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Virtual Reality Game Analysis for People with Functional Diversity: An Inclusive Perspective †

María del Carmen Miranda-Duro *, Patricia Concheiro-Moscoso, Javier Lagares Viqueira, Laura Nieto-Riveiro, Nereida Canosa Domínguez and Thais Pousada García

TALIONIS Group, CITIC, Oza, Universidade da Coruña, 15071 A Coruña, Spain;
patricia.concheiro@udc.es (P.C.-M.); javier.lagares@udc.es (J.L.V.); laura.nieto@udc.es (L.N.-R.);
nereida.canosa@udc.es (N.C.D.); thais.pousada.garcia@udc.es (T.P.G.)
* Correspondence: carmen.miranda@udc.es
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Abstract: Virtual reality (VR) allows us to simulate everyday life environments with realism and in an immersive environment, with the use of the appropriate hardware. People with functional diversity, either because of environmental barriers or because of their reduced mobility, have fewer opportunities to participate in different daily activities or risk situations outdoors. Therefore, VR can be a technological resource for these people to access, try out, and experience different environments and scenarios, offering new participation experiences. Therefore, the aim of this proposal is to analyze the properties and determine the possibilities of the virtual reality applications available on commercial platforms for use in the practice of rehabilitation and intervention aimed at people with functional diversity. This is a transversal, descriptive study that has focused on the analysis of the 40 applications from the STEAM Virtual Reality and VIVE platforms for High Tech Computer Corporation (HTC). After analysis, it has been observed that there are no applications available that are fully accessible and with a minimum degree of usability for use by people with functional diversity.

Keywords: virtual reality; functional diversity; accessibility

1. Introduction

Virtual reality (VR) allows us to simulate everyday life environments with realism and in an immersive environment, with the use of the appropriate hardware. These virtual spaces allow for the reproduction of everyday situations, such as shopping, attending a concert, or going on a medical visit, but also, other experiences that are less frequent, such as exposure to risk events, adventure experiences, or stimuli that can simulate "phobias" for their approach. People with functional diversity, either because of environmental barriers or because of their reduced mobility, have fewer opportunities to participate in different daily activities or risk situations outdoors. Therefore, VR can be a technological resource for these people to access and try out different environments and scenarios, offering new experiences of participation. Furthermore, the possibility of adapting and customizing these virtual contents gives them added value, optimizing their applicability in a therapeutic intervention [1,2].

The aim of this proposal is to analyze the properties and determine the possibilities of VR apps available on commercial platforms for use in the practice of rehabilitation and intervention aimed at people with functional diversity. As a specific objective, it is proposed that the content of the apps must be related to different activities in people's daily lives, such as simulations of a job or activities such as cooking.

2. Material and Methods

The present study was carried out between February and May. The apps included in the analysis of the present study met the inclusion and exclusion previously defined (see Table 1).

The present study consists of a transversal, descriptive study that has focused on the analysis of the different apps included. This process has been carried out on the basis of a checklist of our own elaboration through which different characteristics were analyzed, such as language options; age for use; type of activity (observation or interaction); purpose; duration; physical and cognitive, comprehension or usability implications; game mode (individual or multiplayer); level of accessibility, and cost.

Table 1. Inclusion and exclusion criteria of virtual reality app analyzed.

Inclusion Criteria	Exclusion Criteria
Virtual Reality app about any activity of daily living (i.e., cooking, driving, job simulator) VR app from Steam VR and Viveport platform for HTC glasses	Virtual Reality app about aggressive or conventional videogames

3. Results

A total of 40 VR apps were included in the analysis of the present study. From Viveport were Camila, Let Hawaii Happen, Lifelique VR Museum, BallomBon Cashmere, Ikea VR Pancake Kitchen, The Stanford Ocean Acidification Experience, Richie Experience, Sim City, The Blu: Whale Encounter, VR Bowls, Engage, ISS 360º Tour with Tim Peake, Crossing the Road with Safety, Cmoar VR Cinema, Cabinet Model Room, The VR Museum of Fine Art, Underwater Mermaid, Clash of Chefs VR—Early Access, Bartender VR Simulator, Manifest Dream, VR Paris Bus Tour—France, Museum of Other Realities, 3D Organon VR Anatomy, OhShape, Ultimate Fishing Simulator, Mona Lisa: Beyond the Glass, First Person Tennis—The Real Tennis Simulator, Virtual Vacations, Blueplanet VR, Conductor, Paper Fire Rookie, and Healthy Badminton 2019 [3]. From the Steam platform, we included BoxVR, Tiny Town VR, Budget Cuts, Thief Simulator, Surgeon Simulator: Experience Reality, Ocean Rift, and Minigolf VR [4].

The most common language was English (92.5%), while the 52.5% of them were only in English, followed by Spanish (30%)—but none of them were only in Spanish—and Chinese (27.5%), while 7.5% were only in Chinese. The languages included in the apps were English, Spanish, Chinese, Korean, French, German, Italian, Japanese, Korean, Polish, Portuguese, Russian, Turkish, and Dutch. However, no app specified the appropriate age for use. In addition, related to the type of activity, 30% of the 40 apps were only for observational mode, while the rest were available in an observation and interaction mode with the VR scenario.

Among the different purposes that the different apps had, it is worth mentioning some of them, for example story-telling; vacation simulator; education (i.e., anatomy) and learning cultural aspects (i.e., visiting museums or cities); creating dresses; games such as blow up balloons; activities such as cooking; observation of oceans or landscapes; job simulator (i.e., office job, waiter, surgeon); a city simulator; playing sports (i.e., bowls, golf, tennis, badminton, boxing); organization of classes, meetings and others; space simulator in the role of an astronaut; crossing the road with safety; leisure activities such as cinema, room design, fishing, firefighting, and a thief simulator. The duration of the experience in each app was specified only in five of them and ranged from minimum 2 min to 2 hours maximum, depending on the type of activity. In addition, 82.5% are to be enjoyed individually, while the rest allows for a multi-player experience.

With regards to accessibility, 37.5% are required to be used standing up, while 5% are performed sitting down. However, 57.5% can be used both standing and sitting. In this line, 45% are free, while the rest range from EUR 0.99 to EUR 27.99.

4. Discussion and Conclusions

The aim of this proposal is to analyze the properties and determine the possibilities of VR apps available on commercial platforms for use in the practice of rehabilitation and intervention aimed at people with functional diversity. Therefore, it should be noted that the purpose of the apps mainly does not include in leisure activities, clothing, food, social participation, education, work, and play. Activities such as personal care, grooming, or others such as money management are also not included.

In the same way, the authors have found it difficult to classify the different apps as "easy", "difficult", or "intermediate" taking into account what is involved at the physical, cognitive or understanding level due to basic limitations, such as language or the controls themselves that are used for virtual reality experiences. Thus, there was no app specifically designed and created for people with functional diversity, but which also met the accessibility requirements defined by Web Content Accessibility Guidelines 2.1 [5].

In conclusion, after the analysis was carried out, it has been observed that there are no applications available that are fully accessible and with a minimum degree of usability for use by people with functional diversity. In addition, there is a language handicap, since they are mostly only available in English. The way of interacting with the virtual environment can also generate problems, since the use of the controls and the activation of different buttons complicates and limits the complex handling in case the person has reduced mobility. Given this lack of adequate resources and the relevance that VR can have in therapeutic processes, the need to create virtual reality scenarios adapted and suitable for people with functional diversity is detected.

Conflicts of Interest: The authors declare no conflict of interest.

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