Breaking Social Isolation for Older People Living Alone with Technology

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ABSTRACT

This paper is aiming to present two studies investigating attitudes of older people towards different technologies to break their social isolation and investigating the impacts of Immersive Virtual Reality (IVR) on physical and mental dimensions. The first study, based on focus groups conducted with 23 older people (aged from 65 to 93 years-old) allowed to collect attitudes and opinions of older people about different technologies to help them to break social isolation. The second study, based on an experiment conducted with 42 older people (aged from 63 to 85 years-old) allowed to investigate the impact of a specific Immersive Virtual Reality (IVR) on physical and mental dimensions. The first study confirm that Immersive Virtual Reality (IVR) can be a relevant digital tool for elderly people according to them, *i.e.*, a digital tool perceived as useful, usable and acceptable. The second study demonstrates that use of a specific Immersive Virtual Reality (IVR) system can reduce the perception of social isolation and can have positive impacts on physical dimensions such as the weight and the waist circumference. Theoretical and applied implications are discussed.

CCS CONCEPTS

• **Social and professional topics**; • **General and reference** → **General conference proceedings**;

KEYWORDS

technology, acceptability, older people, social isolation, loneliness

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1 INTRODUCTION

As people generally live longer, maintaining physical autonomy of older adults, and thus their independence, is a key challenge that all modern societies must face and succeed to ensure the economic and social well-being of the entire population. Moreover, loneliness is also a key challenge in the social domain related to aging. So, the ability to stay connected to community services and to maintain social interactions is considered today to be crucial to well-being and successful aging (for a synthesis, see [6]). To stay connected with other, to maintain social interactions and to preserve physical activity, walking is one the best activities for older adults because it has positive effects on physical and mental health for older adults [7]. If there are different interventions and methods to improve social skills and to enhance social support [1], several studies demonstrated that Immersive Virtual Reality (IVR) can be relevant and acceptable for older people to promote and maintain physical and social activities [4, 6]. Moreover, several recent studies showed that the older adults reported positive experiences and positive attitudes with Immersive Virtual Reality (IVR) . So, if IVR technologies can be used as a tool to reduce social isolation of older adults and to increase engagement in physical activity, we assume that an IVR system is efficient if behavioral changes are transferred from the virtual to the real physical world.

In this vein, we present two complementary studies:

- The first study, based on focus groups conducted with 23 older people (aged from 65 to 93 years-old), is aiming to collect attitudes and opinions about different technologies to help them to break social isolation.
- The second study, based on an experiment conducted with 42 older people (aged from 63 to 85 years-old), is aiming to investigate the impact of Immersive Virtual Reality (IVR) on physical and mental dimensions.

2 STUDY 1

The first study was based on focus groups conducted with Twenty-three French older people to collect opinions and attitudes towards different technologies to help seniors to increase their physical activity outside.

Figure 1: One of the focus groups conducted with volunteers older people.

.Each focus group had three steps: First, after a brief presentation of the main goals of the study, participants were asked to verbalise freely their opinions and attitudes towards technology. Moreover, they were asked to explain what kind of technology they use in their daily life, for what activities, in what context, etc. (e.g., to search for information about health, to communicate and to share photos with their children, to practice e-banking); Second, three digital tools are presented to participants by the experimenter. These digital tools have been presented with three videos displaying seniors using them (Fig.2) (i) a wearable device/sensor used to collect data about gait and balance; (ii) an Immersive Virtual Reality (IVR) system to simulate navigation at home; (iii) a connected watch with its smartphone. Participants were asked to give their opinions about each of these digital tools, their advantages and limits *a priori*; Finally, like for the first step, participants were asked to verbalise freely their opinions and attitudes towards technology (utility, usability, acceptability).

Contents of verbalisation of participants produced during all the focus groups have been analysed by using an inductive content analysis, and a SWOT analysis (Strengths, Weaknesses, Opportunities, Threats) has been conducted to interpret verbalisation produced by the participants. Based on this SWOT analysis, utility, usability and acceptability have been estimated. As Fig.2 summarizes, our results obtained in the first study tend to demonstrate that an Immersive Virtual Reality (IVR) system could be the most relevant digital tool for elderly people, *i.e.*, a digital tool perceived as useful, usable and acceptable.

It is the reason why we investigate more precisely, in an experiment presented below (study II), the impacts of an IVR on physical and mental dimensions for older people. In particular, we hypothesize that an IVR can have positive impacts of physical data and social isolation for elderly people.

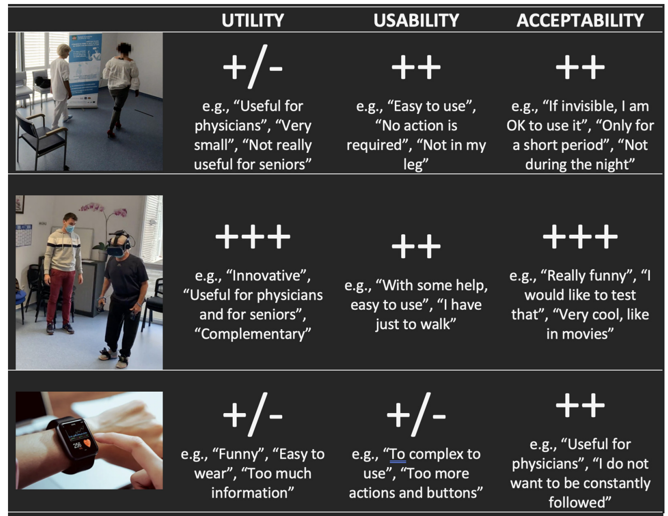

Figure 2: Utility perceived, usability and acceptability for each of the three digital devices displayed to elderly people during the focus groups: a wearable device/sensor (at the top); Immersive Virtual Reality (or IVR, at the middle); a connected watch (at the bottom line).

3 STUDY 2

We hypothesized that the use and navigation in an Immersive Virtual Reality (IVR) system can have positive impacts on real behaviors (walking) in the real world and on perception of social isolation. Forty-two older adults participated to our experiment (63-85 years-old), half of whom interacted with a specific Immersive Virtual Reality (IVR) daily for 4 months in their homes and half of whom served as a standard-of-care control.

Forty-two French older adults aged 65 to 85 years participated to our experiment (percentage of female= 64.2; mean age = 78.1, SD = 7.1 years). Distribution of participants is presented in Table 1. All participants have lived alone for different reasons (separated, widowed, divorced, never having married). Participants are distributed in two separate groups: 21 participants in the experimental group and 21 participants in a control group. Participants in the experimental group were asked to interact with a specific Immersive Virtual Reality (IVR) daily for 4 months in their homes, at least 15 minutes per day. No specific information has been provided for participants who served as a standard-of-care control.

The IVR used in our study was specifically created for a series of experiments investigating the behaviors of pedestrians with specific needs (e.g., older adults, adults with motor impairment) in urban areas. This IVR has been developed by Human Games© company and requires the use of an HTC Vive headset (Fig.3). In this IVR system, pedestrian/user can freely navigate in a city, i.e., s/he can cross streets, s/he can move where s/he wants, s/he can stop to move where s/he wants. Other pedestrians and vehicles are also present.

As Table 2 shows, four main interesting results have been obtained:

	IVR group (n = 21)	Control group (n = 21)	Total (N = 42)
SEX(n, %)			
Male	8 (38%)	7 (33.3%)	15 (35.7%)
Female	13 (61%)	14 (66.6%)	27 (64.21%)
AGE			
Mean (SD)	78.4 (6.7)	77.8 (6.9)	78.1 (6.8)
Min.-Max.	64-85	63-84	63-85
REASONS FOR LIVING ALONE (n, %)			
Never having married	2 (9.5%)	2 (9.5%)	4 (9.5%)
Divorced	3 (14.2%)	4 (19%)	7 (16.6%)
Separated	1 (4.7%)	0	1 (2.3%)
Widowed	14 (66.6%)	15 (71.4%)	29 (69%)
SCORE MMSE			
Normal (> 24)	17 (80.9%)	16 (76.1%)	33 (78.5%)
Mild (21-24)	4 (19%)	5 (23.8%)	9 (21.4%)
Moderate (10-20)	0	0	0
Severe (<10)	0	0	0
AIDS(n, %)			
Using glasses	19 (90%)	20 (95.2%)	39 (92.8%)
Hearing Diff.	5 (23.8%)	6 (28.5%)	11 (26.1%)
Limited mobility	2 (9.5%)	2 (9.5%)	4 (9.5%)

Table 1: Distribution and characteristics of study participants.

Figure 3: Two screenshots of urban scenes extracted from the IVR created by Human Game© used in our experiment.

- The mean weight and the mean waist circumference of participants using the specific IVR system decrease significantly ($p.$ = .002) while these data remain stable for the control group;
- The number of steps outside and the perception of intensity of activity increase significantly for participants using the specific IVR system ($p. < .001$), while these data remain stable for the control group;

	Fist session (Week 1)	Last session (Week 10)	*p.*
WEIGHT (in kg.; Mean and SD)			
IVR group (n = 21)	66.8 (7.9)	63.7 (8.7)	.002
Control group (n = 21)	67.1 (9.1)	67 (8.8)	*ns*
WAIST CIRCUMFERENCE (in cm.; Mean and SD)			
IVR group (n = 21)	102 (12.3)	97.5 (14.2)	.003
Control group (n = 21)	101 (13.9)	100.5 (11.2)	*ns*
NUMBER OF STEPS OUTSIDE (Mean and SD)			
IVR group (n = 21)	3890 (878)	7604 (754)	<.001
Control group (n = 21)	4002 (652)	3791 (448)	*ns*
TIME OF USE OF IVR (in min. per day; Mean and SD)			
IVR group (n = 21)	15 (3.8)	12 (4.7)	.02
Control group (n = 21)	-	-	-
PERCEPTION OF INTENSITY OF ACTIVITY (from 0 to 7; Mean and SD)			
IVR group (n = 21)	1 (0.1)	5.5 (0.3)	<.001
Control group (n = 21)	0.8 (0.2)	1.3 (0.3)	*ns*
LONELINESS SCORE (Mean and SD)			
IVR group (n = 21)	37.06 (4.2)	21.43 (6.1)	<.001
Control group (n = 21)	37.02 (5.7)	36.71 (6.6)	*ns*

Table 2: Mean (and SD) obtained in the experiment conducted in the study 2, for the two groups (IVR group and Control group), at the beginning and the end of the experiment.

- the loneliness score (*i.e.*, perception of social isolation) decreases significantly for participants using the IVR system ($p. < .001$), while this score remains stable for the control group;
- The positive impacts related to the use of the IVR exist even if the time spent to use this IVR system decreases.

In other words, the use of IVR has positive impacts on physical dimensions (weight, waist circumference) and on mental dimensions (loneliness score) because it has a positive influence on the number of steps performed outside. This result is really interesting because positive impacts exist even if the time spent to use the IVR decreased ($p. = .02$). If the IVR led to reduced loneliness, it is probably because physical activity created opportunities to meet people in the real/physical world, that is being an indirect effect of the IVR.

4 GENERAL DISCUSSION

Results obtained in the first study, based on focus groups conducted with 23 seniors, confirmed that an Immersive Virtual Reality (IVR) system can be a relevant digital tool for elderly people according to them, *i.e.*, a digital tool perceived as useful, usable and acceptable. Results obtained in the second study, based on an experiment conducted with 42 seniors, have mainly shown that use of a specific Immersive Virtual Reality (IVR) system can reduce the perception of social isolation and can have positive impacts of physical data (weight and waist circumference) for older adults because activity performed with the IVR stimulates activity performed outdoor (*i.e.*, walking as pedestrian). In other words, walking in the virtual world has a direct and positive impact on walking activity performed outdoor, in the real world.

Even if future studies are needed to control the possible impact of some individual factors (e.g., gender, status, hobbies), our experiment confirms that as Immersive Virtual Reality (IVR) has become more accessible, affordable, and comfortable, it provides a unique opportunity to use these technologies to enable older adults to escape from their often confined area [2, 3, 5]. More precisely, the use of a specific IVR can modify positively human behaviors of older adults from the virtual to the real and physical world. In other words, impacts of an Immersive Virtual Reality can be positive because its use can help individuals (here, older adults) to adopt new intentions and new positive behaviors in real and physical world.

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