

## **Welcome to Socrates**

Socrates is an innovative project for obesity treatment that proposes virtual reality (VR) to allow patients tackling three major root aspects related to the condition of obesity:

- recognition of their medical condition (self-awareness)
- self-stigmatization triggered by their condition
- decreased autonomy

Socrates distinguishes itself from conventional treatments of obesity that simply treat the symptoms of obesity without focusing on its root causes. Partly because of this, traditional treatments of obesity remain limited in their effectiveness.

Socrates combines VR embodiment and body-swapping techniques. VR embodiment provides a body ownership illusion that enables patients to experience a virtual avatar as being themselves. Body swapping is the ability to switch between two (or more) avatars while being immersed in a VR environment, still maintaining embodiment. Based on these techniques, Socrates will adapt the *conVRself* platform (developed by one of its partners: Virtual Body Works) to engage patients in a self-conversation where they switch between an avatar of themselves and an avatar of a counsellor of their choice. Priming education and specific training before each VR experience (based on cognitive behavioral therapy and motivational interviewing) will provide patients with the tools and knowledge to have an effective virtual self-conversation that will help them engage with a healthier lifestyle.

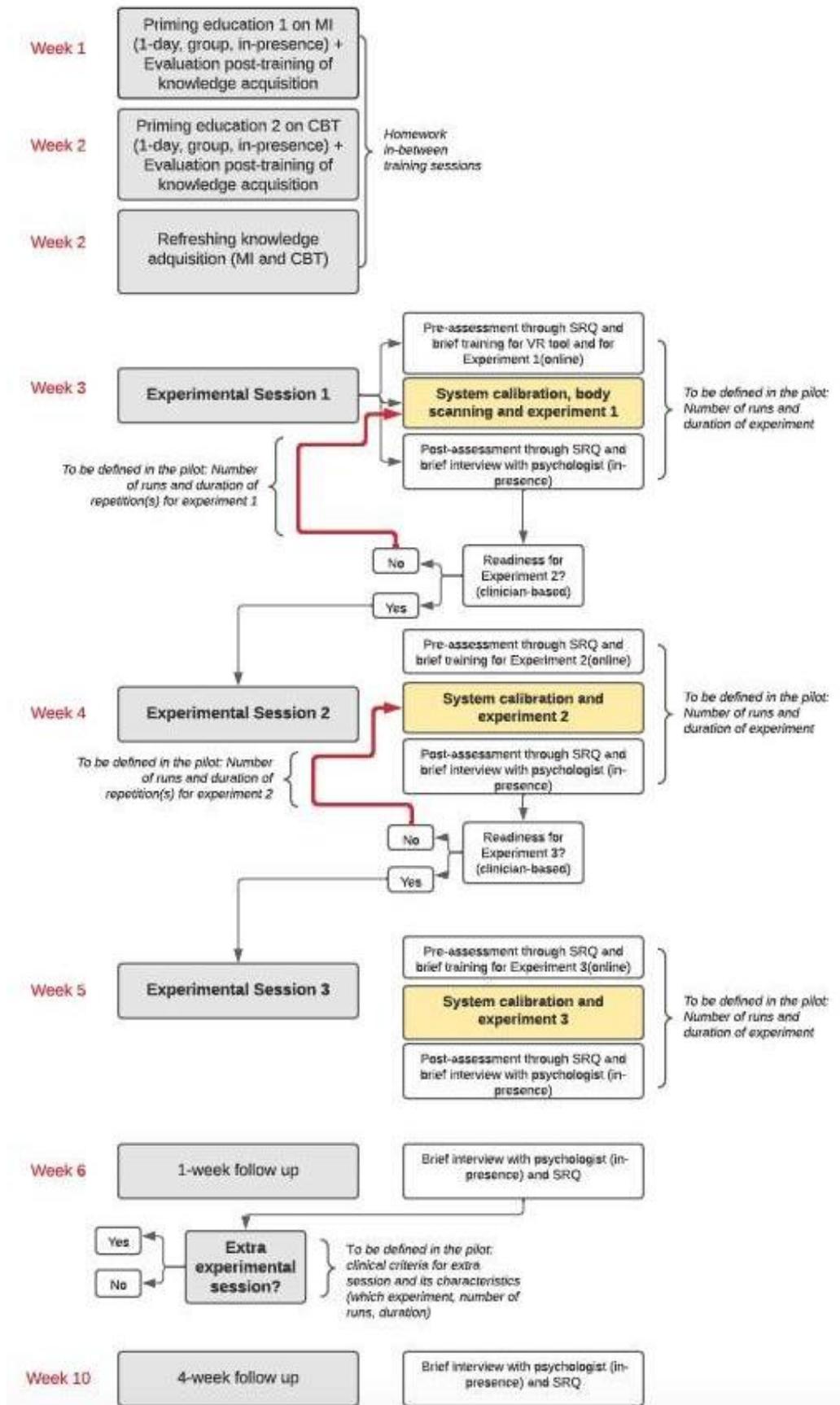
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### **In the Spotlight: Product specifications**

Socrates integrates novel technologies and clinical knowledge for effective treatment of obesity. Then, it implies a high level of interdisciplinary and intersectoral work. Socrates partners have developed the product specifications and elaborated the detailed procedure of the Socrates' training and VR experience for the treatment of obesity (Figure 1). In particular:

- Defining the settings, rules and guidelines that determine the interaction of avatars (i.e. patient own avatar and counsellor's one) during the self-conversation.
- Specifying the instruments to measure clinical change throughout the treatment, with a focus on both objective and self-reported outcomes.
- Determining the protocol for the randomized controlled clinical trial; including prior education and training, and experimental and follow up sessions (Figure 1).



**Figure 1.** Provisional procedure of Socrates´ proposed trainings and VR experience during the clinical study.

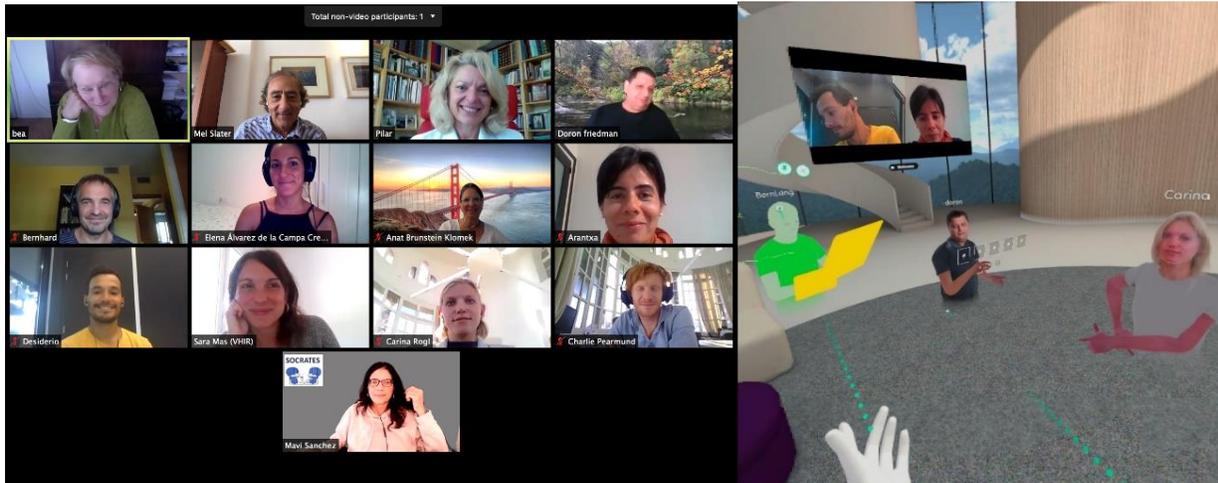
The product specifications feeds and integrates to the software development of digital avatars that will incorporate artificial intelligence, and to the adaptation of the conVRself platform that includes the scanning technology and the task-oriented design of the experimental sessions that will focus on the patients’ self-awareness, self-empathy and self-determination.

In parallel, Socrates partners are working to establish covid-proof, biosafety protocols that, in due time, will facilitate the actual development of the clinical trial.

## Progress and achievements

### Kick-off meeting

Socrates had an official, remote kick-off meeting on September 28 that included a Zoom videoconference and a break interaction virtual reality session through the spatial.io platform.



### Socrates website and social media channels

We have successfully created the Socrates webpage (<https://socratesvr.eu/>), and Socrates channels:

- YouTube specific channel at: <https://youtube.com/channel/UCmclKHUC52pUt0sqZuaCGaQ>

- Instagram page at: [https://www.instagram.com/socrates\\_vr](https://www.instagram.com/socrates_vr)

- Linked-in group at: <https://www.linkedin.com/groups/12473464/>

- Twitter feed at: <https://twitter.com/SocratesVr>

### Data management

Socrates already completed the ‘quality plan’ and ‘project handbook’, both data management deliverables finalized in 2020. Moreover, a dissemination and communication strategy has been established and shared among Socrates partners.

In addition, Socrates has secured an External Advisory Board (EAB) including key experts in eating disorders and clinical implementation of immersive VR technologies. The EAB makes part of a key strategy for the engagement of stakeholders. EAB members will sign a Non-Disclosure Agreement in order to protect confidential information. The EAB will be consulted via email and virtual meetings (like zoom) throughout the project to ensure that outputs remain relevant. Members of the EAB will also be invited to attend face-to-face meetings, as well as project workshops and seminars.

Finally, Socrates has completed an exhaustive Data Management Plan (DMP) that will be sent shortly to the European Commission. This DMP is essential to maintain the Socrates project ethically and legally responsible, and to preserve privacy and confidentiality, especially concerning personal data from participants.

### **News from the partners**

Virtual Body Works is currently dedicated to the development of avatars. In Socrates, the scanning technology and the apps for designing avatars will be key to promote embodiment and ownership illusion among persons with obesity participating in the clinical study. The technology will generate avatars with different shapes and sizes, as well as with younger and older look-alikes.

Additional features will be the ability to morph avatars gradually. Clinical considerations are in place during the avatar development stage. For instance, patients with obesity should not have an embodiment experience of self-avatar that looks underweight or very skinny. An integrated clinical team will determine the validity of avatars' final versions.

Led by IDC Herzliya, Socrates explores Generative Pre-trained Transformers (GPT) for defining the rules of virtual therapists (i.e. virtual agents, or virtual boards with prompts that might appear in the VR environment, for example, when there is a technical issue during the VR experience or when patients are unable to progress with their self-conversation). GPT are text generation models based on artificial intelligence (AI) that can acquire contextual knowledge and process long-range dependencies following pre-training. Socrates is currently working on pre-training contextual data, data fine-tuning, definition of specific model goals, animation and voice. To effectively carry out the above-mentioned tasks, IDC is working in close collaboration with Maastricht University and Vall d'Hebron Research Institute, through regular meetings. The healthcare professionals from both institutions provide them with suggestions and feedback on how AI pre-training should be carried out following available clinical evidence about effective psychological treatments for obesity.

Maastricht University and Vall d'Hebron Research Institute have recently completed all deliverables related to product definitions. Including guidelines for avatars' interaction, determining clinical outcomes for measure of significant clinical change during the obesity treatment, and a detailed protocol for the study design.

Researchers from Vall d'Hebron Research Institute and Maastricht University are currently acting as handling editors of a Special issue of *Frontiers in Psychology* focused on psychological treatments for the treatment of obesity, using VR.

Researchers from Vall d'Hebron Research Institute, after having presented the Socrates study to obesity experts and members of the Advisory Board, are currently working on the detailed definition of the research protocol in order to submit the protocol for approval to the ethical committee of their hospital and also to register the protocol on ClinicalTrials.

## Upcoming events

- [The International Society for Virtual Rehabilitation \(ISVR\) will host an ‘Online Seminar on Virtual Rehabilitation: Illusions of presence: Implications for Rehabilitation’.](#)

Prof. Mel Slater and Prof. Maria V. Sanchez-Vives, founders of virtual bodyworks and part of the Socrates team, are invited speakers. Hear from them directly about how the body ownership illusion and the virtual body are used to manipulate the perception of the real body, and its impact in pain management, behavioral change and clinical psychology.

- [EPA Virtual 2021: 29th European Congress of Psychiatry \(April 2021\):](#)

Dr. Pilar Lusilla Palacios and Dimitra Anastasiadou, from Vall d’Hebron Research Institute, will present an e-poster describing the protocol of the randomized controlled trial proposed by Socrates to test the preliminary effectiveness of the conVRself VR tool.

Consortium partners

# VIRTUAL BODYWORKS



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