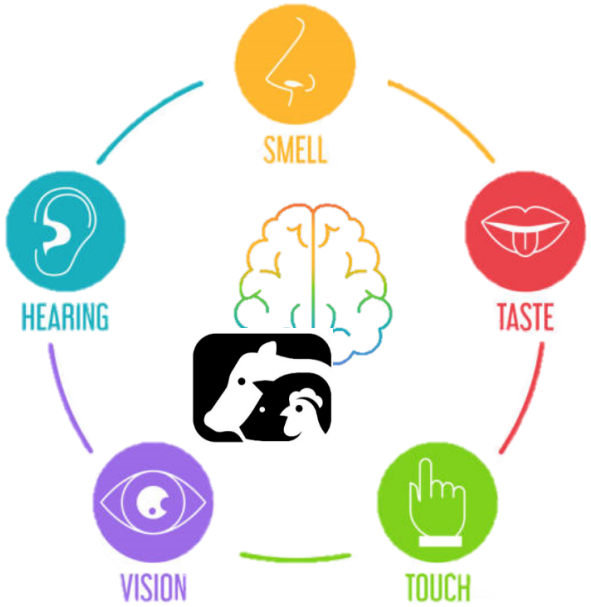
Context

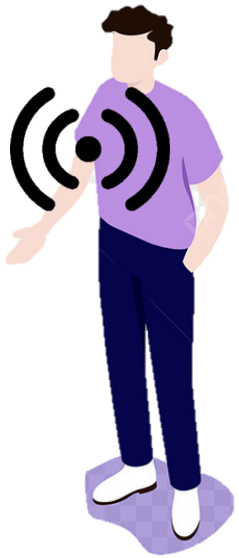
Animal welfare : « positive physical and mental state (…) linked to the perception of the animal's situation»

L'ANSES, 2018.

Environmental perception ?

= human perception ?





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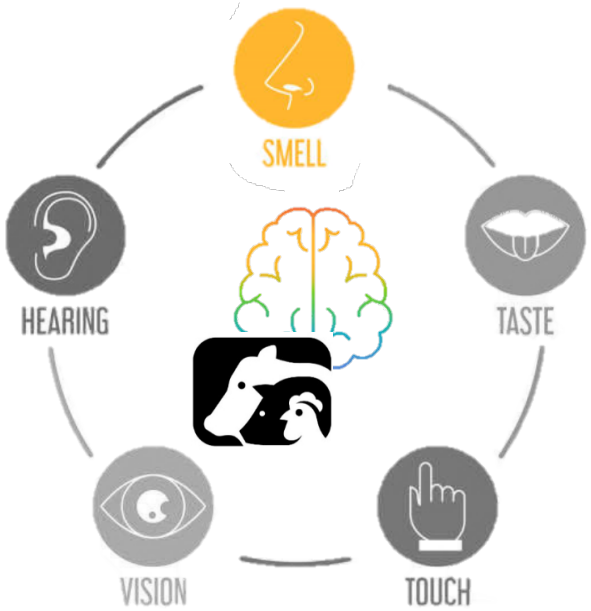
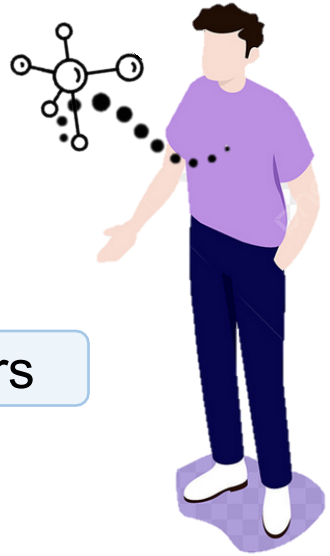


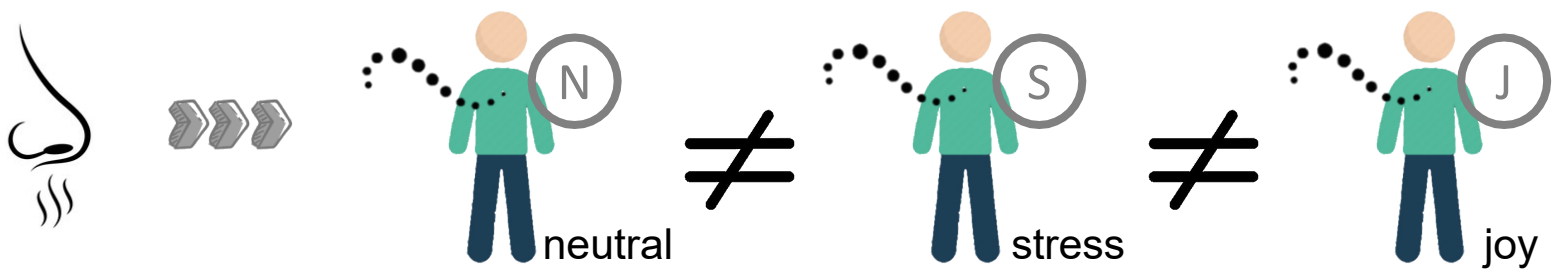
Emotional odours



- isoprene, acetone (Williams et al., 2016)
- esters (Smeets et al., 2020)

Emotional odours

Intraspecific interactions (De Groot et al., 2015; Calvi et al., 2020)



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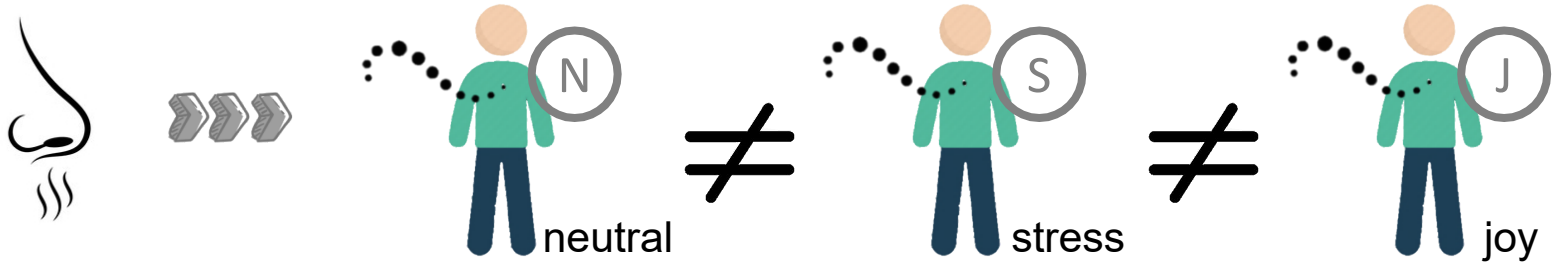
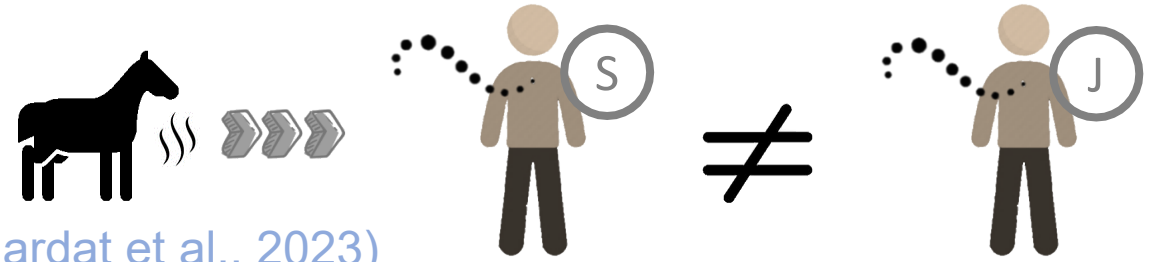
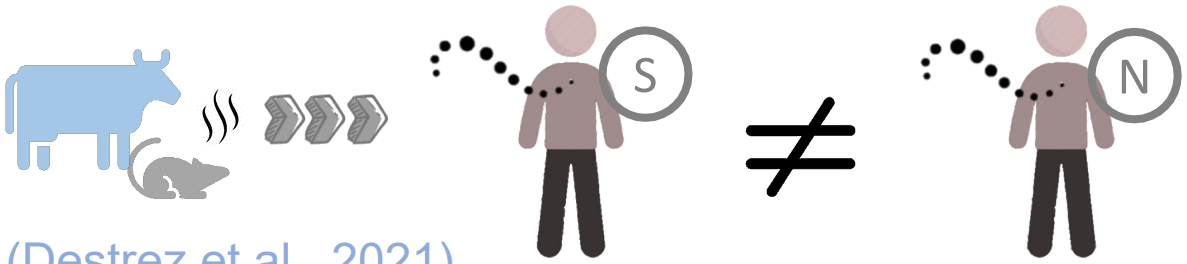


Interspecific interactions



(Jardat et al., 2023)

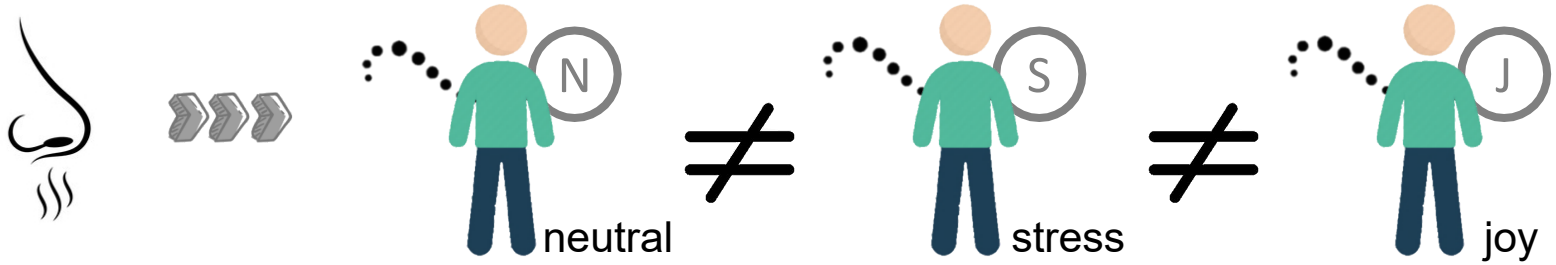


(Destrez et al., 2021)

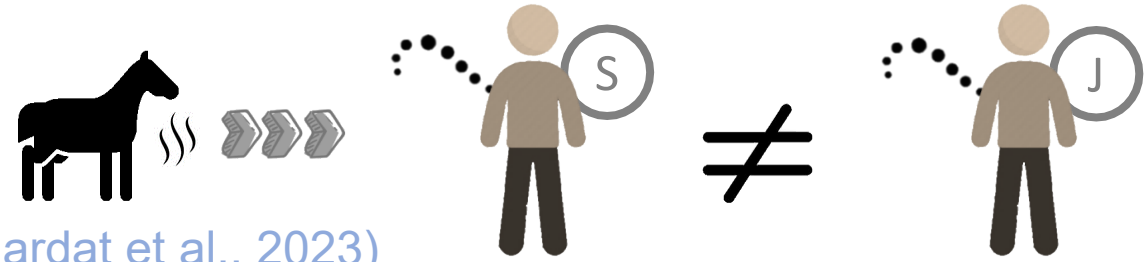
- Different smells depending on emotional state
- Possible interspecific communication
- Possible emotional contagion

Emotional odours

Intraspecific interactions (De Groot et al., 2015; Calvi et al., 2020)



Interspecific interactions



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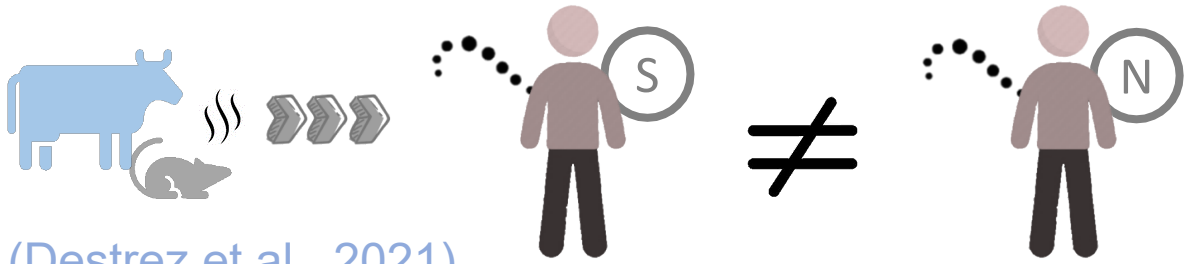
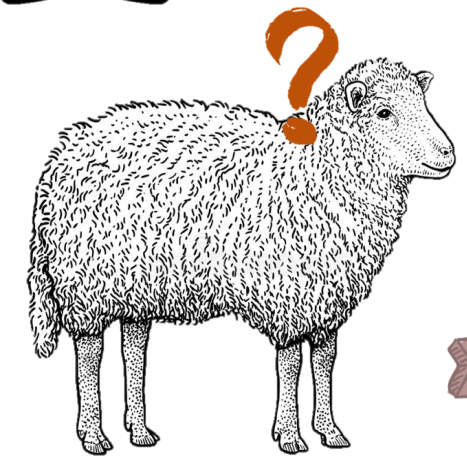


(Destrez et al., 2021)

Is this the case for other livestock animals ?

What about sheep ?

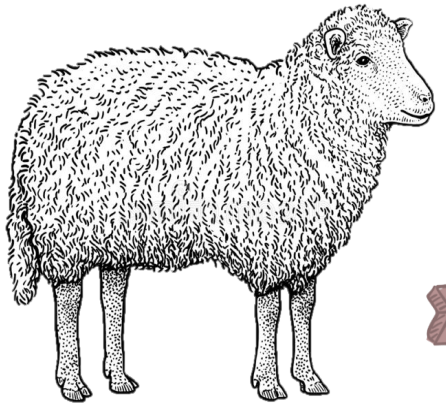


- One of the 1st domesticated species (Zeder, 2008)
- Highly humanised breeding

- Very sensitive to stress
- Emotionally very responsive

→ Animal model to study emotions (Boissy, 2004; Greiveldinger, 2007)

What about sheep ?



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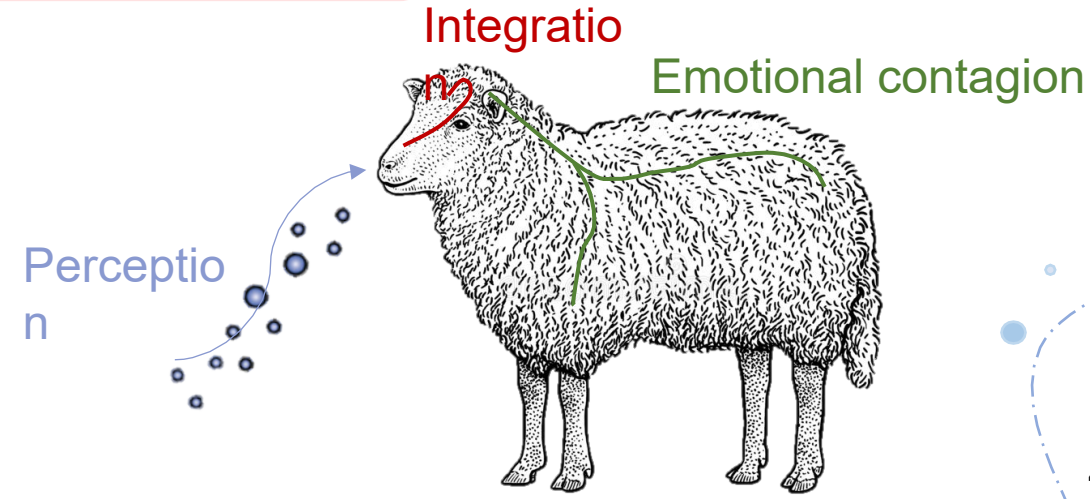
Can sheep perceive and discriminate 2 types of human emotional odours ?

= if so : Emotional contagion ?

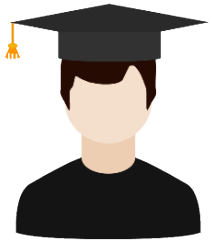


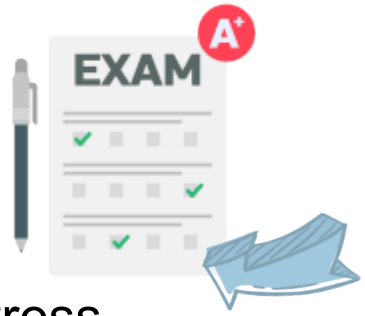
Methods

Can sheep perceive and discriminate 2 types of human emotional odors ?

- **Odours collection**

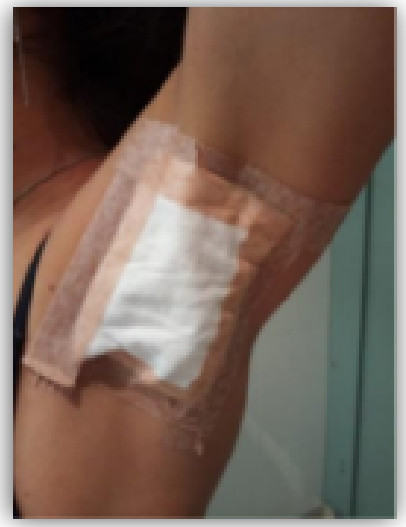
(D'Aniello and al., 2018; Sabiniewicz and al., 2020)





Stress

S



Neutral

N

Length : 2h

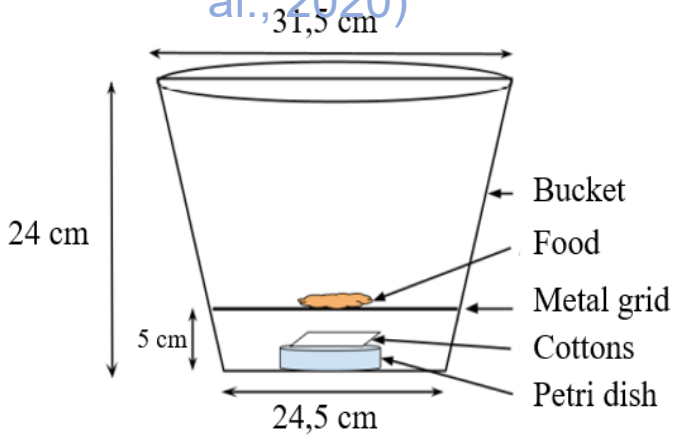
Samples pooling

Samples pooling

Methods

Can sheep perceive and discriminate 2 types of human emotional odors ?

- **Habituation – dishabituation test (H-D)** (Aviles-Rosa and al., 2020)



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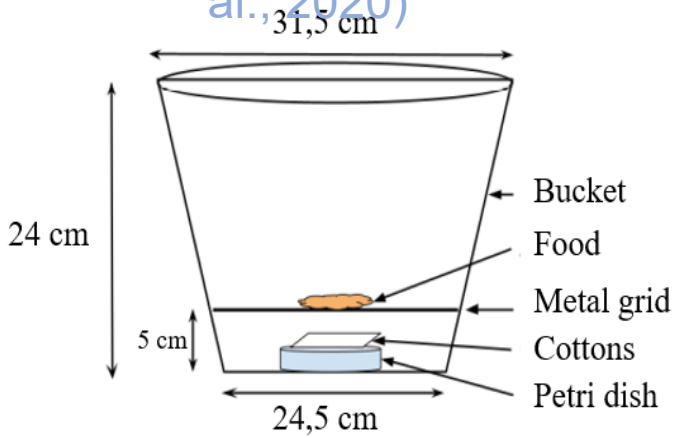
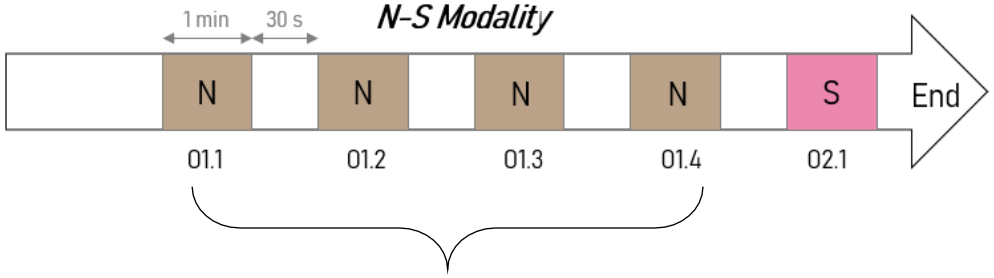
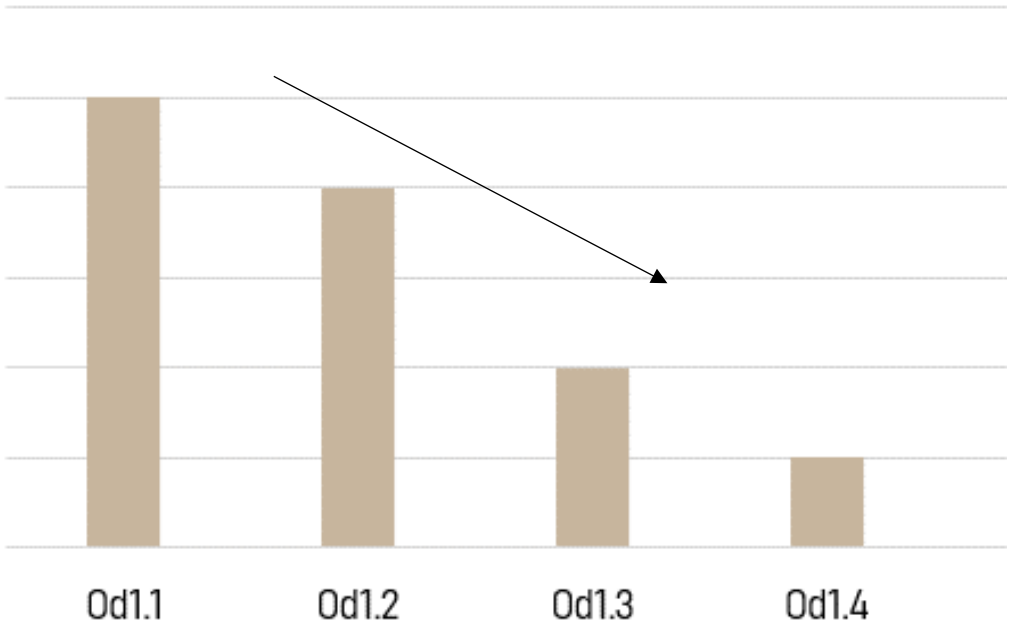


Presentation of buckets



Expected pattern for H-D test results



Habituation phase

Methods

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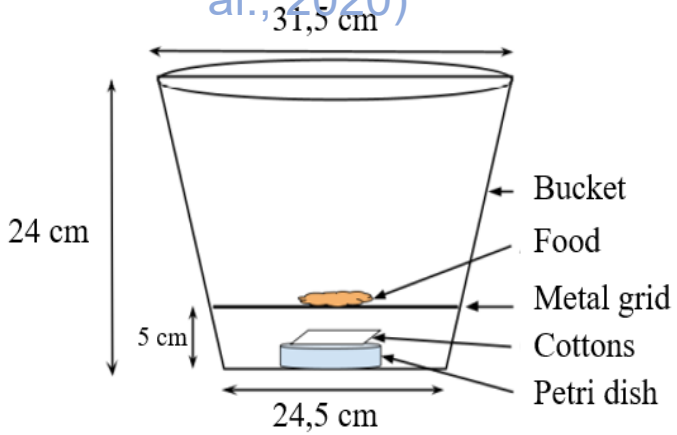

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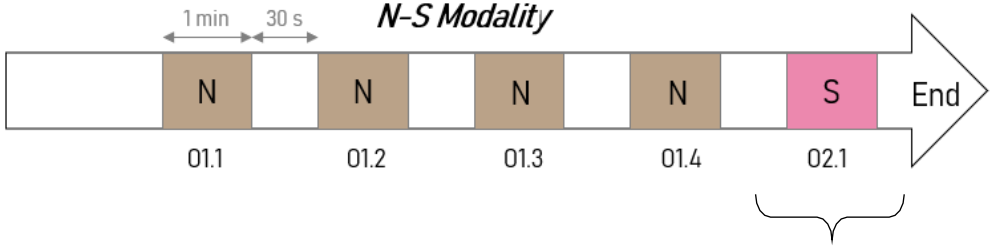

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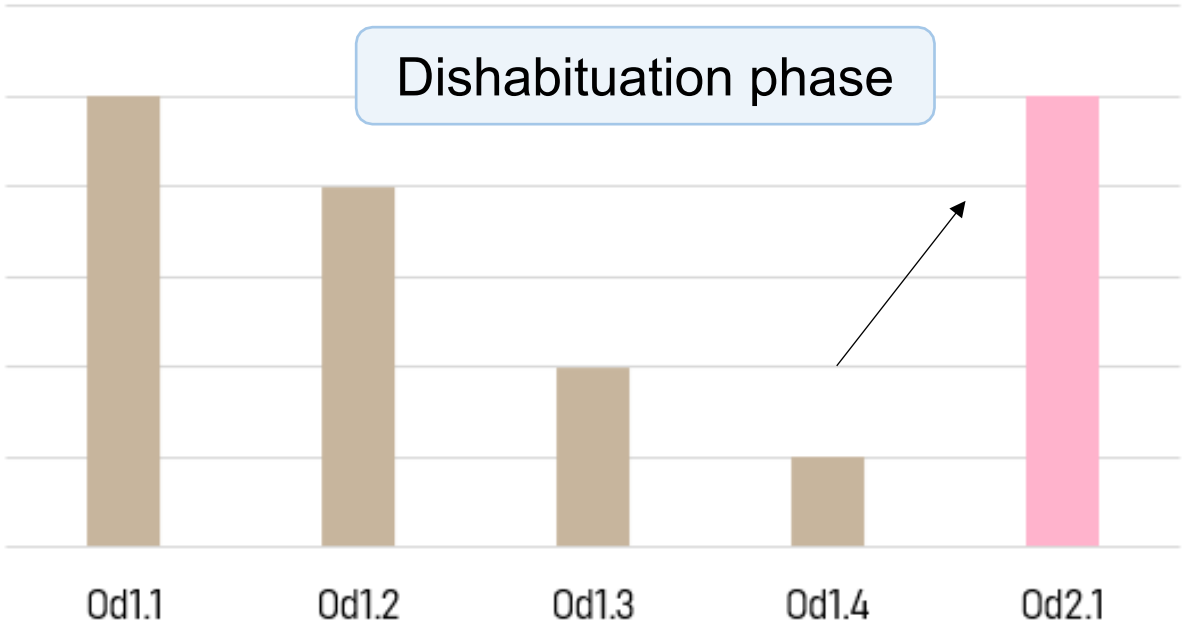

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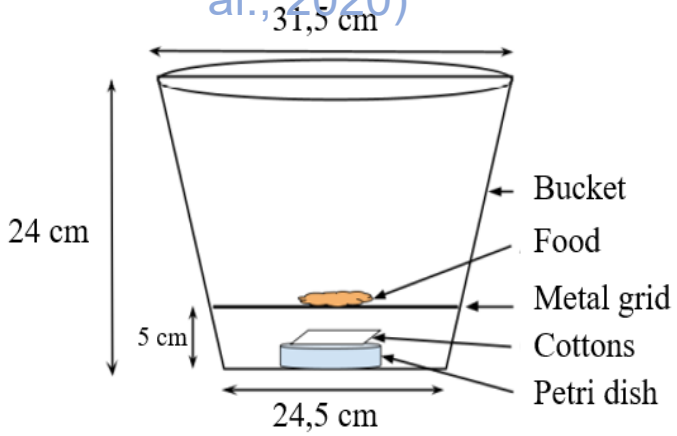

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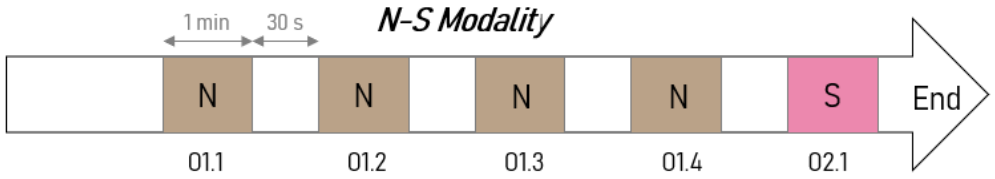

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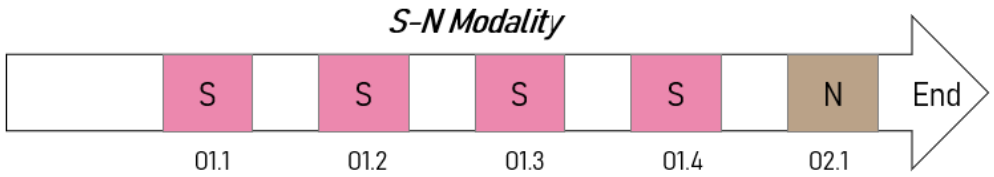
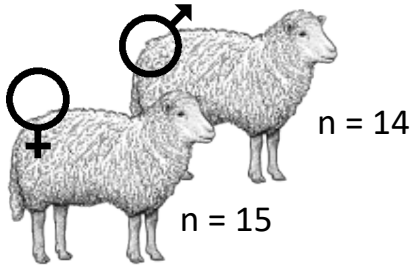
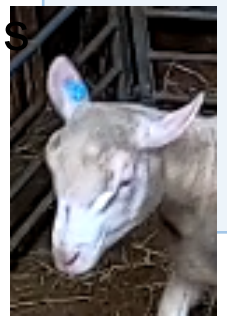




(Boissy, 2011; Reefman and al 2009; Tamioso and al., 2017)

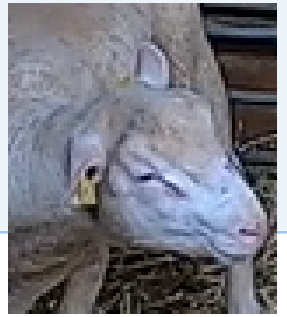
Ears positionning

Backwards



Horizontal

Asymetric



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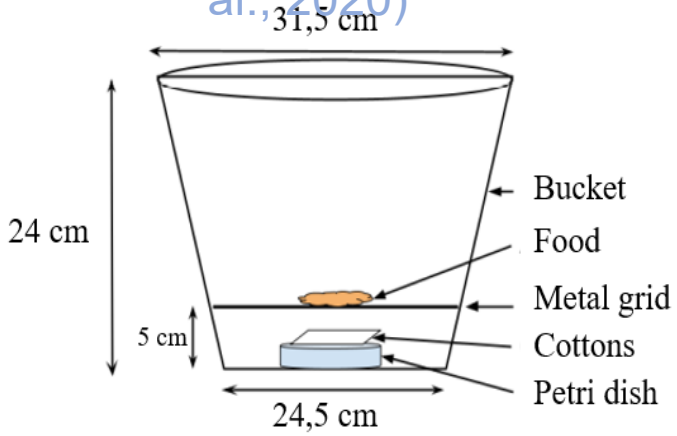

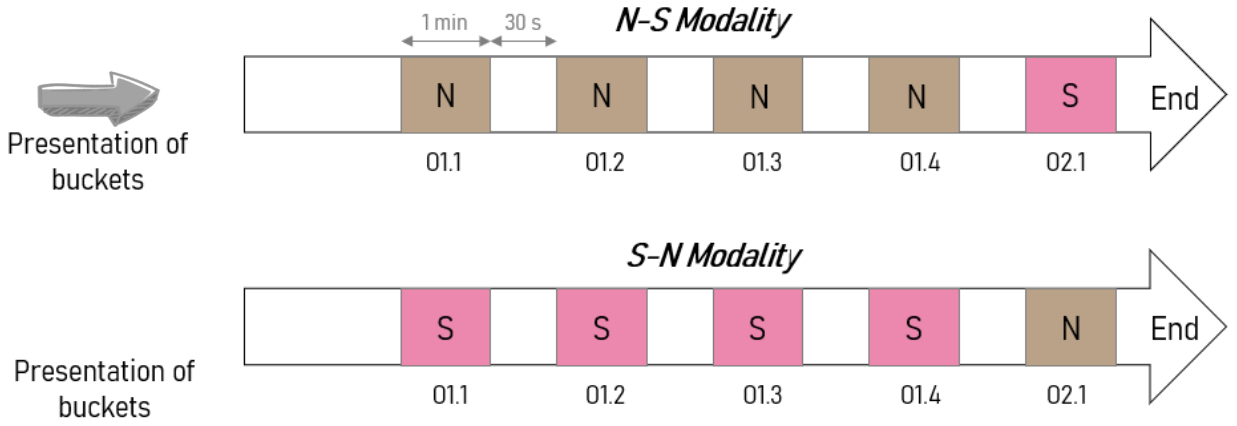

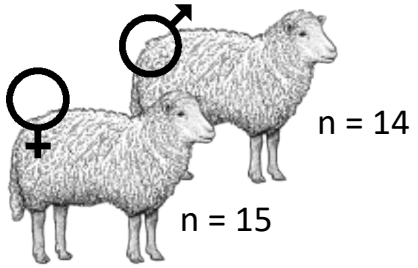

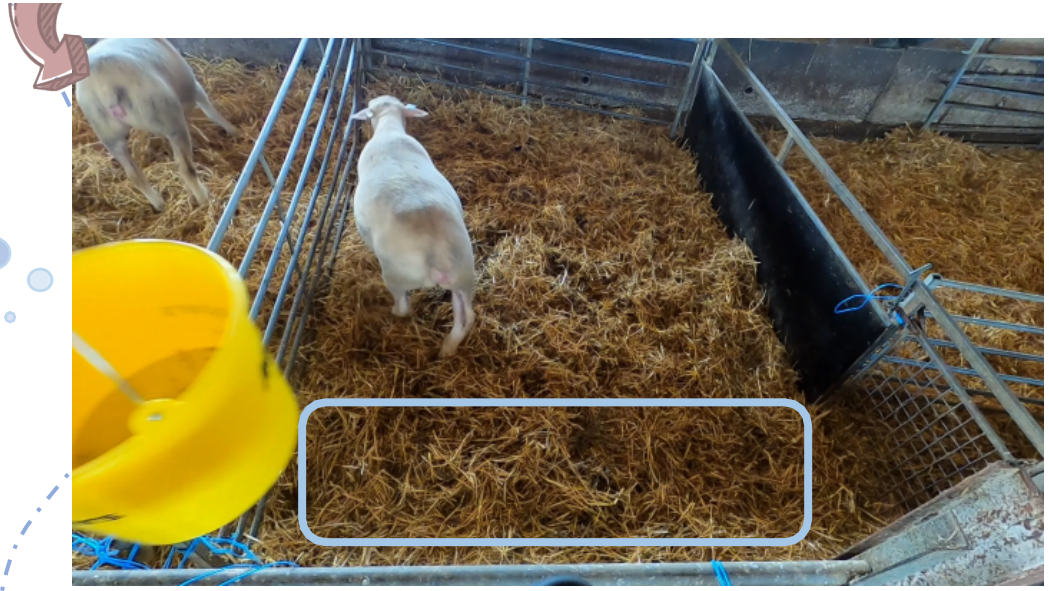

- Ears positionning
- Test pen exploration
  - area near the bucket

Methods

Can sheep perceive and discriminate 2 types of human emotional odors ?

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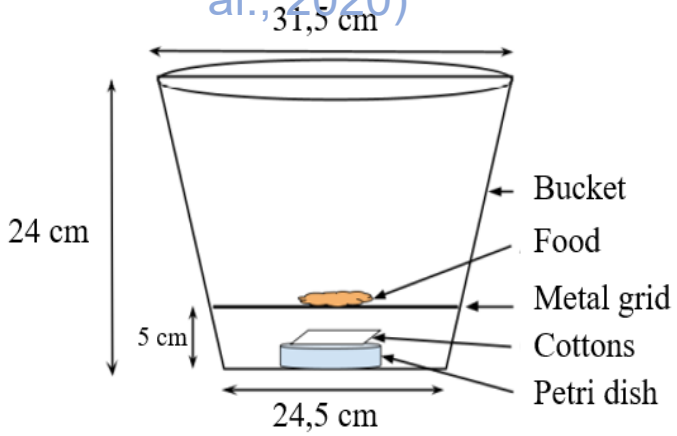

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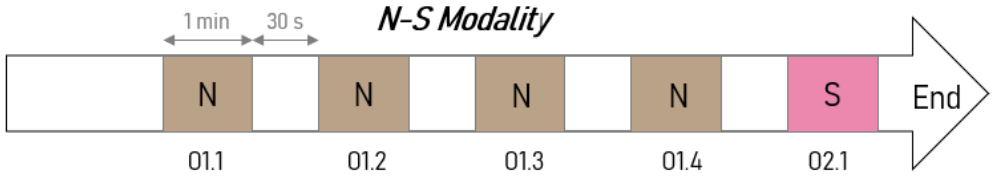

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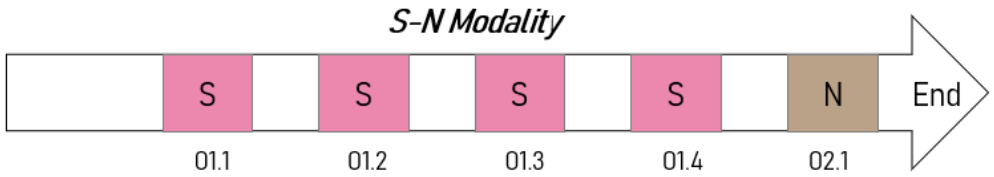

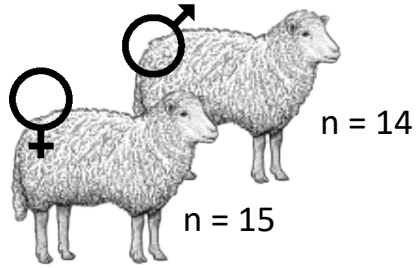

- Ears positionning
- Test pen exploration
  - area near the bucket
  - area away from the bucket

Methods

Can sheep perceive and discriminate 2 types of human emotional odors ?

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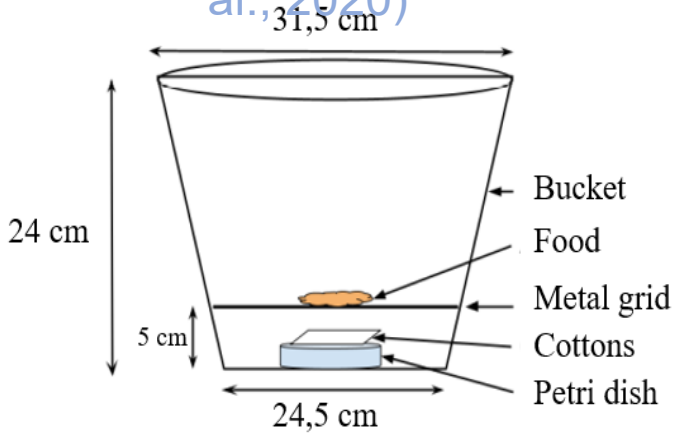
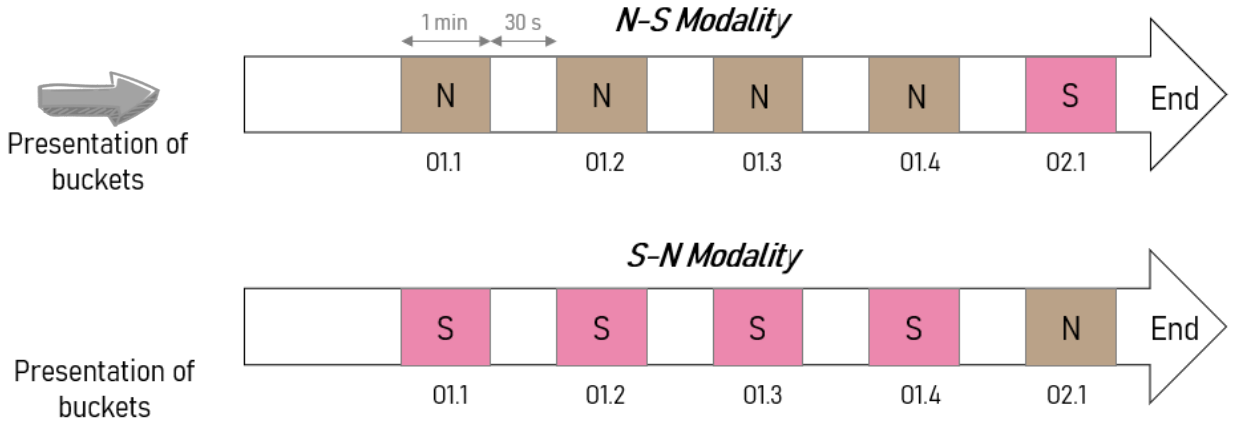
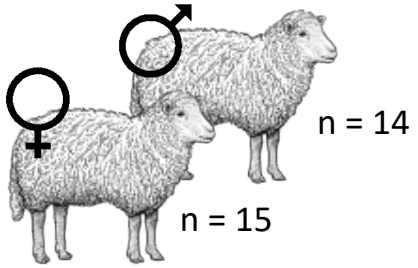




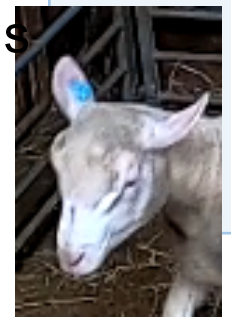


- Ears positionning
- Test pen exploration
- Behaviours
  - Interaction with bucket

Results

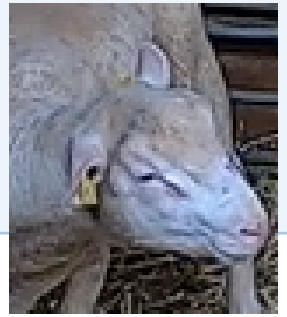
Ears positionning

Backwards



Horizontal

Asymetric



Forwards

Negative emotion

♂ + ♀

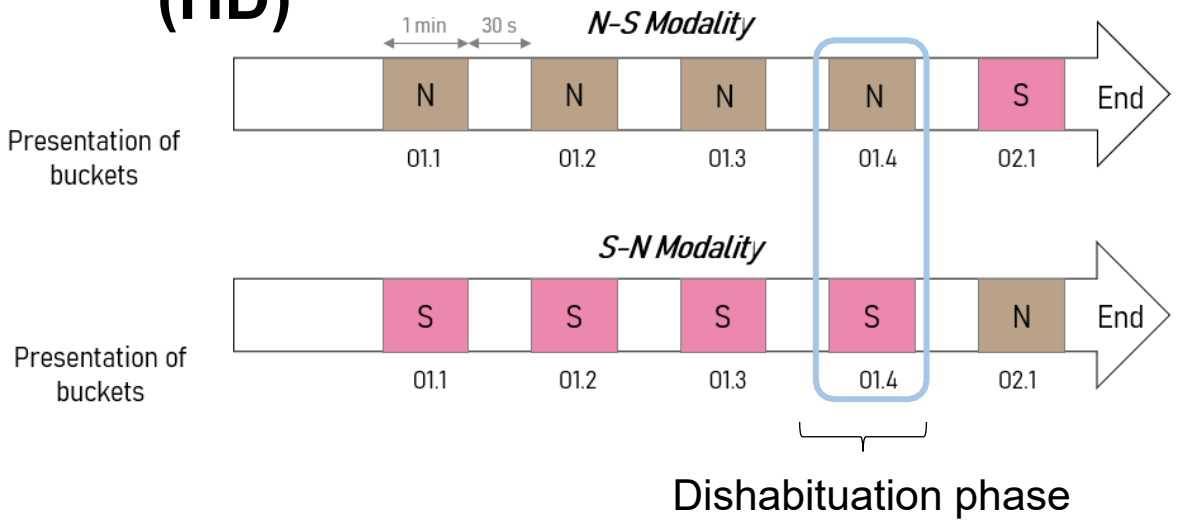
$\sum$ = Forward ears
= Backward ears
= Asymmetric ears

(Boissy, 2011; Reefman and al 2009; Tamioso and al.,

Results

Mixed model

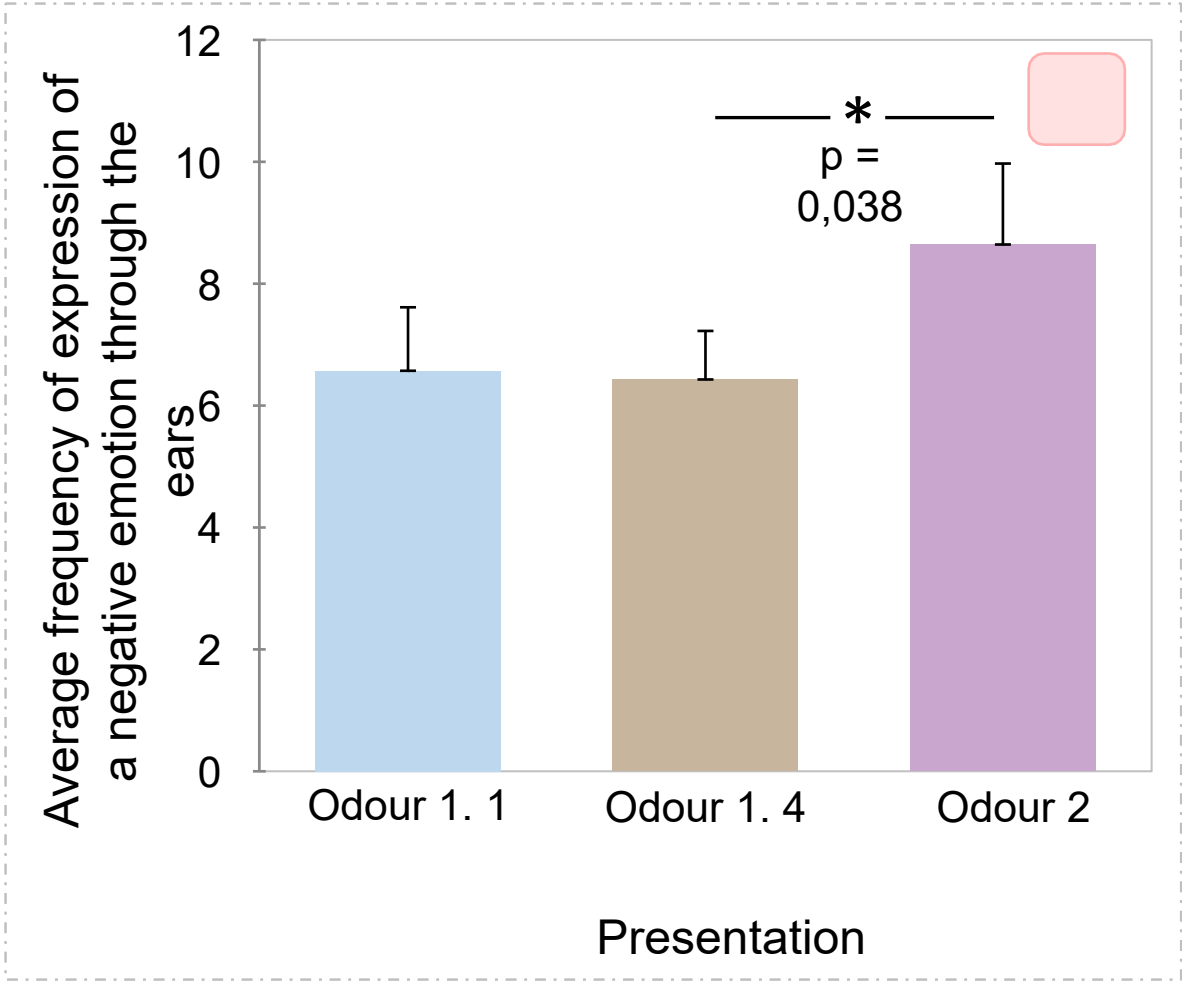
- **Habituation – dishabituation test (HD)**



Dishabituation phase

- Whatever the odour presented
- Discrimination of 2 odours

n = 14



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Results

Mixed model

Frequency positions

Ears

n = 14

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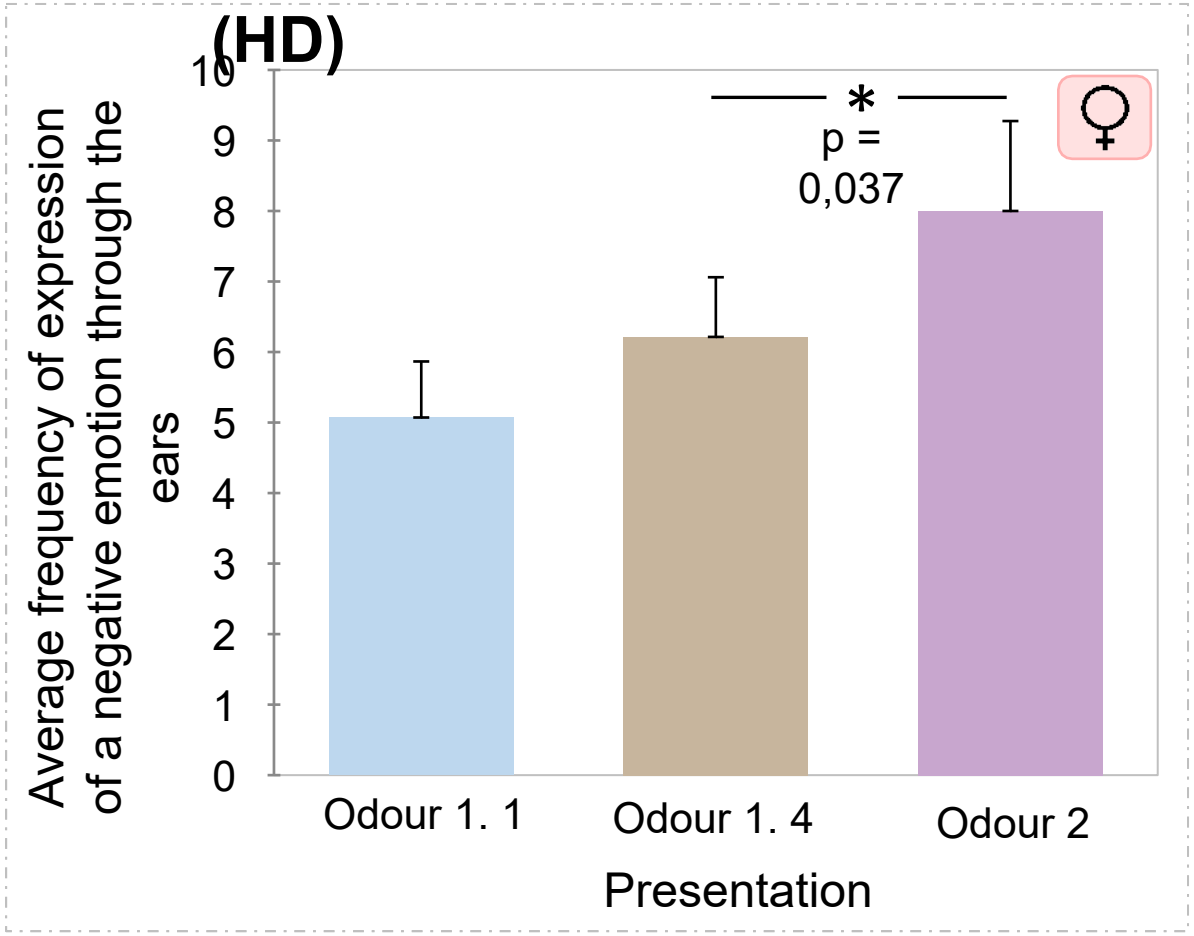

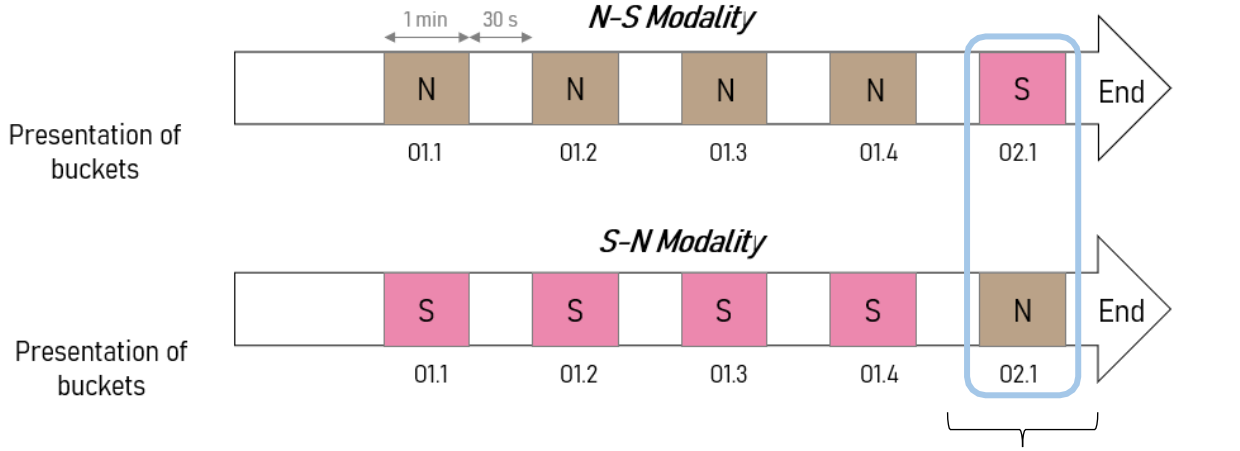

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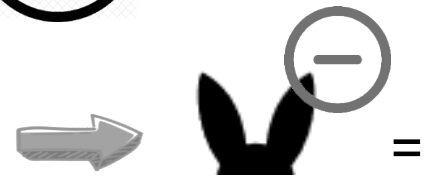
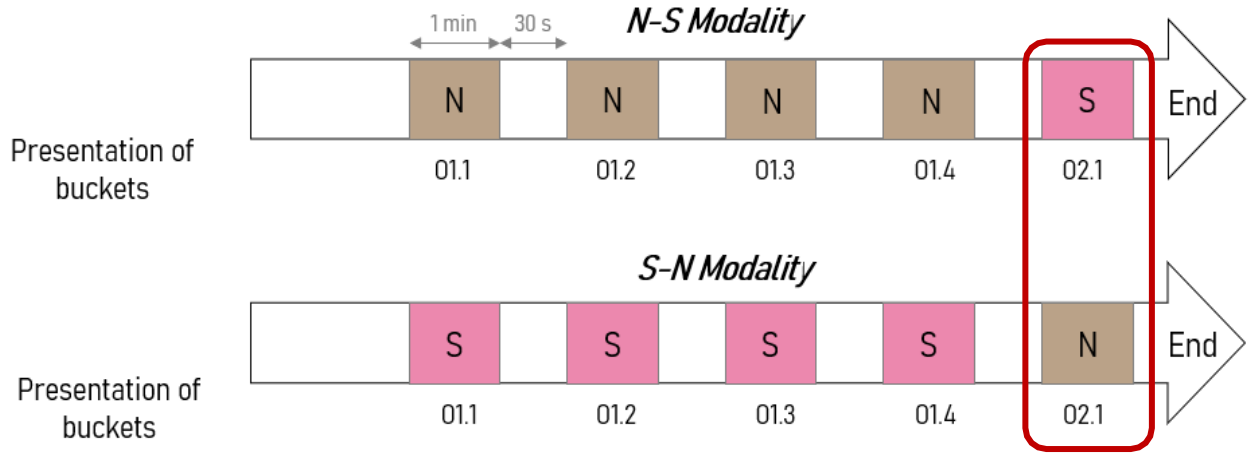
Summary

Perception of 2 different human emotional states transmitted by olfactory cues



= more important when presenting the new od r



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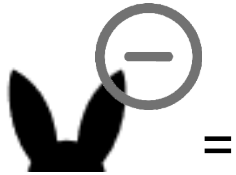


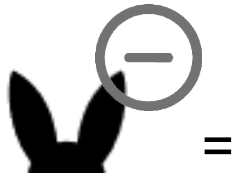
= more important when presenting the new odour

Conclusion

Perception and **discrimination** of human stress/neutral emotional states through their odours

Summary

Perception of 2 different human emotional states transmitted by olfactory cues ?



= more important when presenting the new odour

Conclusion

- **Perception** and **discrimination** of human stress/neutral emotional states through their odours

Different impacts depending on perceived emotional state ?

- Perception of the odour of an unknown human : **same whatever his emotional state**

= no emotional contagion

Discussion

- **Perception** and **discrimination** of human stress/neutral emotional states through their odours

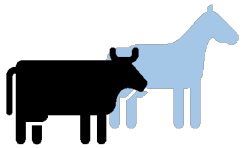
= matching : 

(Sabiniewicz et al, 2020; Jardat et al, 2023)

(De Groot et al., 2015; Calvi et al., 2020)

(Wilson, 2022)

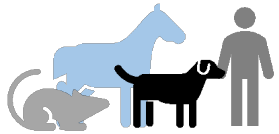
- **No emotional contagion**

= matching : 

(Jardat et al, 2023)

(Destrez et al., 2021)

≠ :



(Sabiniewicz et al, 2020)

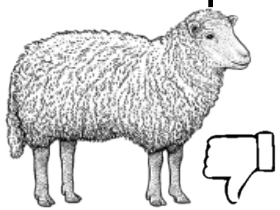
(De Groot et al., 2015)

(Destrez et al., 2021)

(Daniello et al., 2018)

New odour : stressful for sheep = Neophobia

(Schaffer et al., 2021; Van Tien et al.,1999)



Unknown

≠?

Breeder

Take home message

Sheep are able to perceive human emotional odours

Thanks for your