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Aesthetics Meets Oncology: A Participatory Design Project to Speed Up Time Passage in Chemotherapy Through Virtual Reality*

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Abstract. Virtual images are often conceptualized as fascinating and powerful but also possibly harmful. In this article, we introduce the theoretical framework and the first operational steps of a research project, TIMELAPSE, which deploys virtual images in their *therapeutic* potential. TIMELAPSE aims at developing, testing, and launching a virtual reality (VR) application to speed up time passage perception during chemotherapy. TIMELAPSE adopts a strongly user-centered methodology, involving from its early stages the invaluable standpoint of the cancer patients. In this article, we present and discuss the results of the project's first participatory design lab with the patients. In addition to informing further stages of TIMELAPSE, these results provide more general suggestions concerning the therapeutic usage of images. Specifically, they underline the importance of visually appealing stimuli; they remark the need to assess carefully technological accessibility; and they suggest the relevance of using images as gateway to the domain of play.

Keywords. Time perception, immersive media, chemotherapy, participatory design, empirical aesthetics.

1. *Introduction*

In a cold police station, a run-down computer expert is trying to convince the detectives that the small creatures populating his favourite videogame are fully sentient and eager to transmit an important message to humanity. Exasperated, the detectives allow the man to draw a QR code, which he shows to the security camera. Through the camera, the videogame creatures infect the government's servers, and send out a signal that reprograms every human's brain.

Those who are familiar with British TV series *Black Mirror*, may have recognised the plot of last season's episode 4, «Plaything». Those who are not, may have feared that this story was more than mere fantasy.

Contrary to a longstanding conception of images as inert pictorial objects, nowadays we receive more and more hints that images – to use Trevor Paglen's notorious expression – do not represent the world, as much as they «"do" things in the world» (2014: 1). As it is well-known, Paglen was commenting on Harun Farocki's three-part installation *Eye/Machine* (2001-2003), concerned specifically with most recent image-making techniques. While other authors have stressed that images started «acting in the world» way before becoming automated or even digital (Parikka [2023]; Manovich [2001]; but see as well Freedberg [1989]), it is also plausible to argue that contemporary images express a distinctive agentive power. A relevant field in this sense is virtual reality (VR)[1].

With reference to virtual images, the issue is not much that their impact on our life and the world is not acknowledged, but rather that such impact is mostly seen as problematic. If VR tends to be glorified – often uncritically – by producers

1 For a discussion of the operativity of VR's "sister", augmented reality (AR), see Pirandello (2024).

and practitioners[2], it is often surrounded by variable degrees of concern in the scientific discussion – a path notoriously paved by authors addressing critically the notions of simulation and virtuality, such as Jean Baudrillard (1995, 2004) and Paul Virilio (1995).

However, precisely where *harm* is feared, *therapeutic* possibilities can emerge.

In fact, VR has gained a prominent role within the growing domain of *digital health* (World Health Organization [2021]), which explores fruitful applications of digital and virtual technologies in medicine and healthcare more broadly. Years ago, VR had already proved successful in the treatment of several mental disorders, including specific phobias, post-traumatic stress disorder, anxiety, eating disorders (Freeman *et al*. [2017]; Park *et al*. [2019]). VR finds therapeutic applications with regard to organic conditions too: e.g., in post-stroke rehabilitation (Demeco *et al.* [2023]).

One reason why VR is effective in all these cases is that it acts on multiple aspects of our perception of the world and/or of ourselves. For instance, in the treatment of eating disorders VR images intervene on our body image; in the treatment of phobias, they modify the emotional and behavioural responses associated with specific stimuli in the environment.

Among the perceptual skills not as often discussed in the field is *time perception*. The study of time has a long-standing tradition in philosophy. To limit oneself to contemporary reflection, one can easily think of cornerstones like Bergson's *Matter and Memory* and *Creative Evolution* on the side of continental philosophy, and to what have become classics in analytic philosophy (e.g. Dainton [2010]; Le Poidevin [2003; 2007]).

In cognitive psychology, time perception is conceived in more operational terms as a complex ability comprising (among several others) the two related yet not overlapping aspects of duration estimation and time passage perception (Wearden [2015]; Droit-Volet, Wearden [2016]). While duration estimation refers to the process of quantifying the amount of time elapsed during a certain interval, usually in conventional units like seconds or minutes, time passage perception designates the qualitative impression of how fast or slow time seemingly passes in a given situation.

Both aspects of time perception are elastic constructs prone to modulations depending on manifold factors. Variations in time passage perception, in particular, tend to have clear emotional correlates. For instance, Wearden and colleagues (2014) investigated empirically time passage perception in relation to different

2 Think of the mythology of the Metaverse propagated by Marc Zuckerberg in 2021, but also the equally disconcerting rhetoric of other and less visible exponents of the Silicon Valley environment. See for instance Tony Parisi's "Seven Rules of the Metaverse", https://medium.com/meta-verses/the-seven-rules-of-the-metaverse-7d4e06fa864c (last accessed 12/07/2025).

psychological states and everyday activities. Confirming what is often observed intuitively in daily life, the impression of «Time flying» was associated with being happy, concentrated, and engaged in pleasant social activities. The impression of «Time dragging», instead, was paired with boredom, sadness, and tiredness.

A psychological construct known for combining temporal acceleration (or even disappearance) with positive emotions is flow (Csíkszentmihályi [1975a], [1975b], [1990], [2014]). Flow is a psychological state ideally placed between the extremes of anxiety and boredom, which results from being happily and continuously engaged in an activity that challenges but does not exceed one's skills. Examples of situations found by Csíkszentmihályi to easily elicit flow are climbing, playing chess, but also working (when the job has the appropriate features).

Time passage acceleration and flow can be *induced.* Since these two phenomena are typically associated with positive emotions, this opportunity can prove relevant to improve situations typically characterised by unpleasantness and unease. Among them, there can be situations related to illness. One's sense of the speed of time can be modulated by creating *ad hoc* those conditions that the literature indicates as relevant in this regard. However, real life can be hard to manipulate at one's will. A valuable alternative is thus working on *representations*, paving the way to an innovative operational and in a sense *therapeutic* use of images.

In this article, we present TIMELAPSE, a project that – building on this intuition – aims at creating a VR app to speed up or even dissolve time passage in the context of chemotherapy. More in particular, we will delve into the participatory design phase of the project, which hints at one of TIMELAPSE's signature features: the decision to involve, from the earliest stages of its development, the very specific end users of the desired VR app, i.e. the cancer patients.

2. *The project*

TIMELAPSE[3] attempts to systematically combine the above constructs: the therapeutic value of images and the desire to create conditions that foster positive emotions associated with time passage perception.

It is important to clarify here the sense in which TIMELAPSE's scope is "therapeutic". On the one hand, the project *operates* in a context that is certainly therapeutic in a strict, clinical sense: i.e., cancer care. On the other hand, the project's methods and tools are not "therapeutic" in the same sense. In fact, TIMELAPSE's VR application is *not* a medical device. At the same time, TIMELAPSE does not position itself as a psycho-therapeutic intervention. Its theoretical foundations are

3 https://timelapse.unimi.it/it/

in *cognitive* rather than *clinical* psychology. Hence, borrowing from an understanding of "therapeia" that is familiar to the philosophical reflection, TIMELAPSE sets the goal to act on the patients' well-being in a broader sense than the clinical one.

Within the context of diseases with high societal impact, cancer nowadays represents a major public health issue. Chemotherapy has significantly improved patient outcomes in terms of survival and potential recovery (El Mathari [2024]). Nonetheless, alongside its physical burden, this treatment often entails psychological distress, partly attributable to the prolonged duration of each session (Chirico *et al*. [2015]; Krebber *et al*. [2014]). The latter engage the patients for up to several hours: spending this amount of time in a highly medicalised context can cause the patients to hyper-focus on their condition, which can lead to a significant emotional burden. Avoiding this outcome is crucial for promoting the patients' mental well-being and, consequently, fostering and increasing their adherence to treatment (Chirico *et al*. [2020]). TIMELAPSE aspires to make chemotherapy sessions more bearable, particularly by influencing the patients' perception of time.

TIMELAPSE originated as a spin-off from the ERC Advanced project AN-ICON[4] and aims to develop, test, and launch a virtual reality application that can accelerate time passage as perceived by patients during chemotherapy. VR, in fact, plunges the users into 360-degree environments, excluding contact with their physical surroundings (Loetscher [2023]). In relation to chemotherapy, this has a high potential in terms of distraction (Rutkowski *et al*. [2021]). However, by using content specifically selected for this purpose, the isolating nature of VR can also be used to redirect the patients' attention and resources so as to bring about an impression of accelerated time passage (Cavaletti [2021]).

The TIMELAPSE project relies on an international research team coordinated by the University of Milan, and including a clinical partner (Fondazione IRCCS San Gerardo dei Tintori, University of Milan-Bicocca), who contributes expertise in clinical organization and trial management, and an industrial partner (KHORA), who is directly responsible for the production of the planned VR application. All staff members are working together at different levels on interrelated objectives: 1) to formulate a theoretical hypothesis on the types of VR content that could subjectively accelerate the passage of time during chemotherapy; 2) to specify and refine the hypothesised VR content, taking the users' point of view into high consideration; 3) to concretely develop the content for the VR application, thus obtaining a prototype ready for testing; 4) to assess the tolerability and effectiveness of the VR application prototype, and 5) to launch on the market the VR application. Table 1 illustrates how each objective gives rise to a specific implementation phase, each with its own purpose and methodologies.

4 https://an-icon.unimi.it/

Phase	Aim	Methodology
1) Theoretical Elaboration	Developing a solid theoretical framework to identify which types of VR content may effectively influence time perception and potentially make chemotherapy sessions feel shorter	Literature review and prior studies carried out by AN-ICON group members, complemented by practice-oriented insights emerging from the partially concurrent Phase 2
2) Participatory Design	Enhancing the proposed VR content by integrating feedback and insights from the users' point of view (i.e. cancer patients, with caregivers and clinical staff)	A combination of experiential didactics, design-thinking activities, and interviews; in addition, integration of the theoretical directions from Phase 1
3) Production	Concretely developing the content for the planned VR application, thus obtaining a prototype ready to be tested	Design and development of the product guided by the principle of a balanced trade-off between functional complexity and economic sustainability
4) Assessment	Assessing the VR application's tolerability and its potential effectiveness through empirical testing	Validated methods for clinical research, with the primary aim of safety and tolerability
5) Pre-Commercialization	Launching the VR application on the market	Planning and implementation of dissemination events–featuring demonstrations and hands-on testing–targeted at potential stakeholders

Table 1 – Phases, aims, and methodologies of the TIMELAPSE project

A crucial element of the project concerns the willingness to include patients in imagining and designing the VR application. TIMELAPSE adopts a participatory and patient-centred design approach, which innovatively incorporates in the conception of the VR application the irreplaceable perspective of its specific end-users; these include firstly the cancer patients, but also their caregivers and the clinical staff taking care of them.

Participatory research is an umbrella term including practices that have at their core the direct involvement of those affected by the issue being studied, which is typically of societal and/or political relevance[5]. Participatory research is oriented towards the concrete and operational goal of affecting positively a given situation or context, and thus it strives to transform knowledge into guidelines,

5 It could very well be an issue of societal relevance within the clinical domain. See for instance Faisal *et al*. (2025).

policies, and ultimately action and change (Vaughn & Jacquez [2020]). Participatory design (Bødker *et al*. [2022]), more in particular, is a well-established methodological framework to incorporate elements of user engagement in the design of computer-based technologies, and virtually any device or object of use. This approach is particularly advised when the needs of the target users are scarcely known or visible. We decided to adopt a participatory approach based on the acknowledgment of our difficulty to fully understand and anticipate the necessities of cancer patients, without any first-person experience of their health condition and of the chemotherapy treatment they undergo.

TIMELAPSE's participatory design phase comprised two sessions, held approximately two weeks apart. This article will focus in particular on the first of these sessions.

3. *State of the art and existing literature*

As anticipated, subjective time passage acceleration – and flow more in particular – can be *induced*. This can be done by studying what psychological factors ground these phenomena, and then creating the appropriate conditions for these factors to come into play. One of the most complete models to do so – the Dynamic Occupation in Time model – was put forward in the domain of occupational therapy by Elizabeth Larson and Alexander von Eye ([2006], [2010]). According to these authors, factors facilitating time compression or even flow are high, but not overwhelming, levels of novelty, complexity, skill demand, engagement, and focus on the activity being performed. One of the authors of this paper used Larson and von Eye's insight to formulate starting hypotheses as to how to create a VR application to speed up or dissolve time passage with pleasant emotional implications during chemotherapy (Cavaletti [2021]).

During the first phase of the TIMELAPSE project, we expanded on this preliminary work by conducting a further mapping review of the literature. Since flow is always associated with pleasant emotions, while time passage acceleration may not (think of the feeling of running out of time during a written exam), we decided to focus primarily on flow. Thus, the leading research question in our mapping review was how to induce flow by means of VR. Operationally, however, we decided to extend our mapping to time passage manipulation more broadly too, as works on this topic could contain information to be extrapolated and adapted to our goal. Search was done by keywords on Google Scholar, and inclusion was based on pertinence and, in case of empirical studies, methodological rigour. We explored studies pertaining to three thematic axes: foundational works on flow (Csíkszentmihályi [1975a], [1975b], [1990], [1997], [2014]); studies on flow or time perception manipulation in videogames (Tobin, Grondin

[2009]; Takatalo *et al*. [2010]; Sweetser *et al*. [2012]; Moon, Anderson [2013]; Michailidis *et al*. [2018]; Alvarez Igarzábal [2019]; Bogon, Halbhuber [2023]); and studies on flow or time perception manipulation in VR (Read *et al*. [2021]; Lemmens, Freiherr von Münchhausen [2023]; Micillo *et al*. [2023]; Mioni, Pazzaglia [2023]; Picard, Botev [2023]). Three studies compared flow in VR and its 2D counterpart (Pallavicini, Pepe [2019]; Mullen, Davidenko [2021]; Rutrecht *et al*. [2021]).

The review had two main outcomes. First, it allowed to identify with greater precision the preconditions of flow as described by Csíkszentmihályi: namely, being engaged in an activity that challenges without exceeding the person's skills; that expresses clear goals and feedback; and that allows concentration on the task to be performed, and an overall sense of control. Second, the review suggested ways to operationalise such preconditions in the form of content, UX, and/or UI features of the VR app to be designed. For instance, Rutrecht and colleagues (2021) provided the idea of designing the gameplay so that challenge (a precondition of flow) is inevitable. Alvarez Igarzábal (2019) and Lemmens, Freiherr von Münchhausen (2023) pointed out the usefulness of adjustable difficulty, to match different users' skills. All these possible features were to be tested with our patients.

Additionally, some studies offered even more concrete ideas of commercially available VR apps to be tested with our patients. We were particularly interested in the game *Thumper* (see below), which proved particularly effective in eliciting flow in the study by Rutrecht and colleagues (2021), and seemed plausible to be tested with our patients too.

4. *A laboratory on VR to speed up time perception*

The desire to include cancer patients, as well as their stated expectations and needs, translated into the organization of a participatory design phase (Phase 2). The main goal of this stage, which was conducted by researchers from the University of Milan together with collaborators from the SEGE group (a company specialising in design-thinking)[6], was to ensure that the final VR application is user-centred. The group used design thinking approach and techniques to engage participants in participatory design and testing (Ku *et al*. [2022]; Pfannstiel, Rasche [2018]). The expected outcome of this phase was a clearly defined concept for the desired VR application, ready for KHORA to start production.

6 This phase was carried out by Federica Cavaletti (Head of Research Unit), Ilaria Terrenghi, and Irene Magrì from the University of Milan; Stefano Cribellati, Michele Crippa, Livia Gamondi, and Agata Regeni, from the SEGE group; and professor Marina Elena Cazzaniga (Head of Clinical Unit), Cristina Tagliabue, and all staff members of the Oncology Department of the IRCCS San Gerardo dei Tintori Foundation, University of Milano-Bicocca.

Participatory design took the form of two meetings, or "labs" (Figure 1). The first one was introductory and experiential (Lab 1), while the second aimed to supplement the initial data with further field observations (Lab 2).

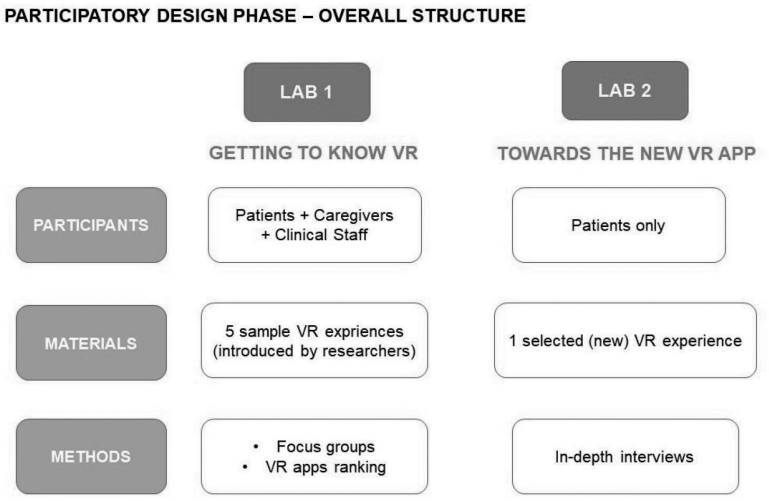


Figure 1: Participatory design Phase: overall structure

Now, let us take a closer look at the first meeting[7]. Lab 1 was held at IRCCS San Gerardo dei Tintori Foundation in Monza, the institution of the project's clinical partner. Twenty-four people attended the meeting, including nine patients, twelve clinical staff members, and three caregivers.

The workshop comprised two distinct moments:

1. The first involved an introductory plenary seminar to familiarise patients with VR technology (its features, how it is used, the types of content and experiences available), as well as the concept of subjective time and the fact that it can be altered.

2. The second moment was more experiential: patients, caregivers, and healthcare staff were able to experience short VR sessions offering different immersive experiences, which were chosen by the researchers. The catalogue of experiences was systematically constructed to offer subjects a wide variety of experiences in terms of the proposed content, the duration of the experience, and its degree of interactivity. Table 2 shows the proposed catalogue of experiences. This moment included subsequent discussion and assessment activities, facilitated by SEGE.

7 Data from the Lab2 will be discussed in a forthcoming publication.

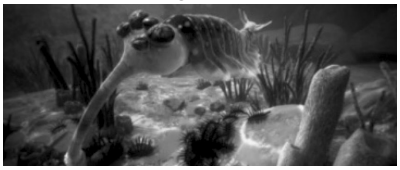
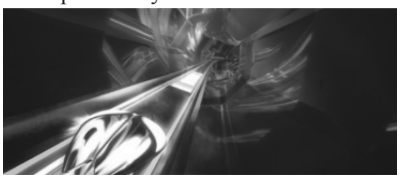
Immersive Experience	Description	Key features
David Attenborough's First Life 	In this documentary, the voice of British science populariser and naturalist, David Attenborough, guides the user on a 3.5 billion-year journey to discover the origins of life on Earth.	• Degree of interactivity: nil • Genre: documentary • Duration: approx. 11 minutes • Comfort level: medium • Language: ENG • Other notes: sea creatures come a little close to you
Lego Bricktales 	This virtual version of the popular Lego bricks game engages the players in building activities on a guided route alongside other characters.	• Degree of interactivity: high • Genre: construction • Duration: as desired • Comfort level: good • Language: ITA
Mare 	Playing as a mechanical bird, the player must accompany a mysterious little girl through the ruins of a city, solving mysteries and unlocking mechanisms to open subsequent gates.	• Degree of interactivity: high • Genre: adventure, puzzle • Duration: from 10 minutes upwards • Comfort level: good • Language: – • Other notes: slight risk of dizziness
Thumper. A Rhythm Violence Game 	In this music-based game, the player becomes a metallic beetle racing along a track, and has to overcome and smash obstacles following the soundtrack beats.	• Interactivity level: high • Genre: rollercoaster, musical • Duration: as desired • Comfort level: medium • Language: ITA • Additional notes: very impactful
Tripp 	This experience introduces the users to meditative practice and guided breathing by immersing them in captivating and relaxing virtual scenarios.	• Degree of interactivity: low • Genre: wellness • Duration: as desired • Comfort level: good • Language: ENG

Table 2 – The five immersive experiences proposed in Lab 1, with a brief description and their main features.

The experiential moment was designed so that all subjects could share their personal views and thoughts on VR technology and their chosen experiences. This moment was constructed in two distinct stages (Figure 2).

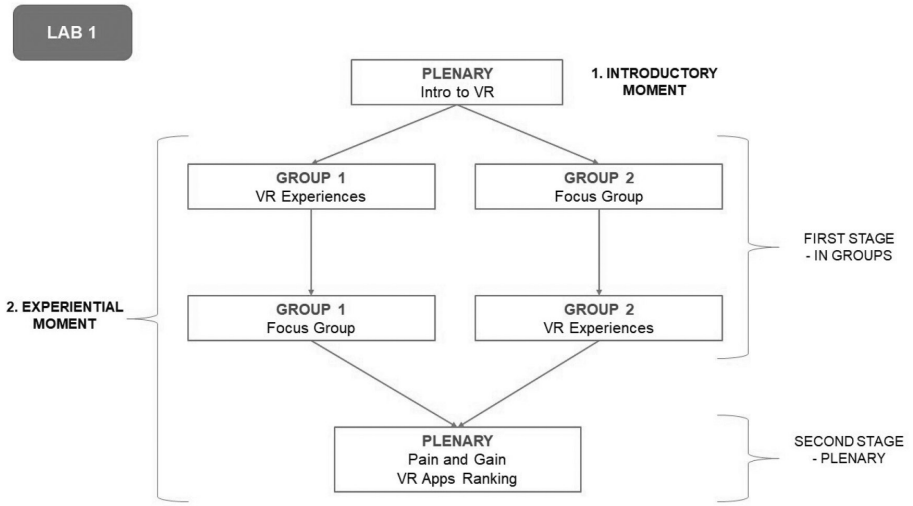


Figure 2: Structure of Lab 1

The first stage was conducted with the participants being split into two groups and involved gathering subjective contributions from participants through focus group techniques (Zammuner [2003]) and in particular guided brainstorming. To enrich and diversify the data collected, one group completed this activity before having the VR experiences, while the other group completed it afterwards. This produced interesting results in terms of the timing of the input and insight, as it allowed for the collection of thoughts and suggestions before (first group) and after (second group) the VR experiences. Participants were asked to identify themes of interest in three areas: 1) technology, 2) emotions and feelings, and 3) expectations.

The second stage, in which all participants regrouped after having tried the VR experiences, involved a "pain and gain" mapping activity and a voting activity, with the intention of identifying useful items following the testing phase. During the mapping activity, participants were asked to write down the positive and negative aspects they had experienced during the VR device testing phase on Post-it notes. Different coloured Post-it notes were given to patients, caregivers and clinical staff to allow the information collected to be

clustered. In the final voting phase, subjects were asked to "rate" the applications they had tried by affixing stickers to billboards.

Throughout the Lab, researchers from the SEGE group collected useful information to be integrated with the data collected from the activities as well. They conducted direct observations in the field using a checklist that proposed several items[8] to be rated on a 5-point Likert scale.

5. *First insights and discussion*

The structure of Lab 1 enabled us to collect interesting data on the participants' initial perceptions and their subsequent general evaluations of the immersive experiences. This data can help us build a relevant and diverse picture, enabling us to compare participants' opinions at different stages of the process.

Before carrying out the VR experiences, the first group of participants were able to share their expectations with the researchers. Initially, they said that it was important to them to explore new and unfamiliar places with VR, as this would help them to escape the reality of the hospital through relaxing, natural, brightly coloured scenarios. They expressed a desire for open spaces, nature, music, and colours. Then, they mentioned some potential concerns as well, mainly relating to two areas: on the one hand, they were worried about not having enough expertise to use the immersive technology (technical level), and on the other hand, they were concerned about losing control over their surroundings, themselves, or their bodies (perceptual level).

Among participants who had tried the VR experience in the first stage of the lab, interesting data emerged regarding their evaluation of the experiences, partly consistent with previous descriptions. Firstly, the aspects that were liked the most concerned the sense of escapism and distraction that VR can provide, which is considered particularly important for cancer patients. Another aspect that was appreciated was the immersive imagery: the participants rated highly the graphic quality of the experiences and their visual features, which they deemed very pleasant and involving.

In general, the participants liked being able to choose and model their experiences. Indeed, the patients in particular said they really valued being able to select both the contents of the immersive experience and the level of interaction required. Many appreciated the opportunity to simply observe the environment and enjoy the graphics and images, while others were motivated by the prospect

8 Below is an exhaustive list of the items: Approach to technology; User-friendliness; Restraint; "Wow" effect; Immersion; Effective Interaction; Use of controllers; Engagement; User's ease; Experience completion.

of interaction. This appeared related not only to personal tastes and inclinations, but also to the patients' current well-being. This may be a particularly significant element, given that in our target population physical and mental conditions can vary considerably not only across participants, but also for each participant within very short time spans.

On the other hand, the difficulties expressed were particularly related to the risk of isolation and loss of human contact, especially between patients and caregivers. Many did not expect that the VR experience could make them feel "alone" in the therapy process, and this is undoubtedly something that needs to be reflected upon. Another issue raised was the discomfort caused by technology, particularly for those who wear glasses or suffer from headaches and dizziness. Although no participant experienced severe discomfort, the possibility of this was emphasised.

In sum, taking into account what participants said and what emerged from observations of the activities proposed in the workshop, we can see that the data collection provides important insights. On the one hand, it highlights the need to personalise the experience based on the patient's preferences. On the other hand, it stresses the relevance of ensuring accessibility and comfort through technology. These two overarching themes can be broken down as follows.

Personalization of the experience:

– offering options for relaxing or more active experiences, allowing patients to choose based on their mood and physical condition;

– providing a wide catalogue of experiences to choose from, including natural environments (sea, mountains), cultural experiences (museums, cities), nature and historical documentaries;

– allowing customization of elements such as music, light level and colours.

Comfort and accessibility:

– optimizing the VR experience to reduce fatigue, dizziness and anxiety; avoiding excessive movement, significant vibration, excessively loud lights and sounds;

– developing user-friendly interfaces with clear instructions;

– using a single controller to facilitate interaction.

Finally, when we looked at the overall evaluation of the experiences, we found that the one that participants liked the most was David Attenborough's *First Life*. This was the case even though, notably, due to a connection problem, participants only viewed this experience on desktop (and thus not in immersive mode). This clearly deserves some reflection since, apparently, the participants did not perceive the impossibility of experiencing *First Life* in VR as an important loss.

What does it suggest in terms of the specific potential of VR, as opposed to non-immersive alternatives? Through the observation tools specially designed for this experience, we noted that the participants were so excited about *First Life*'s *content* that its *medium* temporarily faded into the background. However, we had at least as many hints that, in other cases, it was precisely the immersive nature of VR to keep our participants hooked to the experience. Indeed, the second place in our ranking went to the meditative app *Tripp*. In this case, participants were fascinated by the feeling of being surrounded by very relaxing scenarios – a specifically VR-related possibility. Thus, we may even speculate that participants rated highly *First Life* by imagining how charming it would be if it were in VR, based on the comparison with the experiences they could actually have in this medium. This view is reinforced by the fact that some participants concretely asked us whether in the future it would be possible for us to bring them again *First Life*, this time in VR. Proceeding in our ranking, *Mare* and *Lego* were generally less popular, though to some extent still appreciated by some participants. This may have been due to the participants' personal preferences and level of skill. Ultimately, *Thumper* was the least appreciated among the proposed experiences. Many of the participants struggled to understand the purpose of this rhythm game and how to actually complete it. Many complained about the too strong colours and the unfamiliar music.

This last result, far from being the expression of a simple personal preference, seems to us to deliver an important methodological consideration, which must necessarily be carefully considered if the project is to be set up correctly. While some studies suggest that this particular application, *Thumper*, is widely appreciated and linked to the experience of flow (Rutrecth *et al*. [2021]), it appeared less effective in relation to our specific sample. In experiencing *Thumper*, patients, their caregivers, and clinical staff members frequently interrupted the session well before reaching the more advanced stages of the game. In some instances, the experience was discontinued after only a few seconds. This initial finding underscores the need for further investigation, particularly to evaluate the applicability and transferability of existing scientific literature to different target populations.

6. *Take-home messages for the app design*

The initial findings emerging from Lab 1 represent highly valuable data for effectively advancing the TIMELAPSE project, particularly in guiding the second meeting of participatory design.

To facilitate the progression through the subsequent steps and to identify essential guiding elements for the effective development of the immersive VR application, the research team outlined several key aspects corresponding to specific focal points.

Lower standards for manageable and enjoyable interactivity

The first point to consider concerns the possibility for patients to choose the degree of interaction within the experience. This may be structured along a continuum, ranging from a merely contemplative mode – in which the patient simply observes the environment in a relaxed state without actively intervening on objects or scenarios – to a medium or high level of interactivity. This approach is important because, ideally, patients would like almost no level of interaction (following the model of *Tripp* or the documentary), but still the opportunity for activation for those occasions in which they feel good enough.

"Catalogue" and customizability

Patients expressed a high level of satisfaction regarding the aspect of choice: having access to a catalogue of experiences enables individuals to make decisions that are especially aligned with their physical and mental states at a given moment. Additionally, the possibility of adjusting elements such as color intensity, music, and other primarily visual aspects within the chosen experience generated particular interest.

Pausing and resuming across sessions

Patients appreciated the possibility of resuming the session from the point at which it was previously interrupted. This feature was valued for two main reasons: first, it allows users to continue the narrative or experiential journey without losing their progress; second, it enables the continuation of the experience in settings beyond the hospital environment, thus supporting greater flexibility and integration into daily life.

Great desire for sharing

The final key-aspect relates to the patients expressed desire to maintain a sense of connection with the physical environment–particularly with the caregivers who accompany them during therapy. This highlights a broader need to foster interpersonal connection and avoid complete isolation within the VR experience. To address this need, a twofold strategy could be implemented. First, moments of shared reflection could be integrated after the immersive experience, such as structured storytelling sessions or guided discussions and evaluations. Second, from a design perspective, the application could incorporate features like tournaments, where users can share scores or outcomes – encouraging social interaction and strengthening interpersonal bonds.

In conclusion, these key elements will be carefully considered in the development of the VR application and will be shared with our colleagues at KHORA, along with the findings from the second laboratory phase, which will further en-

rich and build upon these initial results. The project will therefore continue with the implementation of the next steps, which will lead to the development of the application. Thanks to the participatory phase, the application will be designed with the wishes, needs and perspectives of the patients in mind, thus bringing a very important added value for us.

7. *Concluding remarks: therapeutic insights, within and beyond TIMELAPSE*

Until now, we have illustrated the implications of the outcomes of Lab 1 for the subsequent steps of TIMELAPSE. In this final paragraph, we would like to develop some more general reflections about what the experimentation conducted could suggest concerning the broader topic of the therapeutic value and usage of images.

Though the concrete TIMELAPSE app is yet to come, our image-based intervention, we claim, was already therapeutic in the crucial sense that people variously dealing with a serious illness (i.e. patients, but also their caregivers and clinical staff) could enjoy a positive break from the aggravating feelings and thoughts usually connected to their condition or role. Notably, as we will see, this was true not only for the patients, but also for their caregivers and clinical staff[9]. Moreover, the described break was not a mere and self-referential distraction. On the contrary, our observations and data suggest it was a stratified and deep experience, with possibly longer-term impact on the parties involved. Three aspects in particular are noteworthy.

Concerning their encounter with the VR *content*, the participants were spontaneously drawn towards visual and auditory stimuli that proved sensorially appealing. Often, appreciation was shown at plastic level, for instance regarding bright or vivid colours. At the figurative level, the participants' positive remarks tended to apply to natural scenarios, mostly recalling the aesthetic category of beauty, but with some interest in sublime inflections as well. The therapeutic potential of nature is deeply felt in our society, in both a broad and more strictly medical sense. Especially since modernity, nature was reinterpreted as a healthy haven to escape industrialisation. In this regard, the more untamed the nature, the more powerful its effects – an idea condensed in the concept of *wilderness* exemplarily pursued, for instance, by Henry David Thoreau (1854). More recently, the connection between being in nature and well-being has been addressed more

9 Deploying the therapeutic potential of VR to benefit not only the patients, but also the clinical staff constitutes a promising direction, which has been explored particularly during the years of the COVID-19 pandemic – in which doctors and nurses were at high risk of burnout. See for instance Nijland *et al*. (2021). The field is starting to map this usage of VR systematically. See for instance Shankar *et al*. (2025).

systematically, as in the studies surrounding the so-called «biophilia hypothesis» (Kellert, Wilson [1993]), and in a rather domesticated, literally «gardened» version (Stuart-Smith [2020]). During Lab 1, participants were reminded of a relatively easy way of improving their well-being – i.e., engaging with nature – which can remain accessible even during the difficult time of the illness, either inside or outside the VR headset. This is in line with previous findings in the literature, attesting to the stress-reduction effects of virtual reality (VR) representing natural environments (Gentile *et al*. [2023]).

Taking advantage of two well-known medium-specific illusions associated with VR, namely transparency and presence (Pinotti [2025]; Slater *et al*. [2022]), participants *transported* themselves into the natural places they liked. In spite of its seeming disappearance, however, the VR medium is very much there (Bolter, Gromala [2003]). This brings to a second noteworthy aspect of our observations and data.

Nowadays, many types of image are mediated by *technology*. This state of affairs requires adequate competence on the user's side, and sufficient friendliness on the device's side. As Lab 1 has shown, this is even more crucial in therapeutic settings, for at least two reasons. First, compared to other population groups (for instance, students), patients are a rather unpredictable sample when it comes to technological literacy. With mixed ages, backgrounds, and interests, there is no reason to expect for this group a specific average expertise in the use of technology. Second, cancer patients in particular, due to possible chemotherapy-induced fatigue and generally higher levels of stress compared to the general population, have proved particularly prone to that frustration that typically sets in when struggling with an unfamiliar device. Thus, our experimentation may be taken as indication of the even greater importance of media and technological accessibility when deploying images and representations in the therapeutic domain.

Lastly, we gathered some relevant *relational* notes from our activities in Lab 1. To start with, as already mentioned, the participants voiced a concern related to the risk of isolation deriving from the usage of VR, and stressed the importance of finding ways to share their "intra-headset" experience. Such concern resonates with a broader set of critical stances toward immersive technologies that, following Baudrillard, Virilio, and like-minded thinkers from the last century, today coalesce in mass culture in productions like the show *Black Mirror* with which we opened this article. Undoubtedly, the existence of anxieties and fears surrounding digital and virtual media has to be taken into account when employing or devising representation with a therapeutic aim, to avoid that the means sabotage the goal.

In relational terms, however, we also observed something more unexpected and exciting. In fact, as soon as we let the participants try out the VR apps, the room quickly turned into a *playground*. Patients, clinicians, and caregiv-

ers experimented playfully with novel perceptions and feelings, but also – as it often happens in these settings – they were laughing at the bizarre behaviour of their playmates using VR as seen "from the outside". This gave rise to the otherwise inconceivable situation of a patient making fun of another patient (who normally shares a dramatic life circumstance, and the discomfort and pain of the treatments), or a clinician (who normally administers their therapy and is seen as a guide through the therapeutic path). In other words, soon after starting the hands-on session with the VR apps, our group of participants, at first implicitly reflecting the everyday power dynamics between patients, clinicians, and caregivers, was undergoing a transformation that made its structure much more flexible and horizontal. Among other factors, we believe that what triggered the described transformation was the exceptional situation of Lab 1, together with its clear delimitation in space and time. In this regard, a key-role was arguably played by the venue of Lab 1: a conference room far away from any clinical space, and that happened to be quite isolated due to unstable Internet connection.

On this grounding, we could read Lab 1 with reference to the classic account of *play* developed by Johan Huizinga (1939): a situation of departure from everyday life, facilitated by a space of its own, and allowing the emergence of rules and dynamics of its own; further, an unconstrained and fun situation, but with its particular seriousness.[10]

The positive effect on the participants can be defined with no hesitations therapeutic. While the patients had the chance to detach from their main characterization of "people with an illness", caregivers and clinicians could temporarily leave aside the heavy responsibility that comes with their task or job. What is more, we had concrete suggestions of a longer-term therapeutic effect of such an experience of play. A debriefing session that we conducted with the clinicians upon their request highlighted that they were benefitting from the continuing positive impact of Lab 1, and that they were eager to repeat similar activities in the future. In fact, play may constitute an important additional ingredient in future aesthetic experimentations in the therapeutic field. The power of play has already been widely explored in psychotherapy – resulting in systematized approaches (e.g. Schafer [1979], [2011]), which sometimes even include digital and virtual media (Bocci *et al*. [2023]). Aesthetics, with its long-standing tradi-

10 Another account that could be evoked here is Callois' (1958). This is so, even if the author's stress on the *classification* of *games* makes his insights not perfectly fitting here. In fact, arguably, the activities of Lab 1 do not fall obviously in any of his categories. The deliberate alteration of perception induced by VR would induce us to see Lab 1's activities as instances of *ilinx*, the «pursuit of vertigo»; however, it is not this aspect of Lab 1 that we were primarily concerned with in this article.

tion in the understanding of images and representations, is likely to provide a valuable contribution in this regard.

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