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INTRODUCTION

- ❖ **Emotional contagion** is the automatic synchronisation of feelings between individuals. Seeing someone laugh or yawn causes a reflexive impulse to smile or yawn in return.
- ❖ This process is called **affective resonance** and is driven by **facial mimicry** (Hatfield, Cacioppo, & Rapson, 1993; de Waal & Preston, 2017).
- ❖ In healthy individuals, this process promotes empathy and social connections.
- ❖ After a **traumatic brain injury (TBI)**, this ability may be impaired, especially when it comes to complex or negative emotions (Rushby et al., 2013). Patients with TBI have more difficulty recognising feelings such as pain and sadness than other positive emotions, showing greater difficulty with negative feelings (Rosenberg et al., 2014; Rushby et al., 2013).
- ❖ The recognition of social emotions is fundamental to **empathy**, so these deficits can significantly compromise interpersonal relationships after injury (Rushby et al., 2013; Rosenberg et al., 2014).

STUDY AIM

- ❖ Investigate how patients with **Traumatic Brain Injury (TBI)** recognize contagious emotions such as **laughter, yawning** and **pain**.
- ❖ Examine if differences in recognition depend on the stimulus being **self, familiar** or **unfamiliar**.
- ❖ Understand if trouble recognising emotions is linked to specific **brain damage**.
- ❖ Explore the role of **positive, neutral and negative valence** in emotional contagion among patients with traumatic brain injury.

EXPERIMENTAL DESIGN

PHASE 1: Stimuli acquisition

YOUTUBE VIDEO STIMULI

- to elicit:
- PAIN
 - LAUGH
 - YAWN



FACE ACQUISITION

Video recorded



PATIENT (SELF)



CAREGIVERS (KNOWN)



UNKNOWN (UNFAMILIAR)

PHASE 2: Evaluation of emotional contagion

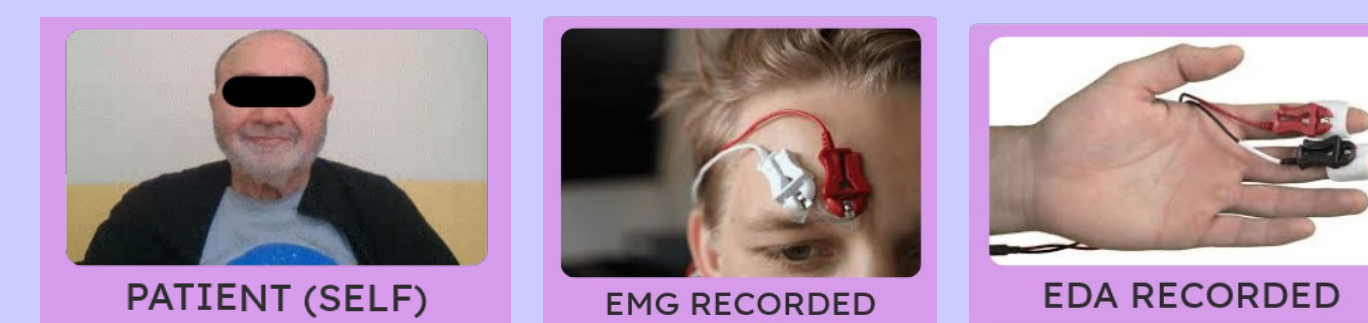
• PRELIMINARY ASSESSMENT

Neuropsychological tests →
Psychometric Questionnaires

Interpersonal Reactivity Index (IRI)
Toronto Alexithymia Scale (TAS)
Pain Catastrophizing Scale (PCS)

• FINAL VIDEO ADMINISTRATION

Face Acquisition
EMG recorded
EDA recorded



• EVALUATION QUESTIONNAIRE

In your opinion, what emotional state is the subject experiencing?
What emotional state did you experience while watching this video?

Subjects: 8 patients with moderate to severe TBI and heterogeneous brain lesions (mixed gender, age range 28–65 years, mean \approx 45, SD \approx 13)

Stimuli: video clips of contagious facial expressions: laughter (positive), yawning (neutral), and mirror pain (negative), recorded from three types of individuals: the patient themselves (Self), a familiar person (Familiar), and an unfamiliar person (Non-Familiar).

Task: participants were asked to observe the stimuli and respond naturally.

Output: video recordings of the participants; facial EMG signals from the zygomaticus major, corrugator supercilii, and orbicularis oculi muscles; evaluation questionnaire responses recorded as emotion recognition (correct labeling) and emotional elicitation (contagious response)

RESULTS

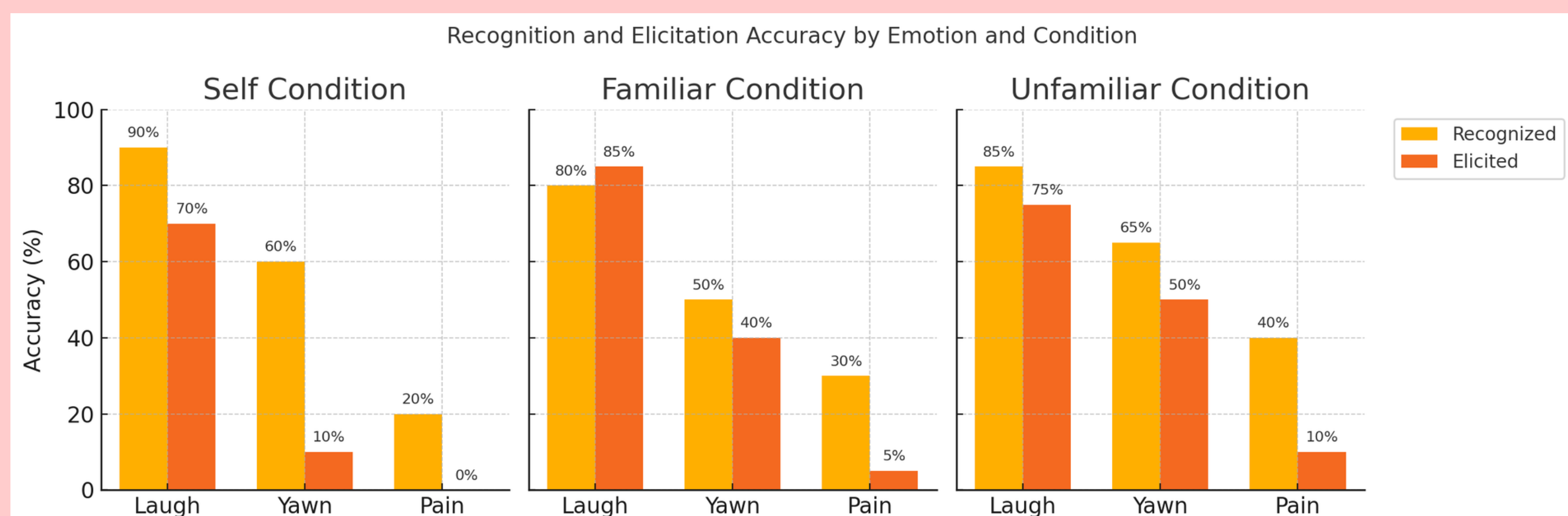
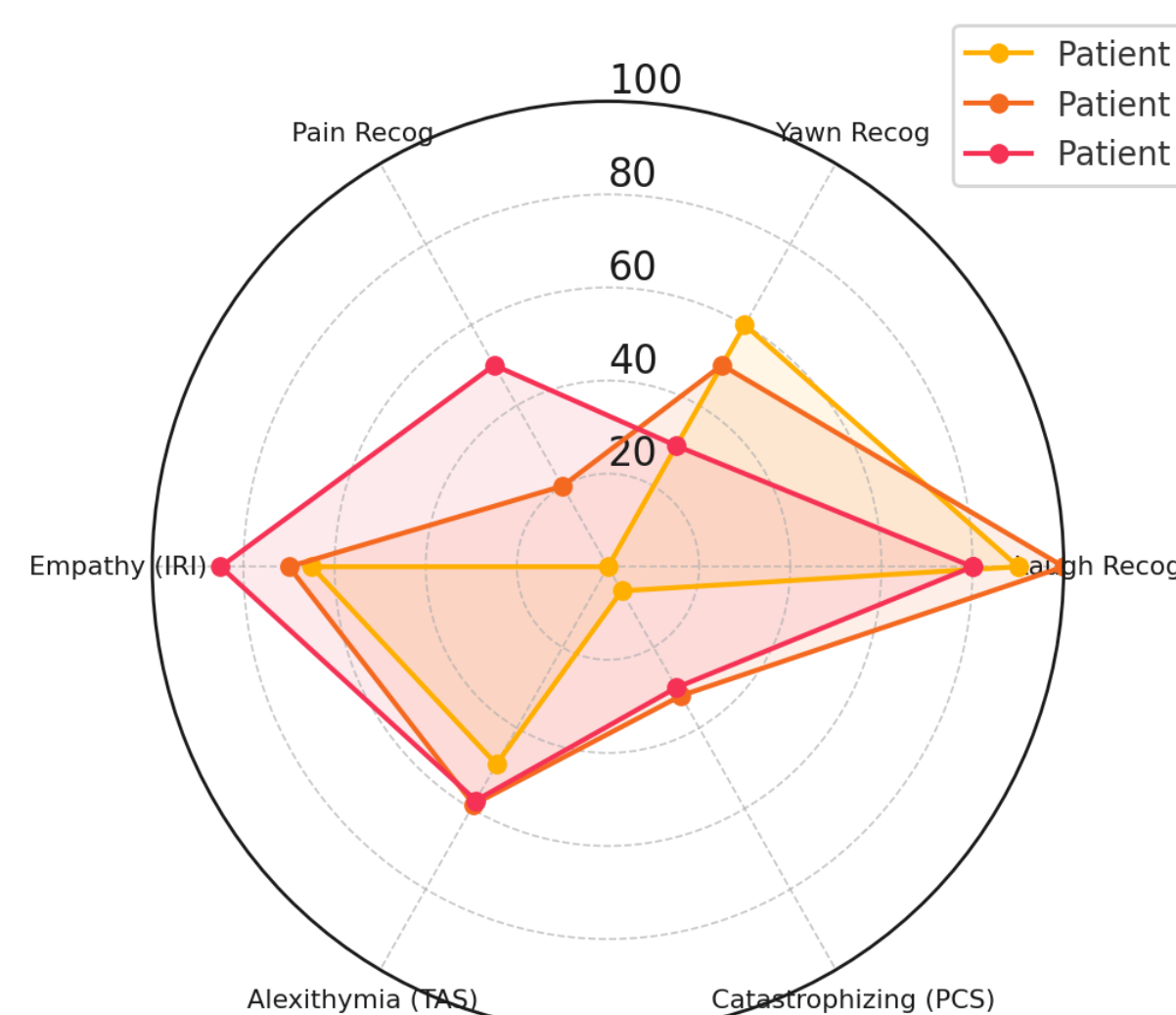


Figure 1: laughter is highly recognized and contagious, mirror pain is the minimum, yawning is intermediate. Familiarity slightly reduces laughter recognition and yawning contagion.

Figure 2: compares the three selected patients (STEPZ2, FEDPZ3, ALIPZ5) All show strong laughter resonance but impaired responses to yawning and mirror pain. High empathy does not guarantee empathic responses for pain.

Psychometric Traits and Performance of Selected TBI Patients



- ❖ TBI patients show **stronger resonance for positive emotions**.
- ❖ **Laughter:** most recognizable, eliciting reactions across all conditions; **Yawning:** moderate recognition, occasional contagion. **Mirror pain:** least recognized, rarely triggered empathic responses.
- ❖ **Psychometric traits** (IRI, TAS, PCS) did not predict performance, injury-related factors seem more influential.
- ❖ Familiarity can **distort emotion recognition**, especially for yawning and pain.

CONCLUSIONS

- ❖ Our results suggest impaired **emotional integration**, most evident for **negatively valenced cues**.
- ❖ Patients may **recognize distress cognitively** but **fail to feel it** emotionally. This dissociation leads to **social misunderstandings**

OUTCOMES

- ❖ Affective resonance in traumatic brain injury is directed to positive emotions.
- ❖ Recognising this tendency can guide **rehabilitation strategies**.
- ❖ Doctors and healthcare professionals can use this information to promote the **patient's social reintegration** and, consequently, their **quality of life**.

PATIENT FOCUS

STEPZ2 (49-year-old female, severe motorcycle accident)

- ❖ **Injuries:** diffuse frontal-temporal contusions.
- ❖ **Profile:** moderate cognitive deficits, mood instability, borderline alexithymia (TAS=49), high empathy (IRI=65), low pain catastrophizing (PCS=6).
- ❖ **Emotion recognition:** recognized laughter well (self, strangers, familiar), often smiled along; occasionally confused yawns with laughter; never recognised reflected pain or responded empathically to it.
- ❖ **Pattern:** strong response to positive cues but blunted reaction to others' suffering.

FEDPZ3 (57-year-old male, severe motorcycle accident)

- ❖ **Injuries:** diffuse axonal injury, bilateral temporal lobe hemorrhages, fronto-parietal damage, ventricular enlargement.
- ❖ **Profile:** high alexithymia (TAS=59), high empathy (IRI=70), elevated pain catastrophizing (PCS=32).
- ❖ **Emotion recognition:** strongest for laughter, recognized across all conditions and often laughed along; moderate recognition of yawns, sometimes misidentified yawns/pain as laughter in familiar faces; rarely recognized mirror pain, especially in familiar faces.
- ❖ **Pattern:** emotional responses biased toward positivity; poor processing of negative distress.

ALIPZ5 (53-year-old female, severe TBI)

- ❖ **Injuries:** right fronto-temporal damage, hippocampal sclerosis, diffuse axonal injury, thalamic and limbic involvement.
- ❖ **Profile:** high alexithymia (TAS=58), extremely high empathy (IRI=85), high pain catastrophizing (PCS=30).
- ❖ **Emotion recognition:** recognized own yawns and mirror pain, but showed little emotional contagion; with unfamiliar faces: partial recognition of laughter and pain, poor recognition of yawns, emotional resonance mainly for laughter; with familiar faces: good recognition of laughter, some pain, emotional resonance still limited to laughter.
- ❖ **Pattern:** more cognitive/analytical approach, detached from complex and negative emotions.