COGCOM
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# A REWARDING HUMAN SMILE
## An fMRI study investigating canine emotion perception

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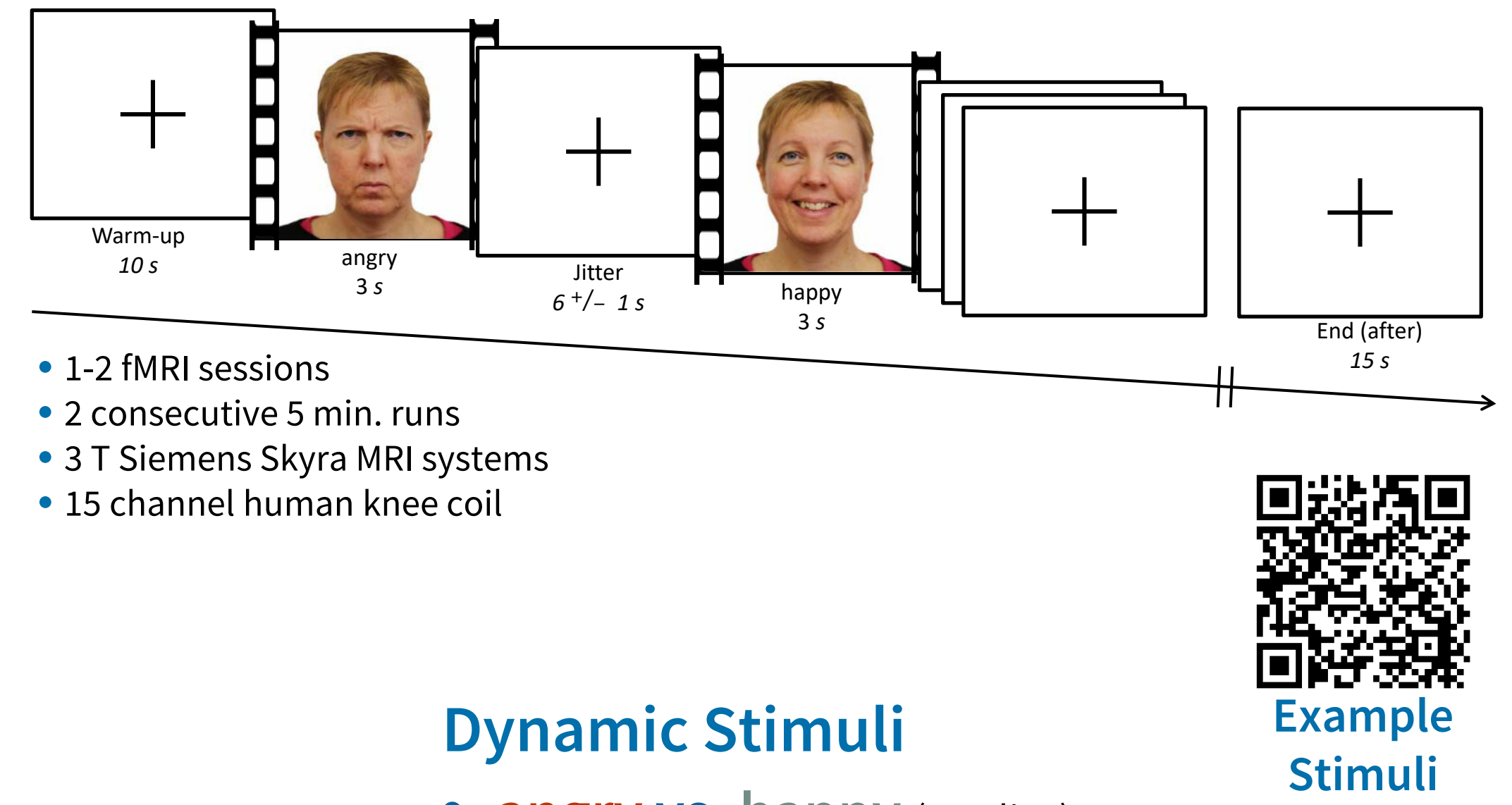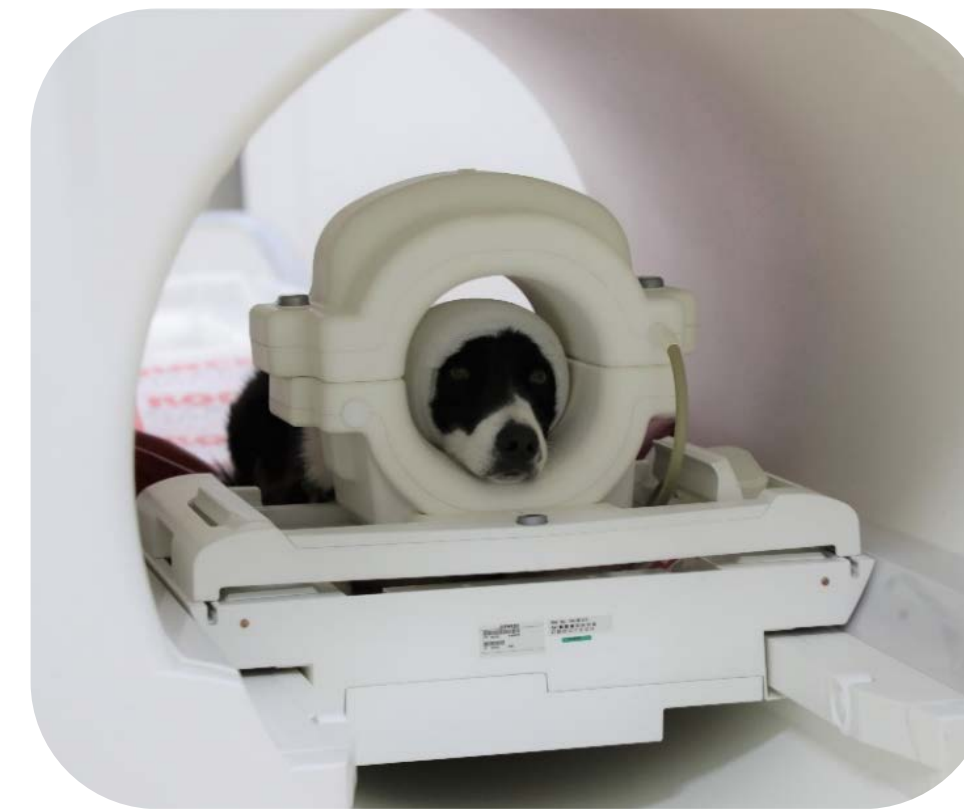
## INTRODUCTION

The **ability to identify the emotion of another individual** is a crucial component to establish & maintain social relationships[1].

Thus, considering the **special bond between humans & dogs** [2], emotion processing in dogs has been studied extensively over the last decade[3,4], recently also using fMRI[5].

However, studies so far have focused on **static visual stimuli** and to date one dog fMRI study revealed **increased sensory rather than emotion-associated activation**[6].

**What are the neural underpinnings of positive and negative emotion processing using dynamic human facial expressions?**

## METHODS & DESIGN



- Warm-up 10 s | angry 3 s | Jitter 6 +/- 1 s | happy 3 s | End (after) 15 s

- 1-2 fMRI sessions
- 2 consecutive 5 min. runs
- 3 T Siemens Skyra MRI systems
- 15 channel human knee coil
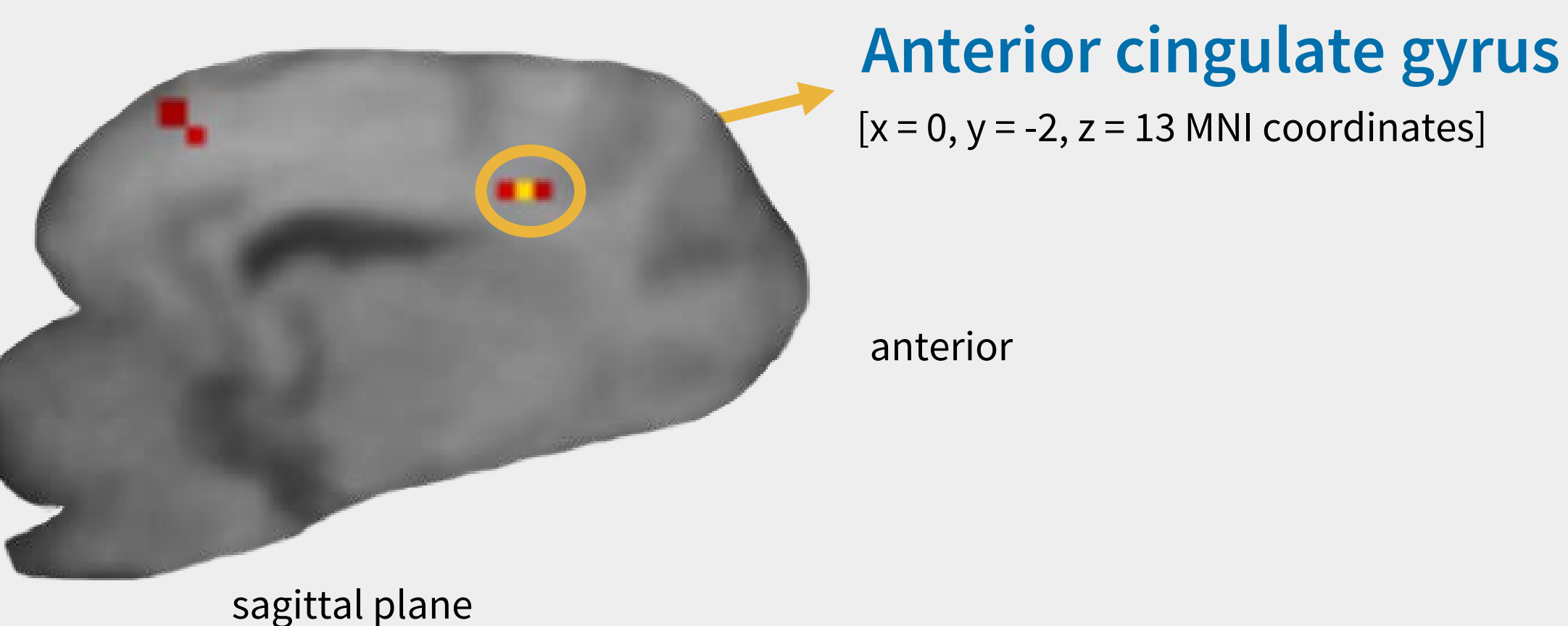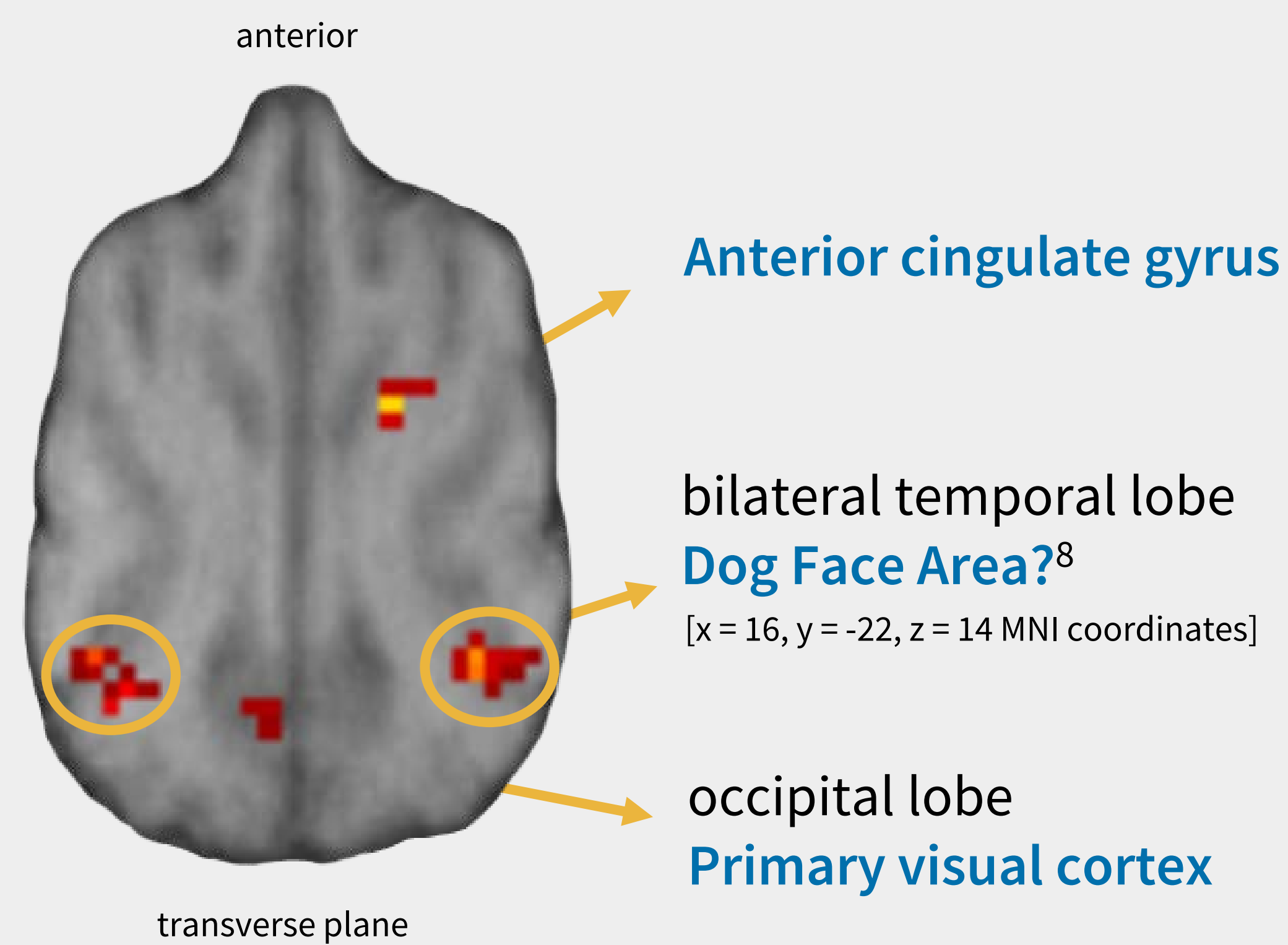
Example Stimuli

### Sample
- *N* = 6 female dogs
- Fully awake & unrestrained
- Age: 3 – 10 years
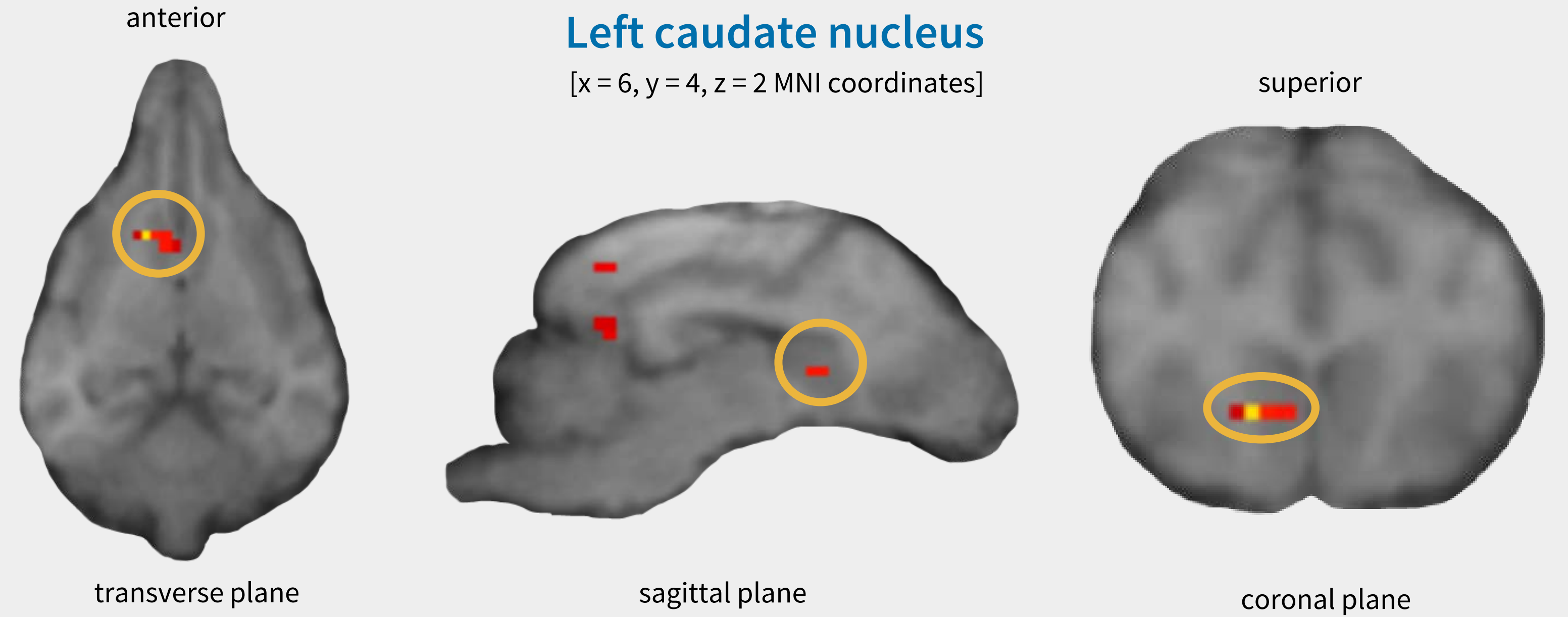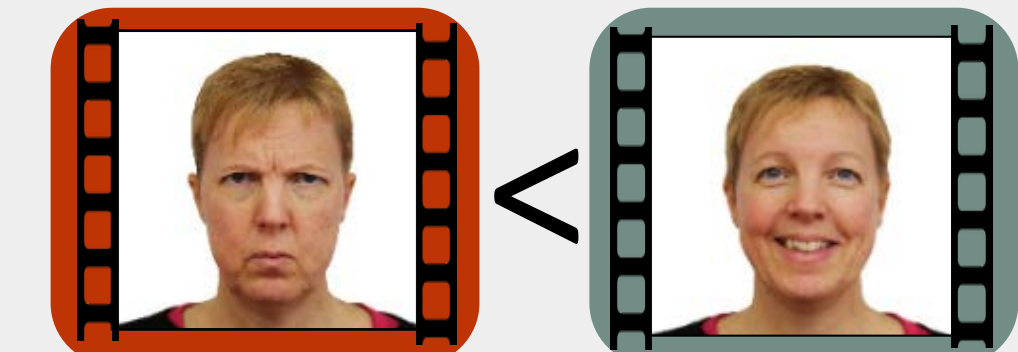- 2 labrador retrievers, 4 border collies

### Dynamic Stimuli
- **angry vs. happy** (3 s clips)
- 3 human models (owner, familiar, stranger)
- 10 trials per condition
- controlled for luminance[7]

## PRELIMINARY RESULTS

**1** > Baseline [+]



- anterior
- **Anterior cingulate gyrus**
- bilateral temporal lobe **Dog Face Area?**[8] [x = 16, y = -22, z = 14 MNI coordinates]
- occipital lobe **Primary visual cortex**
- transverse plane
- t-value 15 / 10 / 5 / 0
- **Anterior cingulate gyrus** [x = 0, y = -2, z = 13 MNI coordinates]
- anterior
- sagittal plane

**2** < Baseline



**Left caudate nucleus** [x = 6, y = 4, z = 2 MNI coordinates]

- anterior
- transverse plane
- sagittal plane
- superior
- coronal plane

**3** > no specific activation

## PRELIMINARY CONCLUSION

Evidence that dogs show **increased activation in areas of the reward network in response to dynamic positive human facial expressions**, and for first evidence for **activation changes in the cingulate cortex a core emotion processing area** in humans.[10]

Activation associated with emotion processing in response to dynamic stimuli might have **crucial implications for future research**.

**The preliminary results indicate that dogs perceive happy faces as rewarding and may process human emotions similar to humans.**

## NEXT STEPS
- Further data collection & exploration
- More rigorous statistical testing[11]
- Strengthen inferences: behavioral preference test between happy vs. angry emotion expressions
- Direct comparison: static vs. dynamic emotion expressions

All results: *p* < .005 uncorrected, voxel threshold *k* = 5; areas of activation were determined using the canine breed-averaged t2w atlas[8] and are displayed on the mean structural image averaged across all *N* = 6 dogs.

**REFERENCES** [1] Schmidt & Cohn, Am. J. Phys. Anthropol 2001; [2] Thalmann et al. , *Science* 2013; [3] Kujala, *Animal Sentience* 2017; [4] Huber, *Curr Dir Psychol Sci* 2017; [5] e.g. Thompkins et al., *Comp. Cogn. Behav. Rev.* for review; [6] Cuaya et al., *Plos One* 2016; [7] Willenbockel et al., *Behav Res Methods* 2010, [8] Dilks et al, *PeerJ* 2015; [9] Nitzsche et al, *NeuroImage* 2018; [10] e.g. Adolphs, *Curr Opin Neurobiol* 2002 for review; [11] Huber & Lamm, *Learn. Behav.* 2017