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Virtual reality in retirement communities: Technology acceptance and tourist destination recommendation

Abstract

Despite the importance of analysing virtual reality (VR) technology acceptance by older adults and investigating the use of this technology as a marketing tool to enhance destination tourism word of mouth (WOM), no study seems to have addressed these issues. Thus, this study explores how the technology acceptance model (TAM) and anxiety regarding the use of VR after virtually visiting a tourist destination influence older adults' intention to reuse VR for tourism. Most importantly, this study examines whether this intention is related to WOM recommendations of a virtually visited tourist destination. Using a combination of quantitative (PLS) and qualitative (thematic analysis) methods, this study uses data gathered from older adults living in four continuing care retirement communities. VR glasses (Oculus Go Standalone) were used to virtually visit the Carnival of Venice. Results show that the TAM factors are key drivers of older adults' use of VR, which in turn influences tourist destination recommendations. Anxiety was found to reduce the VR device's perceived ease of use, but it was not found to be related to perceived usefulness. Implications for practitioners and possible directions for future research are discussed.

Keywords: virtual reality; technology acceptance; destination recommendation; older adults; mixed methods; partial least squares (PLS)

1. Introduction

The tourism sector has recently undergone several changes due to a range of global trends (Kim & Wang, 2019). Two of these trends are particularly noteworthy, given their impact on the traditional behaviour of travellers. The first is the appearance of innovative technologies, such as virtual reality (VR), capable of creating memorable experiences for potential customers (Flavián et al., 2019; Serra-Cantallops et al., 2018). The second is the increase in the number of older travellers (Pan et al., 2021). People in developed regions and countries, such as Europe, are increasingly reaching an advanced age in better health and with more motivation to engage in physical and leisure activities than older adults in past decades (e.g. Huber, 2019; Hunter-Jones & Blackburn, 2007; Patterson & Pegg, 2009). This trend suggests that older adults will demand more products and services in keeping with their life situation (Huber, 2019).

The World Tourism Organization (UNWTO, 2011) forecasted that the number of international tourists will approach 2 billion by 2030, with an estimated 15% to 30% of tourist aged 60 years and over. Therefore, the population of those aged 60 or older will represent a huge market segment with an abundance of unexploited opportunities for the tourism market (Zsarnoczky, 2017). Furthermore, in most developed countries the disposable income of consumers aged 60 years and over is increasing every year, which makes this age group extremely important to the consumer industries. For example, in 2014 the mean income of Europeans aged 60 years or over was 15,064 euros, whereas in 2019, it was 16,863 euros (28 countries, Eurostat, 2021). Companies, therefore, should closely examine these changes in demand, given the attractiveness of this segment (Patterson & Balderas, 2020). Companies that already target this segment should make a greater effort to meet this incremental demand, whilst companies that do not yet do so should develop specific offerings for this segment in order to grow their market.

Considering the above trends, the use of VR by older adults for tourism has two aims. First, it offers entertainment at a level adapted to the physical state and limitations of this segment of travellers (Jeng et al., 2017). Second, it promotes specific tourism destinations to this target group (East et al., 2014). Because many people in later life may have physical difficulties that make it problematic to travel to faraway places (e.g. taking international flights; Harvey et al., 2019; Lee & Bowes, 2016; Peltz et al., 2011), the use of VR could let them live a unique experience by virtually visiting a distant tourist

destination that they might not otherwise be able to see (Baker et al., 2019a). In fact, a recent study of virtual tourism for older adults living in residential care showed that the 'inability to afford insurance' and 'mobility issues' were the biggest barriers to tourism amongst individuals residing in collective dwellings (Fiocco et al., 2021).

Furthermore, although older adults are rarely potential clients of a given tourist destination, they could act as customers in a position to influence the consumer purchase decisions of relatives, peers and close friends to visit this destination. For example, East et al. (2014) suggested that social influence on brand purchase can be measured using word of mouth (WOM) and that this influence may occur when people give or receive advice about a specific product or service. The type and degree of this influence varies with the product category and people's living circumstances. Regarding product category, East et al. (2014) pointed out that certain products or services, such as the choice of a tourist destination for holidays, are more likely to be influenced by social recommendations than others. Although a decrease in the number of social contacts and interactions means that social influence may diminish as people age, trust in older adults' recommendations tends to be higher than trust in recommendations by younger people because older adults can offer more experience-based advice (Bailey et al., 2015; Li & Fung, 2013). Additionally, as suggested by East et al. (2014), the type and degree of social influence can vary according to the circumstances under which people live in terms of factors such as education, neighbourhood, work, friendships and family.

Likewise, older adults living in a continuing care retirement community (CCRC), are likely to have greater social contact than older adults who live in their own private homes because CCRCs provide an array of social and leisure activities in a campus-like setting (Roberts et al., 2019). In fact, the availability of physical, recreational and leisure programmes and activities in CCRCs plays a key role in offering older adults a platform for continuous learning and social engagement, which are essential for life satisfaction and well-being in later life (Fiocco, et al., 2021). Currently, most of these programs are done physically. However, extending such physical experiences into virtual-based opportunities is gaining interest as an intervention for improving older adults' well-being (Lin et al., 2018). One virtual leisure activity that has not been studied in depth in the context of residents of CCRCs is virtual tourism. This lack of research is surprising, given the widespread evidence that tourism positively affects life satisfaction and well-being by

allowing people to escape their daily routine and that tourism can offer opportunities to learn and experience something new in a restorative environment (Chen & Petrick, 2013). For example, Baker et al. (2019b) described how, after taking a virtual trip, residents living in a CCRC wanted to share their emotions about the destination with their families. Therefore, studying people living in CCRCs may be of great use for the promotion of WOM strategies involving older adults' recommendations of visits to tourist destinations.

To be able to recommend a tourist destination after a VR experience, older adults must first accept the use of this technology for tourism purposes (Roberts et al., 2019). However, compared to other age groups, older adults have received little attention in the VR literature, with a few exceptions. Previous research on older adults' use of VR for recreational activities has mainly focused on sports activities (e.g. Yeh et al., 2019). This lack of research may be because older adults rarely perceive themselves as users of VR in leisure activities and tend to adopt a wait-and-see attitude (Jeng et al., 2017). They are also often reluctant to accept new technologies, sometimes even rejecting them due to fear of incorrect use (Yeh et al., 2019).

However, the use of VR for recreational activities in CCRCs is on the rise (Baker et al., 2019a; Fiocco et al., 2021). Recently, some studies have investigated adults' use of VR in tourism experiences, travel, leisure, relaxation, or cultural and heritage tourism (e.g. Baker et al., 2019a; 2019b, Fiocco et al., 2021; Lin et al., 2018). In fact, in the study of Backer et al. (2019a) where exploring the design of social VR experiences with older adults, they find that travel was an important category of applications that had strong appeal to their participants. These authors conclude that the use of VR as a tool that allows older adults to travel virtually 'opens new possibilities for designers to create vivid travel experiences, and interrogate new interaction techniques, that allow older users with different levels of physical ability to not just view a new destination, but share this experience with others' (Baker et al., 2019a, p. 307). In this sense, these studies point out that the use of VR can support positive health outcomes for older adults by mitigating the effects of loneliness, providing therapeutic solutions and fostering meaningful connections within senior communities. Furthermore, they highlight the need to draw more attention to the examination of the factors that influence older adult's technology acceptance of VR.

Several meta-analyses have shown that the technology acceptance model (TAM; Davis, 1989) is a valid, robust and powerful model to explain technology acceptance behaviour in general, including amongst older adults (e.g. Roberts et al., 2019). This conceptual model recognises the role of perceived usefulness and perceived ease of use in users' attitudes and thus users' intention to use a specific technology. Other contextual and affective factors such as anxiety regarding the use of new technology have been revealed as major barriers to the use of technology by older adults (Dogruel et al., 2015; Heerink et al., 2010). Although the TAM has been widely used in the literature, this study is one of the first to use it to analyse the acceptance of technology by older adults in a tourism context. This contribution is important because the technology acceptance process of older adults greatly differs from that of children, youths or adults (Czaja et al., 2006; Jia et al., 2015), which is where previous studies have centred their attention.

The aim of this study is therefore to address the above research gaps and seeks to explain how TAM factors and anxiety regarding the use of VR technology after virtually visiting a tourist destination (Venice) influence older adults' intention to use VR again for tourism. Most importantly, the study also examines whether this intention is related to older adults' WOM recommendations of the virtually visited tourist destination.

2. Theoretical framework and hypotheses

2.1. Intention to use VR technology and destination recommendation

VR technology has a unique ability to provide perceptual simulations of real travel experiences. The travel and tourism industry has taken note and has begun applying this innovative marketing tool to transform the way people gain information about tourist destinations (e.g. Han et al., 2018). The travel and tourism industry also uses VR technology to perform interactive advertising (e.g. Scholz & Smith, 2016) and to boost the attitudes of tourists towards a specific place (e.g. Chung et al., 2018). Accordingly, research on VR use in tourist destinations reveals that visitors with higher intention to use VR may be more interested in the tourist destination they have just virtually visited (Rainoldi et al., 2018). Thus, an important element that influences the perception of the virtual tour experience is the concept of *presence*, which is 'the extent to which one feels present in the mediated environment, rather than in the immediate physical environment' (Steuer, 1992, p. 76). By creating the feeling of 'being there', VR technology intensifies

effects on media users, increasing or enhancing enjoyment, involvement, task performance and training (Yung et al., 2020).

Furthermore, scholars have suggested that the feeling of presence generated by using VR technology positively affects tourists' satisfaction (e.g. tom Dieck & Jung, 2018), and recommendation intention is an indicator of a positive behavioural outcome from a satisfactory tourist experience. For example, Chung et al. (2018) found that the sense of presence generated by VR technology use positively affects tourists' intention to revisit and recommend cultural heritage sites and museums. In the case of older adults, seemingly no studies have explored the link between the intention to use VR technology after having visited a tourist destination virtually and the intention to recommend it. The exception is the study by Baker et al. (2019b), who described how, after taking a virtual trip, residents living in aged care wanted to share their emotions about the destination with their families.

By contrast, in other areas of research, the intention-recommendation link has received widespread empirical support. For instance, Thornton et al. (2005) found that older adults who had participated in VR-based balance exercise programmes were highly motivated to attend those programmes and then recommended them to both their family and other participants. Kim and Kim (2017) also confirmed that, in older adults, satisfaction arising from the use of a special technology or system leads to perceived benefits, which may in turn result in WOM intentions. Thus, by creating a sense of 'being there', VR tours can promote positive feelings towards a destination (Tussyadiah et al., 2018) and generate intentions to visit and recommend it (Marasco et al., 2018, Yung et al., 2020).

Given VR technology's novelty, together with its importance and potential use as an information tool to enhance leisure and destination tourism WOM by older adults, the following hypothesis is proposed:

H1: Older adults' intention to use VR technology again is positively related to their intention to recommend (through WOM) the tourist destination they have virtually visited.

2.2. Technology acceptance model (TAM)

In the older adult segment, VR technology has mainly been applied as a training tool in medical settings (e.g. Hayhurst, 2018; Kim et al., 2017; Stone, 2018) and for entertainment and leading an active life (Baker et al., 2019b; Thornton et al., 2005). Very

few studies have focused on older adults' acceptance of VR technology for entertainment and leisure activities. For example, in a study of how older adults respond to VR, Roberts et al. (2019) found that VR increases entertainment options for people in CCRC, indicating that older adults with a positive attitude towards VR technology have higher intention to use it in the future.

To examine which factors condition VR technology adoption by older adults, this study uses the TAM (Davis, 1989), which has been described as 'the most influential and widely used theory for explaining an individual's acceptance of information technology' (Min et al., 2019, p. 2). The TAM has been commonly adopted and empirically validated as a means of understanding tourists' use of virtual environments (e.g. tom Dieck & Jung, 2018) and tourism and destination visit intention (e.g. Tussyadiah et al., 2018). According to the TAM, perceived usefulness and perceived ease of use influence users' attitudes and thus users' intention to use a specific technology (Venkatesh, 2000; see Figure 1).

Attitude is a central concept in consumer behaviour literature because it is generally accepted that attitude predicts intention behaviour (Ajzen & Fishbein, 1980). Accordingly, older adults' attitudes towards the use of VR technology for tourism should reinforce their intention to use this technology in the future. For example, Heerink et al. (2010) tested the acceptance of assistive social agents by older adults, finding that attitude is one of the most significant influences on use intention. Furthermore, in the TAM, attitude and intention to use a given technology are key endogenous factors determined by the two technology-related exogenous constructs of perceived usefulness (PU) and perceived ease of use (PEOU).

In this research, PU is understood as the degree to which older adults believe that using VR technology would improve their quality of life (Venkatesh et al., 2003). In contrast, PEOU is the degree to which older adults believe that using VR technology (i.e. glasses) would be free from effort (Venkatesh, 2000). Previous research has provided strong support for the impact of both PU and PEOU on attitudes towards the adoption of a particular system or technology in the context of decision-making processes (e.g. Doll, et al, 1998), consumer satisfaction and preferences (e.g. Devaraj et al., 2002), and tourism (e.g. Mendes-Filho et al., 2018; tom Dieck & Jung, 2018). Moreover, previous studies have highlighted the fact that the role of both factors (PEOU and PU) in attitudes towards a new technology is even more prominent for older users than for younger users (Jia et

al., 2015). Empirical evidence of older adult's acceptance of new technology suggests that the lack of PU is one of the most important factors preventing them from adopting technologies in their daily lives (e.g. Dogruel, et al., 2015).

Therefore, understanding why older adults may accept or reject VR technology for tourism based on their PEOU and PU is crucial to avoid mistakes when implementing these technological innovations. Finally, according to the general TAM, PEOU also plays an important role in explaining PU. Many authors (e.g. Lin et al., 2018; Tsai et al., 2020) agree that the ease of use of a specific product or technology means that older adults find this product or technology more useful for them and therefore have a stronger intention to use it. In this study, if older adults find VR glasses easy to use, they are likely to see them as an important and useful tool for their travel experiences (Mendes-Filho et al., 2018).

Based on this discussion, the following hypotheses are proposed:

H2: Older adults' attitude towards the use of VR technology is positively related to their intention to use it again.

H3: Older adults' perceived ease of use is positively related to their attitude towards VR technology.

H4: Older adults' perceived usefulness of VR technology is positively related to their attitude towards VR technology.

H5: Older adults' perceived ease of use of VR technology is positively related to perceived usefulness.

2.3. The role of anxiety regarding the use of technology

Technology anxiety (TA), or anxiety regarding the use of new technology, is defined as an individual's evocation of anxious emotional reactions when considering using or actually using a certain system or technology (Heerink et al., 2010). In the present study, TA refers to the anxious emotional reactions of older adults towards using VR technology for travel experiences. Such reactions are purported to be a particularly important factor amongst older adults (Tsai et al, 2020).

Older generations usually have more TA towards unfamiliar technology than younger generations because older generations have lower self-efficacy and weaker technology skills (Czaja et al., 2006; Tsai et al., 2020). Therefore, this attitudinal variable is a major barrier to innovation adoption by older adults (Dogruel et al., 2015; Heerink et

al., 2010). For instance, Berkowsky et al. (2018) analysed older adults' adoption of nine technologies, confirming that technology adoption by older adults is affected by technology-related anxiety. Similarly, Lee et al. (2011) found that anxiety was one of the two main obstacles for older women in learning to use computers. This finding is consistent with those of Wagner et al. (2010), who observed that anxiety-related constructs are the main barriers to computer use amongst older adults. Finally, Czaja et al. (2006) analysed the use of technology amongst community-dwelling adults and found that older adults show more computer anxiety and are less likely to have computer and Internet experience than younger adults. In the literature, there is widespread agreement that the greater the technology anxiety is, the lower the PEOU and PU will be for everyday technologies such as wireless/sensor technologies (Tsai et al., 2020), computer use (Wagner et al., 2010), and assistive social agents (Heerink et al., 2010). However, no study seems to have addressed these issues in tourism. Therefore, the following hypotheses are proposed:

H6: Anxiety regarding the use of VR is negatively related to older adults' perceived ease of use of VR technology.

H7: Anxiety regarding the use of VR is negatively related to older adults' perceived usefulness of VR technology.

The hypotheses are summarised in Figure 1.

< Insert Figure 1 about here>

3. Method

3.1. Research design

A mixed methods design was used to analyse older adults' acceptance of VR and destination recommendations. This approach has become more prevalent in tourism in recent decades (Molina-Azorín & Font, 2016). The combined use of a quantitative (dominant) method and a simultaneous (concurrent) qualitative method (QUAN + qual) was considered a suitable approach, given the lack of previous research on older adult technology adoption in tourism. A personal survey was administered to each participant just after each individual VR experience. Later, focus groups of six people were held to further discuss the use of the technology and other issues related to the experience and the destination. This exploratory technique overcame the rigidity of a closed-ended questionnaire and complemented and expanded the quantitative analysis.

3.2. Data collection and sample characteristics

To choose the optimal VR experience, the research team first selected 17 European destinations based on input from older adult tourism specialists and travel blogs (e.g. Brighton, 2016; Roy, 2017). This list was shortened after three in-depth interviews with travel agents for 10 destinations that are commonly visited by older tourists (Paris, Rome, Venice, etc.). Based on this list, 10 in-depth interviews were performed with older adults to ask them about their travel interests and preferences (Pretest group 1). Overall, Venice (Italy) was the most popular destination, with more than 85% of respondents expressing an interest in travelling there.

Afterwards, six VR experiences of visits to Venice (YouTube + VR filter) were selected. These visits were experienced by a group of 10 older adults (Pretest group 2) using an Oculus Go Standalone VR Headset (hereafter VR glasses). These older adults took part in a focus group to describe and discuss their experience so that the visit that best suited their characteristics could be selected. The experience '360°, Carnival of Venice, Italy. 4K video' was selected (Figure 2). This VR experience also follows the recommendations by Silva et al. (2019): it had an intermediate-length duration (around 5 minutes), it was high quality and comprehensive (Gondola ride, Piazza San Marcos, R, etc.), and it had a pace and perspective that reduced stress, dizziness and vertigo amongst older adults. None of the participants in the study felt (expressed) negative sensations due to their VR experience.

< Insert Figure 2 about here>

Prior to any data gathering, ethical approval was obtained from the ethics committee of the university that was performing the research. To enhance the representativeness of the sample, four continuing care retirement communities (CCRCs) were selected based on the socio-economic profile of their residents. The key criteria for the purposive selection were i) having never visited the destination before and ii) belonging to the older adult segment. Given the broad diversity of the residents in terms of their cognitive and physical ability, the selection of participants was supported by psychology and physiotherapy experts in each CCRC. The team in charge of gathering the data consisted of i) six university employees (research team), ii) one technician from the VR company (supporting staff), and iii) the psychologist and the physiotherapist at each of the CCRCs

(supporting staff). The final sample consisted of 120 older adults residing in four CCRCs in the city of Alicante (Spain) between May 2019 and January 2020, before the COVID-19 crisis (Table 1). This sample size is similar (and larger in many cases) to that in other studies of technology acceptance amongst older adults (e.g. Lin et al., 2018; Roberts et al., 2019).

< Insert Table 1 about here>

The data gathering procedure is now described. First, participants watched the VR experience '360°, Carnival of Venice, Italy. 4K video' for 5 minutes using VR glasses. Trained interviewers (Dahlgren & Hansen, 2015) then administered a structured questionnaire (quantitative data) to the participants just after this 5-minute VR experience. Next, the residents were placed into focus groups of six people (qualitative data) in a separate room on the premises of the CCRC. Two moderators encouraged and ensured balanced participation (Figure 3). A total of 20 focus groups were held (four at CCRC1, eight at CCRC2, four at CCRC3 and four at CCRC4). The average session length was around 45 minutes. The sessions were recorded with two cameras to enable subsequent analysis. Informed consent was explicitly obtained to record the sessions.

< Insert Figure 3 about here>

3.3. Measures

Measures of 'intention to use VR again' and its antecedents were selected and adapted from the literature on technology acceptance and tourism.[1] These measures were attitude towards VR (ATT), perceived usefulness (PU), perceived ease of use (PEOU) and technology anxiety (TA), as shown in Table 2. Destination recommendation (RECOM) was measured using responses to the following statement '*After the VR experience, I will recommend visiting Venice to other people*' (Disztinger et al., 2017). All constructs were measured using multi-item measurement scales. Respondents were asked to indicate their agreement on a scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). The key descriptive statistics are presented in Table 3.

< Insert Table 2 about here>

[1] Given that all the older adults taking part in this study had a 5-minute VR tourism experience at the beginning of the session, the intention measured here was the 'intention to reuse' or 'intention to use again'.

< Insert Table 3 about here>

As a complementary tool, 20 semi-structured focus groups were performed. After a brief introduction to the topic and rules, the participants discussed aspects of the VR experience. A semi-structured script was used to guide the focus group to ensure that the participants talked about the key factors previously measured in the questionnaire.

3.4. Estimation procedure

The quantitative data were analysed using SmartPLS v.3 and IBM-SPSS v. 25. Following Hair et al. (2019), a two-step estimation procedure was performed. First, the measurement model was estimated, and reliability and validity were assessed. Next, PLS-SEM was used to estimate the structural model and to test the proposed hypotheses. A variance-based method (PLS-SEM) was chosen. This choice was made because this method imposes low restrictions on non-normal data and performs well with small samples, as is the case when gathering data on older adults' VR experiences (e.g. Roberts et al., 2019). Although the recommendations of Podsakoff et al. (2003) were followed, there was still a risk of potential common method bias (CMB) because the data were gathered from a single survey. Alternative methods to assess CMB were applied. Specifically, Harman's single factor test and the method of partialling out a 'marker' variable were used.

Regarding the qualitative data, all focus groups were recorded on camera and then manually transcribed by two researchers. The transcripts were then revised by another two researchers. Thematic analysis was employed to analyse the data (Braun & Clarke, 2006). This analysis helped identify and report patterns (themes) within the data. Themes were derived from both the data based on the meaning captured in the content in an inductive approach and the researchers' semi-structured script based on the theoretical understanding of the phenomenon in an a priori approach (Ryan & Bernard, 2003). Because qualitative data played a supporting role in this research (QUAN + qual), theoretically driven thematic analysis was performed (Sibbritt et al., 2019). Similar to the procedure described by Fiocco et al. (2021), the information in the transcripts was coded and organised into pre-established themes, mainly related to the psychological constructs of the quantitative research. The outcome of these activities was revised and corrected by another two researchers. This process provided richer qualitative data (quotations) to complement the quantitative behavioural analysis.

4. Results

4.1. Reliability and validity

First, the psychometric properties of the measurement model were assessed (Hair et al., 2019). Table 2 shows that the internal consistency of all constructs was above the recommended threshold (all Cronbach's alpha scores > 0.70). The reliability indicators of composite reliability (all > 0.80) and rho_A (all > 0.70) were acceptable. Convergent validity was ensured because the factor loadings of all items were above 0.708, and the average variance extracted (AVE) was greater than 0.50 for all factors. Discriminant validity was verified because the square root of the AVE (on the diagonal) was greater than the correlations between each construct and any other construct (below the diagonal; Fornell & Larcker, 1981), and the heterotrait-monotrait ratio (above the diagonal) was below the recommended level of 0.90.

4.2. Common method bias (CMB)

To assess CMB, two procedures were used, following the indications of Tehseen et al. (2017). First, Harman's single factor test was performed in IBM-SPSS to check whether a single factor was accountable for variance in the data. Principal component analysis (PCA) was run, entering all items and considering the unrotated solution. No CMB was observed because the extracted variance of this common factor was 22.346%, far below the acceptable level of 50%. Given the controversy surrounding this procedure, a second method was used to partial out an unmeasured marker (Podsakoff & Todor, 1985). This procedure was performed in IBM-SPSS. The research model was estimated in SmartPLS. The initial R^2 of the endogenous constructs was observed. The second model was estimated by adding this *general factor* to the endogenous constructs. The new R^2 was then observed. If CMB were present, there would be a significant increase in the R^2 value of the endogenous constructs after adding the general factor. Table 5 compares the R^2 of the endogenous constructs with and without the general factor (marker variable). This procedure required estimation of the former model and another model where a general factor (unmeasured marker variable) had been added to the endogenous constructs. There was no evidence of CMB because there was no significant increase in the R^2 value of the endogenous constructs after adding this general factor. The increase was, on average, approximately 5%.

4.3. Model estimation

The proposed model was estimated using the consistent PLS algorithm (SmartPLS) and bootstrapping (5,000 resamples). Regarding the predictive power of the model, Table 4 shows that the R^2 values of almost all dependent constructs were greater than 0.15 and statistically significantly different from zero, the exception being perceived usefulness. Six out of the seven proposed relationships were observed to be statistically supported.

< Insert Table 4 about here>

The results presented in Table 4 show a positive association between the intention to use VR technology again and the intention of the older adults to recommend a specific destination ($\beta = 0.45$, $p < 0.01$), thereby supporting H1. Most of the participants of the focus groups stated that they would recommend the virtually visited tourist destination to their family and friends. For example, an 83-year-old women, who was 'impressed' by the virtual experience, reported the following: '*I would tell my grandson, "You have to go to Venice because I've seen it with these special glasses and it's beautiful. I recommend you go on your honeymoon to Venice*."' However, eight older adults expressed that although they had really liked the experience, they did not think it made much sense to recommend Venice to their relatives because their relatives had already visited. This finding suggests that it is not only the type of technology that is important when making recommendations but also the tourist destination itself (e.g. a new or exotic destination).

Most of the proposed relationships relating to the TAM model are also supported. The figures reveal a positive relationship between attitudes towards VR and the intention of older adults to use VR again ($\beta = 0.63$, $p < 0.01$), thereby supporting H2. Further support is provided by the focus groups. Virtually all participants had a very positive attitude towards using VR to visit a tourist destination. One participant, a 76-year-old man who required minimal assistance with the VR glasses, reported the following: '*Look, having the glasses gives you the chance to experience what you can't actually do. And you forget that it's virtual; you are seeing it with your own eyes and in the views you're offered; you focus on what you're most interested in, not what you're being forced to see*'. Furthermore, the participants frequently mentioned that they would like to have more opportunities in their CCRCs to use VR technology to visit more cities. Most indicated that they would like to have this chance weekly or fortnightly but that they did not

consider VR glasses a technology for everyday use. Perceived ease of use and perceived usefulness are direct antecedents of older adults' attitude towards using VR, supporting H3 ($\beta = 0.36$, $p < 0.01$) and H4. As the literature suggests, perceived ease of use of VR technology is positively related to its perceived usefulness in tourism ($\beta = 0.41$, $p < 0.01$), thereby supporting H5. This finding highlights the importance of ease of use in TAM models for older adult users. The focus group participants reported that, at first, they did not know how to use the glasses and that they were only able to use them thanks to the expert's help. Accordingly, most participants indicated that they would be able to learn to use this technology with help and to use it on their own. This view is supported by comments such as those by one 82-year-old man: '*I think that once they tell you, look, you have to put them on [the VR glasses] like this . . . , it wouldn't be difficult to use them'*; or a 76 year-old woman: '*The first time, you don't even know how to do it, but once you try to use them, I think you won't have much difficulty* '. However, 12 people in different focus groups said that they would not be able to. These people thought that they were too old to learn how to use the VR device and that this technology was for younger users. For instance, two women aged 84 and 79 years felt less technically competent than the rest of the group: '*For us, I think it is very difficult to put on and wear the glasses . . . I'll forget how to turn it on*'; '*I also think that it's for younger people. I'm too old to use this kind of device . . . Someone will have to help me every time [to use the VR glasses]*'.

Lastly, anxiety regarding the use of VR seems to be negatively associated with perceived ease of use ($\beta = -0.43$, $p < 0.01$), thereby supporting H6. However, it is not related to perceived usefulness ($\beta = 0.16$, $p > 0.05$), thereby leading to the rejection of H7. All participants in the focus group indicated that they did not feel anxious at any time whilst using the VR glasses. The participants also discussed whether the experience had seemed dangerous at any point. All participants, except for one, stated that they felt safe throughout the experience. The one exception, a 91-year-old woman, stated the following: '*Well, when I got into the boat I was a little nervous, and next to me there was a young lady, and I said to her, "it seems like it's in the water, don't let go of me" and she answered "no, you're with me," "it seems like it's totally in the water!*"'

5. Discussion and conclusions

For older adults living in continuing care retirement communities (CCRCs), VR in tourism can offer numerous benefits. VR has the potential to improve their quality of life,

and VR is believed to be beneficial for its immersive interaction capabilities (Wiederhold, 2018). Furthermore, VR can be used as a new way of promoting destinations through the virtual experience of visiting a tourist destination. Accordingly, VR is considered a promising tool for use within the older adult care sector. However, if VR companies wish to target older adults, they must understand which factors influence the decision making behind this segment's VR technology adoption (Golant, 2017). The key findings of this study will help tourist destination marketers identify the potential of this technology for the older adult segment and to value their role in spreading positive WOM about virtually visited destinations.

This study uses variables from the TAM model (Davis, 1989) to provide new insight into older adults' attitudes and intention to use VR again after a virtual tourism experience. The proposed model highlights the key role of attitudes towards VR technology in intention to use it again, reflecting the findings of previous research (e.g. Casaló et al., 2010; Min et al., 2019). Regarding the antecedents of attitudes towards VR, perceived usefulness (PU) and perceived ease of use (PEOU) also seem to be important factors amongst older adults. That is, when VR devices are easier to use and more useful for entertainment, travel activities and well-being, the attitudes towards using these VR devices are stronger. This conclusion confirms previous findings on VR acceptance in tourism (e.g. tom Dieck & Jung, 2018; Tussyadiah et al., 2018) and technology acceptance amongst older adults (e.g. Mendes-Filho et al., 2018; Tsai, et al. 2020). Notably, nearly all participants perceived the VR glasses to be easy to use for a travel experience (with the initial support of an expert). There were a small number of exceptions, where older adults perceived themselves as incapable of using the VR device without someone's help.

A key antecedent in the study of technology acceptance amongst older adults is the level of anxiety regarding its use. As highlighted by previous research (e.g. Wei, 2019), the level of anxiety regarding the use of a given technology negatively affects both PEOU and PU. In this study, however, mixed results were observed regarding the impact of technology anxiety. Technology anxiety seems to reduce older adults' PEOU of the VR device. However, it does not seem to be related to the level of PU in the case of travel experiences. Interestingly, these findings are consistent with those of Tsai et al. (2020), who analysed older adults' acceptance of wearable healthcare technologies. There was a

consensus amongst focus group participants regarding the utility and helpfulness of VR technology in offering a new and enjoyable pastime through virtual travel experiences.

Unlike previous research, this study uses intention to recommend as a behavioural variable related to a specific tourist destination (Venice). The evidence suggests that the greater the intention to use the VR device again for tourism purposes is, the more older adults intend to recommend the destination city they have previously experienced. Notably, this study shows that older adults enjoy the way in which VR allows them to live memorable tourist experiences that they could recommend to friends and family. They can thus share their emotions with loved ones and engage in more social interactions, as found by Baker et al. (2019b).

This research contributes to the literature in several ways. First, it is one of the first studies to analyse VR technology in tourism amongst older adults living in CCRCs. Studies of VR acceptance by older adults are scarce, especially in tourism. Therefore, this study can broaden scholars' understanding of such behaviour. Second, the analysis used affective factors (i.e. anxiety) in addition to cognitive factors (i.e. TAM factors) to understand older adults' intention to use VR again after a virtual tourism experience. These affective factors were analysed to consider the non-rational process of technology acceptance, which is crucial in the case of older adults. Third, this study appears to be the first to focus on older adults and tourism in an attempt to understand the relationship between the intention to use VR technology again and older adults' recommendations of a virtually visited tourist destination. Therefore, this study has implications not only for technology managers but also for marketing managers in terms of the promotion of tourist destinations by an often-neglected segment. If developers wish to target older adults, they must understand which factors influence the decision making behind this segment's VR technology adoption (Golant, 2017). Finally, a mixed methods approach was used to complement the quantitative findings and provide a deeper understanding through valuable qualitative insight. This approach provides contributions in the area of emotional experience and content preferences in older adults' technology acceptance.

5.1. Managerial implications

Our findings suggest that for older adults living in CCRCs, the intention to use VR technology again for tourism is high. Thus, companies that develop and sell VR technology should develop marketing strategies that specifically target this segment.

Given that VR technology is the future and that, in a few years, the so-called *baby boomers* will reach old age, being one of the first to connect with this segment could lead to a competitive advantage (Fryer, 2019). According to the findings of the present study, companies that develop and sell VR technology should sell the idea that this technology is easy to use and useful for virtually experiencing a trip to a specific destination, which in many cases, older adult users could not visit in person.

Furthermore, the results of the current study show that technology anxiety could create a barrier preventing older adults from using VR technology for tourism. An effective way to increase the acceptability of VR technology in the older adult segment is by offering practical workshops in CCRCs or day care centres where older adults are taught how to use this technology. This approach could be especially effective because people who live in CCRCs or go to this type of centre are used to group activities in their day-to-day lives. Thus, the growing trend in CCRCs of using new technologies is helpful because it allows older adults to become used to new devices and makes them more open to accepting them. This familiarity and openness can help companies break into this segment. Therefore, the key findings of this study will help tourist destination marketers to identify the potential of this technology for the older adult segment and to value their role in spreading positive WOM about the virtually visited places, as well as their influence on the travel decision-making processes of their loved ones. In fact, many firms have already started developing VR applications (e.g. physical exercise, virtual trips and VR memories) to enhance older adults' quality of life (Min et al., 2019; Rogers, 2019). This VR technology can also be used for tourism purposes to attract older adults.

Regarding tourism activities, VR is changing the way travellers search for information and evaluate tourism offerings, giving them the chance to virtually test their travel experiences. In this context, tourism companies and destination marketing authorities should develop immersive technologies to differentiate themselves from competitors when promoting their destinations. They should also communicate with all kinds of potential visitors, especially those with some form of physical or cognitive impairment or limitation, as is often the case with people in later life. This contact is critical in stages prior to the tourist visit, where awareness of or interest in the specific destination is created in the minds of tourists (Jung & tom Dieck, 2017). Virtual tourist experiences for older adults should be used to attract the attention of this target group and

to provide them with stimulation, entertainment and engagement (Baker et al., 2019b). Despite their physical limitations regarding travelling, older adults could play an important role in recommending tourist destinations (Abubakar & Ilkan, 2016), particularly in WOM recommendation strategies, as shown by the findings of the present study. Furthermore, considering the enthusiasm with which the participants of the current study experienced their virtual tour of Venice and given their acceptance of VR glasses, public institutions that wish to promote their tourist destinations should create more immersive videos adapted to older adults. Such videos can help build the name of the tourist brand and create a better image of the destination.

5.2. Limitations and future research

This study has some limitations that could provide the basis for future research. First, although this research explores the acceptance of a VR tourist experience by older adults living in CCRCs, it would be of interest to test this model using a sample of older adults living in private homes. This two-group study could provide insight into the importance of contextual factors. Second, the results must be interpreted with care because causality cannot be inferred from the data. Future longitudinal studies or experimental designs are needed. Third, this research examines how cognitive factors (i.e. the factors of TAM) and affective factors (i.e. anxiety) condition older adults' intention to use VR again. Further research should incorporate other relevant factors that could be important to older adults. Examples include perceived enjoyment, virtual presence and perceived loneliness. Another important issue that should be addressed in future studies of older adults and VR technology acceptance and use is the role of the socialisation elements of technology, such as social exclusion or inclusion, social connectedness, the influence of telepresence and the sense of 'being there'. Lastly, whilst this research focuses on the WOM intention of older adults following a VR experience in a given destination, other behaviours are also worthy of analysis to understand the impact of VR (e.g. intention to learn more about the destination or visit the destination).

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