

Looking Through Your Eyes: Using Immersive Virtual Reality to Promote Well-Being among Cancer Survivors and Their Partners

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Abstract. The growing success of cancer therapy has increased the survival rates of many oncological diseases, posing the challenge of how to sustain survivors' well-being. Since partners are the most important source of support for patients, and their role is essential to successfully cope with the challenges associated with the disease, the current study aims to enhance the survivors' adjustment to the post-treatment life changes by focusing on the couple's well-being. An Embodied Perspective-Taking (EPT) paradigm will be implemented by using Virtual Reality (VR) to propose a VR Patient-Journey (VR-PJ) that guides the partner in feeling on their skin what their significant other is suffering and the problems they are facing. EPT will create in the participant the perceptual illusion of taking the perspective of the partner, allowing the caregiver to see through their eyes, from a first-person perspective, all the steps of the partner's oncological journey, from the diagnosis to the current daily life. Our hypothesis is that the VR-PJ will work as a transformative experience able to promote empathic communication and greater couple well-being.

Keywords. Virtual Reality, Cancer, Survivor, Well-Being, Partner, Transformative Experience, Perspective-Taking, Empathy, Communication

1. Introduction

The growing success of cancer therapy and detection has increased the survival rates of many oncological diseases. Consequently, the number of survivors is increasing over time, presenting the challenge of appropriately sustaining survivors [1]. Relationships represent a primary starting point for promoting their well-being. Partners are indeed the most important source of support for patients, and their role is essential to successfully cope with the challenges associated with the disease [2; 3]. Nevertheless, the complications that follow oncological treatments put a strain on the relationship, negatively affecting coping success throughout the survivorship [2]. Among the areas of interventions for improving the couple's well-being, communication is one of the most important [4]. Feeling understood is a key characteristic of emotional support, able to promote couple satisfaction [5] and functional dyadic coping [6]. In educational contexts,

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assuming the patient's perspective, and experiencing the steps of the medical journey through their eyes, showed a positive impact on empathy levels [7]: feeling what the Other is feeling creates a bridge between the experiences of the two people, promoting an emotional awareness of what is happening [8, 9, 10]. The use of a Patient-Journey (PJ) paradigm [11] provides certainly a framework for understanding the complex phases and numerous stages in the lives of individuals who have experienced different types of clinical conditions. To achieve this objective, the use of Virtual Reality (VR) represents an advantageous approach [12]. The embodiment of bodily experiences through VR offers a universal language capable of transcending individual variance, thereby facilitating the challenges associated with comprehending other people's emotions. Psychological experiences often have, in fact, an abstract nature, making them difficult to grasp universally due to individual differences in imagery and perspective-taking. VR circumvents these challenges by visually presenting participants with the necessary information, providing an immersive experience comparable to real-life situations [13], and inducing a sense of presence within the given scenario [14]. These distinctive attributes, combined with the ability to adopt the visual perspective of another individual fully embodying their experiences [15], have given VR the label of "*ultimate empathy machine*" [16]. The aim of our VR-PJ is thus to introduce a groundbreaking approach designed to empower partners in communicating with their significant others more empathically. By accomplishing this goal, we also expect to amplify the perceived support bestowed upon the cancer survivor, ultimately fostering closeness between the two individuals. We hypothesize that the VR-PJ will be more effective than theoretical VR training in boosting empathic communication and that its characteristic of being immersive and able to make up for possible difficulties in imagery (thus visually showing what is described as opposed to simply telling the steps of care) will play a role in promoting this change.

2. VR Patient-Journey and Its Potential as a Transformative Experience

2.1. Design

The VR-PJ has been structured according to the three-stage model proposed by Lamprell and Braithwaite [11]. Specifically, in the first stage (i.e., interruption of the Ordinary World and crossing the threshold into the Special World), the PJ describes entering the patient's condition: the new setting of the story becomes the health care system. During the second stage (i.e., Road of Trials and Obstacles), the patient describes the events and treatments, sharing perceptions and the personal impact of such experiences. Lastly, in the third stage (i.e., Road Back to New Normal), the patient's story concludes with the completion of the medical process: the patient contemplates a new conception of normalcy, incorporating lifestyle changes. In our VR-PJ, this model is narrated using an Embodied Perspective-Taking (EPT) paradigm. EPT creates in the participant the perceptual illusion of taking the perspective of the survivor, allowing the caregiver to see through their eyes [17]. Once the partner assumes the egocentric view, they will experience the oncological journey, from the diagnosis to the current daily life. Different avatars will be created depending on the type of oncological disease of the survivor (e.g., breast, gynecological, colon, or head and neck cancer, etc.). This experience will include multimodal stimulation (i.e., auditory - the storytelling of what the patient is thinking, feeling, or saying, and visual stimuli - all the steps of the journey seen from the perspective of the survivor) to create greater involvement in the task and a deeper perception of being in their significant other's body. Excerpts of the scenario can be found in Figures 1 to 4. The protocol will be carried out as a single-blind randomized controlled trial and will include both within (i.e., evaluation pre, and post-VR experience, and at 1-month follow-up) and between components. Regarding this latter characteristic, participants will be randomly allocated to one of the following experimental conditions:

Condition 1: VR Patient-Journey (VR-PJ), characterized by visual and auditory stimulations along with immersiveness;

Condition 2: PC Patient-Journey (PC-PJ), represented by the same experience as the VR-PJ, but participants will use a pc (i.e., non-immersive);

Condition 3: AUDIO Patient-Journey (A-PJ), distinguished by the presence of the VR-JP storytelling alone. Partners will thus rely solely on auditory stimuli and imagery;

Condition 4: VR Theoretical Training on Empathic Communication (VR-TTEC), depicted by an avatar who will explain the importance of empathic communication, using an immersive scenario of the same length as the VR-PJ with no first-person perspective of the cancer journey steps.

2.2. Participants

The targets of the study are partners of female cancer survivors. We specifically chose to focus on male partners in light of gender differences observed in empathy, where male individuals more often compared to women encounter difficulties in adopting another person's perspective or "standing in their shoes" [18]. Couples will be considered eligible for recruitment if survivors underwent surgery (alone or in addition to other treatments), are in a relationship, are not in active treatment, and do not present comorbidities that are incompatible with the use of VR.

2.3. Procedure

Following the completion of self-reported questionnaires at the baseline, both the partner and the cancer survivor will engage in a role-playing exercise centered around a communication task. During this phase, physiological measures will be recorded. Subsequently, the partner will partake in the VR-PJ session, lasting approximately 30 minutes. After the VR-PJ experience, a post-VR-PJ assessment involving the same baseline measures will be administered, alongside the repetition of the initial communication task. To assess the potentially lasting effects over time, a follow-up evaluation will be conducted one month after the VR-PJ experience, involving only the completion of questionnaires by the participating couple. This follow-up will enable us to ascertain the persistence and durability of the observed effects following the VR intervention.

2.4. Measures

The study will employ self-reported questionnaires, physiological measures (e.g., heart rate), and a behavioral task to collect data concerning the emotional and cognitive states of participants before, during, and after the VR experience. Self-reports will collect information about psychological variables such as empathy, couple's satisfaction, well-being, perceived support, emotional closeness, and communication, as well as VR-related variables like sense of presence, embodiment, and cybersickness. Physiological measures will complete such evaluation helping to understand whether the VR experience increases the autonomic synchronization between the two partners [19]. To analyze if the partner is more empathic in communicating with their significant other, the dyad will also undergo a structured communication task, evaluated by the partner (i.e., perceived self-efficacy in communicating empathically), the survivor (i.e., perceived empathy in the partner's words), and external evaluators (trained *ad hoc* to identify verbal and non-verbal cues of empathic communication).

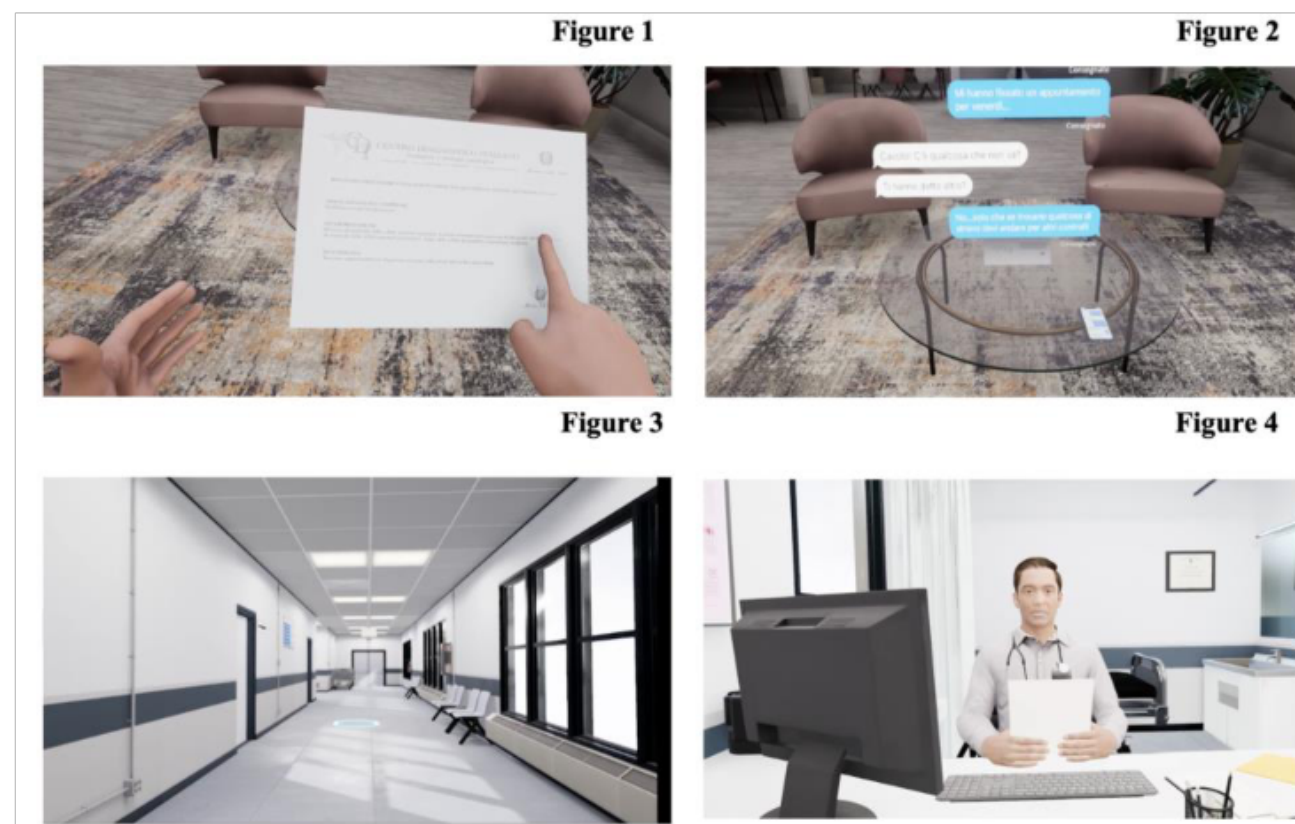


Figure 1. The person receives the screening results. **Figure 2.** After receiving the screening results, she tells her partner that she must go to the hospital for a medical visit. **Figure 3.** The person is in the hospital, looking for the waiting room. **Figure 4.** The person meets the physician for the medical visit.

3. Discussion

The current VR experience aims to improve couples' well-being by using a VR-PJ that gives the possibility to the partner of a cancer survivor to stand in their significant other's shoes, fostering empathy. Given that experiencing conditions inherent to illness is part of the so-called "transformative experiences" [20], in that they transform the individual epistemically and existentially, we believe that carrying out the VR-PJ can enhance the variables involved, functioning for the partner precisely as a potentially transformative experience. The VR-PJ may thus work as an out-of-the-ordinary life moment that allows the partner to reflect on deeper dimensions of his existence and enhance feelings of connectedness towards the Other [20]. Looking through the partner's eyes and feeling what she is feeling involves emotional and epistemic affordances [21]. Emotional affordances are visual clues designed to provoke a strong emotional response from the user. Epistemic affordances are, on the other hand, cognitive signals mostly shaped into scripted narratives designed to elicit introspection and life-changing realizations which provide participants the chance to incorporate and construct new knowledge systems. According to this viewpoint, epistemic affordances are created to provide open-ended "*experiments of the self*". Such situations, place the participants in confusion or perplexity and serve as turning points from which change may emerge. Visually seeing the different steps of the oncological journey (i.e., scenario) while listening to what their significant other is thinking, saying, and feeling (i.e., the storytelling told from an egocentric perspective) will provide the emotional and cognitive richness that is necessary to promote a transformation in the way the partner looks at their own and at their significant other's experience: it will be possible to make accessible and understandable what is epistemically inaccessible (i.e., vicariously undergoing the experience lived by another person), with the sensory wholeness of real-life experiences [22]. Thanks to this, the partner will deeply connect with the survivor, building closeness and communicating in a more empathic way.

Changing the body changes, indeed, also our mind. Numerous studies have established that the embodiment in different body forms exerts diverse influences on individuals' cognition. This phenomenon relies on the integration of multisensory signals that provide the person with perceptual evidence regarding their body. Consequently, such embodiment experiences can lead to modifications in body ownership,

subsequently influencing attitudes and behaviors [23]. White participants in a dark-skinned avatar, for example, exhibit a reduction in racial prejudice against Black persons; adults embodied in a kid avatar overestimate item sizes as compared to an adult-shaped body of the same height as the child; white individuals embodied in a dark skin casually dressed avatar play the drums more aggressively than white people embodied in a light skin formally dressed body [23]. Likewise, within the context of our VR-PJ, manipulating the partner's virtual body has the potential to induce bodily resonance and alterations in their cognitive processes, resulting in heightened empathetic responses. Embodiment in a scenario experienced from a different perspective may thus be seen as a powerful, implicit, learning technique [24].

In conclusion, recognizing VR-PJ as a technique capable of initiating changes from the body upwards presents a promising avenue for unexplored applications. This approach offers a rapid and effective means of enhancing empathic communication, in stark contrast to conventional training methods that are often time-consuming and resource-intensive. Classical empathy and empathic communication enhancement training frequently encounter limitations, leading to participants' dropouts and substantial costs for sponsoring institutions. The lengthy and intricate protocols, often requiring numerous prolonged sessions, can pose significant challenges. For instance, previous studies have required participants to undergo eight sessions lasting one hour and thirty minutes each [25] or five sessions of two hours each [26], impacting the feasibility of large-scale implementation. Embracing the VR-PJ as a transformative tool offers a pragmatic solution to overcome these limitations. By considerably reducing the intervention time frame while still achieving the desired outcomes, this approach paves the way for widespread adoption and utilization. Its potential to rapidly cultivate empathic communication skills holds immense promise for promoting meaningful connections, empathy, and support among individuals, providing novel opportunities to enhance well-being and relationships in various contexts. As further research delves into the full spectrum of applications, the integration of VR-PJ can revolutionize empathy-based interventions and empower individuals to understand others.

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