EthnoVR 3.0: Fostering Ethnocultural Empathy and Mitigating Ethnocentrism through Immersive Virtual Environments and Virtual Reality Perspective Taking

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ABSTRACT

The objective of the presented study was to develop and empirically validate a tool utilizing Immersive Virtual Environment (IVE) technology through the Virtual Reality Perspective Taking (VRPT) technique. The tool, named EthnoVR 3.0, was designed to enhance general empathy and ethnocultural empathy levels while mitigating ethnocentrism. Furthermore, the assessment of Virtual Reality presence was incorporated to explore its potential correlation with increased empathy. The results of a two-phased quantitative study (N = 45) revealed that the utilization of the VRPT tool, compared to the pre-test, resulted in: (1) elevated levels of affective and cognitive empathy; (2) heightened level of ethnocultural empathy, which was also associated with a sense of presence, and (3) a reduction in ethnocentrism.

Index Terms: Immersive virtual environment—Virtual reality perspective-taking—Presence—; Cross-cultural psychology—Ethnocentrism—General empathy—Ethnocultural empathy

1 INTRODUCTION

Ongoing globalization and the resulting development of multicultural societies underscore the growing social importance of issues related to ethnocentrism and ethnocultural empathy. Ethnocentrism hinders cross-cultural relations and may exacerbate culturally motivated conflicts, whereas ethnocultural empathy fosters deeper understanding among individuals from diverse cultures. Research has shown that Virtual Reality-based interventions are an effective measure in increasing the level of cognitive empathy [1, 2, 7] and decreasing ethnocentrism [1, 2]. Moreover, tasks using Virtual Reality Perspective Taking (VRPT) can more effectively induce empathy than traditional, less immersive perspective-taking tasks like watching a movie or reading a narrative [4].

This study introduces EthnoVR 3.0, representing the next generation in immersive cross-cultural experiences. Building on the significant results of 360-degree movies: EthnoVR 1.0 [1] and EthnoVR 2.0 [2], this iteration specifically explores the use of Immersive Virtual Environment (IVE) technologies to verify their potential to induce similar results.

2 MATERIAL

2.1 EthnoVR 1.0 and EthnoVR 2.0

EthnoVR project was launched in 2020 with the objective of creating an experience to foster a better understanding of individuals from different cultural circles, using head mounted display technology.

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Figure 1: The first scene in EthnoVR 1.0/2.0 (on the left) and in EthnoVR 3.0 (on the right).

EthnoVR 1.0, is a 7-minute 360-degree video depicting a cross-cultural misunderstanding between two students - one from Poland and the other one from China. Users can immerse themselves in the same scenario from two different perspectives, experiencing the Chinese student's internal dialogue and listening to his heartbeat through VR goggles. The video ends with a cultural explanation of the events. The design process was documented in [1].

EthnoVR 2.0 [2] improved upon its predecessor by incorporating the thoughts of the Polish student (while EthnoVR 1.0 presented an 'internal dialog mode' exclusively from the Chinese student's perspective) and providing subtitles in the native languages for each cultural group (Polish for Poles and Chinese for Chinese), as well as in English.

2.2 EthnoVR 3.0 (EthnoVR IVE)

The EthnoVR Immersive Virtual Environment was designed to evaluate its potential impact on participants' empathy and ethnocentrism, akin to the effects observed with the usage of EthnoVR 1.0 and EthnoVR 2.0. The script of the original tools [1, 2] was completely transferred to a virtual environment created in a game development and animation engine Unity (see Fig. 1 & 2). In this way, the person participating in the experience is no longer bound to the perspective of a 360-degree camera. Instead, all the movements of the subject are accurately reproduced in virtual reality in the 6 degrees of freedom mode (6 DoF).

Furthermore, an element of interactivity between the user and the tool has been added. At the end of the experience, participants, aided
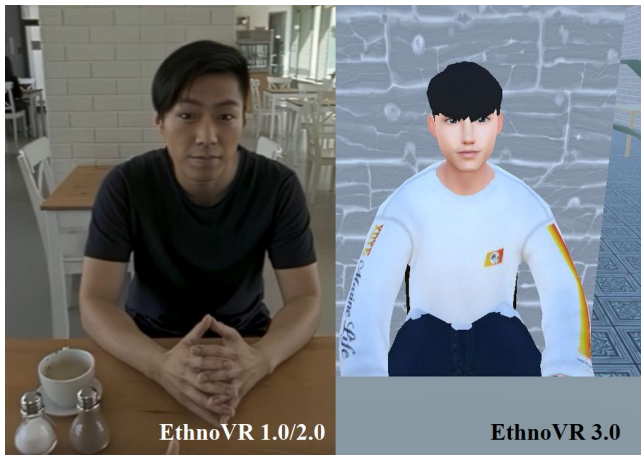
Figure 2: Comparison of the example scene from EthnoVR 1.0/2.0 (360-degree movie) and EthnoVR 3.0 (IVE).

Figure 3: The comparison of pretest and posttest mean scores.

by the controllers, selected one of two options to provide a potential explanation for the misunderstanding that occurred on the scene. Regardless of the choice made, each participant received a cultural explanation, read by the voiceover, present in the previous iterations. It is noteworthy to add that EthnoVR 3.0, in alignment with the initial iteration (EthnoVR 1.0) but distinctively different from the second iteration (EthnoVR 2.0), lacks the inclusion of subtitles.

2.3 Production methods

The character avatars were generated with ReadyPlayerMe's online platform providing a Software Development Kit for the Unity engine. The avatars were then rigged and animated by combining multiple full body animations delivered from Mixamo. Facial expressions were filmed with actors and then re-created using artificial intelligence face tracking technology from DeepMotion. The integration of these technologies into a single environment on the Unity platform was done with scripts written in C#. Application was then transferred to the Meta Quest 2 VR headsets, through which participants experienced the video.

3 RESEARCH RESULTS

In order to test whether participation in an experience using the EthnoVR tool would affect the level of ethnocentrism, general empathy and ethnocultural empathy, a quantitative analysis was conducted. The sample included 45 psychology students of Polish origin aged 19–33 years (M = 23.56 years, SD = 3.88 years; 38 females, 6 males, and one sex unknown). Two phases were undergone in the study. In the first phase, participants completed a set of online questionnaires (pre-test), including the Interpersonal Reactivity Index (IRI) to measure general empathy (encompassing cognitive and affective facets), the Scale of Ethnocultural Empathy (SEE) to measure ethnocultural empathy, and the Ethnocentrism Scale (ES) to measure ethnocentrism. The second phase took place a week later in a laboratory, where experimental manipulation was conducted using the VRPT tool (EthnoVR 3.0 IVE), followed by a re-evaluation of the analyzed variables (post-test).

The results of the analyses confirmed a significant increase in empathy: ethnocultural, cognitive and affective, as well as a decrease in ethnocentrism. The results we obtained only partially coincide with the conclusions from a meta-analysis of 43 studies on the impact of VR on various types of empathy [6]. These analyses revealed that VR improved emotional empathy, but not cognitive empathy, whereas in our study, the effect on both types of empathy
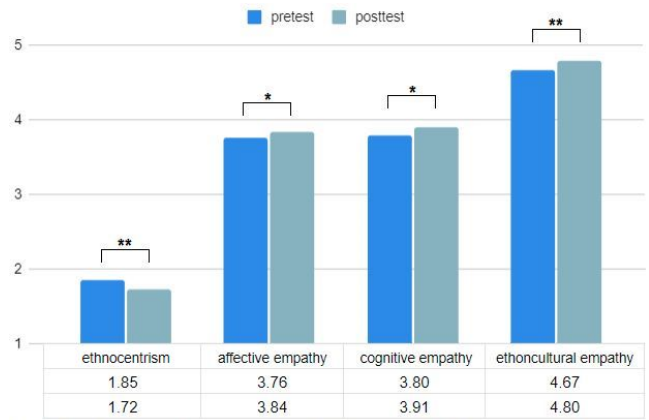
was statistically significant ($p < 0.05$, see Fig. 3). In our study we also tested whether the level of presence correlates with the change in the level of empathy after the post-test experimental manipulation. The study has shown that the level of sense of presence in Virtual Reality was positively related to the growth of ethnocultural empathy. Our results aligns with many findings from research on the use of VR for inducing empathy [5, 7].

4 CONCLUSION AND FUTURE WORKS

IVE tool presented in this paper contributes to the development of methods used at the intersection of psychology and technology. The findings may also be relevant to education regarding cross-cultural differences in communication and indicate the direction in which researchers can develop research tools. The EthnoVR 3.0 proved to have high potential for enhancing etnocultural empathy and reducing ethnocentrism. Shaping appropriate attitudes and reducing prejudice against people from different cultures is essential for maintaining healthy relationships at school, work or business.

In the future, EthnoVR 3.0 could be expanded to incorporate comparisons among different groups, considering factors such as gender, education, age, or ethnicity of the participants. It is important to emphasize that the high scalability of the technologies used makes it possible to explore many different types of cross-cultural scenarios, making it possible to identify those that have the greatest impact on the level of ethnocultural empathy and ethnocentrism. In the future, we may enchance the tool with the ability to view one's own Virtual Body (VB), whether by looking at one's limbs or even by placing a mirror in the virtual room. This could make it easier to identify with the VB and thus increase the sense of presence [3], which in turn could translate into a stronger induction of empathy. We could also bolster the interactive element, for instance, by incorporating the option to establish contact with avatars. This way, participants could decide how to steer the conversation by selecting from the available dialogue options displayed on the screen.

REFERENCES

[1] D. Hekiert, M. Igras-Cybulska, and A. Cybulski. Designing VRPT experience for empathy toward out-groups using critical incidents and

cultural explanations. In *2021 IEEE International Symposium on Mixed and Augmented Reality Adjunct (ISMAR-Adjunct)*, pp. 506–507. IEEE, 2021.

[2] D. Hekiert, M. Igras-Cybulska, A. Cybulski, and K. Kwiatkowski. eth-novr 2.0.: A first-person experience of cross-cultural misunderstanding in Virtual Reality. In *2022 IEEE International Symposium on Mixed and Augmented Reality Adjunct (ISMAR-Adjunct)*, pp. 895–896. IEEE, 2022.

[3] S. Jung and C. E. Hughes. The effects of indirectly implied real body cues to virtual body ownership and presence in a virtual reality environment. In *Proceedings of the 22Nd ACM Conference on Virtual Reality Software and Technology*, pp. 363–364, 2016.

[4] M. Mado, F. Herrera, K. Nowak, and J. Bailenson. Effect of virtual reality perspective-taking on related and unrelated contexts. *Cyberpsychology, Behavior, and Social Networking*, 24(12):839–845, 2021.

[5] A. J. Marques, P. Gomes Veloso, M. Araújo, R. S. de Almeida, A. Correia, J. Pereira, C. Queiros, R. Pimenta, A. S. Pereira, and C. F. Silva. Impact of a virtual reality-based simulation on empathy and attitudes toward schizophrenia. *Frontiers in Psychology*, 13:814984, 2022.

[6] A. J. Martingano, F. Hererra, and S. Konrath. Virtual reality improves emotional but not cognitive empathy: A meta-analysis. *Technology, Mind, and Behavior*, 2021.

[7] A. Van Loon, J. Bailenson, J. Zaki, J. Bostick, and R. Willer. Virtual reality perspective-taking increases cognitive empathy for specific others. *PloS one*, 13(8):e0202442, 2018.