Considering Fundamental Psychological Needs in Virtual Reality Experiences

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Current notions in positive technology research emphasize the importance of considering psychological needs such as autonomy, competence and relatedness in the design process. Though the benefits of this approach are manifold, psychological needs such as autonomy are still seldom considered in the design of VR applications. In this position paper, we reflect on how we can deepen the understanding of considering psychological needs in VR applications. We discuss the value of considering psychological needs in the process of artistic expression of emotional experiences in VR. Second, we outline how VR could support the processing of negative emotions. Finally, we address opportunities and challenges when investigating relatedness in VR in the context of emotional experiences. By discussing potential use cases, we provide conceptual challenges and discussion points on defining a research agenda for future VR research taking psychological needs into account.

CCS Concepts: • **Human-centered computing → Virtual reality**; *HCI theory, concepts and models*; Visualization systems and tools.

Additional Key Words and Phrases: Virtual Reality, SDT, Psychological Needs, Well-being, Happiness, Emotions, Emotion Regulation, Positive Technology, Autonomy

ACM Reference Format:
Nadine Wagener, Jasmin Niess, and Yvonne Rogers. 2022. Considering Fundamental Psychological Needs in Virtual Reality Experiences. 1, 1 (March 2022), 5 pages. https://doi.org/10.1145/nnnnnnn.nnnnnnn

1 INTRODUCTION

In recent years, the HCI community has shown an increased interest in exploring how to design Virtual Reality (VR) applications (apps) as positive technology. Designing VR apps as positive technology can be described as consciously considering well-being in the design process [4, 5, 22]. One way of achieving this goal is by considering psychological needs such as autonomy, competence and relatedness in the design of VR apps [1, 7, 9]. Self-determination theory (SDT) describes that people are profoundly motivated by those psychological needs [14]. Previous work emphasized the importance of considering autonomy and emotional expression [6], highlighted the (therapeutic) benefits of autonomously designing virtual environments (VEs) [20], and recommended a real-time adjustment of emotional content [12] such as real-time emotional annotation in VR [24].

In an ideal world, these developments appear to be an amazing opportunity for a utopian future with users empowered to satisfy their psychological needs and lead healthier lifestyles aided by VR. Yet, psychological needs such as autonomy are seldom considered in the design of prototypes and commercially available VR apps [20]. Notably, some studies support autonomy by choosing different preset virtual environments (VEs) [3]. However, mostly, users get assigned

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to a certain predefined condition (e.g. [11, 19]) and then they, if at all, experience autonomy solely within the VE, e.g. manipulating objects, deciding where to teleport etc. Other research engages participants during the design of a VE, but in these cases, they remain passive during the game play (e.g. [8]). The same is the case for commercially available VR well-being apps [20].

In this position paper we reflect on, discuss and extend the findings of one of our recent papers which introduced and evaluated *Mood Worlds* [21]. We designed Mood Worlds as a VR self-care experience, which allows users to visualize their emotions by self-creating a VE. The goal of Mood Worlds is to enhance well-being and increase positive affect. To design Mood Worlds, we modified and extended the VR painting app Open Brush by Google [2]. Apart from offering drawing options with sixteen brush types, participants can freely adjust the lighting, adjust the colors, choose between pre-defined environments, and add animated and non-animated pre-defined objects to their scene. Results and challenges addressed below refer to an exploratory user study (N=16) of Mood Worlds.

In general, in our research, we strive to deepen our understanding of how we can address psychological needs in VR applications, extending prior work by Ahmadpour et al. [1]. We define autonomy as being independent and self-governing [10, 17]. Further, we define autonomy as having agency over one's life [16] as well as over the design and content of an app. In this position paper, we discuss three of the current challenges we focus on in our research. First, we reflect on addressing psychological needs in the process of artistic expression of emotional experiences in VR. Second, we discuss how we can support the processing of negative emotions in VEs. Finally, we address facilitating relatedness in VR in the context of emotional experiences.

2 FOSTERING AUTONOMOUS EXPRESSION AND WELL-BEING IN VR

Mood Worlds constitutes an example of how psychological needs, namely autonomy, competence and relatedness, can be successfully addressed in HCI research using VR. Our results indicate that, besides supporting emotional engagement and positive affect, users experienced autonomy and felt empowered. We also found that Mood Worlds addresses competence. Participants reported a boost in self-confidence through the autonomous design process, but simultaneously felt at ease by operating within the framework provided by pre-defined environments and objects. First, this made participants more creative, as they felt insecure about how to visualize emotions before. Second, unlike apps that solely offer painting options or different media such as the PC, changing entities such as light and environment in VR opens up new ways of design and expression. For instance, empowering users to physically moving through one's emotions supports autonomy in a different way by creating a 360° emotional world.

In the future, we will explore in which situational contexts interventions such as Mood Worlds can be most beneficial. Furthermore, we plan to conduct a longitudinal study to explore how Mood Worlds might stimulate psychological needs over a longer period of time.

3 PROCESSING NEGATIVE EMOTIONS IN VR

Our findings show that Mood Worlds allows users to engage with their emotions and increase well-being and positive affect when visualizing happiness. However, the question remains what would happen when Mood Worlds is used in a negative context, e.g. to visualize anger or sadness. Our results show that some participants hypothesize that this could have a negative impact on their emotional well-being, whereas other participants imagined a positive outcome of such an experience. For instance, one participant indicated that the system could be helpful to put a definite end to the negative emotion and allow users to let go of their negative experience. We hypothesize that, to address this aspect, one could implement a process at the end of the negative mood world design process that visualizes the experience

of letting go. For instance, similar to the commercial app ReMind VR [1], the whole environment could fold itself into a paper airplane, which one could then throw away to let go of the negative feelings, or it could burn up. As a next step, the sun could start shining and birds' chirping sounds could be heard to induce positive emotions before the person leaves the VE. Further, we argue that it is crucial to investigate if an autonomous creation process still enhances positive emotions and mitigates negative ones when engaging with a past negative experience. Will users still feel more competent by the app design and feel relatedness to family and friends when immersed in a negative mood world or will they experience a reactivation of their negative experience and feel an increase of negative emotions? These and more questions should be carefully evaluated by future HCI research.

4 SUPPORTING RELATEDNESS IN VR

The example of Mood Worlds also has the potential to support relatedness. During their experience in Mood Worlds users felt re-connected to beloved people, and experienced the feeling of togetherness with friends or family. While some participants preferred solitude during the Mood World experience and imagined a decrease of autonomy and competence when others would be around, other participants imagined having interpersonal experiences, sharing their emotional world with others in a multi-player design process.

Thus, in future research we will examine the opportunities and challenges of addressing social elements in the design of the virtual experience. As a starting point, the impact of adding soundscapes of other people could be explored. We assume that distant murmuring will have a different impact than affirmative quotes (which are suggested to support one's well-being [20]). However, voices without faces could be perceived as creepy, thereby reducing positive affect, competence and relatedness. Mitigating this aspect by adding non-player avatars, opens up new challenges, such as experiencing negative effects due to the uncanny valley effect [15], and the question of respectful distance [18]. Consequently, such potential negative effects should be taken into account in future studies and evaluated accordingly (e.g. [23]). Second, the effects of multi-player scenarios on psychological needs should be investigated. Sharing the VE might influence autonomous expression (will users rely more on pre-defined entities? When given the possibility to choose between aforementioned multi-player options, how will this affect autonomy?), competence (will users still design with childlike excitement?) and relatedness (will users feel connected with friends and strangers? How should these avatars be designed? [13, 15]). As feeling isolated becomes a growing concern, we hope that harnessing the potential of psychological needs and VR can help mitigate loneliness and support the well-being of people in their everyday life.

5 CONCLUSION

In this position paper, we introduced three aspects of VEs that we are currently addressing in our work. We reflected on the value of addressing psychological needs in the design of VEs in the context of the VR app Mood Worlds [21]. Next, we discussed how virtual experiences could support processing negative emotions. Finally, we showcased the opportunities and challenges in studying the social features of a VR app that supports autonomous self-expression. Our primary goal is to build an understanding of how we can use VR to facilitate emotional expression, therefore increasing peoples well-being and empowering them by addressing psychological needs.

[1] Free Range Games, published by Vive Studios on Steam, https://store.steampowered.com/app/862220/ReMind$VR_{D}ail y_{M}editation/?l = german$

ACKNOWLEDGMENTS

We thank Johannes Schöning from the University of St. Gallen for his fundamental support.

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