AViR: A Virtual Reality based framework for psychological support after involuntary early pregnancy loss

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ABSTRACT

The loss of an unborn child is a tragic event and, unfortunately, 1 in 5 pregnancies ends in a miscarriage in the first 20 weeks. The experience of an involuntary pregnancy loss, even in early stages, has been shown to be linked to persistent symptoms of post-traumatic stress, anxiety, and depression. Early psychological support has been shown to be key for coping with the grief and reducing the incidence of psychological disorders in the long term. However, professional psychological support for earlier pregnancy loss is often scarce or not available at health institutions. Virtual Reality (VR) based support delivery methods have been widely used in mental health applications for different disorders with very good acceptance and effectiveness. Nevertheless, no VR system has been specifically developed to provide psychological support after pregnancy loss. We propose AViR, a novel multi-scenario VR framework that leverages on the adaptability of VR and traditional psychological support protocols to deliver a personalized intervention specifically targeted at grief following early pregnancy loss.

1. INTRODUCTION

An early involuntary pregnancy loss (before 20 weeks), or miscarriage, occurs in about 20% of pregnancies, often causing long periods of grief and psychological distress. However, the psychological suffering of parents is often underestimated by health professionals, family, and society, entailing a high risk for the development of psychological disorders. This highlights the importance of psychological support for managing grief after the event. Indeed, studies showed a decrease in grief symptoms, post-traumatic stress, and depression when women underwent psychological interventions that helped them cope with their losses (Johnson and Langford, 2015). Unfortunately, only a limited number of women have access to professional psychological support following a miscarriage, as this service is often unavailable. Here, technology-based self-management tools for psychological support show promise for increasing access to psychological assistance. In the literature, only a limited number of studies explored technology-mediated interventions, all web-based, targeted to pregnancy loss, but results are very encouraging, showing a decrease in symptoms of post-traumatic stress, grief, and depression (Ashford *et al.*, 2016).

VR is a powerful technology that enables the flexible creation of personalized treatment environments based on neuroscientific and clinical guidelines. VR allows creating well-controlled simulations oriented towards patients' needs, using feedback and reward mechanisms, and increasing engagement by embedding therapy in motivating game-like tasks. VR has been widely used in mental health interventions targeting different domains, the most addressed disorders being anxiety, substance dependence and eating disorders. When a traumatic experience is to be addressed, VR has the advantage of recreating and exposing patients to that situation in a safe space where their emotions can be freely conveyed. On the specific topic of VR to cope with grief after the loss of a significant other, very little work has been done. To our best knowledge, there is only one study that addressed the use of VR for patients suffering from complicated grief (grief that does not resolve over time) (Quero *et al.*, 2019). A controlled study where a protocol delivered through traditional face-to-face was compared to VR using EMMA's World, showed that the VR group was superior in the long-term clinically meaningful change. This system is currently also being used for providing psychological support after pregnancy loss, but at this moment, only the protocol has been published (Corno *et al.*, 2020). Presently, there are no published results on the use of VR paradigms targeted explicitly at pregnancy loss.

2. VIRTUAL REALITY BASED PARADIGM

AViR (adaptive Virtual Reality for coping with involuntary early pregnancy loss) is a VR framework for providing psychological support after early pregnancy, which comprises a portfolio of different paradigms and therapeutic scenarios based on traditional protocols for providing grief support after pregnancy loss, adapted to the specificity of a VR self-guided experience. It encompasses 4 different VR scenarios:

I) PSYCHOEDUCATION. This step consists of providing information about the stages of grief and the typical emotional, behavioral, and physiological manifestations experienced in this period. Psychoeducation takes place in a procedural relaxing and safe virtual scenario, sandbox targeted, where the exploration of the environment is unconstrained. Pre-recorded verbal audios and written messages describing what to be expected in the process of grief are prompted.

II) VALIDATION OF THE LOSS. An early pregnancy loss is often not seen as a legitimate loss. However, grieving parents need to validate that the pregnancy has existed and validate the loss so that the healing process can occur. In this step, the user performs a memorial activity of her own choosing, e.g., planting a tree, to honor the memory of the unborn baby. The memorial is persistent and can be revisited by the user at a later stage.

III) SOCIAL SHARING. Miscarriage is still a cultural taboo, not allowing parents to share their feelings and mourn their loss openly, with negative implications for grief adaptation. This step aims to foster communication concerning the loss and allow the user to share her experience without constraints. Social sharing takes place with a non-conversational empathetic avatar of her choice.

IV) ADAPTATION TO THE LOSS. This last step concerns the resumption of normal functioning through involvement in engaging activities. This scenario consists of an interactive branching narrative focused on eliciting a healthy lifestyle that highlights the importance of physical wellbeing, social network and contact with the surrounding environment. The user controls an avatar whom she guides through the environment, making decisions with short-and long-term consequences for the avatar's life, social relations, and health. After the VR experience, the user can revisit her decisions and journey.

The psychological intervention content presented in each step will be defined following focus groups with psychologists experienced in grief intervention for pregnancy loss, and women that experienced a miscarriage.

3. CONCLUSIONS

The psychological support that is provided after an early pregnancy loss is often insufficient, leading to persistent psychological suffering. VR is a well-established technology for mental health treatment that shows potential for providing support to this population. At the time of writing, there are no VR systems specifically designed for providing support after pregnancy loss nor published results on the effects of any VR based approach. Hence, the framework that we propose is innovative and contributes to both the literature on VR technology for health applications and on the effect of technology-mediated psychological support after pregnancy loss. We envisage the application of such an approach to aid on the adaptation to grief after early pregnancy loss, with a consequent reduction on the incidence of psychological morbidity on the long-term. We are currently developing a prototype that implements the proposed framework in an all-in-one portable Head-Mounted Display for an easy deployment and evaluation of the proposed approach at field settings.

Acknowledgements: This work is supported by the Fundação para a Ciência e Tecnologia through the AViR project (EXPL/CCI-INF/0298/2021) and NOVA LINCS UIDB/04516/2020.

5. REFERENCES

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