Extended reality technologies for behavioral therapy and cognitive training for people with intellectual disability

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A Metaverse for the Good
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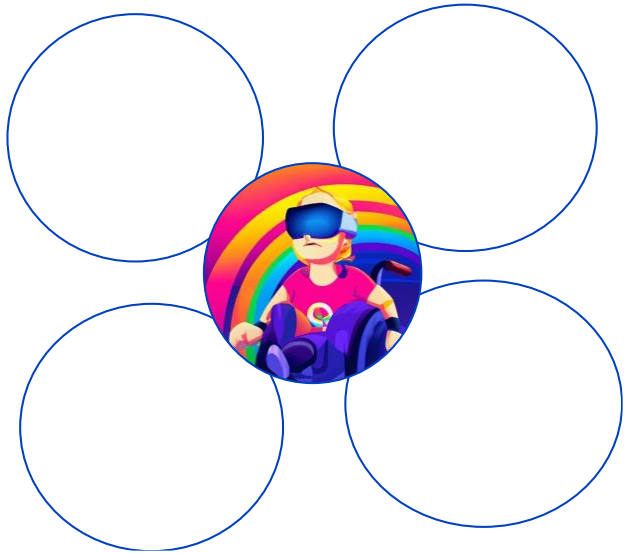
Incluverso 5G

- **Goal:** Designing, developing, and validating XR technologies for the inclusion of people in situations of psychosocial vulnerability
  - Immersive experiences that improve the **quality of life** of people with intellectual disabilities



- **Use Cases:**
  - Remote support for autonomy
  - Behavioural Therapy for mobility
  - Cognitive Training for job integration

Behavioural therapy

- XR can be effective in therapy → Try to solve a real problem…
- Co-design with professionals of the Fundación Juan XXIII:
  - One of the most common and limiting fears among users is **bathmofobia** (going up and down stairs)
  - This fear limits the mobility and independence of these individuals
    - Affects their quality of life, reducing their ability to participate in daily activities
  - Systematic desensitization is the classic technique to treat phobias
    - This technique often requires to **imagine** relaxing and anxious stimuli
  - People with ID have difficulties with imagination → XR can help to overcome those limitations!

Behavioural therapy

- **Our proposal**: To apply the classic technique of systematic desensitization combined with XR and the use of biosensors

Meta Quest 2 + stereo camera

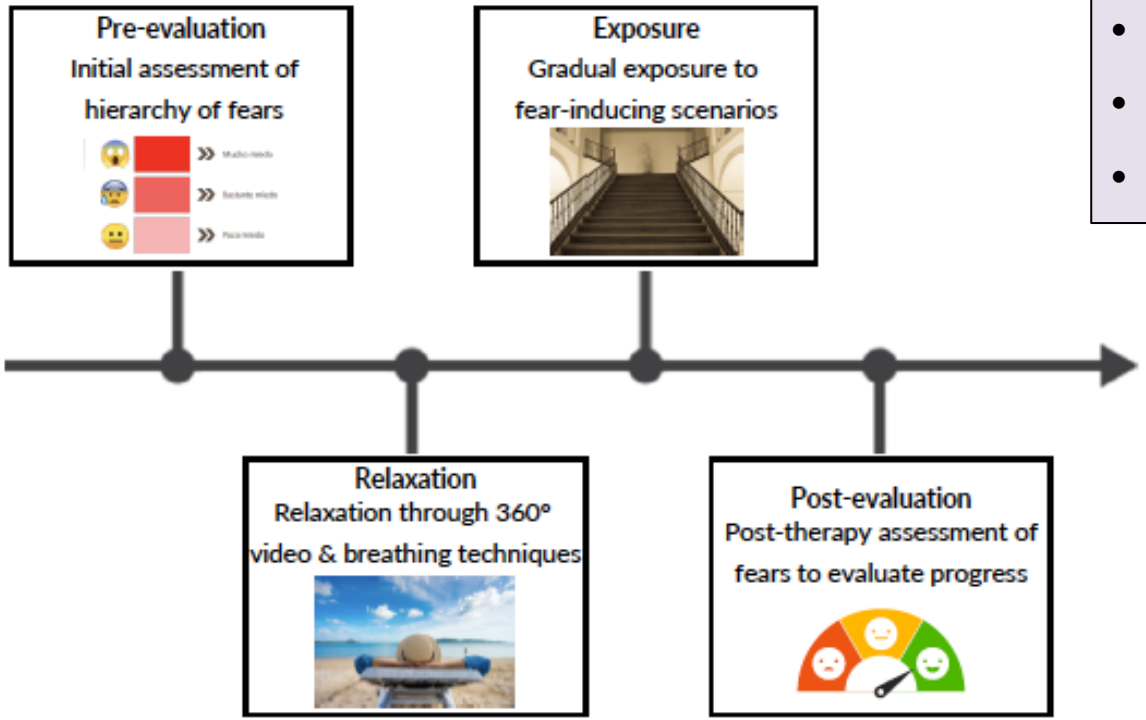
Empatica E4 Wristband

EMG sensors for muscular activity

- **Other benefits** (apart from realism)
  - Safe and controlled environment
  - User monitoring
  - Gradual and personalized exposure
  - Interaction and active learning

Behavioural therapy

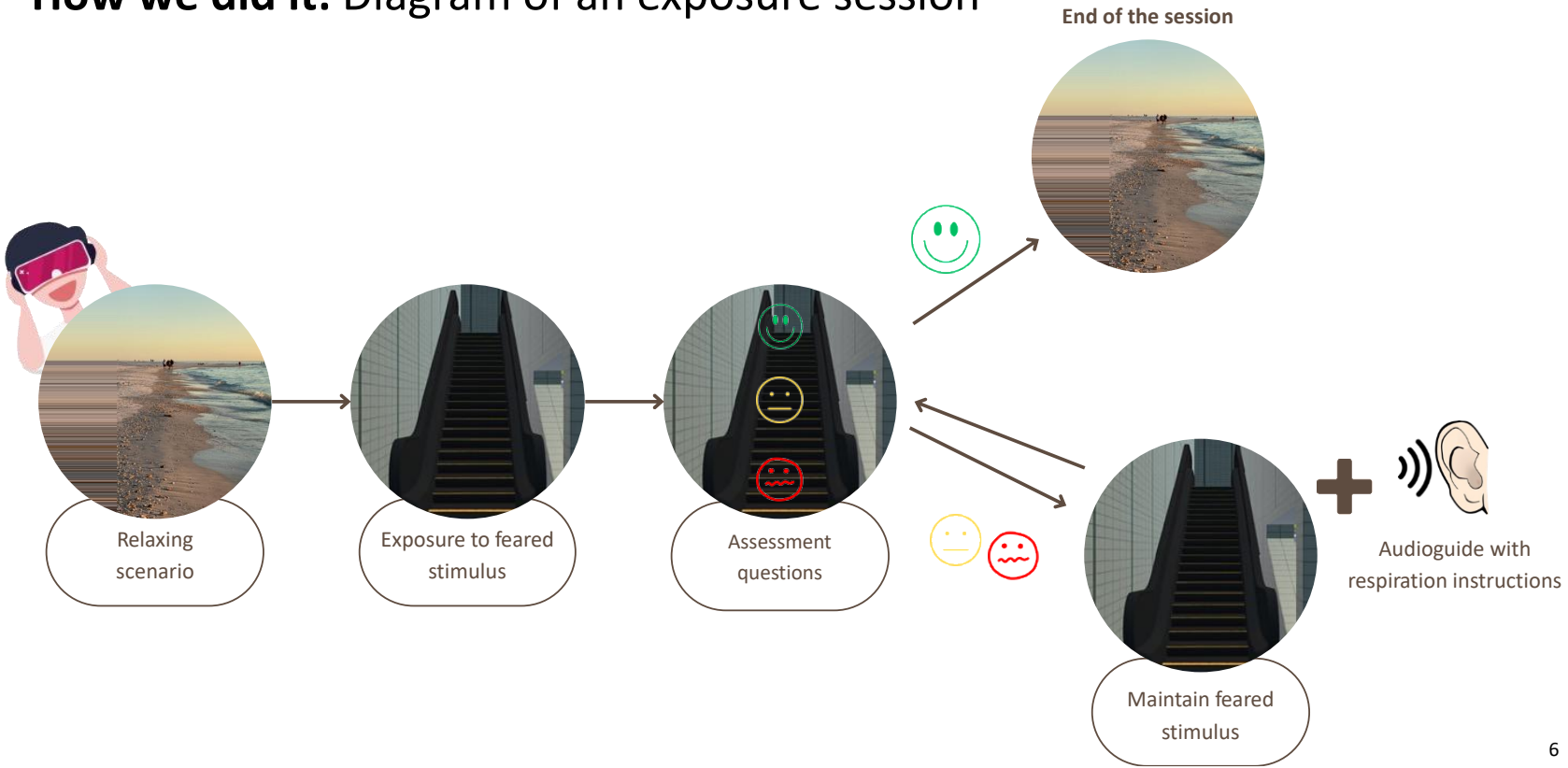
- **How we did it:** Overall procedure



- 9 participants
- 6 months
- 98 sessions

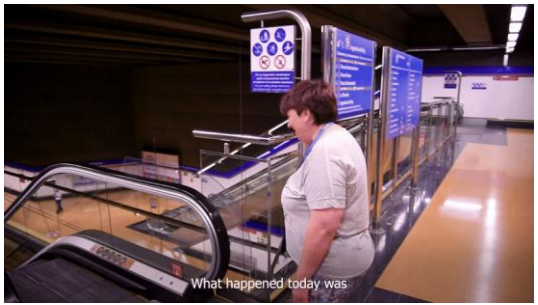
Behavioural therapy

- **How we did it:** Diagram of an exposure session



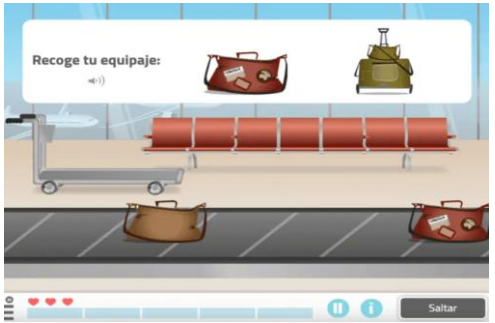
Behavioural therapy

- **What we achieved:**
  - All participants were able to **face the feared stimulus** in real life
  - Both they and their families reported being **very satisfied** with the experience
    - This process not only improved their **quality of life** but also facilitated their **inclusion** in the community
  - The use of the HMD proved to be a **motivating** element for the participants.
  - This study highlights the potential of XR technologies, proposing a non-invasive, adaptable, and accessible approach for people with ID



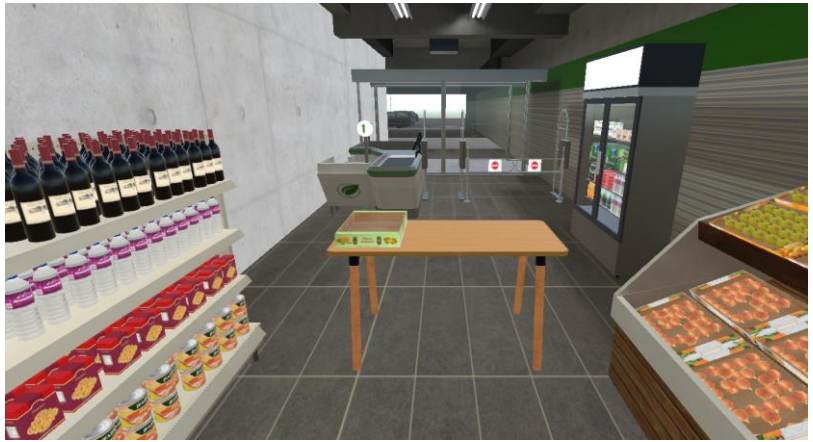
Cognitive training

- XR can also help in cognitive training
- Co-design with professionals of the Fundación Juan XXIII:
  - Occupational center socio-labor insertion area
  - Train attention and inhibition skills to ease job integration
  - Currently done with 2D games in a tablet
    - Problems to generalize to workplace environments
  - XR serious games on workplace scenarios:
    - Enhancing overall performance and efficiency in the workplace



Cognitive training

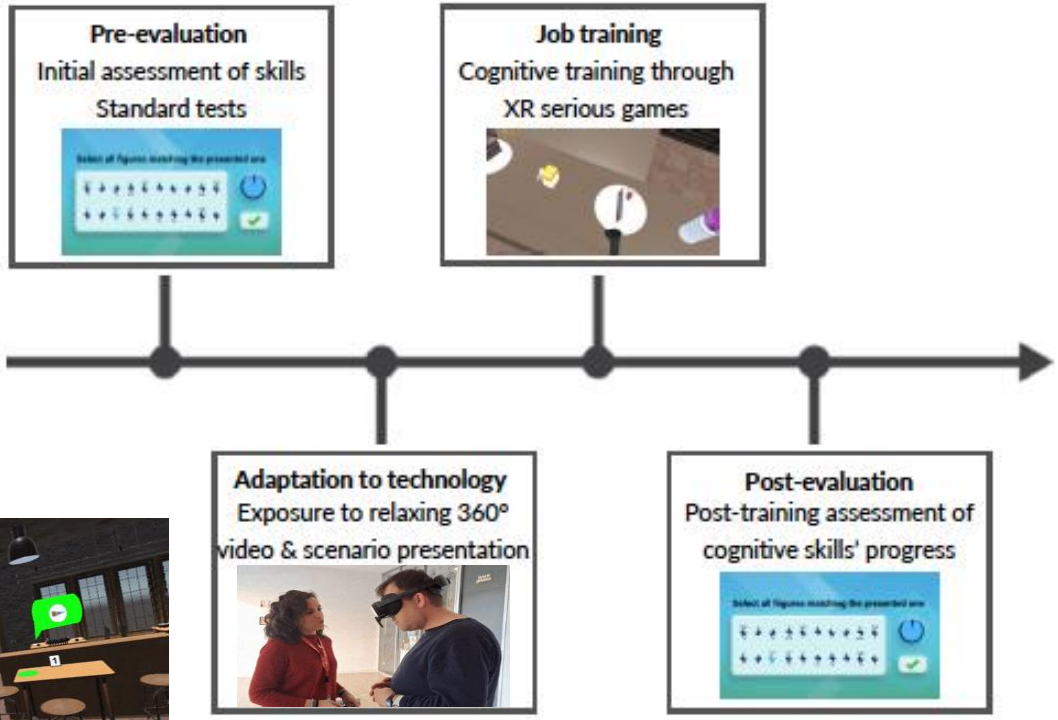
- **Our proposal**: To apply XR and biosensors to train attention and inhibition skills directly applicable in the workplace
  - XR scenes simulating real labour scenarios and requiring motor activity
  - Hypothesis: Improvement in training skills and easy application to real work scenarios



Cognitive training

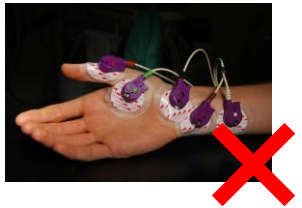
- **How we are doing it**:

  - 8 participants
  - 8 months
  - 2 scenarios:
    - Cafeteria and supermarket
    - 2 tasks and 6 levels



Cognitive training

- **How we are doing it**: Biosensors
  - Signals that provide information about the **emotional** and **cognitive** state of the users
    - Provide useful details about the user to the therapist
    - Provide information about the progress of the training
    - Able the development of semi-automatic training
  - **Non-invasive** biosensors
  - Collected physiological data:
    - Heart rate
    - Electro-dermal activity
    - Electromyography
    - Eye-tracking



Tool for therapy and training

- Two applications: user (HMD) and therapist (monitor)

Control area:
Control the session

Visualization area:
HMD view

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Thanks!

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