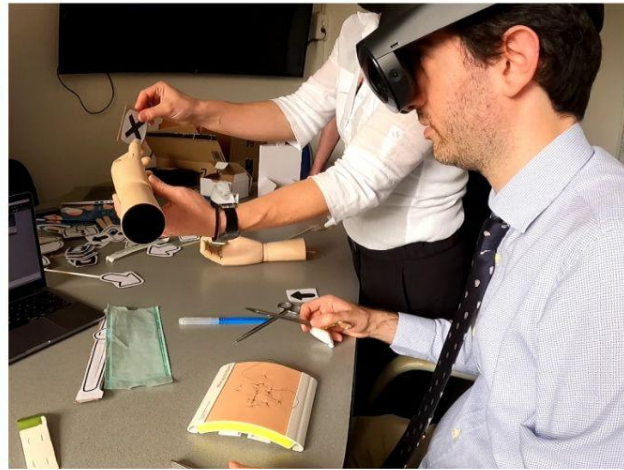
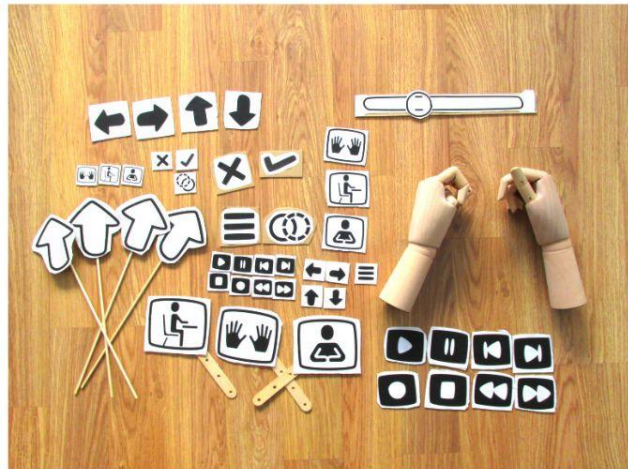


Embodied Hybrid Bodystorming to Design an XR Suture Training Experience

Elena Márquez Segura, José M. Vega-Cebrián,
Andrés A. Maldonado Morillo, Lara Cristóbal Velasco, Andrea Bellucci



Overview

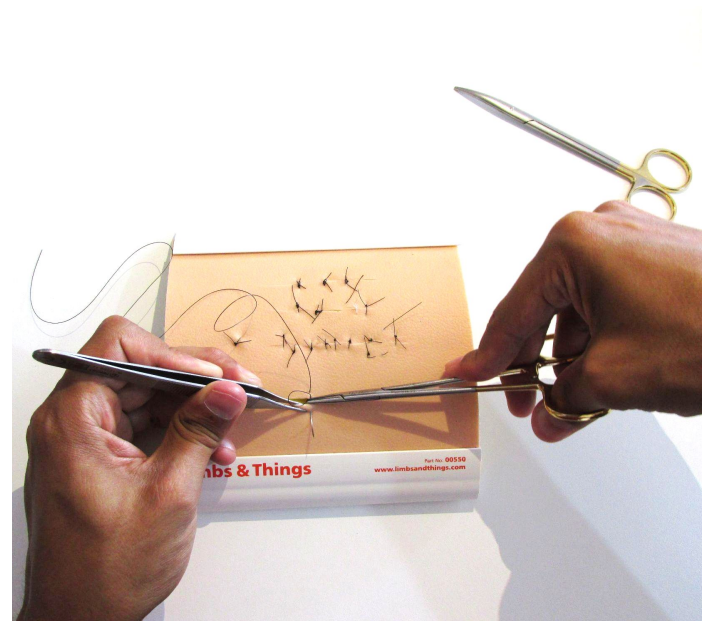
- **Suture training:** designing a XR experience for training **basic suturing** techniques.
- **Participatory embodied design** activities with experienced surgeons can help **open the design space** and arrive at meaningful design solutions.
- **Hybrid bodystorming** combining **physical props** with **XR headsets** with passthrough capabilities, supporting:
 - rich embodied explorations
 - understanding and articulation of key steps of suturing
 - uncovering essential design requirements and features
 - arriving at a design concept proposal



Background

Background

- **Experiential, hands-on learning in surgical training**
 - Acquiring surgical skills is an **embodied activity**.
 - Challenges of hands-on learning model: time, training resources, consistent feedback, personalized guidance.
- **Extended reality for surgical training**
 - Design drivers and rationale are not described.
 - Lack of **design knowledge** on how to integrate **spatially aligned instructional material** with the **haptic feedback** and **visual appearance** of specialized physical tools.



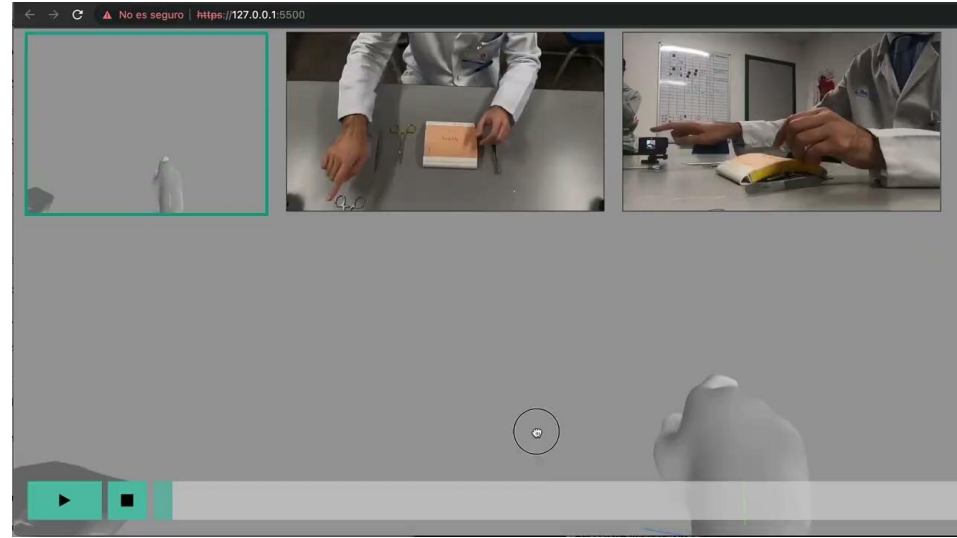
Background

- **Embodied Design Methods and Immersive Technologies**
 - Foregrounding the **bodily, sensorial, and first-person experience** of the stakeholders to elicit **early insights** for a design.
 - **Bodystorming** (Oulasvirta et al. 2003, Scheicher et al. 2010, Márquez Segura et al. 2016)
 - **Embodied Sketching** (Márquez Segura et al. 2016)
 - **Embodied Design Ideation** (Wilde et al. 2017)
 - **Embodied design methods in/for XR**

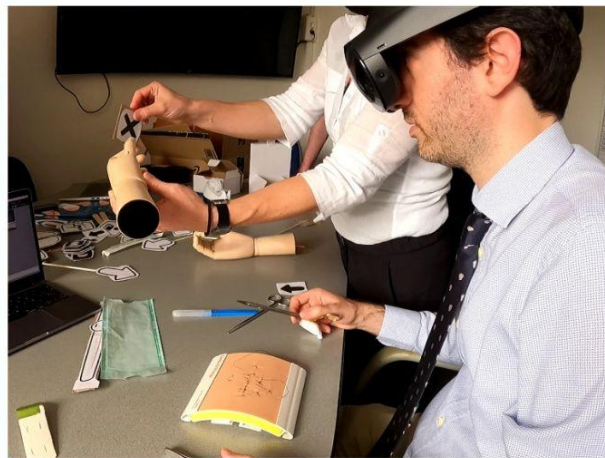
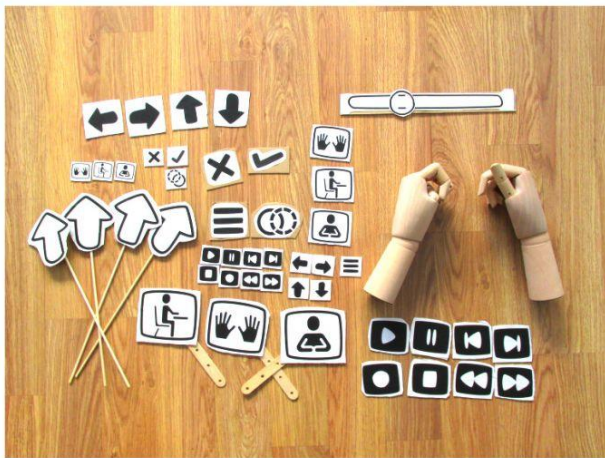
Methodology

Methodology

- Research through Design + Participatory Design
- Design Process:
 - Debriefs
 - Embodied Design Activity 1: Sensitizing and Data recording
 - Embodied Design Activity 2: Hybrid Bodystorming to ideate potential Design Concepts

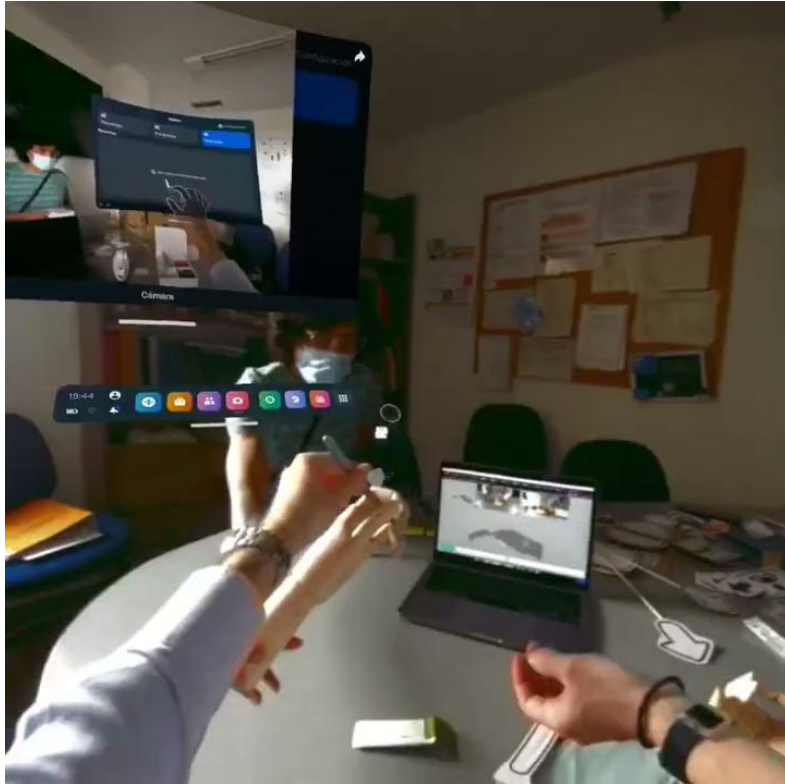


Hybrid Bodystorming: Materials



Bodystorming basket (Vega-Cebrián et al. 2023) + Meta Quest Pro
+ Surgical training equipment

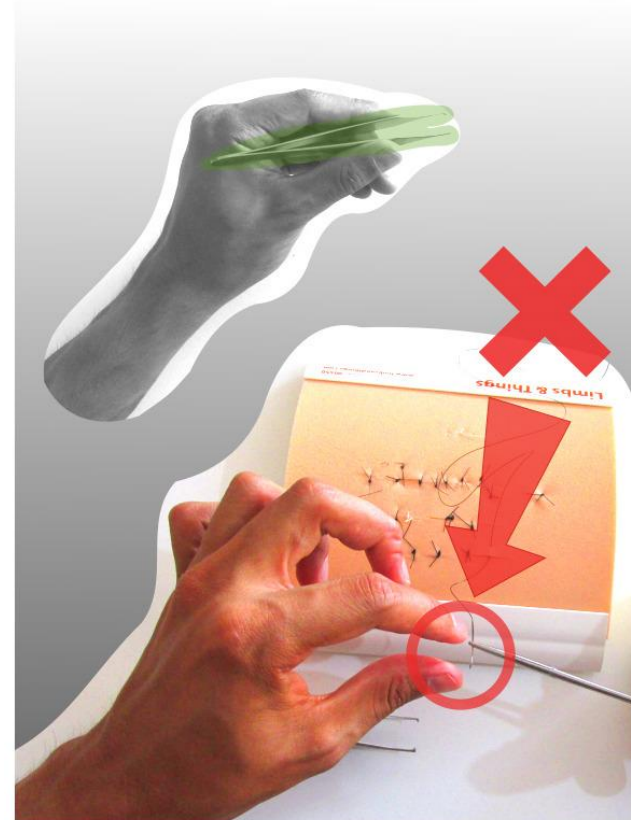
Hybrid Bodystorming: walkthrough, enactment, think aloud



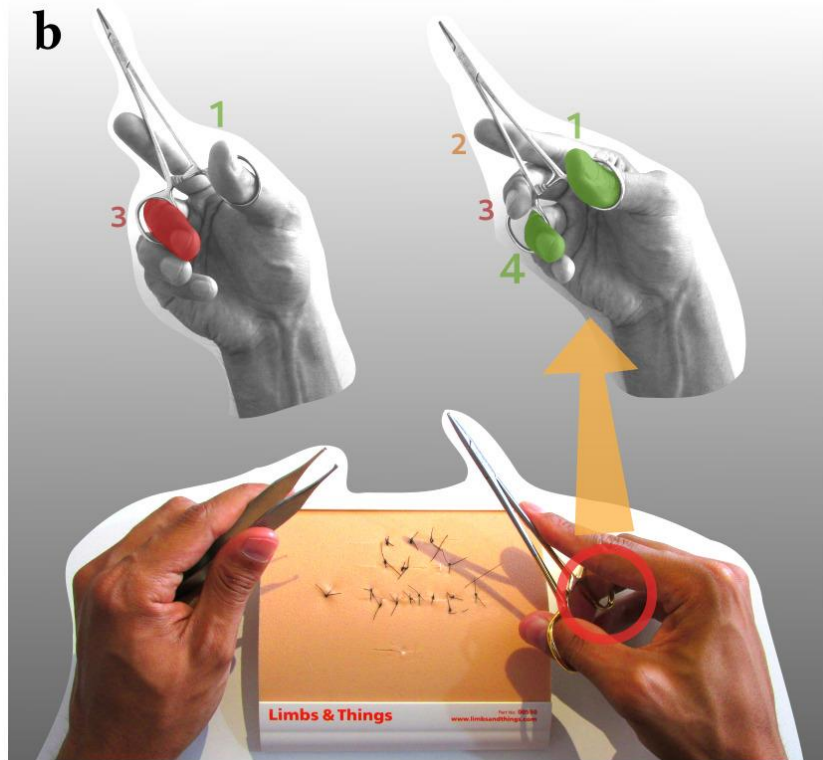
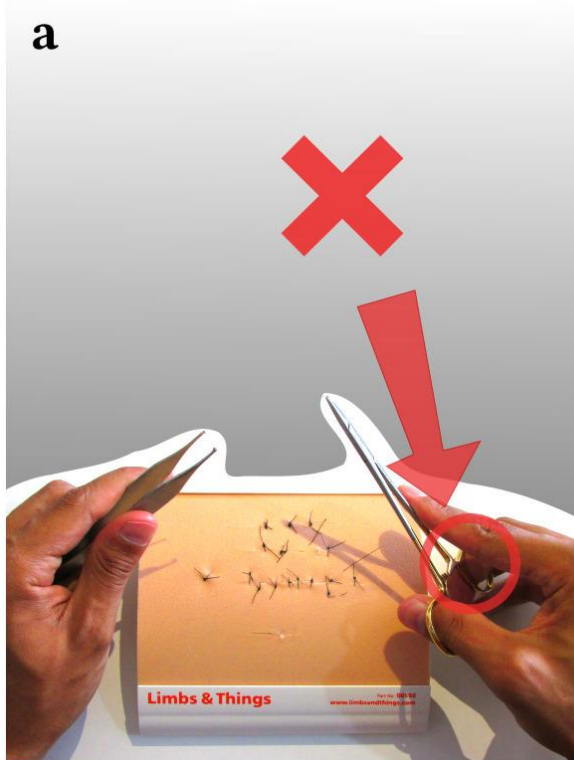
Outcomes

Outcomes: Phases and typical mistakes in suturing

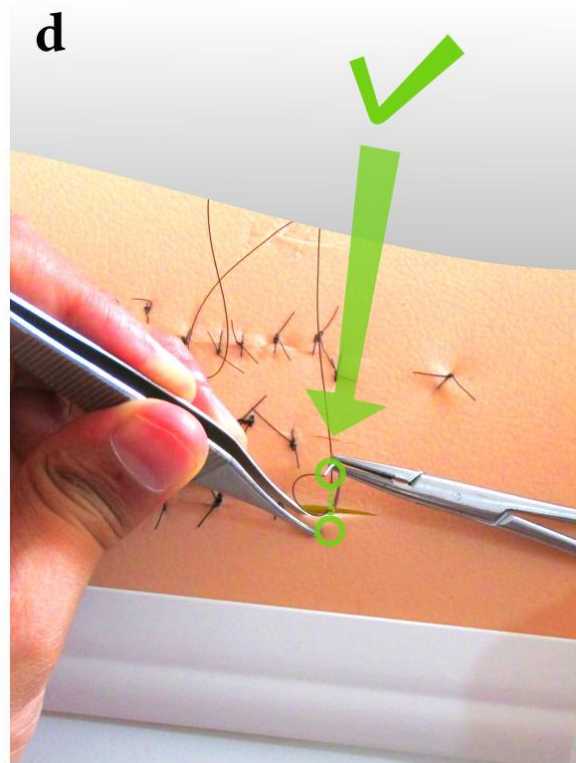
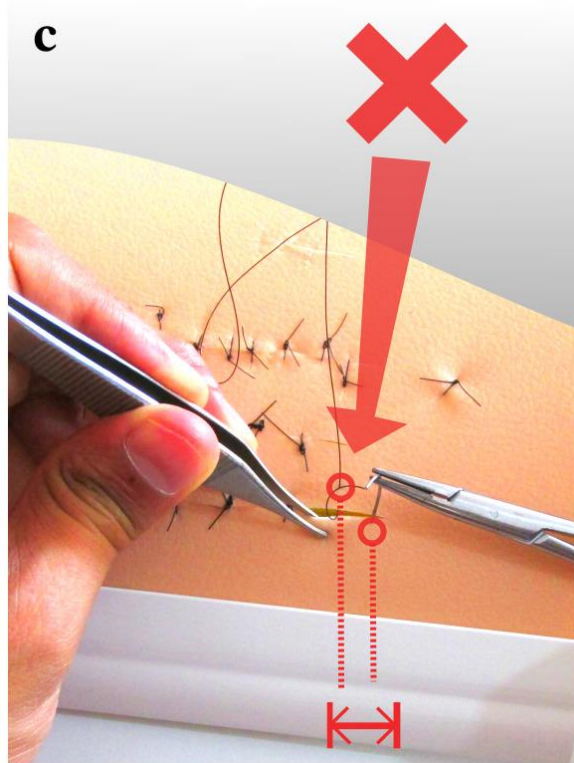
- Pedagogical perspective + Design perspective
- Phases
 - Preparing the materials
 - Stitch
 - Knot
 - Cutting the Knot
- Types of common mistakes
 - Handling of equipment or materials
 - Length, distance and position (of stitches, thread)
 - Count, type, mode of stitches
 - Approximate time
 - Sequence of actions



Outcomes: Design Requirements and Features



Outcomes: Design Requirements and Features



Concluding Remarks

Concluding Remarks

- Focus on understanding **needs from the lived experience of experts** prior to & during co-creation of design concepts.
- **Hybrid bodystorming:**
 - Rich and nuanced descriptions of suturing procedure and mistakes
 - Design solutions: derive and reflect on emerging patterns
- Project pivoted from VR to AR:
 - **Real-world haptic feedback is key** for surgical training
- Future technologies:
 - Automatic assessment of stitching
- Call for innovative **hybrid embodied design methods** to support meaningful XR experiences.

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