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ABSTRACT

Considered to be an emerging topic in tourism research, traveling to familiar places benefits both the travelers and destinations. However, the current development of familiar tourism is severely affected by the epidemic. Recognizing the potential of virtual reality (VR), this research aims to explore VR's relevance in the application of visiting familiar places and the empirical features of VR beyond on-site familiar tourism. We first reviewed the literature and developed an experience framework. Secondly, we conducted an exploratory activity in which participants ($N = 16$) used Google Earth VR to travel to their familiar places with two conditions (free exploration and task-oriented travel). In the activity, we employed think-aloud protocols, a scale, and semi-structured interviews. With our framework, we categorized findings into five dimensions and indicated the similarities and differences between familiar tourism in VR and that in actual places. Particularly, three empirical features (the sense of distance, multi-view space, and montage time) were recognized and formed VR's opportunity to outperform on-site travel. We conclude by discussing the impacts of VR on familiar tourism and providing implications, including designing the timeline, sounds, tasks, and virtual guides. These suggestions inspire designers to acknowledge VR limitations and identify directions for future tourism applications. As a beginning of empirical investigation on VR familiar tourism, this study opens up a new field of discussion around VR tourism experience. We invite the Human-Computer Interaction (HCI) community to collectively probe into the VR experience and design of visiting familiar places. Efforts in this area will stretch beyond the current understandings of various forms of tourism and contribute to crafting rich travel experience by immersive technologies.

1. Introduction

Throughout history, two features of tourism have been characterized, the comfort of the old versus the search for the new (Clarke & Bowen, 2018; Cohen, 1972). As a common type of repeat travel and familiar tourism (Clarke & Bowen, 2018, 2021; P. L. Pearce, 2012), traveling to familiar places emphasizes inertia while retaining dynamism. On the one hand, people reminisce about the past and search for connectivity and the selves. They seek the unfamiliar in the familiar and discover new things or changes in the environment. To individuals, visiting familiar destinations is a gratifying trip that positive emotions, perceptions of time and memories of key life events emerge (Clarke & Bowen, 2018; P. L. Pearce, 2012). In addition to its hedonic value, the visitation assists in affirming identity and promoting well-being (Clarke & Bowen, 2018; P. L. Pearce, 2012; Scannell & Gifford, 2010). From the perspective of place attachment, tourists could obtain self-continuity and compare the past and present selves in the familiar places (Scannell & Gifford, 2010; Twigger-Ross & Uzzell, 1996). The bonds of the place provide restorative qualities, and further prompt the self-regulatory processes essential for reflection and goal achievement (Korpela, 1989). It is also argued that revisiting familiar localities helps build destination resilience. Through utilizing the resources, competences and skills, familiar tourists create values from the places and contribute to the prosperity of the local communities (Clarke & Bowen, 2018). To tourism academia, Visiting Home and Familiar Places (VHFP) is a "multi-facet" phenomenon "worthy of careful and considered attention" (P. L. Pearce, 2012, p. 1025). This pervasive form of tourism conduces to understanding tourist identity which is of central interest in the field of tourism research (Bowen & Clarke, 2009; Clifford, 1997; Cohen, 1984; P. L. Pearce, 1982). Analyzing the characteristics of familiar tourists expand the knowledge beyond the existing tourist research field, such as repeat tourists, Visiting Friends and Relatives (VFR) tourists, and genealogy tourists (Clarke & Bowen, 2018). Furthermore, given that recurring business is both stable and cost-effective, tourism providers and tourism marketing research could obtain strategy and insights from observing familiar tourists (Tan & Wu, 2016; Tsai, 2012).

Nevertheless, in the era of COVID-19 pandemic where conventional travel has been severely damaged, familiar

tourism has also been affected. In order to prevent the spread of the epidemic, several areas with risk of infection are temporarily closed, culminating in the difficulty of accessing some familiar places. In this regard, the emergence of innovative technologies such as Virtual Reality (VR) has brought opportunities to experience familiar tourism and new issues worth exploring. VR offers a variety of distinct advantages over physical travel (Cheong, 1995; Guttentag, 2010; W. J. Lee & Kim, 2021; Tussyadiah et al., 2018). To begin with, providing that the Virtual Environment (VE) is well designed, VR can reach places that are not effortlessly accessible. Accordingly, the danger and risk of accidents occurring are completely eliminated (Cheong, 1995; Guttentag, 2010; W. J. Lee & Kim, 2021). Next, VR tourism brings great conveniences and dispenses with many hassles such as visitor harassment, traffic problems and surplus time expenditure. Last but not least, VR can develop experience in a controllable world. All variables in the VE can be modified. This is especially benign for designing more personalized travel experiences (Cheong, 1995).

The service of visiting landscapes in VR has been provided. For instance, Google Earth VR (GEVR) offers 360° streetscapes in 85 countries (J. Kim, 2017) and can be viewed with popular HTC Vive or Oculus devices (*Introducing Google Earth VR*, 2017). The supportable areas and the quality of imagery continue to strengthen. Although it still remains unclear whether VR are able to completely replace on-site travel, virtual travel can be considered as a way to enhance tourism experience or an alternative type of travel (Beck et al., 2019; Guttentag, 2010; Ijaz et al., 2019; Mura et al., 2017; Musil & Pigel, 1994; Perry Hobson & Williams, 1995; Slater & Sanchez-Vives, 2016; Sussmann & Vanhegan, 2000). In the context of the pandemic, the growth potential of VR tourism is remarkable and sustained by tourists, which has become a practical and valuable choice for mass tourism (Akhtar et al., 2021; W. J. Lee & Kim, 2021; Prandi et al., 2021; Schiopu et al., 2021). VR is expected to provide or enhance more tourism-related functionality and experience, add value to achieve higher tourist satisfaction in the future (Akhtar et al., 2021), and improve the sustainability of tourism (Schiopu et al., 2021).

If VR is capable of supporting the experience of visiting familiar places, it will not only possess the original value of such tourism, but also provide the advantages of convenience, accessibility, lifting time and geographical constraints, and even bring new experience at some levels. In view of the potential of VR in familiar tourism and the insufficient amount of related works, we hope to explore the following research questions: to what extent can VR embody the experience of on-site travel of familiar places? What are the empirical features of VR beyond on-site familiar tourism that become an opportunity for designing such experiences in the future?

Our goal is to provide knowledge and suggestions that help support Human-Computer Interaction (HCI) designers and researchers to further probe into familiar tourism experiences surrounding immersive technologies. Firstly, we review the existing literature and summarize it as a framework. Secondly, since the topic is relatively new and requires exploration at the outset, we conduct an exploratory activity with Google Earth VR for capturing the variability and completeness. We apply the 360° street view of GEVR as the main VE, and let participants ($N = 16$) revisit familiar places in two conditions (free exploration and task-oriented travel) to gain further insight of the VR experience. In the activity, think-aloud protocols, a scale and semi-structured interviews are also adopted to investigate participants' experience. Thirdly, findings related to our experience framework and the new dimensions of experience are presented. Lastly, we discussed the impacts of VR on familiar tourism and provided the design implications for VR experiences. Our work offers the following contributions: (1) an experience framework for evaluating the technology-mediated experience of traveling to familiar places, (2) VR empirical investigation recognizing the new topic and potential of VR familiar tourism, (3) suggestions for creating fluent and meaningful VR familiar tourism experience that empower designers to identify opportunities and directions of future development.

2. Literature review

2.1. VR tourism

VR has received constant attention in the field of tourism, stemming from its outstanding advantages and influence. Tussyadiah et al.'s (2018) work reviewed and summarized the previously analyzed VR benefits. Beck et al. (2019) classify VR applications in tourism into three systems: fully-, semi-, and non-immersive VR. Our work deals with fully-immersive VR referring to "isolating the user completely from the real world by providing synthetic or 360-degree real-life captured content with a VR headset" (Beck et al., 2019, p. 595). Loureiro et al.'s (2020) literature review of VR tourism identifies a number of HCI topics worth exploring, including enhanced longitudinal virtual experience, atmospheric design implications, experiential and telepresence. Turning to VR tourism experience, prior VR studies inquire into usability, user's presence (Beck et al., 2019; W. H. Lo & Cheng, 2020; Tussyadiah et al., 2018), immersion, telepresence, interactivity (W. J. Lee & Kim, 2021), impression, and usage intentions (Jung et al., 2017). Recently, some studies have begun to investigate VR's acceptance and usages from specific tourism perspectives, such as environmental tourism (Sánchez et al., 2021), resilient tourism (Sánchez & Palos-Sánchez, 2020), and cultural tourism (Marasco, 2020; Samaroudi et al., 2020), or to underscore the development of VR memorable and meaningful tourism experience (Han et al., 2020).

In terms of tourism practices, VR devices become more affordable (Disztinger et al., 2017; Marchiori et al., 2017; Tussyadiah et al., 2018), which persistently boosts developments and opportunities for the application of VR travel (Beck et al., 2019; Ijaz et al., 2019; Tussyadiah et al., 2017). GEVR comprises environments from banal localities to exotic regions, and design several educational journeys for students (*Introducing Google Earth VR*, 2017). The

production developed by Captivision (*Escape Now: The Icons*, 2019) features whistle-stop virtual trips of iconic destinations designed by professional filmmakers and virtual trip industries. Some VR producers have attempted to design experiences for replacing or promoting traditional tourism activities, such as First Air's virtual flights (Debusmann, 2020), the Faroe Islands' "Remote Tourism" Campaign (Leotta, 2021), VR tours created by famous cultural heritage institutions (Marasco, 2020; Yoon, 2018). Overall, the current VR has been seen as a prelude or an alternative to visiting actual locations. Despite the lack of in-depth study, the development of familiar tourism in VR is expected.

2.2. Tourism experience research applying VR street view or 360° VR

This research uses streetscapes, a category of 360-degree virtual reality (360° VR), as the main VE for the exploratory activity. 360° VR is often designed to work with head-mounted displays (HMD) and create immersive experience (Prandi et al., 2021). Several HCI studies using 360° VR are conducted in the tourism context. They investigate how different factors influence the viewing experience of 360° VR (Argyriou et al., 2020; Kelling et al., 2017; J.-H. Lo et al., 2021) or enhance tourists' on-site experience (Dionisio et al., 2017; Nisi et al., 2018; Rahimizhian et al., 2020). Furthermore, it is claimed that street view elicits nostalgia and curiosity attributed to the ability of viewing a wide range of proximity destinations in childhood and unfamiliar terrain (Gilge, 2016). Quesnel and Riecke's (2018) work is highly relevant to our study. They conduct the GEVR experiment and recognize that the features of familiarity and personalization induce special experience and emotions during the visit. Nevertheless, these attributes are summarized as awe elicitors and are not discussed in the context of tourism.

Other works from HCI or tourism researchers are dedicated to the study of different aspects of VR tourism experience, but none of them stressed the familiarity of the destination and the identity issues. Tussyadiah et al. (2018) use VR streetscape of Tokyo to recognize the sense of vivid presence when walking through a virtual tourism destination. In Prandi et al.'s (2021) case study, a playful immersive experience in 360° VR is designed to foster meaningful interactions among residents and tourists. H. S. Kim and Lee created a system consisting of Google Street View, an HMD and a treadmill equipment (H. S. Kim & Lee, 2018). The system was expected to deal with the technical issues of limited space and lack of realism when experiencing a virtual walking trip. Similar to Cycle VR (Puzey, 2016), Ijaz et al.'s (2019) work applied streetscapes and developed a feature of riding a bicycle into an integration of body exercise and VR tourism experience. They examined the user experience to support exergame players' health and well-being goals.

2.3. Repeat tourism and familiar tourism

Traveling to familiar places is a category of repeat tourism. Repeat visits are relevant to the concept of tourist loyalty which refers to "a deep commitment" (Clarke & Bowen, 2021, p. 2) towards ongoing visitation in favored tourist destination. Many existing studies of repeat tourists and loyalty are conceived at the macro level of analysis using statistics and behavioral measurement data (Clarke & Bowen, 2018, 2021; Fakeye & Crompton, 1992; Fallon & Schofield, 2004; P. L. Pearce, 2012). Current literature examining destination loyalty and repeat visits is reviewed and categorized in Clark and Bowen's (2021) work. Nevertheless, the previous studies in tourism marketing, repeat or return visitors focus on major tourist destinations (Kotler, 1998; Kozak et al., 2009; Morrison, 2010; P. L. Pearce, 2012) and rarely includes those locations that are little known or personally relevant. Schofield and Fallon (2012) discovered that repeat tourists are not a homogeneous group. Some of them may lack bonding with the place. In light of this, "the comforting familiarity" is proposed (Fyall et al., 2003; Prentice, 2004). It provides another avenue of analysis for more in-depth and detailed inspections of tourists who revisit their destinations, thereby enhancing understanding of this particular experience in the context of tourism.

Seeking to shape research possibilities for the tourism to "personally relevant locations," P. L. Pearce (2012) calls attention to the topic of individuals' experiences in visiting places of previous significance of familiarity. This also gives rise to the concept of "familiar tourists" who "demonstrate both behavioral and affective commitment to their special, or familiar, places" (Clarke & Bowen, 2021, p. 1). Their motivation of returning to familiar places includes socializing, shopping, nostalgia, place mediation and interpretation, and seeking in-depth experiences (Xu & Huang, 2018).

Traveling to familiar places matters to a great many people and is worthy of study. To travelers, the tour helps to affirm identity and promote well-being, mainly benefited from the development of place attachment (Clarke & Bowen, 2018; P. L. Pearce, 2012; Scannell & Gifford, 2010). The tour is also effective in supporting destination development. In that, apart from their destination consumption that spurs economic growth, some familiar tourists actively promote environmental protection, provide travel advice, or engage in other specific undertakings in their familiar places (Clarke & Bowen, 2018). During these activities, they strengthen social network through integrating their resources, competences, and skills, and contribute to thriving of the local communities. To tourism researchers, the phenomenon of VHFP conduces to understanding identity and self-perception issues (P. L. Pearce, 2012). These are major topics of concern in the field of tourism research (Bowen & Clarke, 2009; Clifford, 1997; Cohen, 1984; P. L. Pearce, 1982). Research on familiar tourists also stretch beyond the existing knowledge on VFR tourists, repeat tourists, and genealogy tourists (Clarke & Bowen, 2018). Regarding tourism marketing, recurring business is acknowledged as both cost-effective and stabilizing (Tan & Wu, 2016) for destinations and tourism industries. The maintenance of such

business is a classic marketing priority. Marketing managers could also gain insights from familiar tourists who possess meaningful life experience and memories of the place (Tsai, 2012).

The conceptualization of familiar places and familiar tourists revolves around associations, activities, relationships and reflection in specific communities and familiar environments (D. G. Pearce, 2012; P. L. Pearce, 2012). According to the relevance of research topics, we particularly consider the related research on VHFP in the framework establishment process of this study. As an important reference, P. L. Pearce's (2012) paper lent substance to anecdotal observations of real-world tourist behavior and reactions on tourist's relationships with familiar destination.

2.4. The experience framework of traveling to familiar places

In order to examine whether VR can induce the comparable experience features of visiting familiar places on-site, we review the relevant literature and develop it into a framework. Our experience framework is based on Schmitt's (2003) category scheme and the orchestra model. Schmitt stressed a set of behavioral, relational, sensory, affective, and cognitive themes in assessing the experience. This scheme is considered to accurately reflect the experience of visiting familiar places (P. L. Pearce, 2012). It is further adapted into the orchestra model which helps conceptualise and examine facets of how tourists experience their encounters and settings (P. L. Pearce, 2011; Pharino et al., 2018). In tourism research, the model has been used to measure tourism experience (P. L. Pearce, 2011; P. L. Pearce et al., 2013; Pharino et al., 2018) and inspire tourism experience design (P. L. Pearce & Zare, 2017).

2.4.1. The behavioral dimension of experience
Behavioral components refer to the activities and the things tourists do during the travel. Clarke and Bowen (2018) shed light on familiar tourists' behavior through four themes: temporal dimensions; spatial dimensions; routines and rituals; and resources, skills and competencies. Familiar tourism includes basic behaviors such as talking, observing and photographing. Related to both behavioral and cognitive facets, familiar tourists benefit from "safe haven" and retain "magnifying glass" (Clarke & Bowen, 2018, p. 12). Regarding the safe haven effect, familiar travelers take risks and probe for "off-the-beaten track" arising from the sense of security and confidence brought by the place (Clarke & Bowen, 2018, p. 10). In addition, they actively exploit their existing knowledge of familiar places and seek for new micro-locations and "undiscovered secrets" among the well-known areas (Clarke & Bowen, 2018, p. 10). With the magnifying glass effect, they are capable of seeing and appreciating details in familiar environments, as well as variations over time (Clarke & Bowen, 2018; Io, 2015).

Another theme of the event is the routines and rituals formed locally by familiar tourists. This does not mean a particular activity, but has mainly to do with what they think as must-see or must-do in the local areas, such as meeting important people and going to a certain hotspot. Other behaviors with on-site experience comprise the use of resources and skills in consumption decision-making, locating accommodation, and visiting relatives (Clarke & Bowen, 2018).

2.4.2. The relational dimension of experience
This dimension focuses on the relationship between tourists and the people they interact with during the travel, such as the tourist's companion, tourism service providers, locals, and other tourists (P. L. Pearce & Zare, 2017). These different kinds of tourists' social contacts would most likely affect experience (P. L. Pearce, 2005; P. L. Pearce, 2011; P. L. Pearce et al., 2013; Pizam & Mansfeld, 1999). Familiar tourists selectively introduce friends, colleagues and families to familiar places for strengthening the relationship among social networks. Through the conversations with their travel companions, they share their stories and knowledge of where they have happened, and showcase their unique insight of the place. Alongside this, familiar tourists expand social resources locally and establish social networks in familiar places. In the process of repeated visits, they interact with local specific objects and establish deeper relationships (Clarke & Bowen, 2018).

2.4.3. The affective dimension of experience
P. L. Pearce's (2012) affective environmental assessment provides the initial data that helps to promote VHFP emotion research in the on-site familiar tourism. Derived from the arc of consumption feelings proposed by Richins (1997), the results showed a major affective range of VHFP experience reported by participants.

2.4.4. The sensory dimension of experience
When traveling to familiar places on-site, the experience covers all senses. Visual and non-visual senses are considered when grasping the tourist experience (Agapito et al., 2013). In that, vision (Adler, 1989), hearing (Pilcher et al., 2009), olfactory (Dann & Jacobsen, 2003), space (P. L. Pearce et al., 2013), gustatory, tactile senses and directed response (Hjalager, 2002) are all specific sensory aspects that can be accentuated.

2.4.5. The cognitive dimension of experience
Cognition is an essential facet in the experience of visiting familiar places, which contains various elements. Firstly, the emergence of memories plays an important role. Familiar tourists recall their past local-related ideas, feelings, and experience (Clarke & Bowen, 2018; Io, 2015; Marschall, 2017; McIntosh & Prentice, 1999; Van Dijk & Weiler, 2009) that stir up sense of nostalgia, gratitude and melancholy (P. L. Pearce, 2012). When retracing their own footsteps, they discover changes of places and new things attributed to the
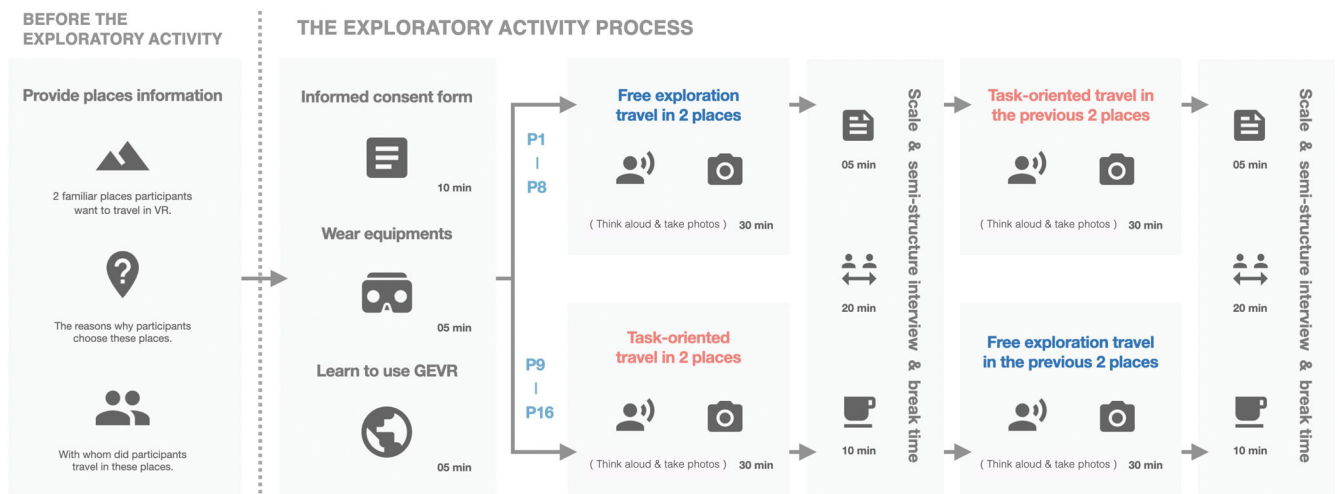
Figure 1. The exploratory activity phases.

magnifying glass and the safety haven effect mentioned in the behavioral section.

Secondly, VHFP elicits keen perceptions of the flow of time (P. L. Pearce, 2012). Familiar tourists occasionally produce some small meaningful insight between the present and the past stimulus in such travel. Among them, an essential concern is how positively people view the past (Lynch, 1976; P. L. Pearce, 2012). If individuals can embrace the past and view it positively, they would generate fulfilment and establish positive identity (Harber et al., 2003; Lynch, 1976; P. L. Pearce, 2012).

Thirdly, the existing literature notes several functions and advantages of familiar tourism derived from place attachment (Clarke & Bowen, 2018, 2021; P. L. Pearce, 2012; Scannell & Gifford, 2010). We put these parts into the cognitive dimension. To start with, familiar tourists have a deep connection with the familiar places, providing individuals with a sense of belonging (Giuliani, 2003; Scannell & Gifford, 2010). Additionally, Self-continuity obtained in familiar tourism refers to "a stable sense of self, or an awareness of the self as continuous" (Scannell & Gifford, 2010, p. 6). Familiar places allow tourists to produce cumulative memories and compare their past and present selves, which create continuity over time (Twigger-Ross & Uzzell, 1996). By visiting the places, they are capable of discovering the links between past, present, and future experiences (Hallowell, 1955; Robinson & Freeman, 1954). Lastly, familiar and favorite places possess restorative qualities and offer a sense of safety, which help to facilitate the self-regulatory processes (Korpela, 1989). There, people can brood over identity issues, including their distance from the target, making relevant plans, assessing their progress, and bringing forth reflection (Carver & Scheier, 2001; Izard & Kobak, 1991; Marschall, 2017; P. L. Pearce, 2012; Scannell & Gifford, 2010).

3. Materials and methods

The research was designed to provide insight into the following research question: How much can VR reproduce the experience of traveling to familiar places? Specifically, what are the characteristics and upsides which make the travel experience in VR transcend that in on-site familiar tourism? In view of the multifaceted nature of tourism experience, our methodology drew on a holistic approach recommended by the literature (P. L. Pearce, 2011). We first organized a scale with items from the literature. Next, we conducted an exploratory activity in which we applied the scale, think-aloud protocols, and semi-structured interviews. In the activity, participants used GEVR to visit familiar places in two conditions (free exploration and task-oriented mode). The overall flow chart is illustrated in Figure 1. In the segment below we describe the rationales of the methods and procedures for the collection and analysis of data.

3.1. Measurement instrument

We applied a scale in the exploratory activity to better determine the direction and scope of qualitative empirical analysis. A scale was considered an effective and valuable measurement instrument to assess the experience of visiting familiar places (P. L. Pearce, 2012). Since there was no existing instrument for measuring the complete familiar tourism experience, we organized a 33-item scale based on our experience framework developed from the previous literature. Considering the limitations of GEVR, our survey omitted specific empirical features that are difficult to achieve in GEVR.

The scale consisted of five major parts related to the dimensions of our framework (Table 1). For the behavioral dimension, we asked participants about the most enjoyable activities. The options were familiar tourists' activities currently supported by GEVR (Table 1, item A). Although the relational dimension had noticeable limitations in GEVR, we still invited participants to report the companions that they wanted to travel with in VR and the local people that they wanted to have good interaction within the scale to investigate the opportunities of VR in this dimension (Table 1, items B–C).

Table 1. The results of all items of the scale applied in the qualitative experiment.

Dimension	Question type	Item code	Item description	Free exploration results	Task-oriented results
Behavioral	Choice	A	Which activity did you enjoy most in the travel?	(Number or people)	(Number or people)
			Observe	9	9
			Move	3	4
			Talk	2	2
			Photograph	2	1
Relation-ship	Multiple choice	B	Please select the partners you want to travel with in VR.	(Number or people)	(Number or people)
			Friends	13	9
			Family members	6	6
			Partner	6	5
			No-one	4	5
		C	Please select the people you want to have good interaction with in the VR travel.	(Number or people)	(Number or people)
			Travel companion	14	11
			Residents	10	7
			Local vendor	8	7
			Other tourists	2	2
Affective	5-Point Likert	D	The intensity of joy.	Mean (standard deviation)	Mean (standard deviation)
				4.06 (.93)	3.69 (1.01)
		E	The intensity of contentment.	3.75 (1.00)	3.50 (1.32)
		F	The intensity of surprise.	3.69 (1.08)	2.94 (1.24)
		G	The intensity of optimism.	3.63 (1.15)	3.38 (1.31)
		H	The intensity of excitement.	3.44 (1.15)	3.44 (1.31)
		I	The intensity of eager.	3.19 (.98)	3.06 (1.48)
		J	The intensity of overwhelmed.	3.06 (1.39)	3.50 (1.10)
		K	The intensity of love.	3.00 (1.26)	3.25 (1.44)
		L	The intensity of peacefulness.	3.00 (1.21)	2.94 (1.29)
		M	The intensity of relieved.	3.00 (1.21)	2.88 (1.45)
		N	The intensity of comforted.	2.56 (1.21)	2.81 (1.38)
		O	The intensity of homesick.	2.19 (1.42)	2.69 (1.54)
		P	The intensity of sad.	1.69 (1.01)	1.94 (1.34)
		Q	The intensity of impatient.	1.69 (1.14)	1.81 (1.05)
		R	The intensity of proud.	1.63 (.96)	2.38 (1.31)
Sensory	5-Point Likert	S	The pleasure of space sense.	Mean (standard deviation)	Mean (standard deviation)
				4.06 (.73)	4.00 (.73)
		T	The pleasure of visual sense.	3.88 (.89)	3.88 (.81)
		U	The pleasure of sound sense.	3.50 (.73)	3.38 (1.02)
Cognitive	7-Point Likert	a	I recalled many precious memories in these places.	Mean (standard deviation)	Mean (standard deviation)
				5.44 (1.50)	6.06 (1.38)
		b	I noticed these places' changes from past to present.	5.38 (1.89)	5.19 (1.56)
		c	I discovered a lot of new things.	5.13 (1.41)	5.06 (1.44)
		d	I viewed the past in a more positive way.	4.81 (1.60)	5.94 (1.06)
		e	I felt a sense of nostalgia.	5.75 (1.39)	6.13 (1.15)
		f	I felt a sense of gratitude.	5.31 (1.85)	6.19 (.91)
		g	I felt a sense of belongingness.	4.94 (1.61)	5.13 (1.75)
		h	I felt a sense of security.	4.88 (1.09)	4.81 (1.76)
		i	I felt a sense of melancholy.	2.00 (1.55)	2.50 (1.97)
		j	I felt connected to my past, present and future self.	4.63 (1.67)	6.06 (.96)
		k	I knew more about who I am.	4.50 (1.10)	5.50 (.73)
		l	I thought about my chances of achieving my life goals.	4.06 (1.36)	4.81 (1.47)

With respect to the affective dimension, considering the purpose of the study to explore the broad overview of the experience, and taking into account the load of participants filling in the scale, we combined several similar emotions by referring to the affective items provided by Richins (1997) and P. L. Pearce (2012) (Table 1, items D–R). In terms of the sensory dimension, since it was difficult for GEVR to achieve the experience of physical travel in olfactory, gustatory and tactile senses, we focused on the pleasure level of three specific senses including sight, sound and space (Table 1, items S–U). Finally, after integration and screening, cognitive questions covered by the scale included the emergence of memories, discovering changes of places and new things to measure the effects of magnifying glass and safety haven (Table 1, items a–c), a positive view of the past (Table 1, item d), the sense of nostalgia, gratitude, belongingness, security and melancholy (Table 1, items e–i), personal continuity, affirming the self and goal support (Table 1, items j–l).

The behavioral and relational dimension were composed of choice inquiries with text options. The sensory and affective dimensions were based on P. L. Pearce et al.'s (2013) work and Richin's (1997) proposal that applied the Likert five-point scale. In the cognitive dimension, we used the seven-point Likert scale as a means to identify detailed perceived differences.

3.2. Exploratory activity

3.2.1. Free exploration and task-oriented travel

With the purpose of capturing the variability of experience and engendering design opportunities in situations, we planned two kinds of travel in the VR environment. In free exploration, participants were invited to travel autonomously in the familiar places they chose. However, to avoid spending unnecessary time straying away from the target location, they were told not to traverse to other destinations outside the counties where their familiar places located. Under this condition, participants could freely compare their VR trips with physical travel, which allowed us to understand the similarities and differences between familiar tourism in VR and that in real sites.

In task-oriented travel, participants were asked to complete a list of tasks in their familiar sites. The tasks were designed to stimulate certain empirical features of familiar tourism, including the establishment of fresh discoveries, perception of personal continuity, and reflection of participants per se. These helped reveal more details and insights into the VR experience. Through the process, we also intended to recognize the strengths and weakness of VR technology in supporting these features. The instructions of the tasks are listed below.

- Task 1: Follow someone or a car until you can't find him/it. In the process, please look around and share what you have noticed.
- Task 2: Take a road that you have not passed before, observe around, and take two new discoveries.

- Task 3: Please go to a place where you feel "meaningful," and share the story about this place.
- Task 4: Please identify three things about yourself that are currently better than what they used to be in this place.
- Task 5: Think about what your past self in this place would say to you, and what your future self in this place would tell you. Then, leave a paragraph to them on the card. (Participants would take off the headset to complete this task.)

The development of these five tasks is based on specific considerations and literature. To start with, finding undiscovered secrets and exploiting off-the-beaten track are key behaviors of familiar tourists (Clarke & Bowen, 2018). Therefore, Tasks 1 and 2 were arranged to better understand VR's adeptness to support these activities and the discoveries they made. We refer to Dérive App (2013), originated from the practice of situationists who drift aimlessly through the city (Wang et al., 2019). Dérive App offers multiple tasks, inviting users to give up control (Leong et al., 2006), drop the daily relationship between them and the city, which encourages them to explore and enjoy the random encounters (Cachucho & Fakhamzadeh, 2013; Debord, 1955).

Furthermore, the category of familiar locations includes both places that are either particularly meaningful to the tourists or without significant attachments for them (Clarke & Bowen, 2021). With a view to documenting deep thoughts and feelings of VR familiar tourism, Task 3 was planned. It prompted participants to discover the specific locations of personal importance and subsequently traverse to the sites.

Finally, familiar tourists obtain self-continuity and profound reflection in the travel which are vital values of familiar tourism (Clarke & Bowen, 2018; P. L. Pearce, 2012; Scannell & Gifford, 2010). Consequently, through Tasks 4 and 5, we intended to examine whether VR familiar tourism could highly support these empirical features. Task 4 referred to the observation by Twigger-Ross and Uzzell (1996). They held that by comparing individuals' present and past self, the continuity of the place across time could be awakened. We hope that participants would recognize continuity, rejoice their achievements (Bryant & Veroff, 2017), and further generate self-worth or motivation (Niemiec, 2013a, 2013b) in Task 4. Task 5 provided participants with allotted time for reflection (Jiang & Ahmadpour, 2021), linking them to the past and the future (Bauer, 2016; Bruce Wan, 2019; Sheldon & Houser-Marko, 2001). This task could also trigger self-introspection (Bruce Wan, 2019; Wagenknecht, 2016), self-talk, and self-awareness (Morin, 1993).

3.2.2. Equipment

Our rationales for applying GEVR come from the following considerations. First, GEVR supports street views in a wide range of locations, from well-known attractions to alleys unknown to the public. This is especially important for some familiar tourists who return to personal intimate sites. Secondly, exploring virtual familiar tourism experiences

Figure 2. Left—the participants traveled to their familiar places in GEVR. Middle—the researchers viewed GEVR display through the laptop. Right—the participant is doing Task 5. The images displayed on the screens were retrieved for Google Earth VR.

through street view is also recommended by the literature. These images of personally relevant locations serve as simulations enabling researchers to capture some elements of familiar tourism experience by observing peoples' reactions to them (P. L. Pearce, 2012). Thirdly, GEVR provides three view modes (street view, aerial view, and map view) for users to switch back and forth. We expected that it could yield unique experiences.

Our hardware consisted of Oculus Quest and two computers. Participants wore Oculus Quest headsets that showed the GEVR screen and held handles for operating GEVR. The application of one of the computers included running GEVR and Airlink, recording what participants saw in GEVR, and making screenshots when participants wanted to take photos. The other computer recorded conversations of the whole exploratory activity, and presented the photos and scale results during the interview.

3.2.3. Participants

Sixteen participants, 5 males and 11 females, ages 20–44 years, were recruited through social platforms. As an exploratory study, we wanted to initially focus on a smaller selection of participants to gain an in-depth, rich understanding of the space as a whole to recognize salient opportunities and considerations for future works. With reference to the informant selection of the literature (Clarke & Bowen, 2018, 2021), we recruited the participants self-identified as familiar tourists and could self-describing their familiar places well (Prentice, 2004). All participants voluntarily took part in the exploratory activity, and none were monetarily reimbursed. The participants received a questionnaire one week before the activity which asked them to provide two familiar places they sought to revisit in VR. Moreover, the questionnaire inquired them about their companions who had went there with them and the motives for visiting these places in VR. Participants were randomly divided into two groups. To balance the potential effects from the preset order of the tours, one group of participants experienced free exploration at the outset, while the other group experienced task-oriented travel first.

3.2.4. Exploratory activity process

We briefly presented our process in Figure 1. The total duration of the exploratory activity was about 150 min, including one participant and two researchers. One researcher was responsible for guiding the participants and conducting the main interview, whereas the other helped record and process technical difficulties. Before the activity began, the participants were briefed and signed informed consent. Subsequently, they wore VR headsets and completed the GEVR tutorial program. After familiarizing themselves with GEVR operation, the participants experienced two kinds of travel (as shown in Figure 2). Each of the travel was limited to 30 min in the two familiar places selected by themselves. In task-oriented mode, they repeated the tasks in the two sites. The task instructions were recorded as a sound file using Watson Text to Speech service (IBM, 2016) in advance which was played during the tour. We informed the participants that there would be a "guide" to provide some things explaining all the tasks needed to be completed in this trip.

In order to capture participants' direct feelings and thoughts whilst visiting familiar places, they were told to think aloud during the two tour conditions. The concurrent think-aloud protocol had been used in VR research (Ijaz et al., 2020; Y. M. Kim et al., 2020), which invited people to verbalize the experience with a minimal degree of cognitive processing. Investigating the way people responded in think-aloud protocols to virtual travel also provided a quick simulation of the familiar tourism encounters (P. L. Pearce, 2012). In the exploratory activity, the participants traveled mostly in street view, but they were also allowed to exploit GEVR's aerial view and map view. They could tell researchers where they wanted to take photos. Researchers would use screenshots in the laptop to help photograph their trip. Between the two conditions, they would rest for 5–10 min depending on their physical states.

After each tour was completed, the participants filled out the scale. They were informed of a holistic assessment based on the experience of the two places. Next, a semi-structured interview was conducted. The interview's data helped us to better understand the outcomes of the experience, such as identity, learning, reflection, and, as a supplement to the framework, cleverly encompass the discussion of familiar

tourism experience (P. L. Pearce, 2012). At the beginning of the interview, researchers first posted photos of participants' travel in Figjam's canvas for them to review their experiences, followed by questions that prompted for the reasons for participants' scores of each scale question. After that, they were invited to share their thoughts about the distinctions between VR and on-site familiar tourism. Lastly, the researchers asked the participants to express their opinions regarding the differences in the experience between free exploration and task-oriented travel, and report their willingness to use VR for familiar tourism again in the future. With the consent of the participant, each travel condition was video-recorded for the following analysis.

After the exploratory activity was completed, the participants' scale data were compiled for basic statistics which provided us the potential scope and direction of qualitative analysis. The contents of thinking-aloud and interviews were then transcribed word by word and used for thematic analysis (Nowell et al., 2017). Apart from the evaluation of the consistency and deficiency of VR based on the experience framework, we also observed the characteristics of VR beyond the on-site familiar tourism and made key reports in this regard.

4. Results

Although a few participants mentioned the decline in novelty and the increased monotony of GEVR itself in their second tour, the results related to their traveling experiences were not affected by the order of two travel conditions. In what follows, we first outlined participants' reasons for choosing the place, and described the empirical evidence categorized within our experience framework. These findings indicated the similarities and differences between familiar tourism in VR and that in actual places. The results of the scale are also depicted in charts (Figures 3–5) and table (Table 1). Our main objective of the quantitative measurement was to provide the potential trends in the data to inform the qualitative analysis. Consequently, we only presented the descriptive statistics of the scale. Interestingly, in analyzing the data, three new components emerged. Each component was entirely distinctive from on-site familiar tourism. We therefore detailed these findings, which helped recognize the opportunities of VR familiar tourism.

4.1. Participants' reasons for choosing the place

After sorting out the data (as presented in Table 2), most of the reasons why participants chose specific places echoed the characteristics of social attachment (Table 2, items a, h, j), physical attachment (Table 2, item b), or both (Table 2, items e, f) (Scannell & Gifford, 2010). It was worth mentioning that a small number of participants chose the location (Table 2, item g) where they did not necessarily want to revisit. They had some negative and painful memories regarding broken relationships and deceased friends or relatives. In addition, the places that were not easily accessible

caused by the lack of time and monetary resources as well as epidemic also induced participants' desire to revisit (Table 2, items c, d).

4.2. The behavioral and relational dimensions of the VR experience
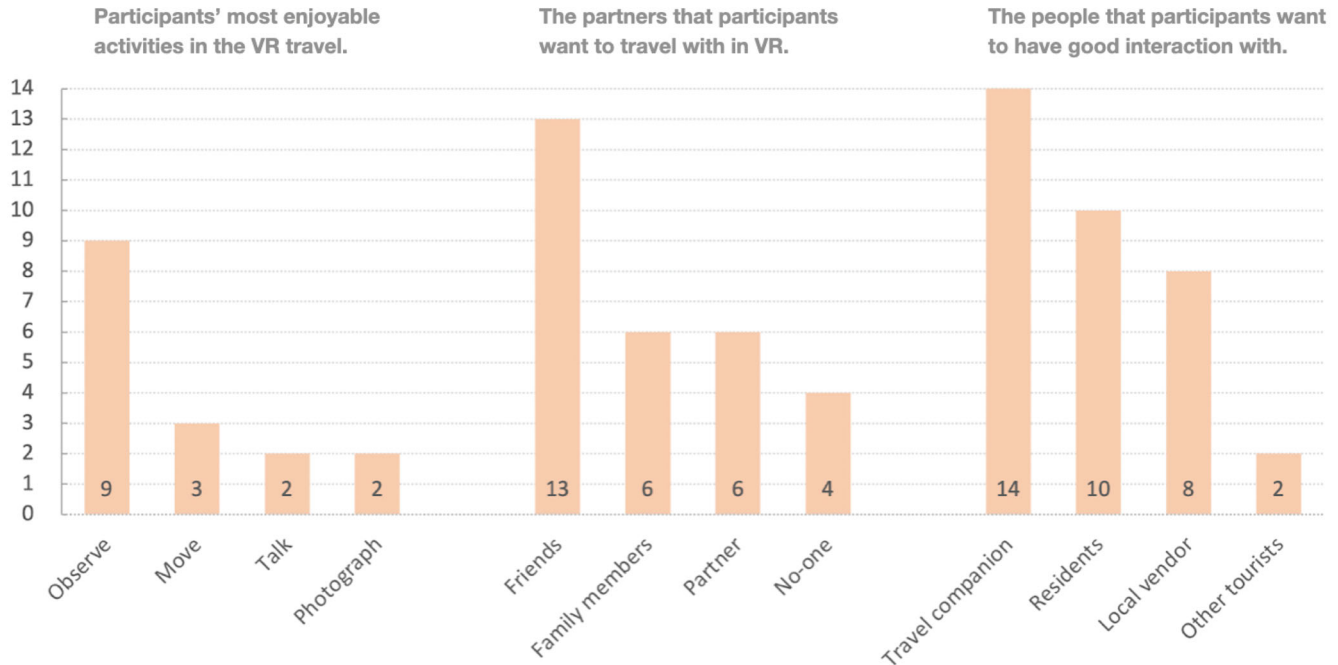
4.2.1. Seeking the familiarity and the novelty

A majority of participants considered observing to be their most enjoyable activity (Table 1, item A). Regardless of the chosen locations, comparable to revisiting in person, they experienced searching for familiarity and novelty. This observation activity was relevant to the empirical features in the cognitive facet. On the one hand, Echoing the magnifying glass effect, not only did the participants find the things connected with their past, but they also learned about the changes of the places from the past to the present and thus reported the high scores of item b (Table 1). For instance, P13 returned to Kenting where he had not visited for more than 20 years. He shared about what had disappeared, and was "excited to find the things he was familiar with" (P13). "It's like looking for treasures" (P13). P2 and P9 repeated the paths they had taken within the vicinity of their old home, which was a ritualistic activity in their prior actual tours. Immersed in traveling between the familiar and the unfamiliar, they compared the same and different parts of the VR street view with those from their memories, such as the street vendors that "have not changed" (P9) and the houses rebuilt recently.

One the other hand, participants probed into new things themselves and therefore scored high on item c (Table 1). Owing that they were not limited by physical barriers and could move to different areas in a short time, the autonomy of observation was seemingly amplified in VR. P10 found unexpected sites such as bricks and houses oddly stuck on the ground, a cistern attached to a roof in a strange way, and plenty of small pillars in groups (Figure 6). In her own words, "even if I Google the place or I actually go there, I probably can't find these cool things. It was really a surprise and I'm pretty happy overall … It only takes ten minutes to find these unexpected Easter eggs" (P10). Unlike physical tours, they shuttled quickly in the region and obtained many new discoveries (P10, P13–15). P13 explored new tourism routes in Kenting, hoping to prepare for future revisitation with his children. In the Philippines, P15 broke into a residential area where only affluent people could enter. Apart from the novelty of "getting into places that are not allowed to go in the actual world" (P15), she also stated the difference between getting lost in VR trip and that in on-site travel:

> (P15) In VR, I enjoy finding new things in my lost way, I won't get lost for too long… I'd actually gone astray here for ten hours. It drove me crazy… but just now I only lost less than ten minutes and I've found many kinds of new houses. I have plenty of time.

When performing Tasks 1 and 2, some participants went into various alleys, developing the off-the-beaten track in

FREE EXPLORATION
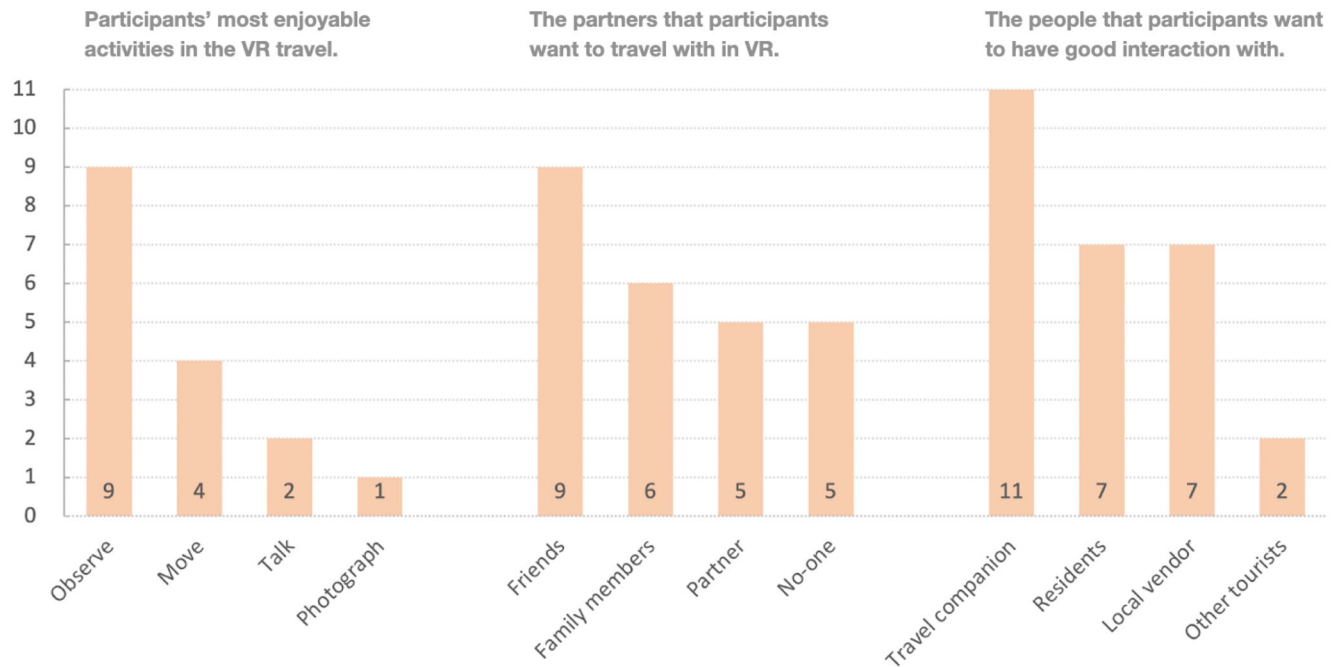
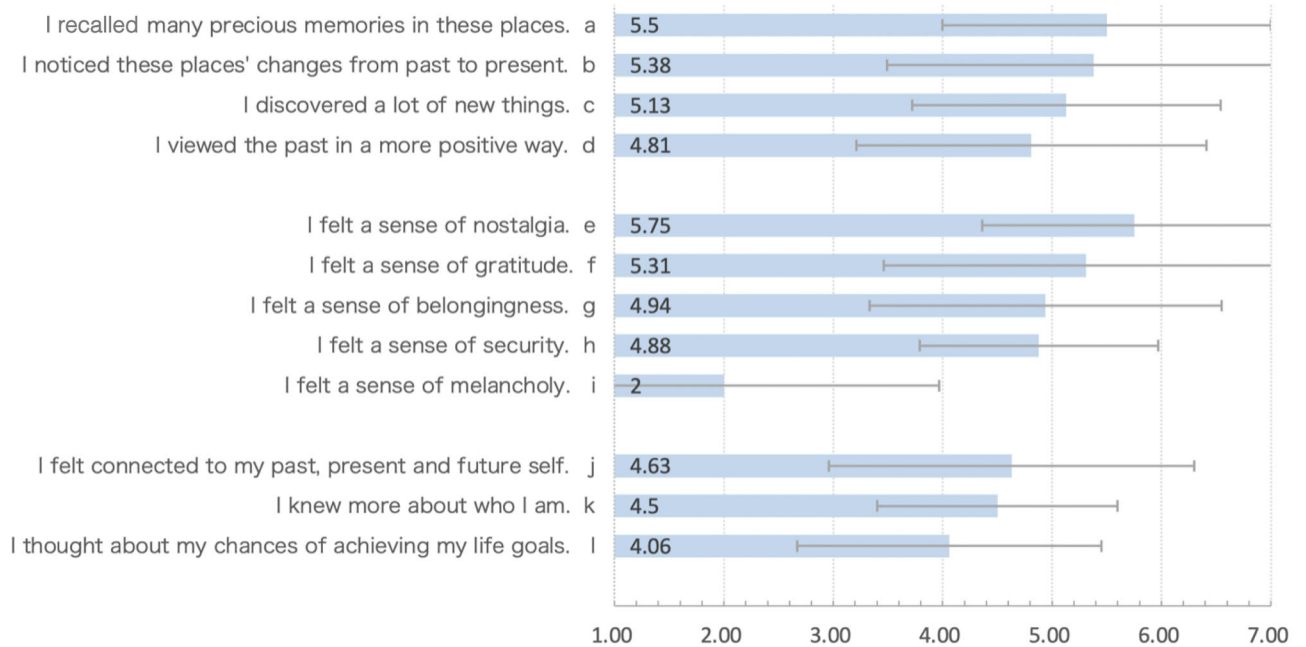

TASK-ORIENTED TRAVEL

Figure 3. The results of the behavior and relational dimensions in the scale. (The value represents the number of participants who select this option.)

VR and gaining appealing discoveries. Take, for example, P1 tracked a rider and found that he retrieved Uber box and became an UberEat delivery driver. P7 followed a car for several kilometers and found that it took the wrong turn to a one-way alley and then disappeared. To P16, the tasks offered a sense of purpose and fun, sometimes even letting her "ignore some shortcomings of VR because of the diversion of attention" (P16). In the process of tracking, P15 ran into a place that was meaningful to her. She then remarked:

(P15) Hey! Isn't that the place where I was in a Jeepney and saw someone shooting! I didn't expect to end up here because I didn't know how to get here … I like this task to bring me serendipity which is connected with my memories.

In GEVR, people could not go through all routes as freely as they actually traveled. As an alternative, the tasks guided participants to pay attention to specific objects and explore routes that were difficult or impossible to experience in actual tours.

FREE EXPLORATION

Item	
I recalled many precious memories in these places. a	5.5
I noticed these places' changes from past to present. b	5.38
I discovered a lot of new things. c	5.13
I viewed the past in a more positive way. d	4.81
I felt a sense of nostalgia. e	5.75
I felt a sense of gratitude. f	5.31
I felt a sense of belongingness. g	4.94
I felt a sense of security. h	4.88
I felt a sense of melancholy. i	2
I felt connected to my past, present and future self. j	4.63
I knew more about who I am. k	4.5
I thought about my chances of achieving my life goals. l	4.06

TASK-ORIENTED TRAVEL

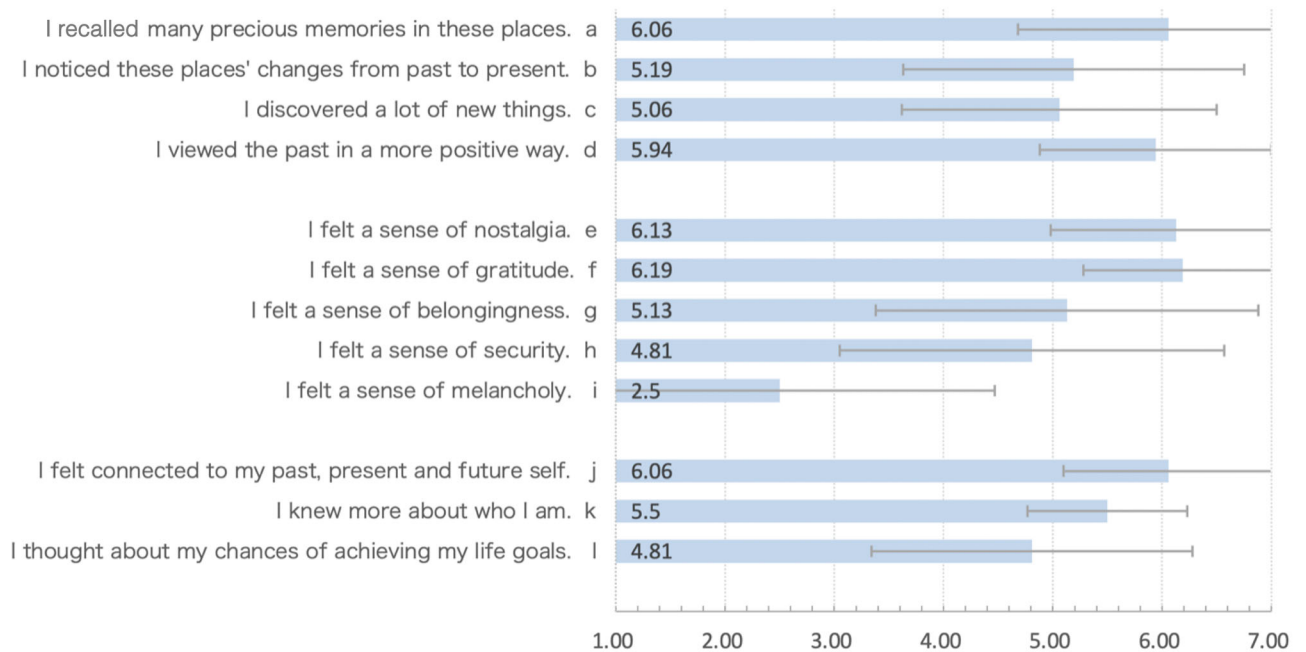| Item	
I recalled many precious memories in these places. a	6.06
I noticed these places' changes from past to present. b	5.19
I discovered a lot of new things. c	5.06
I viewed the past in a more positive way. d	5.94
I felt a sense of nostalgia. e	6.13
I felt a sense of gratitude. f	6.19
I felt a sense of belongingness. g	5.13
I felt a sense of security. h	4.81
I felt a sense of melancholy. i	2.5
I felt connected to my past, present and future self. j	6.06
I knew more about who I am. k	5.5
I thought about my chances of achieving my life goals. l	4.81

Figure 4. The results of the cognitive dimension in the scale. (The value shows the average, and the error bars presents the standard deviation.)
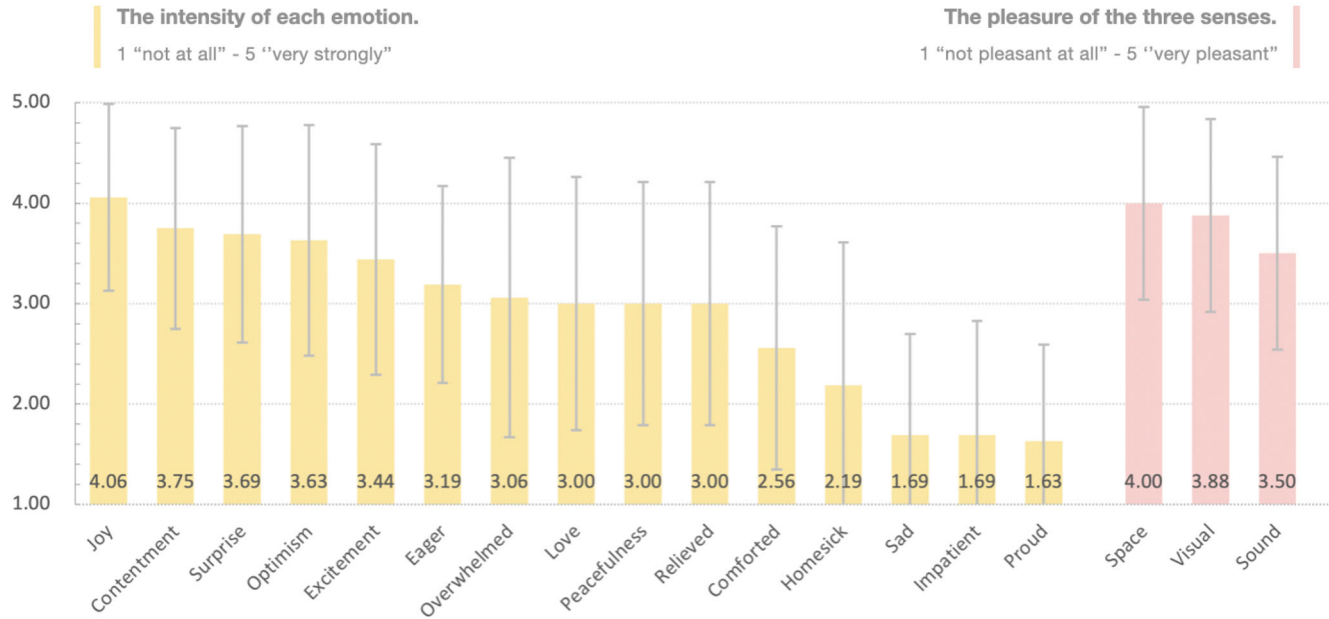
4.2.2. Envisioning traveling and enjoying the conversation with others

Regarding the relational dimension, participants reported people who they wanted to visit the place with in VR (Table 1, items B–C). In the interview, they mostly commented that the travel companion they wanted was someone who had traveled to the place with them before, and they longed to recall the intimate past. To cite an instance, P12 hoped to travel with his friends in Taitung, because "we could experience the noisy and funny atmosphere at that time" (P12). Some participants felt good about singly going there, similar to how they had felt before (P2, P6, P8, P10, P12, P15). A few participants preferred to visit the place with people they had not been to before. In that, they would like to share their past stories with their new travel companions and construct novel memories in VR revisits (P1–2, P9–10, P13–14).

In the exploratory activity, we also found that most participants did not feel stressed regarding thinking aloud.

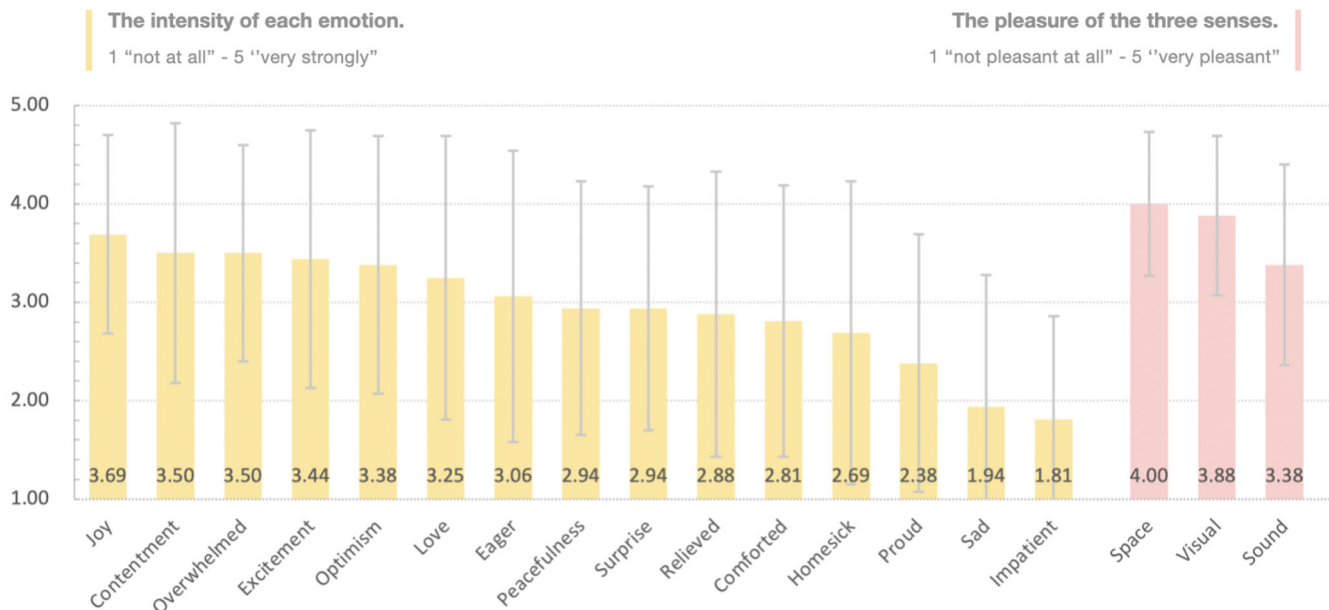## FREE EXPLORATION

TASK-ORIENTED TRAVEL

Figure 5. The results of the affective and sensory dimensions in the scale. (The value shows the average, and the error bars presents the standard deviation.)

Instead, like actual familiar tourists, they easily shared what they had actually experienced in this location, what they knew about it, and what they saw and heard at the moment. In particular, some participants enjoyed the process of conversing with the researchers (P2, P6, P9–10, P12, P14). "When you talk to another person on the trip, you also talk to yourself. It's like three people having a chat together … Through talking, I recall and release pressure" (P9). "I need someone to talk to and share my feelings on a nostalgic trip" (P14). P2 revisited Taichung First Senior High School. This was the alma mater of one

researcher. The two thus had a rich conversation about the place. "It's interesting for us to remember things together … we talked about the nearby vendors, bus and school door reconstruction … as if we really have a common memory there although we didn't go there together" (P2). What made P2 felt special was that VR offered tourists the opportunities to revisit with friends who were familiar with the place but had not been there together before. Even without collective travel, they could share their local stories and memories, as well as the feelings and thoughts when revisiting the place in VR.

Table 2. Participants' reasons for choosing the place.

Item code	Item description	Quantity
a	Participants have had a good time with friends, partner, family in the place.	15
b	Participants once carried out some activities in the place, and they hope to recall it again.	13
c	Participants would not go to the place in the short term owing to the cost of time and money.	11
d	Participants cannot go to the place now because of the epidemic.	7
e	The place includes participants' path of life and growth.	7
f	This place is significant and contains some first experience.	6
g	Participants have no motivation, not even want to revisit the place in person, but they want to try it in VR.	5
h	There is little chance to visit the place after the relationship with someone changed.	4
i	Participants wonder if there would be a new feeling when traveling there through VR revisits.	4
j	The place is the participant's hometown. The participant wants to know more and be close to hometown.	1

Figure 6. P10 made several bizarre discoveries during the 10-min free exploration in her familiar places. The images were retrieved for Google Earth VR.

4.3. The affective and sensory dimensions of the VR experience

4.3.1. Eliciting high levels of joy and excitement whilst perceiving other emotions

Figure 5 illustrated participants' emotion intensity feedback and the pleasure level of space, sound, and visual sense. The mean and standard deviation of each question were shown as items D–U in Table 1. Among all, joy and excitement are seemingly the important emotions in both on-site and VR familiar tourism. They are the emotions strongly evoked in the two travel conditions. With reference to the study data in P. L. Pearce's (2012) work, a number of people also experienced joy and excitement in on-site revisit. Regarding the causes of the emotions, joy and contentment were mainly connected with being able to revisit the places they were partial to or the fact that they had not gone for a while (P3–6, P8–13, P16). Some participants reported higher levels of optimism, comfort and touch owing that they felt self-continuity and growth (P1–3, P8–9, P12–14). Surprise was more elicited in the free exploration than in task-oriented travel (Table 1, item F). Some participants commented that they were more likely to find new angles of vision and environmental changes during the free exploration, and thus witnessed more unexpected articles (P1–2, P6–12, P15). Conversely, participants were primarily engaged in personal matters during task-oriented travel and felt less astonished.

Especially, apart from the emotions listed in the survey, a small number of participants reported fear. Part of this had to do with the place (P4 returned to the site of her past vehicle accident, P2 went to the court where she used to stay with her ex-boyfriend), and the other cause was the daunting aerial view of GEVR (P3).

4.3.2. The pleasant visual and spatial experience, and the discontented acoustic sensation

Turning to the sensory dimension, most participants were pleased with the visual and spatial aspect of GEVR (Table 1, items S–T), mainly because of the presence and immersion provided by VR (P1–4, P6, P10–16). A number of participants with experience of on-screen street view also stated the intuitive (P1, P10) and immersive (P1, P2, P9, P10, P12) advantages of VR. Auditory pleasure was the lowest (Table 1, item U). Many participants pointed out that GEVR's sound effect did not match the environment (P1, P3, P10, P12–16). To illustrate, there was no human voice in the crowded docks or squares, and birds chirping were heard in the subway. This made the experience relatively uncoordinated and reduced the qualities of the local atmosphere (P1, P8, P10, P12, P16). On top of that, several participants responded that GEVR did not provide other sensory experiences, including temperature, wind (P1, P3–5, P16), local flavor (P1, P16), food and drink (P10, P14).

4.4. The cognitive dimension of the VR experience

4.4.1. The precious memories emerging from VR street views

Figure 4 presented the scale results of participants in the cognitive dimension with the mean and standard deviation of each question shown as items a to l in Table 1. Apart from those affected by pathfinding problems and those who explored new things during free exploration (P10, P15), the other participants stated that their memories emerging in GEVR were nearly similar to on-site familiar tourism, resulting in a high degree of nostalgia and a low degree of melancholy (Table 1, items e and i). Several participants bumped

into their memories due to the detailed objects in the VR street view. P2 accidentally found the forgotten port. "We didn't take many photos in the port last time, but in fact we had the most activities in this port … Here, l can recall more details" (P2). In particular, P3 compared VR street view, photos she collected and sound recorded by herself from the perspective of souvenirs. "VR street view is able to expand more memories and discover pieces that I otherwise would have overlooked or forgotten, which brings me more unexpected surprises" (P3). VR street views of participants' familiar places were not photos taken by themselves nor unrelated to them, but they combined some characteristics of both in that they presented the places with personal meanings. Combined with the features of intimacy and immersion, they became joyous memory materials that complemented participants' memories.

4.4.2. The sense of security provided by places and VR technologies

Participants' sense of security mainly came from the following three aspects. The first was related to the places and the past memories there, which was similar to the safety haven effect in familiar tourism. The environment itself provided some familiar elements, and the memories they recalled consisted of their activities there and their travel companions. These made some participants less fretful (P3, P5 P8–9, P11, P13, P16). Additionally, the "arbitrary door" feature of VR brought a sense of security (P2, P9–12, P14). P2 and P9 gave the following examples: "I can do this at any time … Suppose I want to visit this place in the still of the night, I can go right away" (P2). "If anything happens to me, I can finish the trip and come back immediately" (P9). Lastly, the sense of security was enhanced resulting from the "invisible man" role that participants felt in the static VR streetscape (P2, P6, P9–10, P14–15). The comments made by P1 and P9 were pertinent. "I have a feeling of peeping. I know that my participation will not affect the environment … I can do anything I want to do. Others won't notice me and won't be affected by me" (P9). "I can even run around avenues and highways. It's not dangerous at all in VR" (P1). These senses of security serve as the basis for participants to actively explore outwards, making it possible to "be more casual and not afraid when visiting strange places" (P14). As evidenced by P15's remark: "I didn't have to worry about missing my way … In fact, I was immersed in getting lost and quite enjoyed it" (P15).

It was worth emphasizing that the sense of security of virtual familiar tourism included the unique attributes of VR, which even provided privacy for some participants (P2, P9). As P2 stated after visiting the place where her boyfriend lived,

> (P2) I actually think my privacy was protected when visiting familiar places in VR. It's hard to sneak around if I go physically … if a friend wants to ask me out temporarily, I have to say I'm not at home. My whereabouts are public. I have no choice … but in VR, I can keep it to myself. I won't be gossiped that I'm in distress … sometimes I just want to experience the place briefly without the burden.

4.4.3. The effects of Tasks 3, 4, and 5 on the cognitive dimension

In the cognitive aspect, several scale scores of the task-oriented condition were different greatly from those of free exploration. Some participants reported that this was highly attributed to the effects of Task 3, 4, and 5. Additionally, profound reflections emerged after the participants completed these tasks. We therefore presented this section to describe how these tasks affected the cognitive aspect of the VR experience.

According to the empirical evidence, it seemed that Tasks 3, 4, and 5 reeled in participants' cognitive resources from the environment to themselves, contributing to the increase in scale items related to identity issues (Table 1, items j–l). Task 3 prompted them to sort through their memories of previous trips and "think about what places and experiences stood out" (P4, P16). It also helped them reach where they "really wanted to go" (P1–6, P10–12, P16). While performing Task 4, they thought deeply about their changes from the past to the present and subsequently reorganized their thoughts. Besides, the participants performed this task with verbal output. This process facilitated them to "express abstract feelings" (P6, P9, P14). When sharing, they confirmed, sorted out their past, and put things into perspective. In this light, some participants commented that their attitude toward the past became more positive and they were appreciative for the past (P6, P10–12, P15–16), giving rise to their higher scores of items d and f in task-oriented travel (Table 1). As for the last stage, Task 5 provided a peaceful space for participants to establish a dialogue with themselves. They summarized the travel experience, the difference between the present and the past, "what they had gained" (P13) as well as "expectation for the future" (P3, P15), and even experienced a sense of "self-growth" (P2, P4, P10–11, P14).

For instance, P10 pondered the relationship between homelands and identities during Task 4. As a current overseas Malaysian now working in Taiwan, P10 re-thought about the reason for her reluctance of returning to Malaysia when she was young, and why she "would try her best to go back now if she could" (P10). She then realized that she longed to have more connections with the land and family to actively establish identity. "It's a surprise, something I didn't think of in the past … I wanted to change this relationship … somewhat because after going back like this every year and finding that they treated me as a Taiwanese" (P10). Regarding P9's travel, after revisiting the college dormitory and completing Task 4, she found that she had lived through and overcame the unpleasant times there, which made her wish to "dearly love the self in the past" (P9). P15 thought of the friend who actively engaged in international aid and passed away in an accident. In Task 4, P15 reflected on the meaning of life issues. "How to balance this in the end, his life is as important as others' life, but his life burned out to make others happy, is it worth it?" (P15). P15 then left some questions about life to herself in the future during Task 5. "My mood is less negative … Don't force myself to think of the answer now, save it and let it become

a goal for the future … I believe that my future self will answer those questions" (P15).

In the free exploration, participants were privileged with autonomy and explored the places lightheartedly. However, they "just went to see this place" (P6, P11, P16) and didn't think about their own things. "There's no deep connection to that place" (P10). In comparison, following the guidance of Tasks 3–5 in meaningful places, the participants "evaluated whether their past thoughts and feelings are the same as those in the present" (P9). Moreover, the tasks "gave the journey a meaning and knew what the past represents in life" (P4). In the process of "comparing and feeling" (P9), they connected the past, present and future self, and thus secured rich reflection on identity and personal goals.

4.5. The new components of experience framework: the unique senses of distance, space and time

4.5.1. The sense of distance from the site
We found that VR streetscape's low interactivity and sensory constraints made the participants feel distant from the site (P1–2, P4, P9, P11, P14, P16), which also released their cognitive resources. Guided by Task 3, 4 and 5, the released resources were probably drawn back to the attention of the self. P14 provided the following example:

(P14) In VR, I wasn't very involved in that place, so I could associate myself with the different experiences of these places when doing tasks … It didn't come to mind that everything was re-anchored. It's like the main lines of a drama … I'm surprised that I have so many ideas and feelings in Guohua Street.

With the tasks, P14 reviewed the impression of Guohua Street in different life stages, reflected on her growth from confusion to clarity, and generated self-worth.

(P14) This is a very important learning experience. Realizing why the confusion was at that time, realizing I had to overcome the confusion, and how to overcome it … this important life experience has a relationship between before and after, and is still continuing to extend to the future … the feeling of connection is meaningful. It makes this travel experience deep and rich.

At the end of the interview, P14 shared the differences between VR and on-site familiar tourism of supporting self-reflection.

(P14) I think traveling to familiar places in VR is more suitable to reflect on myself … If you really go to a place, it's hard to deal with in-depth thinking and learning. The stimulation for each sense is intense, and the new information is chaotic.

Therefore, the useful ideas and insight that can be spoken out may be few.

The comprehensive effect of distance and tasks even prompted the participants to visit some places with complex or negative memories. During Task 3, P2 and P11 timidly revisited the campuses and libraries in the vicinity of the houses where their ex-boyfriends lived, while P4 traveled to the places where traffic accidents had occurred in the past. "Seriously, I should not dare to go there in person" (P2). The participants concerned that the impact of bad senses in these actual sites would become overwhelming. On the other hand, they needed to pay the transportation fare, and bear the psychological exhaustion in the process of getting there. Instead, in VR, they could instantaneously arrive at the places, and the intensity of feelings and emotions there was just right because of the low degree of sensation and interactivity. Moreover, the aforementioned VR security and privacy protection increased confidence and allowed for exploration. These factors encouraged them to head over to the destinations. After the revisits, they completed the profound growth experience of overcoming psychological barriers. As stated by P2, P4, and P11: "I feel proud because I have finally done this … It's a way that I can examine whether I'm able to face this relationship … I feel that I have grown up" (P2). "I found out that I wasn't so repulsive about my ex-boyfriend" (P11). "I think I changed bravely … It's like challenging myself" (P4).

4.5.2. The sense of multi-view space
In reality, familiar tourists "could only walk in a limited area" (P16). "We were all looking from the perspective of pedestrians, but not on the roof or above" (P9). In VR, however, they had the opportunity to enjoy familiar places from the perspectives of GEVR's built-in aerial view (P6, P12–14), and user-generated 360° photo or aerial view of drones (e.g., P5 and P9 found a view of the sunset campus from the sky). Participants controlled their view and movement fluently and seamlessly (Gilge, 2016) to transit these perspectives that were either technically troublesome or even impossible to reach in person (Figure 7). This lifted the restrictions on physical space and met the demand for new discoveries of familiar tourists. The whole process was also "painless and won't take lots of time or efforts" (P13).

In addition, familiar tourists could use these macro and micro views to quickly establish connections with the place,
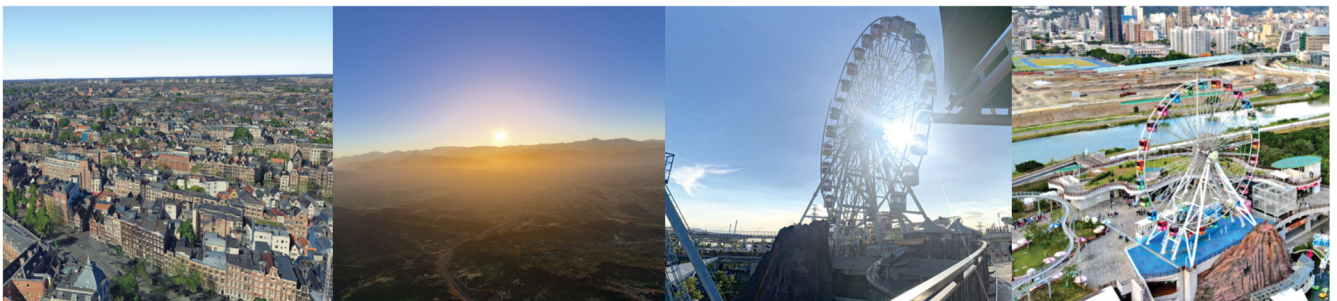

Figure 7. Participants appreciated familiar places through multiple perspectives. Some places are hard to reach in physical world. The images were retrieved for Google Earth VR.
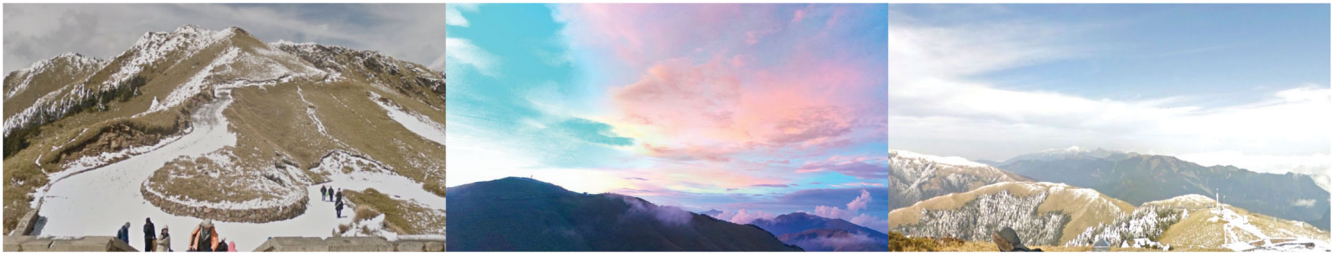
Figure 8. P4 experienced walking in different seasons on the familiar mountain in VR. The images were retrieved for Google Earth VR.

Figure 9. Within a few steps, P1 crossed from the school gate this year to the gate at his graduation ceremony. The images were retrieved for Google Earth VR.

since the switching and transfer of GEVR's different views were highly flexible and swift. They were capable of knowing the location, distance and other relations among places in a more intuitive way, which made it possible to "re-recognize the familiar places" (P1, P11, P13, P16). In conclusion, the multi-view of VR broke the sense of space in real world and formed a brand-new experience of traveling to familiar places.

4.5.3. The sense of montage time

In GEVR, the street views of a region were randomly composed of 360° photos uploaded at different points. Thus, the participants sometimes coincidentally discovered the appearances of the place at different periods of time (P1–2, P4–5, P8–10, P12, P15). The dramatic change gave them a strong sense of serendipity. To cite an instance, in P4's memory, the snow on Hehuan Mountain was generally melting during her actual visitation (the spring scenery). By comparison, in GEVR, she witnessed the mountain both full of snow (the winter scenery) and without snow (the summer scenery) which allowed her to be immersed in the experience of wandering between different seasons in the mountain (see Figure 8). She then remarked, "If there's a chance, I'll use VR for revisits again because the sceneries are rich in variety, maybe spring, summer, autumn and winter, day and night" (P4).

Additionally, the montage street view created a unique sense of time. Combining with Task 3, participants were able to appreciate the evolution of personally meaningful places at a few steps and several seconds. The environmental changes in GEVR could be as short as a few minutes or a day, months, or even years. For example, when P1 finished Task 3 neighboring his university, he suddenly bumped into the gate at his graduation ceremony (Figure 9). In his words,

(P1) GEVR's scene of the school gate could have millions of possibilities, but it showed the gate of my graduation day as if it's meant to be! … this coincidence makes me feel so complicated. It's surprising, exciting, sad but meaningful.

As for P15, she went back to see the old site of her grandfather's house, and found that the place had been purchased and rebuilt to the sixth floor, but suddenly it turned into the original appearance of the first floor. "It feels like time travel … I therefore wonder if the time over there is going backwards … and maybe my grandpa's three-section compound will come back" (P15). It is a serendipity that after P15 wandered around, she found that her relatives put up the signboard written by her grandfather, which intricately surprised her. In the interview, P15 described the insight gained from the VR travel:

(P15) After this experience, I feel that revisiting does not necessarily have to be at the time point of "now". Occasionally doping a little scenery from another time is good, because those scenes in the real world may not appear again, just like my grandpa's signboard.

When the feature of montage time combined with the task 4 and 5, the participants seemed to be more involved in the experience. P8 returned to the mulberry store where he used to visit with his host families in Brazil. He witnessed two statuses of the store (the shop in operation and out of business). At first, he was shaken and remorseful, but after Task 4 and 5 he reflected on himself. This unique journey let him "feel the details emerging and get over it suddenly" (P8). He then shared his reflection:

(P8) They have already become cherish memories… In retrospect, even though I didn't eat at that store with them again, I've stepped out of my comfort zone and learned a lot more, which makes me who I am now … what's important is to pay more attention to my surroundings.

The street views of personally relevant locations evoked a sense of familiarity along with meaningful memories and emotions. However, the random montage ripped these street views from their contexts and chronology, which tainted the familiar places with ambiguity and brought about the defamiliarization (Leong et al., 2011). They might become relatively odd and baffling, but created new orderings of memories and emotions. This unfinalized state and puzzling situation (Baumer, 2015; Jiang & Ahmadpour, 2021; McCarthy & Wright, 2004) invited familiar tourists for sense making and re-interpretation, which nudged them towards serendipity (Leong et al., 2011). When roaming through these streetscapes and completing the tasks, the participants "creatively joined the dots to forge something meaningful" (Leong et al., 2011, p. 392) and gained a deeper understanding of themselves. On-site familiar tourism could only be experienced in special occasions. In contrast, VR was capable of combining environments at separate periods of time. The sceneries were not a fixed proportion of past or present, and were often astounding and unexpected. It generated the feeling and experience that tourism in the actual world could not offer.

5. Discussion

5.1. The evaluation and impact of VR familiar tourism

Through the GEVR exploratory activity, we found that VR is suitable for traveling to familiar places. All participants reported a desire to visit familiar places in VR again, providing that they were able to perceive the values of familiar tourism from the VR experience. In the sensory and behavioral dimensions, VR features good presence and immersion of the sites, and sates the pursuit of novelty and familiarity. Familiar tourists are invited to walk the same path, compare the changes from the past to the present, and explore off-the-beaten track and undiscovered secrets with ease and buoyancy. Regarding the affective and cognitive aspects, in addition to provoking the feelings and emotions, traveling to familiar places in VR well elicits memories. This was the significant element that most participants were satisfied with during the exploratory activity. VR also supports self-thinking. Performing tasks further helps participants become more aware of changes in themselves and thus generate meaningful experiences.

Furthermore, VR has some characteristics and upsides beyond the on-site familiar tourism. To begin with, consistent with the existing tourism literature (Cheong, 1995; Guttentag, 2010; H. Lee & Jung, 2020), the application of VR in visiting familiar places also depicts the convenience of lifting the time and space restrictions. Just as our participants experienced familiar places at home and abroad in a few minutes during the VR trips, familiar tourists could use VR to travel to the destinations that they seldom revisit on-site, which resolved owing to the lack of monetary or time resources, and shuttle in different places with minimal efforts and low risk. Some destinations in VR are even difficult to reach in person either temporarily or permanently on account of human or non-human factors, including politics, precarious environment, and the epidemic. Next,

according to our findings, VR provides a sense of security that reassures people to probe into novelty. The comprehensive effect of arbitrary doors and invisible man meets familiar tourists' needs for traveling privately. In particular, the characteristics of sense of distance from the site render them voluntarily visit specific places that are associated with negative or complex memories. Lastly, the sense of multi-view space and montage time make it possible to visit familiar sites with different perspectives and time points giving rise to unexpected, unique and brand new experience.

With the emergence of virtual tourism technology, such as VR, familiar tourists' destination decisions and revisit frequency would be affected. In on-site familiar tourism, physical accessibility and distance from familiar places to residence are crucial elements influencing their visit patterns (Clarke & Bowen, 2018). In contrast, they are no longer restricted by these elements in VR. On the flip side, based on our findings, the sensory and interactive constraints perceived in the technology-mediated experience come to be the factor encouraging tourists to visit specific familiar spots in VR. People's prior experience of VR familiar tourism also fosters the motivation to make their way to the actual places. This is supported by prior works (Iswahyudi et al., 2021; W. J. Lee & Kim, 2021; Tussyadiah et al., 2018) and the empirical evidence of this study which particularly occurred in some places with new discoveries or pleasant memories (P1, P3, P5, P7, P10 − 13, P16). Delivering more convincing proof of being in the places, VR expands the influence of characterizing actual places with the usage of technology. Links between tourists and familiar places blend between the reality and the virtual world, which makes familiarity of a place become more fluid.

5.2. Considerations for designing VR familiar tourism experiences

Taking into account the current technology development, VR familiar tourism would still take sequential landscape scanning as the main VE. We need to accept that VR has a lot of room for improvement in covering all senses and of flawless content. In view of the possible problems in pursuing authenticity of actual sites, such as heavy costs, valley of terror (Jerald & Marks, 2016), and increasing user expectations (Turner et al., 2013), we recommend considering "experiential fidelity" (Lindeman & Beckhaus, 2009). This concept advocates careful design of user experience, guiding the user's mood to align their expectations, attitudes, and attention with the actual VR experience, and ultimately stimulating the user's own imagination to create memorable experience. According to the aforementioned conception, we propose several design suggestions as a reference for the development of VR familiar tourism.

5.2.1. Crafting the timeline in VE to outperform on-site tours

As an important variable affecting tourism experience, the time of street views is highly recognized by participants and

even leads to new user needs. For instance, P15 hoped that time could be turned back and looked forward to mixing some scenes of different time and space into the journey. Some participants regarded the montage time as Easter eggs that make the experience full of joy. Considering the difficulty of technology implementation, we do not suggest to develop VR environments exemplifying the physical world in real-time. With the accumulation of street view data, VR would gradually highlight its advantages of manipulating the world's time and creating the effect of montage time. Consequently, here we provide implications of three time themes in VR familiar tourism.

1. **Sparking novel experience: familiar tourism with dynamic montage time.** As an enhanced version of GEVR, the travel of this theme randomly combines familiar places at separate periods of time. Familiar tourists are invited to wander between different seasons and phases of time of the destinations. To illustrate, they may witness their familiar places from thirty years ago and suddenly bumped into that from last week. This privilege allows them to explore unpredictable timeslips, seek the unfamiliar in the familiar, and even encounter serendipity (Leong et al., 2011). Designers can also create tasks referred to Dérive App (2013) that prompts travelers to move and observe in personally relevant locations.

2. **Arousing both nostalgia and surprise: familiar tourism with a montage time in a specific period.** Frequent switch of time is not necessarily suitable for everyone, since it may result in a strong sense of bizarreness and affect the fluency. Hence, we recommend providing the autonomy for familiar tourists to set the street view within a particular period. While retaining the opportunity for making unexpected discoveries, this thematic travel delivers a more stable and balanced experience due to the reduced degree of randomness. On top of that, it invites them to review the scenes of important life stages and appreciate the familiar appearance difficult to reach or impossible to see on-site.

3. **Providing complete continuity: familiar tourism in hotspots with the whole timeline.** Hotspots are significant and memorable to many familiar tourists (Clarke & Bowen, 2018), which explains why some participants were touched and obtained temporal or personal continuity while witnessing the growth of hotspots such as famous school gates and mountains. Physical revisit only allows travelers to experience the scenery at its present moment, whereas VR is capable of fabricating different local appearances connected with a myriad of their memories. Accordingly, designers are suggested to combine hotspot's different epochs into a set of trips for producing deeper experience. By way of illustration, they can reference to Google Street View's "Time Machine" (Shet, 2014) and create an experience in VR that enables familiar tourists to revisit the local

environments and connect with the selves in different life periods.

5.2.2. Matching the sound with the local environment
As a problem that is clearly perceived by participants and can be solved in part by existing technologies, the dissonance of sounds must be taken seriously and avoided. In VR, familiar tourists prefer to hear sounds that coincided with the local environment. It is a possible method that the system switches the circulating white noise or music suitable to the environment when they are transferred to different places. According to the interview data, we suggest that the sound types of the place be preliminarily divided into three categories: on the streets of the metropolis, it is appropriate to apply the sounds of passers-by, shopkeepers and vehicles. In the environment close to nature, the sounds of chirping birds, whirring wind, and flowing rivers and waves are matched. Additionally, GEVR's current background music is more suitable for theme places that have already played music originally: bookstores, cafes, restaurants, convenience stores.

5.2.3. Planning tasks for supporting meaningful and memorable experience
In the exploratory activity, we found that the comprehensive effect of the tasks and the sense of distance from the site facilitated the participants to actively review their past and generate reflection. Reminiscing and finding meaning produce the potential to create technology-mediated meaningful experience (Baumer, 2015; Isaacs et al., 2013; Konrad et al., 2016; Odom et al., 2012; Odom et al., 2019) and memorable experience (Bruce Wan, 2019; Heath & Heath, 2017; J.-H. Kim et al., 2012; Tung & Ritchie, 2011; Wan et al., 2021) which are topics of interest in both HCI and tourism communities (de Freitas Coelho et al., 2018; Diller et al., 2005; Han et al., 2020; Lindeman & Beckhaus, 2009; Mekler & Hornbaek, 2016, 2019; Pullman & Gross, 2004; Tussyadiah, 2014).

We recommend designing tasks related to self-awareness that are performed in the VR street views of personally meaningful places. Since VR streetscapes feature the sense of distance without chaotic sensory information and high interactivity that distract familiar tourists, performing tasks in these environments helps guide them in exploiting the cognitive resources effectively and reflecting on themselves. They may even revisit the places with complex memories, and experience profound growth journeys after overcoming mental barriers. On the other hand, it is also appropriate to duly combine Dérive tasks (2013) featuring randomness and abdicating choice (Cachucho & Fakhamzadeh, 2013), or insert a certain proportion of free exploration in the experience. The purpose is to maintain their interest and engagement. Through utilizing VR street views and guiding tourists gradually, we expect that VR could achieve meaningful and memorable tourism experiences (Han et al., 2020) surpassing those in on-site travel.

5.2.4. Exploring virtual tour guide's application and implication to enhance familiar tourism experience

In task-oriented travel, we sent missions and provided information through a mimetic voice assistant. We believe that this role is not only a travel partner, but also becomes a virtual tour guide, which forms an extended design space of VR familiar tourism. This echoes the discussion of virtual personal assistants (Loureiro et al., 2020; Marinchak et al., 2018) featuring artificial intelligence to help increase tourists' satisfaction and willingness to return, stimulate co-creation processes with tourists, and facilitate their engagement in the future. There are various guiding functions and implications which can be developed. We suggest that designers consider giving tour guides the following different aspects of guidance:

1. **The guide of location:** To assist in the route planning that considers users' need and helps craft memorable tourism experience in VR.
2. **The guide of knowledge**: To present information and broadcasting stories.
3. **The guide of exploration:** To encourage tourists to observe and discover new things or ideas in their familiar places.
4. **The guide of meaningfulness:** To promote tourists' self-exploration and self-reflection.

Furthermore, with reference to the existing research (Decker et al., 2020; Geigel et al., 2020; Rzayev et al., 2019), designers are invited to explore the form of tour guides, including its auditory style (tone, speed, gender, and age), visual style (avatar such as human, animal, or other), movement, and the possibilities of integrating other senses. The personality of tour guides can also be taken into consideration.

5.3. Limitations and future works

The findings in this study are subject to certain limitations. First, the comparison of VR and on-site experience of visiting familiar places was mainly based on previous literature and participants' self-report review. We did not carry out the on-site exploratory activity. In view of limited research resources and energy, physical accessibilities, and the outbreak, requiring participants to replicate the exploratory activity in actual places is difficult to implement. To illustrate, it is painstaking for them to cooperate in flying abroad for comparative studies in a short time. On top of that, numerous familiar places went into lockdown temporarily because of the risk of contagiousness, and some sceneries supported by VR were technically unreachable. Second, while the participants' VR experience was explored in considerable detail, different genders and ages, and the small sample size of 16 participants yielded less conclusive results. Future studies could focus on how familiar tourists of the specific gender and age affect the VR experience, or find significant effects with a larger sample size. Third, as an exploratory study of GEVR, not all features in the

experience framework had been studied. For example, we did not inquire into familiar tourist's behavior of using personal resources in consumer decision-making and special routines. Affective dimension was streamlined into 15 items in our survey. Nevertheless, we do not advocate that the emotions generated by familiar tourism are simplified to only these items. We still hope that future works apply a complete affective scale to conduct a more structured affective assessment of VR familiar tourism.

Future research can also build on the framework of this study to analyze the specific experience aspect with different theoretical perspective. Among all dimensions, we would like to first investigate multi-user familiar tourism connected with the relational facet. Our study examined single-user experiences. Interestingly, many participants showed willingness to visit familiar places with partners, friends and relatives or interact with local people. To familiar tourists, these people play an important role who arise the other-led familiar destinations and become part of their social resources and networks (Clarke & Bowen, 2021). Alongside this, VR offers great advantages in social applications, especially in times of COVID-19 pandemic. Without leaving home, people can still experience familiar tourism together conveniently and safely. Owing to the aforementioned reasons, we plan to explore how the experience of familiar tourist changes, how their relationships differ from reality and how to design the experience when travel partners or local people join the VR familiar tourism.

6. Contribution and conclusion

In this paper, we have evaluated the experience and relevance of VR in the application of traveling to familiar places. We develop an experience framework from existing literature and conduct an exploratory activity with GEVR. Findings evidenced that although VR revealed noticeable limitations in the relational and sensory dimensions, it was able to support specific characteristics in the following dimensions: seeking the familiarity and the novelty (behavioral facet), eliciting joy and excitement (affective facet), satisfying the space and visual aspect (sensory facet), arousing security, continuity, and reflection (cognitive facet). We particularly identified the sense of distance, multi-view space and montage time. Outperforming on-site travel, these features expand and shape unique tourism experiences. According to the findings, design implications and strategies are provided.

As the beginning of HCI research on VR familiar tourism, our framework and empirical results contribute to opening a brand new topic of VR tourism. Deviating from the previous literature studying VR tourism experience with quantitative approaches (Beck et al., 2019; W. J. Lee & Kim, 2021; W. H. Lo & Cheng, 2020; Tussyadiah et al., 2018) or evaluating VR's usages and acceptance of specific tourism forms (Jung et al., 2017; H. Lee et al., 2020; Marasco, 2020; Samaroudi et al., 2020; Sánchez & Palos-Sánchez, 2020; Sánchez et al., 2021), our study focuses on the in-depth and holistic experience in the context of traveling to familiar

places. Compared to the research discussing the role of GEVR's familiar street views for eliciting awe (Quesnel & Riecke, 2018) or the experience of Google Street View that alters our daily life (Gilge, 2016), we probe into how tourists are affected by familiar sceneries in GEVR in different aspects of tourism experience. We call for further inquiry into specific experiential dimension of VHFP surrounding immersive technologies, which helps tourism and HCI academia gain additional insights beyond the existing bodies of knowledge on repeat tourism, VHFP, virtual tourism, and VR experience design.

Regarding practical implications, our work recognizes the advantages of VR and provides design suggestions related to the design directions of the timeline and sound in VR, the arrangement of the tasks performed in the trip, and the development of virtual tour guides. These considerations inspire and empower VR designers to circumvent limitations of VR and identify design opportunities in their targeted context. We invite the HCI community to jointly explore the experience and design of VR familiar tourism. These efforts will contribute to supporting more types of tourism with immersive technologies and ultimately enabling more people in public to achieve a self-development and meaningful journey in VR.

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Disclosure statement

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