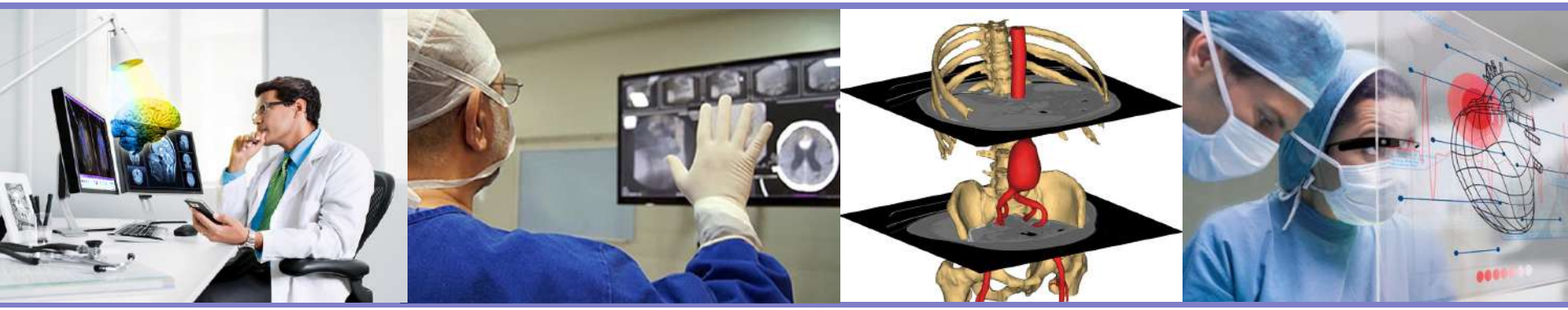
DEPARTMENT OF
ENGINEERING FOR INNOVATION
University of Salento

Augmented and Virtual Reality Laboratory
AVR Lab

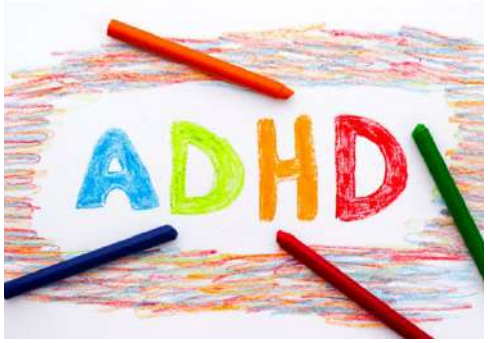


eXtended Reality Applications
BRAVO – Includiamoci - Neurofeedback

Lucio Tommaso De Paolis

Progetto BRAVO

BRAVO Project



(Beyond the tReatment of the Attention deficit hyperactiVity disOrder)

progettobravo.it

BRAVO Project

INATTENTION

HYPERACTIVITY

IMPULSIVITY

Contents

ADHD is a neurodevelopmental disorder that manifests itself through numerous symptoms (inattention, impulsivity and hyperactivity) and leads to learning and adaptation problems in different life contexts

Contents

The BRAVO project aims to create an immersive therapeutic game environment to enable the application of therapies in the form of a serious game through a gamification platform

Contents

Through the use of wearable sensors and virtual and augmented reality devices, personalised therapy processes can be implemented

ADHD - Problema

Patients tend to refuse standard treatments

ADHD - game-based approach

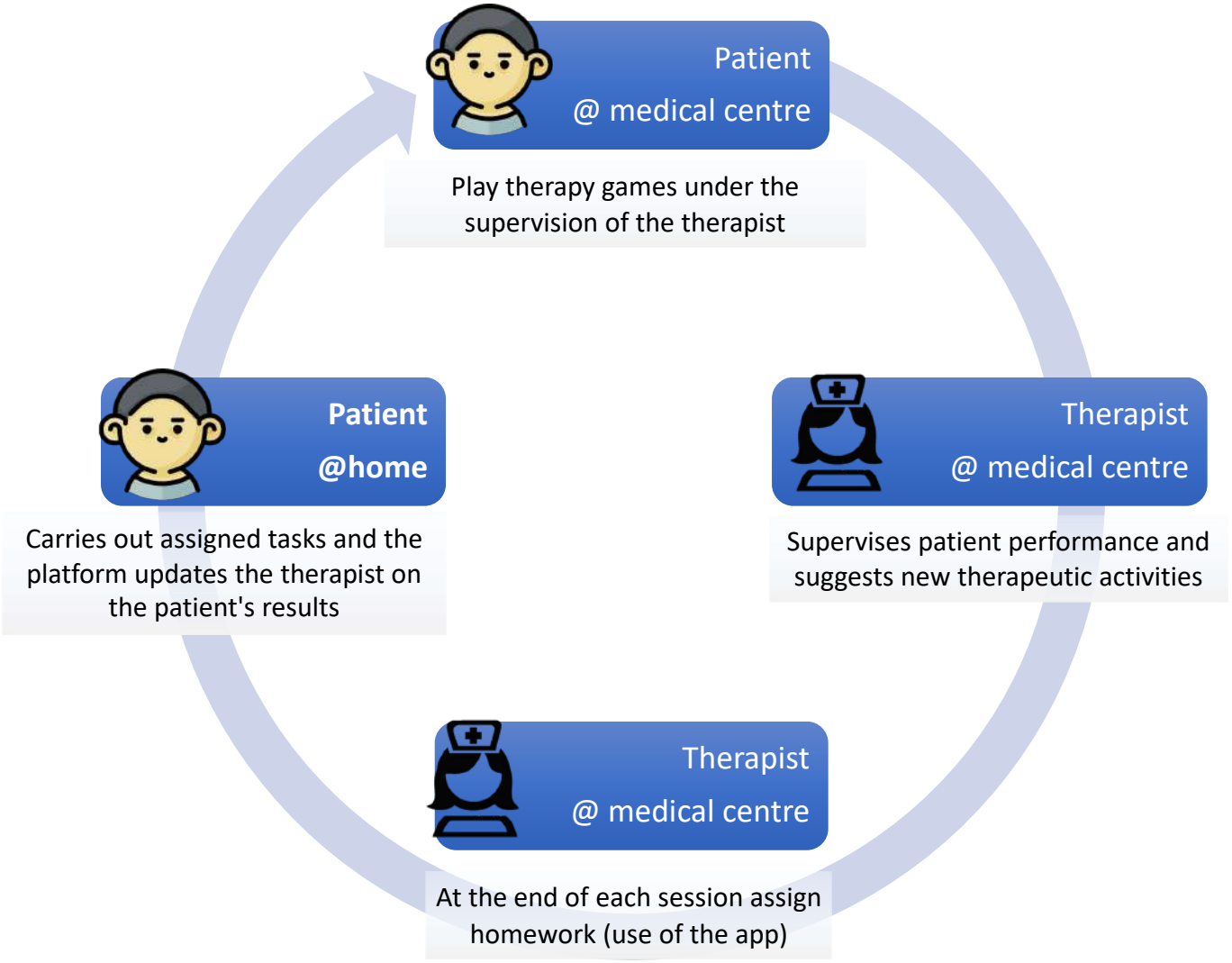
The game-based approach is considered an ideal tool for developing learning systems for children with ADHD:

- the play approach helps to balance the motivational aspect with the learning aspect
- videogames keep the child motivated and involved throughout the therapeutic process (paradigm of *learning by playing*)

serious game → capturing the user's attention → make treatment fun

Serious games have been implemented with well-defined therapeutic objectives in mind

ADHD - Approccio di BRAVO

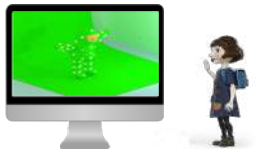


ADHD – BRAVO Project

- Facial recognition system
- Personalised avatar: virtual patient companion
- Therapy based on serious games
- Use of holograms (HoloBravo)
- Analysis of the emotional state (biofeedback analyzer)
- Evaluation of the BRAVO system through usability and effectiveness tests

Avatar

Virtual patient companion throughout the therapy



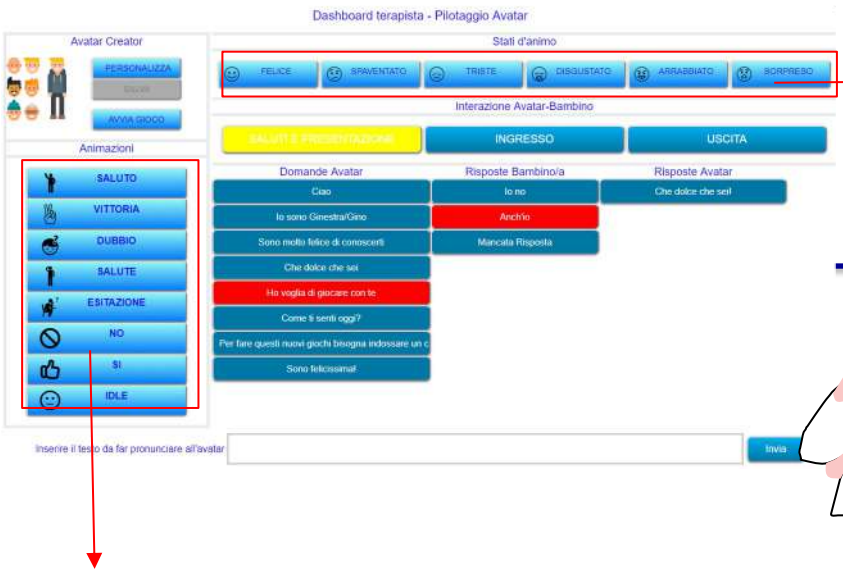
The child can customise the avatar (Gino or Ginestra) in two different styles: Disney and Manga

AIMS :

- to welcome the young patient
- introduce the child to the therapy session
- Establish a relationship of trust (the child finds his avatar as he had personalised it)
- the avatar is aware of the patient's therapeutic progress and is responsive during his or her interactions

Dashboard to control the avatar

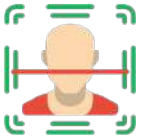
Predefined questions will be chosen in order to optimise the variety of dialogue between avatar and patient



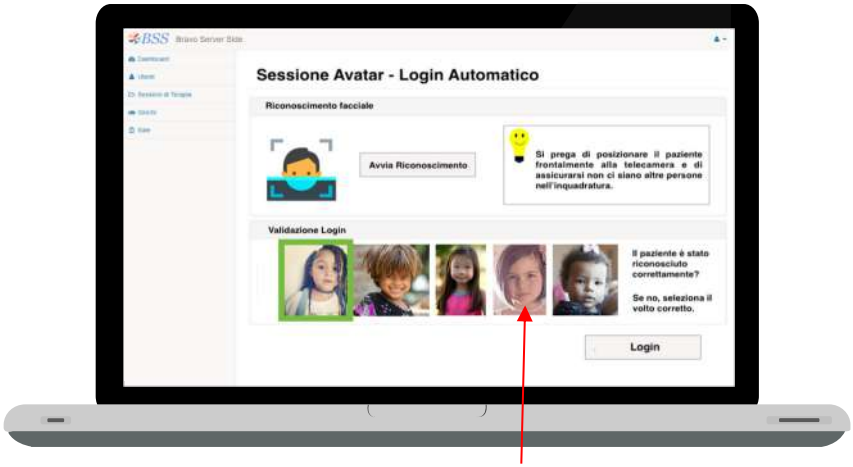
EMOTIONAL STATES

ANIMATIONS

Facial recognition and automatic login



facial recognition: every time the patient comes to the clinic, he/she is automatically recognised and authenticated within the system

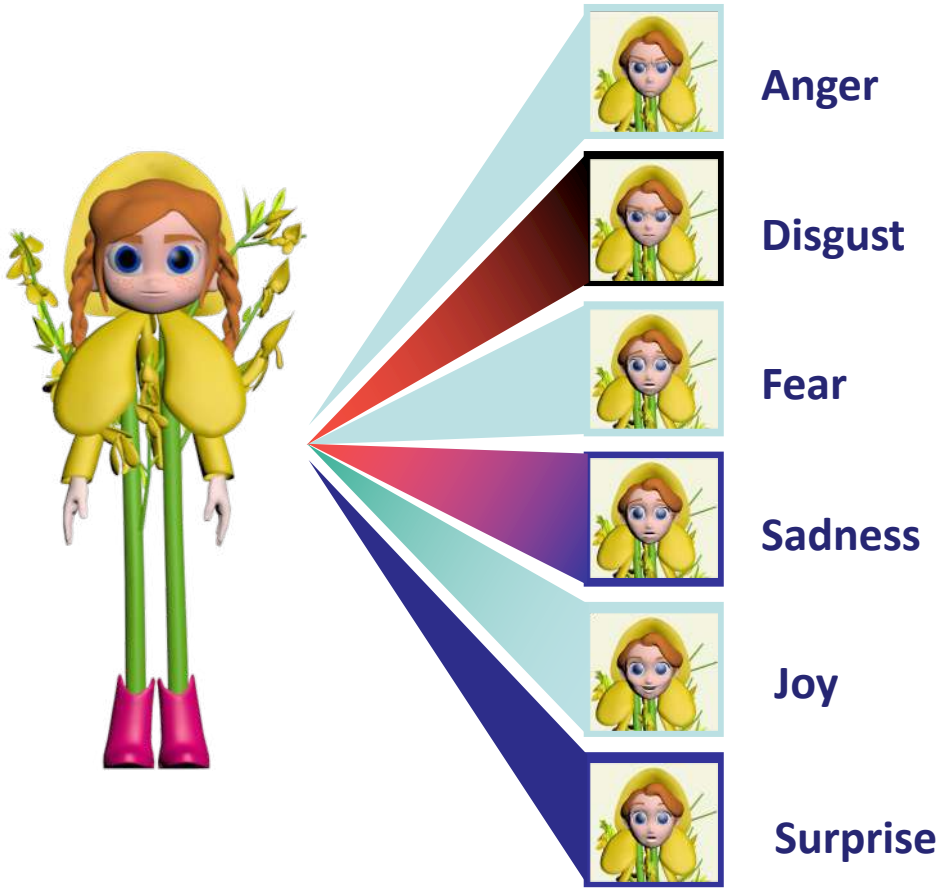


Enrolment phase: when the patient arrives at the centre, he/she will be welcomed by the therapist who, through the special section on the dashboard, starts the automatic login of the new face into the system

Avatar customizer

The aim is to develop emotional connections with the avatar, which can be personalised as desired

Non-verbal communication



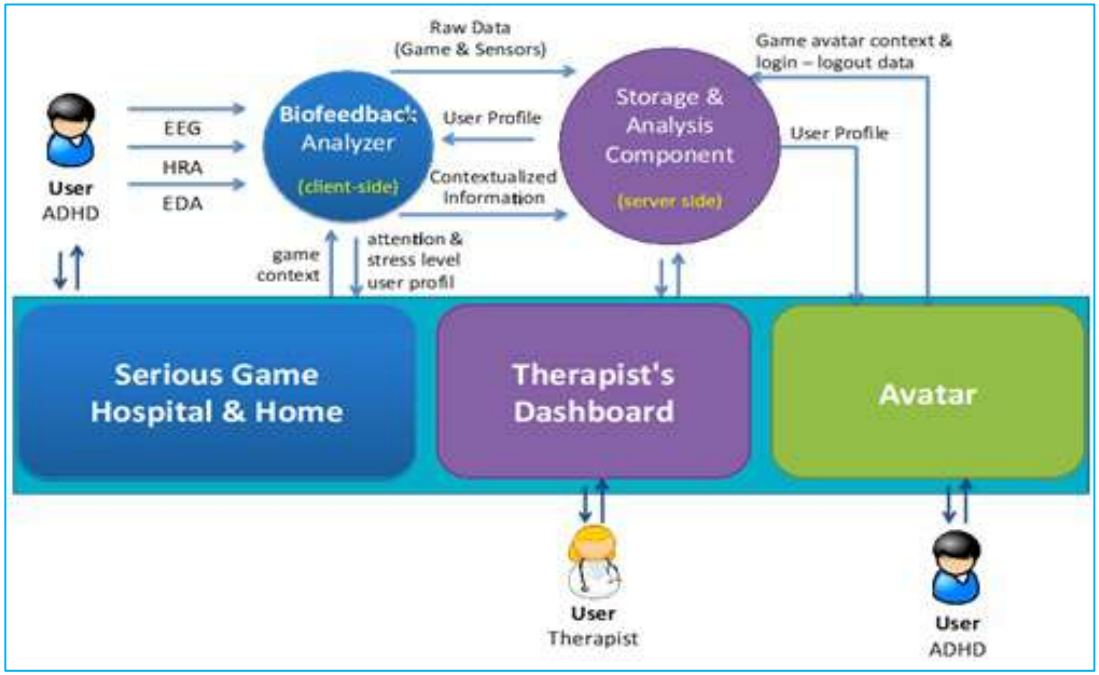
Biofeedback analyzer

The Bravo games are designed to fit the stress level of the child

Learning processes are optimized within a specific range of stress

Biofeedback analyzer

During therapy, various sensors and actuators detect and store the patient's emotional states and help adapt the game in real time



biofeedback analyzer → stress level in the game context → **game adapted accordingly**

Serious game – in clinica

TOPOLOGICAL CATEGORIES

HTC VIVE

- Topological category
- Memory Span
- Attention
- Concentration
- Planning
- Waiting Skill

INFINITE RUNNER

KINECT

- Semantic Categories
- Motory coordination
- Rules respect
- Waiting Skill
- Attention
- Concentration

PLANNING GAME

KINECT

- Planning
- Memory Span
- Attention
- Concentration
- Reflection on cause and effect

Serious game – at home

ASTRO MEMORY

SPACE TRIS

PLANNING

\+

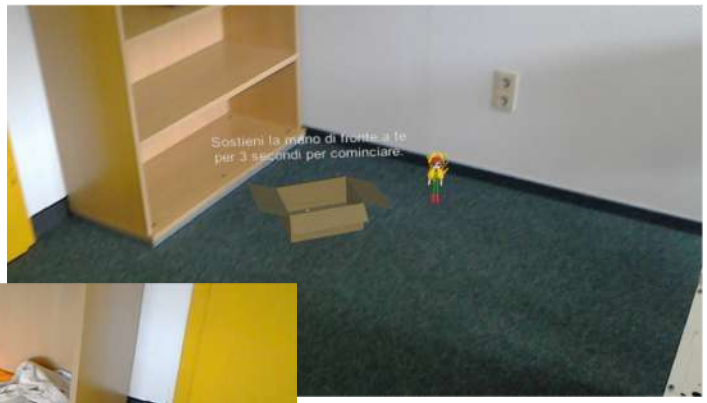
SMARTPHONE or TABLET

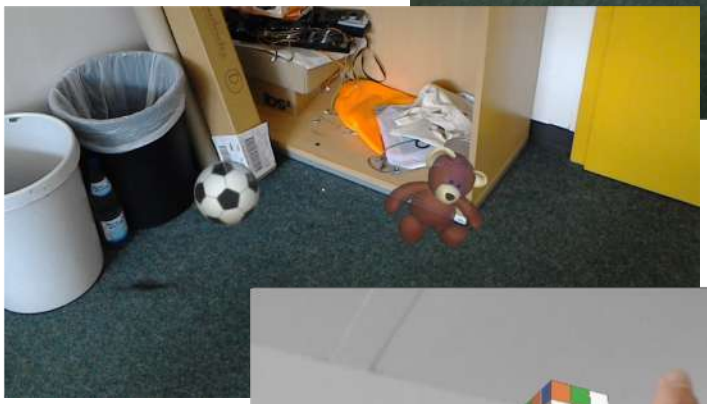
Serious game - exemples

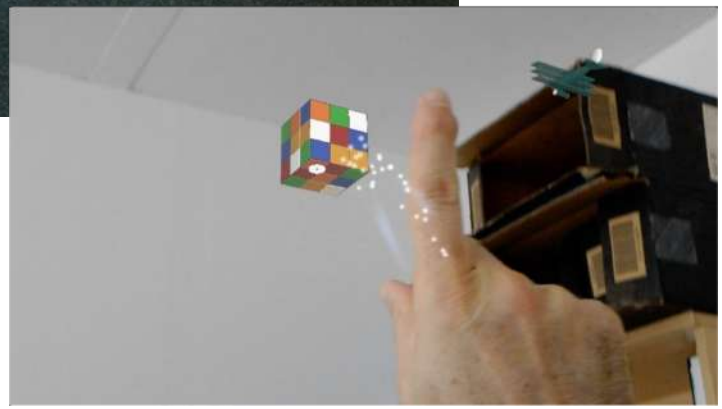
Serious game

The child must find the randomly distributed toys in the room and drag them into the box

HoloBRAVO

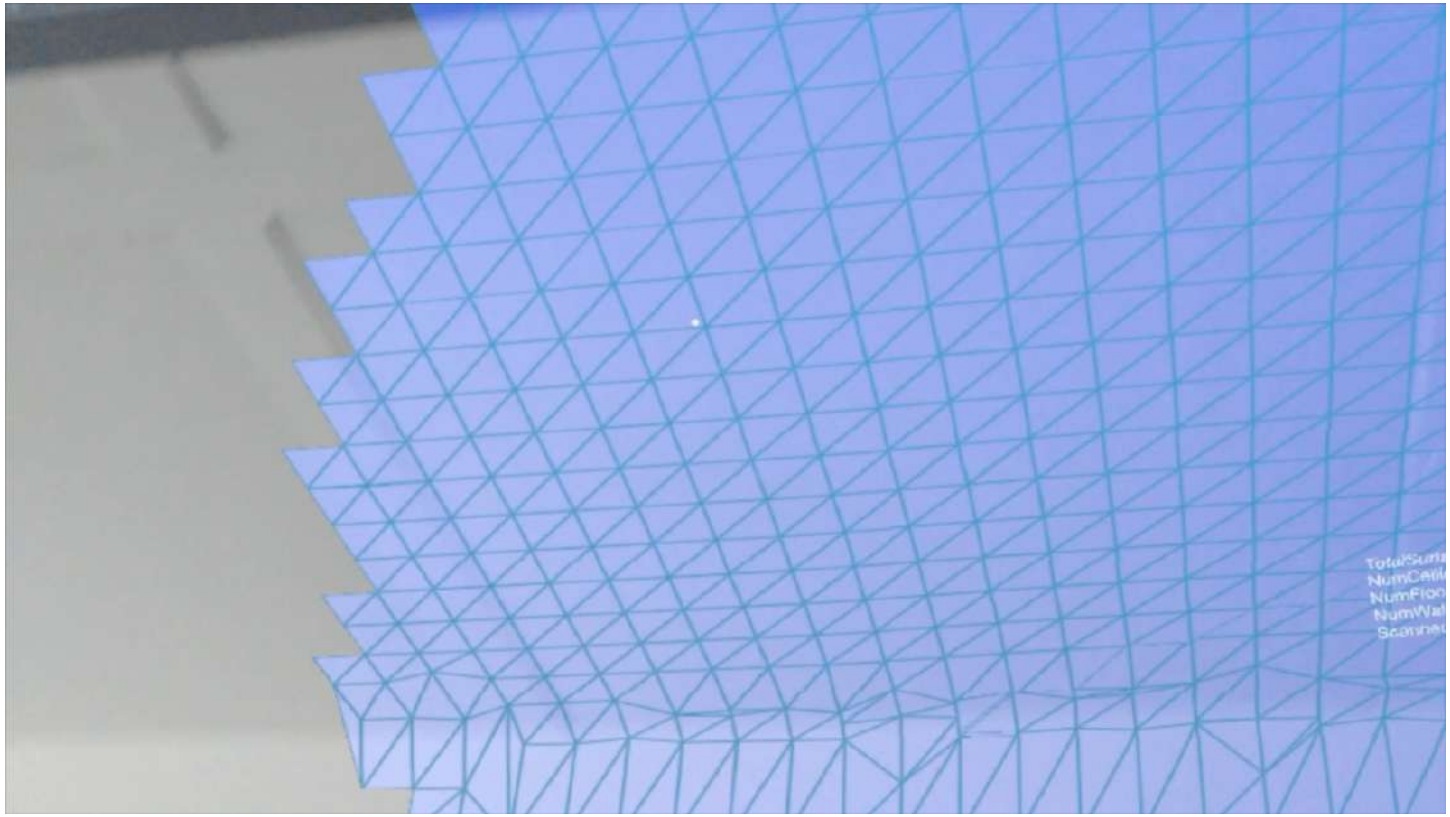






AVR Lab

HoloBRAVO



HoloBRAVO

Progetto INCLUDIAMOCI

INCLUDIAMOCI Project

Workshops of social inclusion

Design and set up interventions based on technologies in favor of adolescents and young people with disabilities in order to support the development of their own self-esteem that leads them to deal with everyday problems and to overcome forms of discrimination

INCLUDIAMOCI Project

- 21 participants between 18 – 50 years old
- 10 participants have completed the first phase of experimentation

- knowledge of the group and ice breaking
- introduction to AR and VR
- art and cultural heritage education
- art therapy (drawings and sculptures)
- development of the virtual museum
- creation of video mapping
- testing

INCLUDIAMOCI Project – Art therapy

INCLUDIAMOCI Project – VR session

INCLUDIAMOCI Project - Digital contents

INCLUDIAMOCI Project - Implementation

Virtual museum

Implementation of a virtual museum in which the subjects involved can navigate and enjoy their exhibited works, by means of a Virtual Reality headset

Video mapping

Theater performance is realized entirely by the working group, both in the performance part and in the realization of the virtual scenography through the use of Spatial Augmented Reality (SAR) techniques

INCLUDIAMOCI Project – Virtual museum

The virtual museum is composed by:

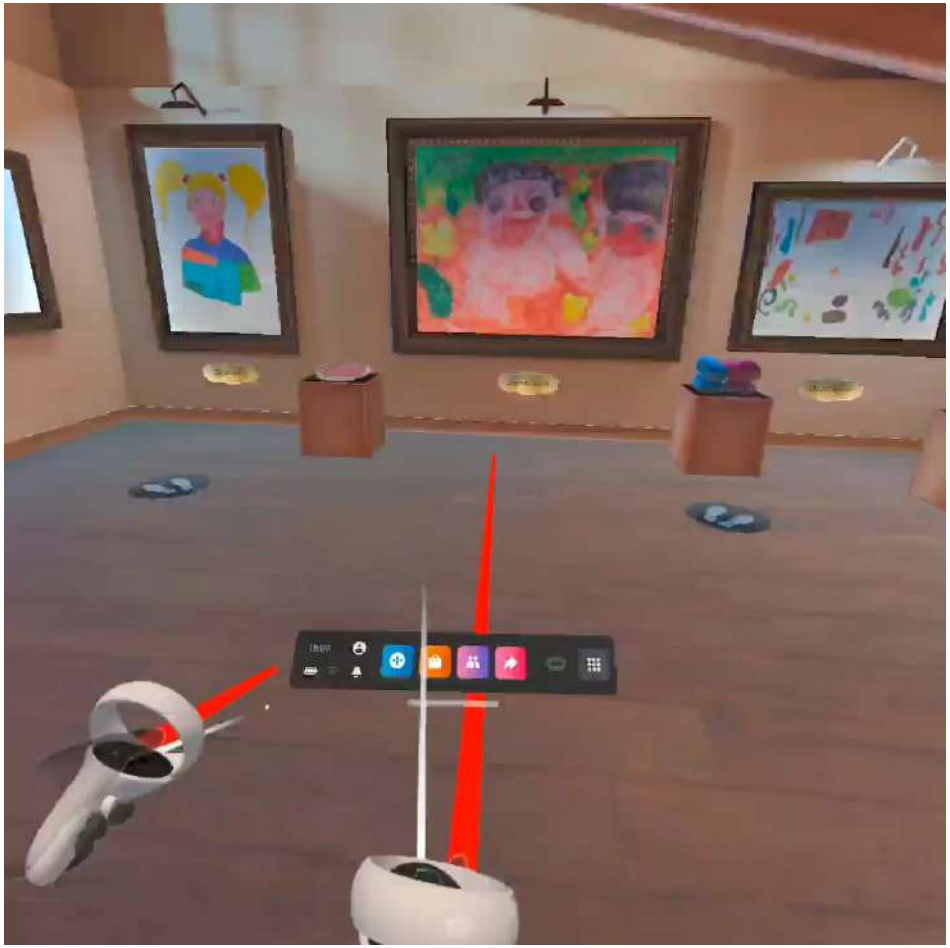
- four rooms
- the collection of sculptures and the drawings
- a cinema room for displaying a short movie

INCLUDIAMOCI Project - Virtual museum

Two walking system in virtual environment for user with special need:

- the anchor teleport system, which allows the user to move autonomously between the 12 points
- the aided system in which the user can only move consequentially from point 1 to point 12 without the possibility of choice by means a button

INCLUDIAMOCI Project



INCLUDIAMOCI Project – Video mapping

Virtual scenography

INCLUDIAMOCI Project - Tests

We provided two tests:

- well-being impact of the entire experience (UCL Museum Wellbeing Measures Toolkit (*))
- user experience (UX) of the VR application

(*) The UCL Museum Wellbeing Measures Toolkit is a set of measurement scales used to assess levels of well-being resulting from participation in museum and gallery activities that has been piloted in the UK

INCLUDIAMOCI Project - Tests

Generic Wellbeing Questionnaire
Short 6-item version

Please circle a number for each statement to indicate how much you agree with it.

1) I felt happy

None of the time	Not very often	Some of the time	Very often	All of the time
1	2	3	4	5

2) I felt engaged

None of the time	Not very often	Some of the time	Very often	All of the time
1	2	3	4	5

3) I felt comfortable

None of the time	Not very often	Some of the time	Very often	All of the time
1	2	3	4	5

4) I felt safe and secure

None of the time	Not very often	Some of the time	Very often	All of the time
1	2	3	4	5

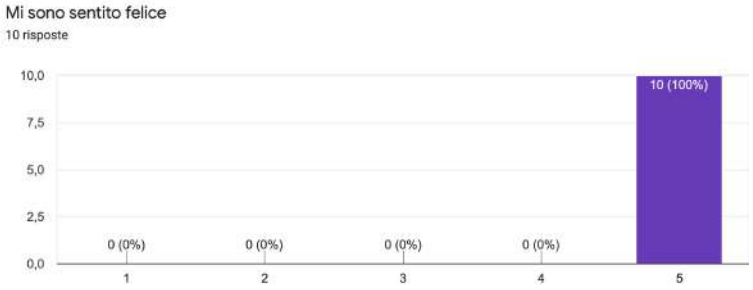
5) I enjoyed the company of other people

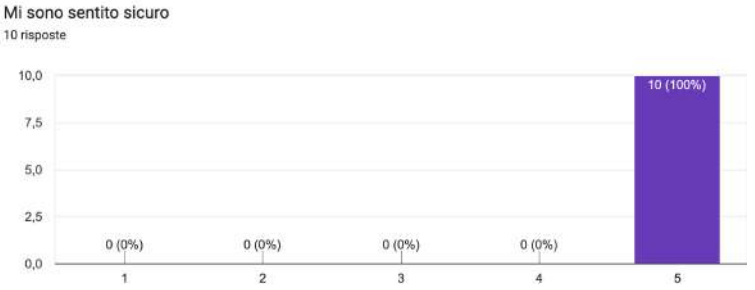
None of the time	Not very often	Some of the time	Very often	All of the time
1	2	3	4	5

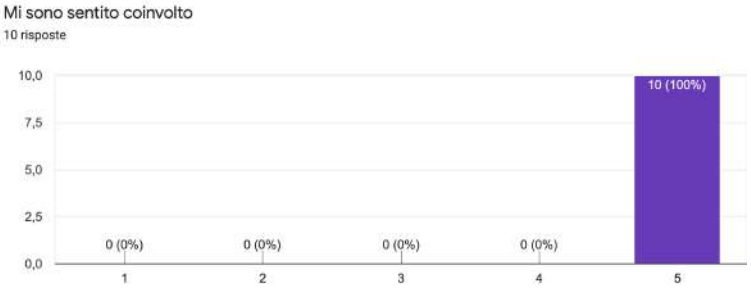
6) I talked to other people

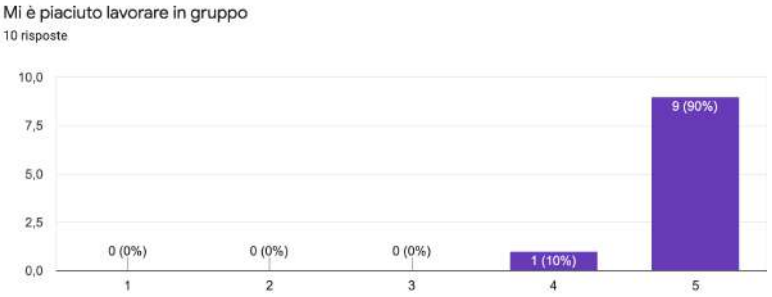
None of the time	Not very often	Some of the time	Very often	All of the time
1	2	3	4	5

INCLUDIAMOCI Project - Tests

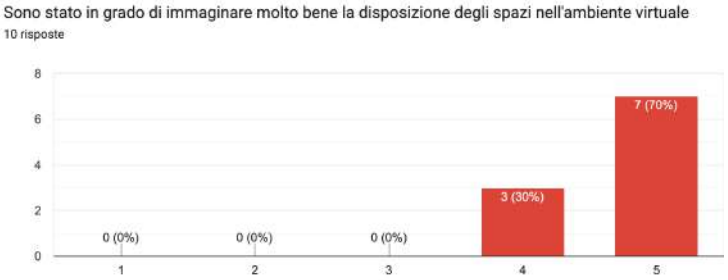


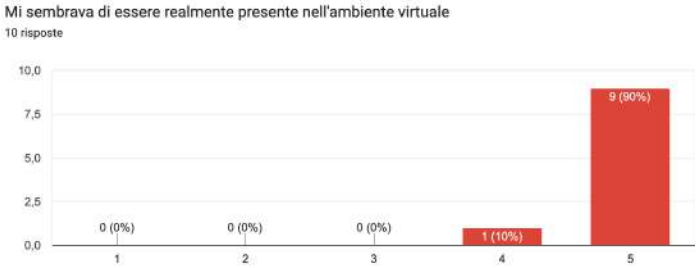


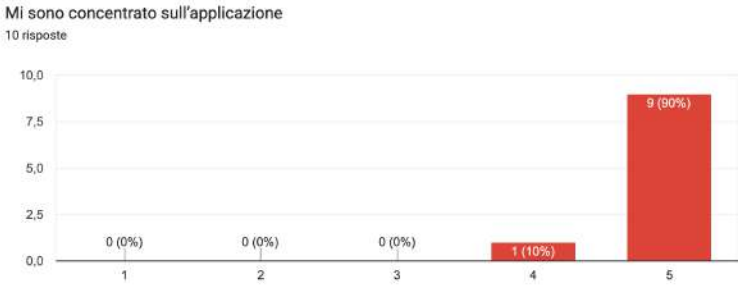




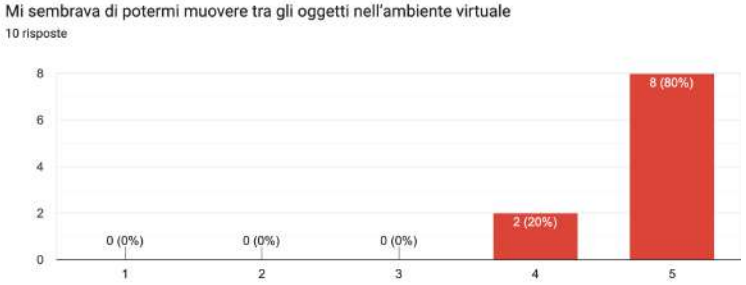
INCLUDIAMOCI Project - Tests

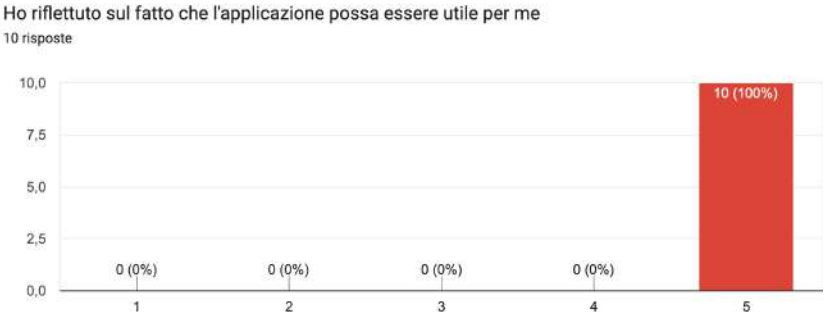


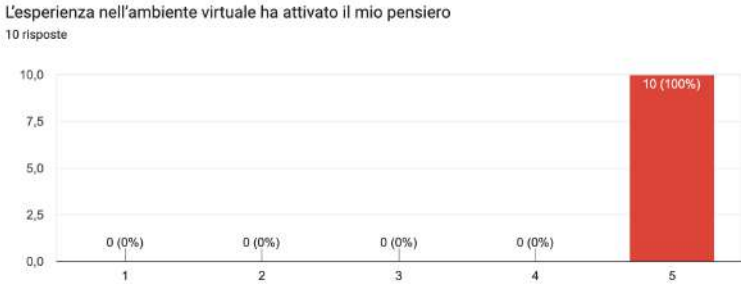




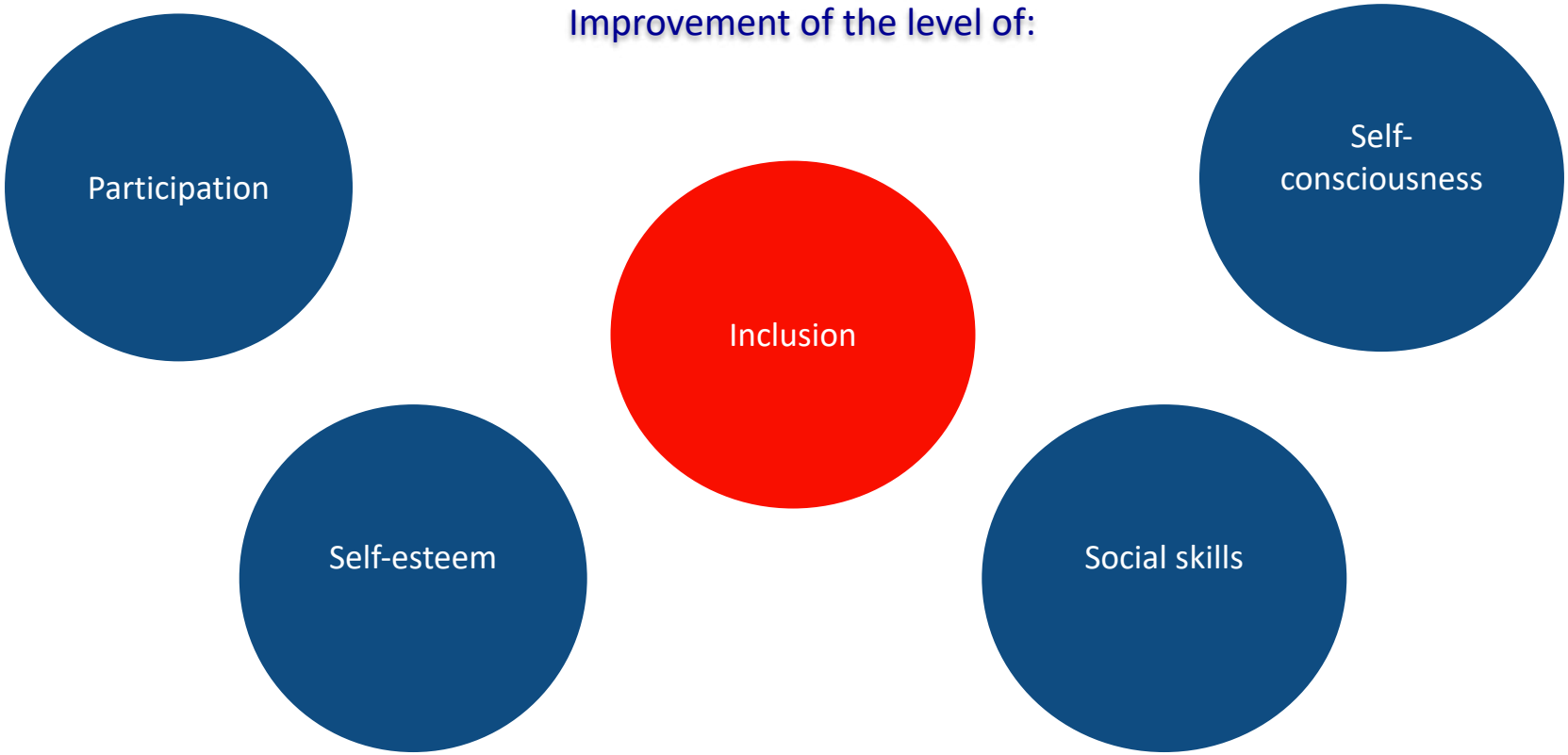
INCLUDIAMOCI Project - Tests







INCLUDIAMOCI Project



Mindfulness-based Emotional Acceptance in Combination with Neurofeedback for Improving Emotion Self-Regulation

Emotional Regulation

- **Emotional regulation (ER)** is the ability to recognise emotions and manage their intensity and duration

- Under dysfunctional conditions, emotions are experienced excessively, with levels of activation above or below the limits of the tolerance window

- Psychological diseases related to dysfunctional emotional regulation:

anxiety, depression, ADHD, addiction, borderline personality disorder, etc.

Emotional Regulation

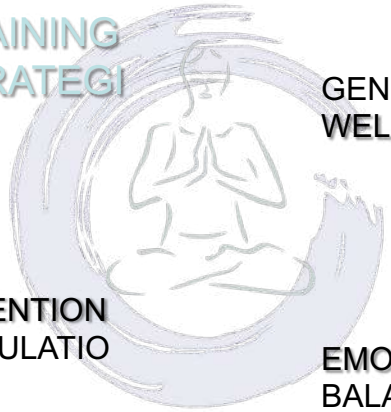
MINDFULNESS

CLINICAL INTERVENTIONS

- Stress-related problems
- Chronic pain
- Anxiety
- Addictions

→ MBSR

TRAINING STRATEGIES



GENERAL WELL-BEING

ATTENTION REGULATION

EMOTIONAL BALANCE

Regulation strategy:
EMOTIONAL ACCEPTANCE

Focus on the emotional response, experiencing the emotion without any attempt at control or suppression. Immersion in viewing images is complete, experiencing internally and expressing externally each emotion that arises.

Neurofeedback

- **Neurofeedback (NF)** is a special form of biofeedback that enables the brain to learn to regulate itself by changing the coherence, amplitude and frequency of its electroencephalographic patterns

- NF is effective in reducing the symptomatology associated with certain psychiatric illnesses and neurological disorders and in the self-regulation of emotional behaviour.

- NF is used to support the cognitive interventions in Emotion Regulation

Research Goals

- Comparing two neurofeedback conditions (in a within-subject design):

  a) cognitive reappraisal task

  b) emotional acceptance task

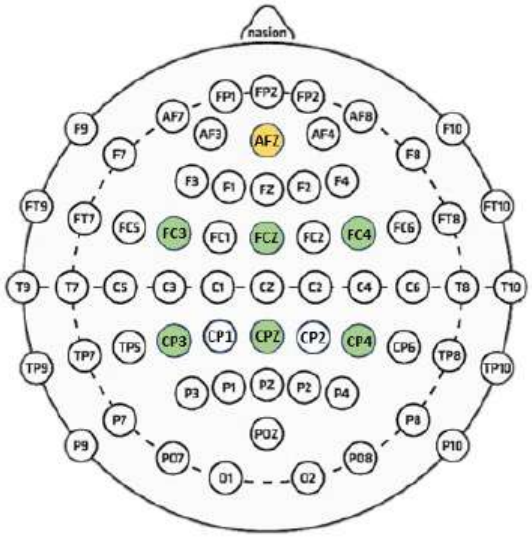
- Investigating Mindfulness-based Emotional Acceptance in Combination with Neurofeedback as an emotional regulation strategy

Proposal:

Hardware

A feasibility of Mindfulness-based emotional acceptance in combination with neurofeedback for improving emotion self-regulation is presented

EEG Acquisition System



EG

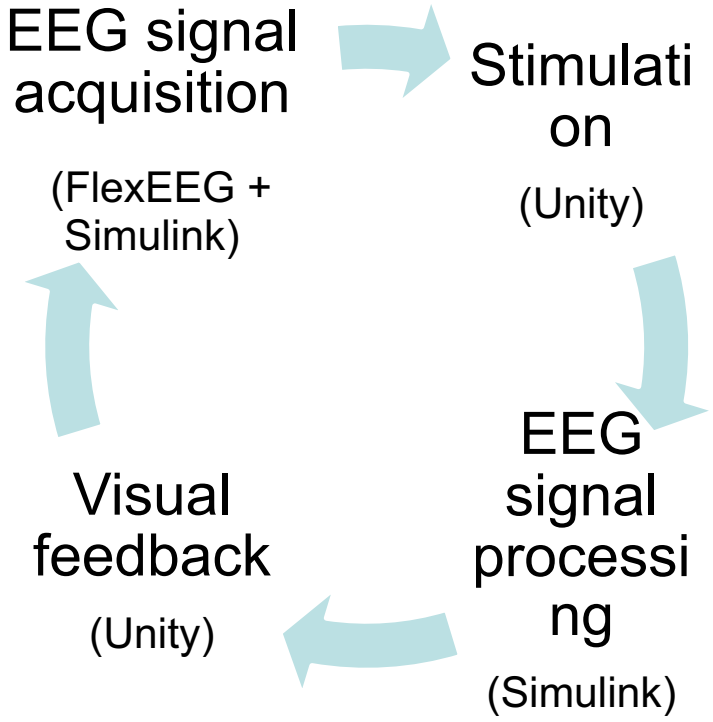
EEG ACQUISITION SYSTEM	Neuroconcise® FlexEEG
N° OF CHANNELS	3 (bipolar)
TYPE OF ELECTRODES	Wet
ELECTRODES POSITION	FCZ - CPZ, FC3 - CP3, FC4 - CP4 AFz Ground
SAMPLING RATE (SPS)	125
DATA TRANSMISSION	BLE
POWER SOURCE	Recharchable battery

Proposal: Neurofeedback System

2D Neurofeedback

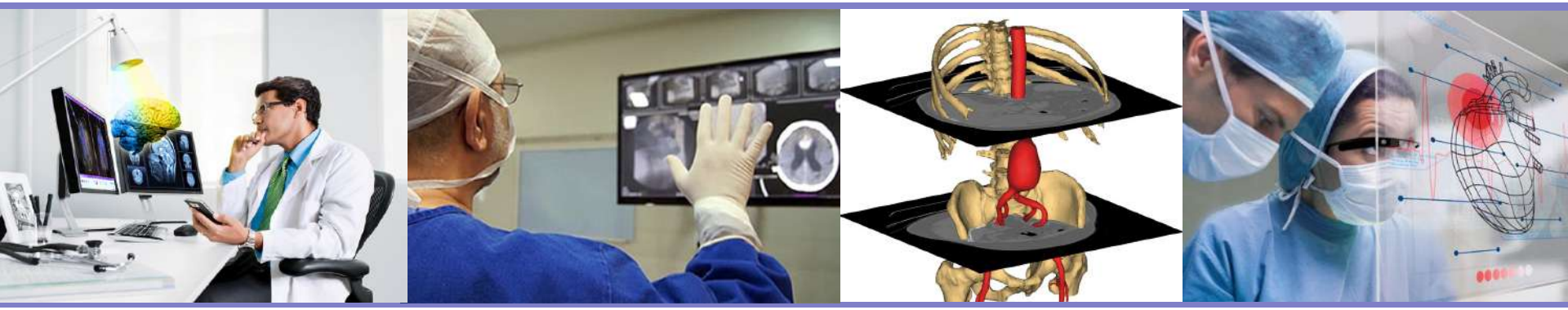
16”
LAPTOP

Proposal: Neurofeedback System



DEPARTMENT OF
ENGINEERING FOR INNOVATION
University of Salento

Augmented and Virtual Reality Laboratory
AVR Lab



Lucio Tommaso De Paolis

Augmented and Virtual Reality Laboratory (AVR Lab)

www.avrlab.it
lucio.depaolis@unisalento.it