Positivity bias in memory for faces with emotional expressions in Alzheimer's disease and healthy older participants is not only due to familiarity

Alina-Alexandra Sava[1], Pierre Krolak-Salmon[2,3], Floriane Delphin-Combe[3], Morgane Cloarec[1] & Hanna Chainay[1]

[1]Laboratoire EMC, Université Lyon 2, France ; [2] INSERM, U1028, CNRS UMR5292, Centre de Recherche en Neurosciences de Lyon, Bron, France; [3]Hospices Civils de Lyon, CM2R, Hôpital gériatrique de Charpennes, Villeurbane, France

Introduction

Although classical models stated the existence of two different functional routes for the processing of the facial identity and the facial emotional expression, more recent findings suggest that the processing of these two types of emotional information are not completely independent (Calder & Young, 2005). For example, in young individuals facial identity seems to be better memorized when the faces are initially seen with negative or positive rather than neutral expressions (Righi et al., 2012; D'Argembeau & Van der Linden, 2007, 2011). Healthy older participants and Alzheimer's disease (AD) patients generally show better memory for faces initially encountered with positive expressions (Werheid et al., 2011). According with the **socioemotional selectivity theory** (Carstensen et al., 2003), this **positivity memory bias** reflects a general age-related preference for positive stimuli, subserving emotion regulation and increasing positive affect. Another explanation for the *positivity bias* might be that **novel happy faces are often considered familiar** (Werheid et al., 2011). Thus, when they are not sure about the correct answer, older participants use compensatory strategies consisting in increased tendencies to consider happy faces as previously seen.

Objective:

The question of the existence of the *positivity memory bias* in tasks not permitting the implementation of familiarity-based compensatory strategies is still open. We addressed this question in two studies by comparing the performance of healthy young and older participants and AD patients for faces with positive, neutral and negative expressions in tasks that didn't allow the familiarity-based memory enhancement.

Hypothesis:

We expected the presence of the *positivity memory bias* in healthy older participants and in AD patients. In healthy young participants we expected to observe better memory performances for faces with negative and positive expressions over the neutral ones.

Materials and methods

Participants: Study 1 : 17 AD patients (MMSE=24.4, SD=2.05; Age=78.82, SD=3.24); 21 Healthy Older participants (MMSE=29.04, SD=0.82; Age=74.33, SD=8.47; 25 Healthy Young participants (Age=19.84, SD=2.03). **Study 2 :** 18 AD patients (MMSE=23.16, SD=1.83; Age=84.22, SD=5.46); 21 Healthy Older participants (MMSE=27.90, SD=1.72; Age=80.81, SD=4.67); 21 Healthy Young participants (Age=22.4, SD=3.28).

Stimuli: Study 1: 96 black and white photographs of 32 human adult faces (each on depicting sad, neutral and happy emotional expressions) from the Montreal Set of Facial Displays of Emotion (MSFDE, Beaupre & Hess, 2005). **Study 1:** The stimuli were identical with Study 1, but the expression of sadness was replaced by anger.
Procedure: Study 1 & 2: Delayed matching to sample tasks and Emotion classification tasks.
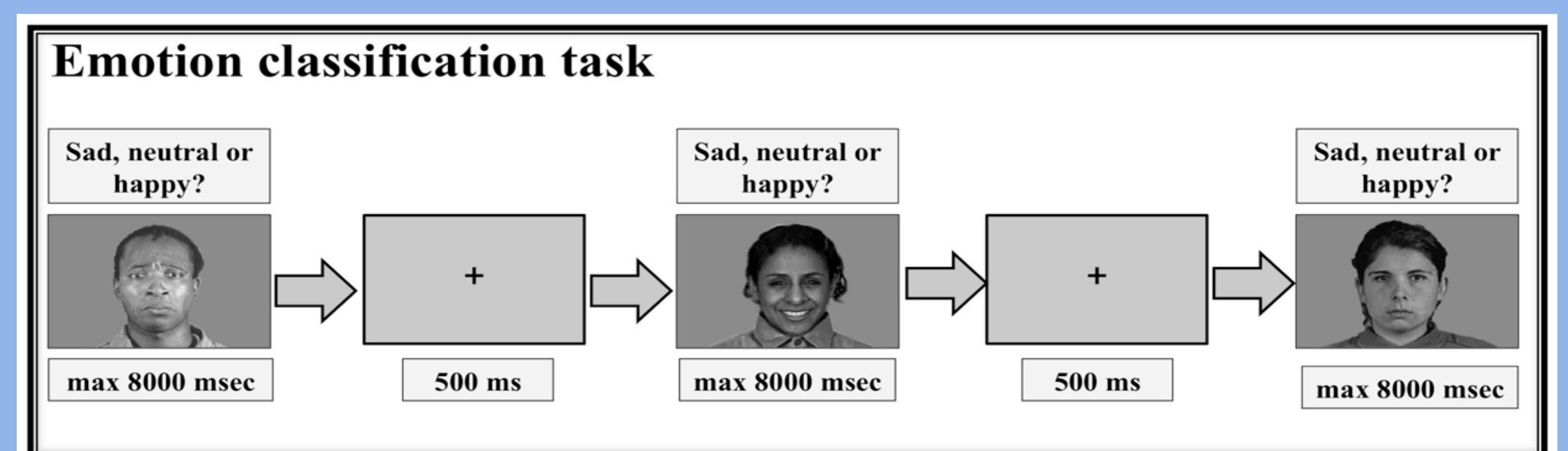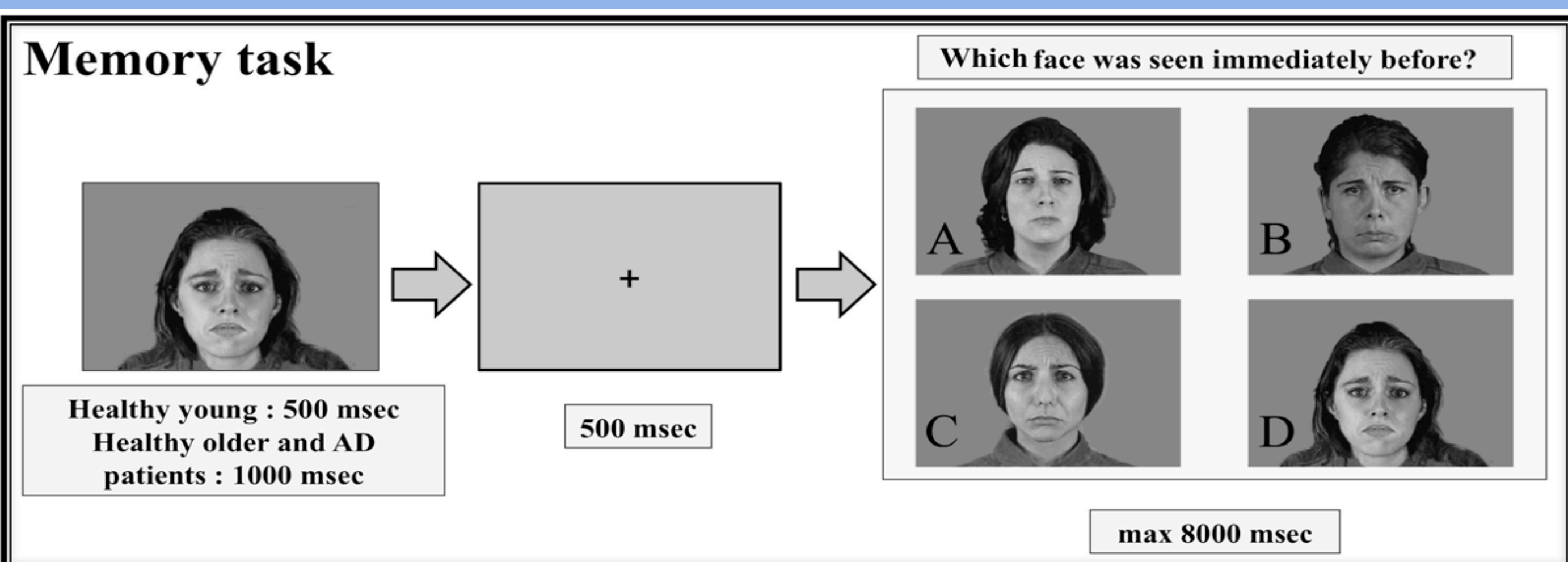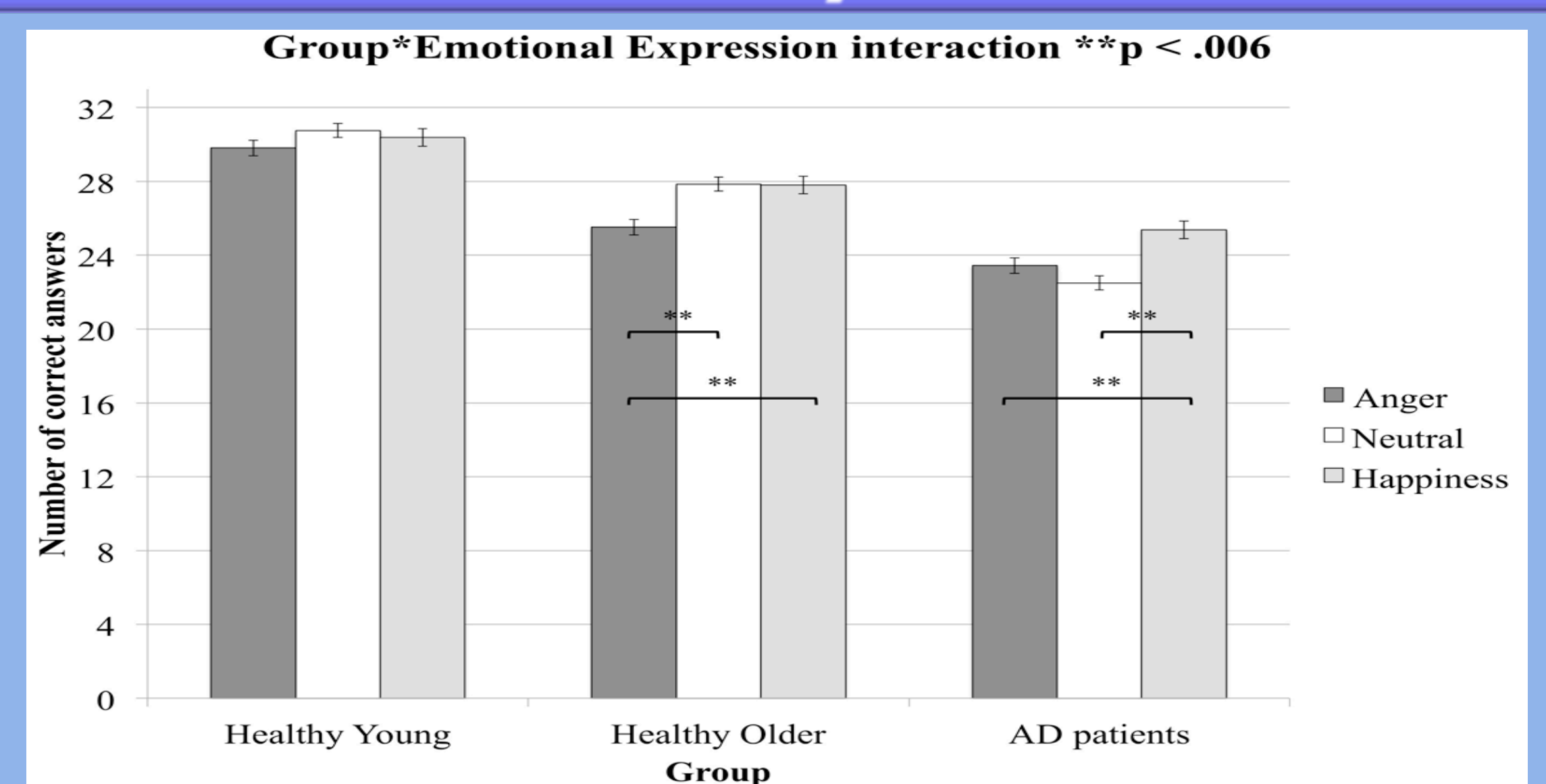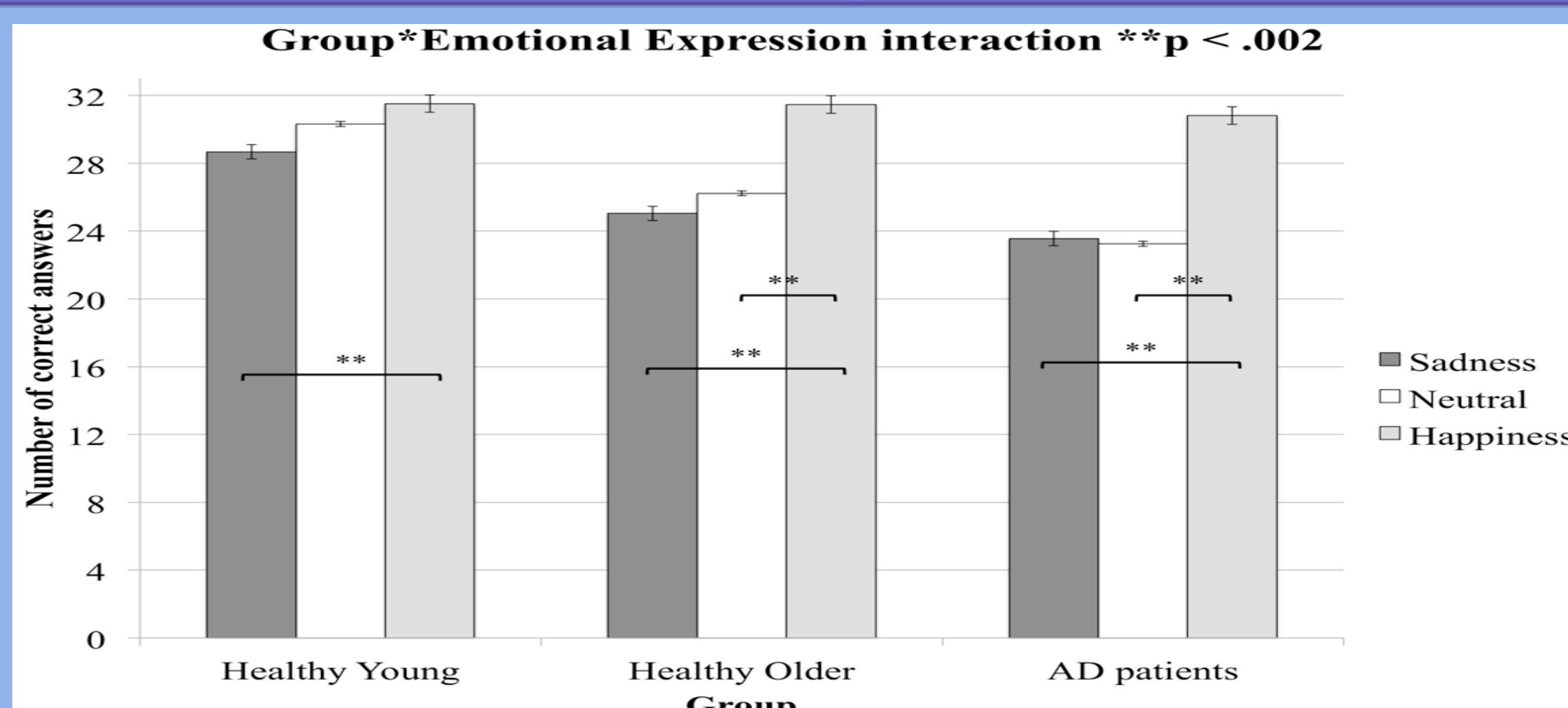

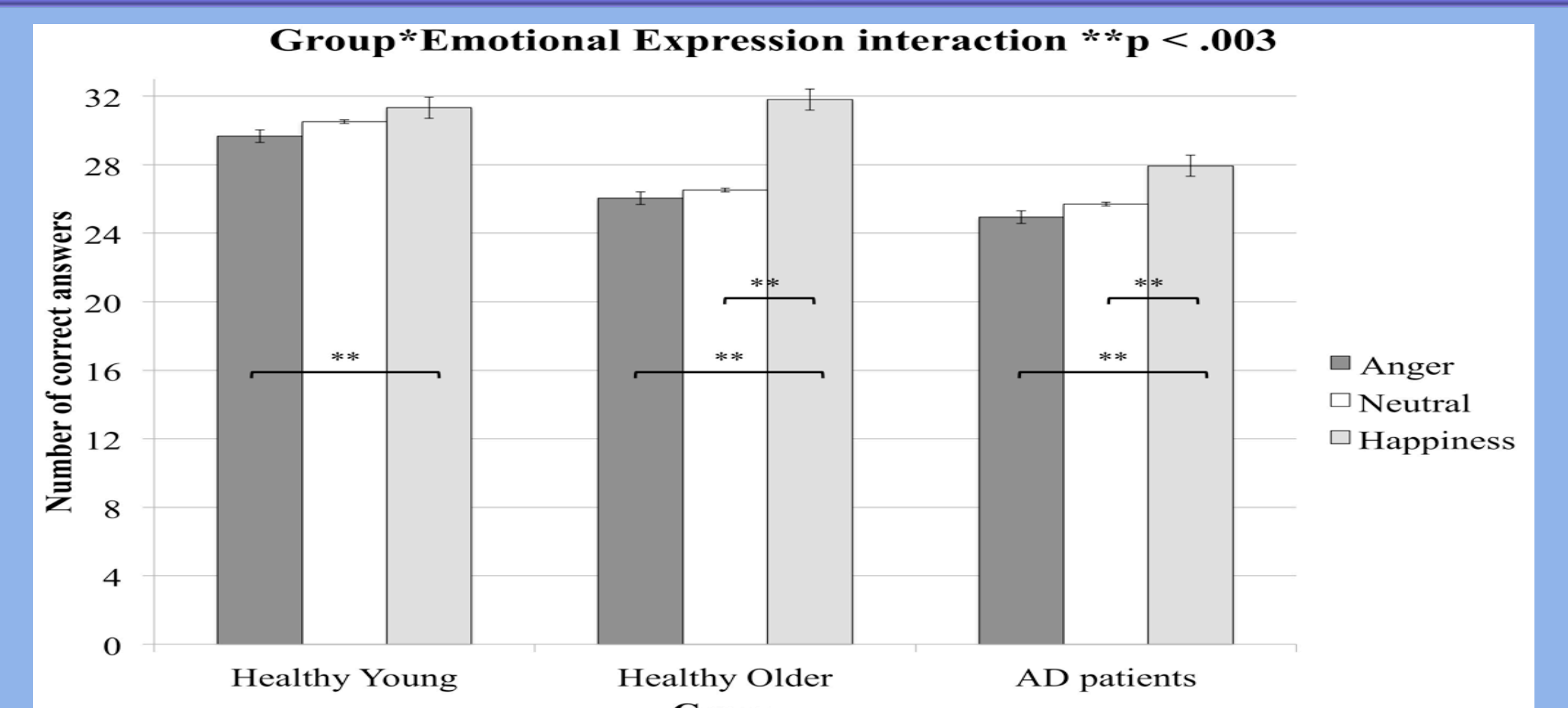## Results: Delayed matching to sample task

Study 1

Study 2

Results: Emotion classification task

Study 1

Study 2

Discussion

Our study shows the presence of the *positivity memory bias* for faces with emotional expressions in both healthy older participants and in AD patients. The pattern of results observed in our study is consistent with the *socioemotional selectivity theory* stating that the *positivity memory bias* observed in older participants is due to an age-related preference for positive stimuli. Our results also suggest that this effect is not only due to familiarity, as, contrarily to recognition tasks, the memory tasks we used (i.e. delayed matching-to-sample tasks) don't permit the implementation of familiarity-based compensatory strategies. Moreover, this effect is present when the emotional expression of happiness is opposed to a less arousing negative emotional expression (i.e. sadness), but also when happiness is opposed to a negative emotional expression that has comparable levels of arousal (i.e., anger) and which benefits of privileged processing (as compared with sadness, and even happiness).