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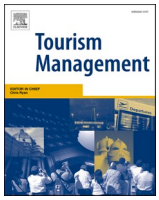

Enhancing exercise visitors' behavioral engagement through gamified experiences: A spatial approach

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ABSTRACT

"Quantified" travelers often use mobile exercise apps and gamified features to manage their physical activities while visiting destinations. Accordingly, this study empirically explores the spatially varying relationships between visitors' gamified experiences—place curiosity and social recognition—and exercise behavioral engagement. Using novel data from exercise app users' activity logs and spatial analytical methods, this study finds that gamified experiences have differential effects on the exercise times and distance of tourist and resident visitors. Furthermore, the visitor gamification-engagement relationship varies according to the type of gamified experience and individual and clustered locations. These findings offer important implications for integrating gamified exercise apps with destination management to improve visitor engagement, which enhances our knowledge of smart tourism design.

1. Introduction

Wellness tourism, traveling for health and well-being, has grown rapidly over the past decade. Wellness tourism generated $639 billion in 2018 and will continue to rapidly expand; it lies at the intersection of two booming industries—tourism and wellness (Global Wellness Institute, 2018). Whereas wellness tourists maintain or promote their health and well-being through physical, psychological, and/or social activities, exercise visitors mainly engage in physical activities in outdoor environments (Voigt, Brown, & Howat, 2011). Due to the diversity of wellness tourist behaviors, this paper focuses on physical, exercise-oriented visitor behaviors. Recently, health-conscious smart tourists have begun using mobile exercise apps to track their physical activities (e.g., hiking, walking, and bicycling) during a trip to a specific destination and during nontravel leisure times. The exercise tourism phenomenon has become increasingly prevalent, specifically because people engage in outdoor tour activities due to the COVID-19 pandemic, which also offers researchers and practitioners an opportunity to build effective smart tourism designs.

To improve exercise app users' exercise engagement, app developers (e.g., Strava) often implement a set of game design elements in nongame settings, so-called gamification (Deterding, Dixon, Khaled, & Nacke, 2011), which can further enhance visitor experiences at a given destination. Research has dealt with tourism gamification, such as how to gamify tourism products and services (Shen, Choi, Joppe, & Yi, 2020) and how to motivate tourists with gamified features (Aebli, 2019). However, less attention has been given to understanding visitors' gamification-driven behavioral engagement in the context of exercise tourism. Furthermore, no studies have investigated the heterogeneous roles of visitors' gamified experiences in designs of smart tourism products/services or in cocreations of meaningful experiences across different locations.

This research attempts to fill these knowledge gaps by empirically exploring the spatially variant relationships between visitors' gamified experiences and their behavioral engagement during exercise travel. To provide strategic implications for destination management, this study uses GIS-based spatial analytical methods to visualize spatially heterogeneous behavioral engagement among tourist and resident visitors to a tourist destination (Hall & Page, 2009). Accordingly, this study captures whether and how the gamification-exercise engagement relationship varies across locations at the individual and subcluster levels. This research contributes to the literature on smart tourism design and

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gamification with two implications. First, in contrast to prior studies in controlled environments (Shoval, Kahani, De Cantis, & Ferrante, 2020), this research examines real-world data on exercise visitor behaviors in a natural setting and extends our knowledge on how gamification can drive visitor engagement. Second, the application of spatial analytical methods to a gamification setting offers a dynamic and place-based paradigm for business and destination managers who intend to customize gamified products and services by targeting different visitor segments in various locations. As such, a gamification-based exercise travel design can enable destination managers to physically and virtually monitor visitor experiences and behaviors and target exercise visitors to maximize their destination engagement.

2. Theoretical underpinnings

2.1. Exercise visitor engagement

As a multidimensional construct, engagement is composed of cognitive, affective, and behavioral components (Hollebeek, 2011), which vary across engagement actors and contexts (Brodie, Hollebeek, Jurić, & Ilić, 2011). Most tourism scholars have conceptualized only tourists' cognitive and affective states regarding specific activities offered by tourism operators (Taheri, Jafari, & O'Gorman, 2014; So, King, & Sparks, 2014). In contrast, this study utilizes the behavioral perspective of visitor engagement. It does so for the following three reasons. First, exercise tourism is inherently behavioral because visitors intend to engage in physical activities at attractions. Second, intrinsic and extrinsic motivations and gamified features are mainly related to health behaviors (Johnson et al., 2016). Finally, the study of visitors' behavioral engagement contributes to the research on both gamification and customer engagement.

To measure exercise visitors' behavioral engagement, this study employs two types of behavioral outcomes: time and distance of an exercise travel activity (Wolf & Wohlfart, 2014). Researchers argue that visitor engagement entails visitor participation in on-site travel activities while visiting destinations (Organ, Koenig-Lewis, Palmer, & Probert, 2015). Prior studies have measured the length of time visitors spend at a certain attraction as visitor engagement (Falk & Storksdieck, 2005). In the context of exercise travel, the activities that are typically supported by outdoor environments, such as hiking, running, or biking, are also those that might be undertaken for longer periods of time and longer distances (Pretty et al., 2007).

2.2. Gamification in exercise visitor experiences

Gamified features in nongame contexts, i.e., gamifications, are useful tools for actively engaging visitors to a destination and help generate memorable visitor experiences (Xu, Buhalis, & Weber, 2017). Gamification is a process that enhances a product or service with affordances—actionable properties connecting an object to an actor (Gibson, 1977)—for gamified experiences to foster a user's overall value (Huotari & Hamari, 2017). Researchers have suggested that gamification affordances motivate people to take action (Deterding, 2011). In tourism contexts, gamification often enhances visitor experiences by immersing visitors in both physical and virtual worlds (Sigala, 2015). As physical activities in exercise travel require commitment to and persistence in healthy behaviors, gamification affordances need to be implemented in hedonic designs to create enjoyable travel environments.

Extant studies have argued that the underlying motivations for using gamified features can be defined by both the specific properties of the game design—artifactual affordance—and the specific situation in which the gamified features are being used—situational affordance (Aebli, 2019; Deterding, 2011). By integrating motivational theories (Ryan & Deci, 2000) with gamified elements, this study defines two types of gamification affordance—place curiosity as a situational affordance—and social recognition as an artifactual affordance. Curiosity, an intrinsic motivation, is the desire to approach and comprehend novel phenomena (Kashdan, Rose, & Fincham, 2004). As some visitors explore remote, unusual places that are distant from famous destinations, place curiosity can represent the situation itself with visitors' intrinsic motivation to visit new exercise routines over established alternatives. Conversely, social recognition, an extrinsic motivation, can be regarded as the main psychosocial construct to impress others and build a higher position within a traveler community (Aebli, 2019). The social recognition enabled by points and badges can represent an artifactual feature with exercise visitors' extrinsic motivation to improve their desire to increase physical activity (Hamari & Koivisto, 2015).

2.3. Spatial heterogeneity of visitors' gamified experiences and behavioral engagement

By systematically incorporating mobile app-tracked individual data, this study captures visitor heterogeneity across locations when predicting exercise visitors' behavioral engagement. Scholars suggest that new and repeat customers have different levels of familiarity with a specific product or service, which causes their level of engagement to vary (Hollebeek, 2011). Based on prior studies of tourist attractions, this research divides exercise visitors into residents (i.e., internal visitors) and tourists (i.e., external visitors). Local residents typically have better awareness, familiarity, and specific knowledge of specific attractions at a destination than tourists (Ho, Lin, & Chen, 2012). For example, residents who live near a beach may have less interest in beach access than tourists (Ellis & Vogelsong, 2005). Tourism resource managers also need to address psychological differences and conflicts of interest between resident and tourist visitors (Chien and Ritchie, 2018).

Furthermore, exercise visitor engagement can be categorized into different geospatial segments depending on gamified situations and artifacts, including exploration (e.g., exercising in remote places) and reward seeking (e.g., accumulating points) (Shen et al., 2020; Shoval et al., 2020). Studying the spatial heterogeneity of visitors' gamified experiences and behavioral engagement is facilitated by the availability of location and behavioral data that are tracked by exercise apps. Furthermore, smart tourism, based on the concept of quantified travelers, not only emphasizes individual-level visitor experiences but also allows monitoring group-level experiences (Choe & Fesenmaier, 2017). Akin to prior studies (Lee, Jang, & Kim, 2020), this study therefore examines the spatially variant relationships between visitors' gamified experiences and behavioral engagement at both the individual and clustered levels.

3. Methods

3.1. Study area and data collection

To examine the effect of gamification on exercise visitor engagement, this study collected novel data from mobile exercise app users' activity logs on Jeju Island, one of the most famous tourist destinations in East Asia. Jeju Island covers an area of 1833.2 km^2 and is regarded as the prime winter destination for Asian tourists seeking warm weather and beautiful beaches and hosts 15 million visitors per year. The exercise app is Tranggle, the largest in South Korea. Similar to Strava, this exercise app enables users to monitor and record the details of each physical activity, including time, location, and distance. The main data were randomly collected from the Tranggle database. A total of 2447 exercise activities were recorded by tourist visitors on Jeju Island in 2015 (one year), whereas 1340 activities were recorded by resident visitors (Fig. 1). Other exercise activities outside Jeju Island were excluded from the sample because those activities could be part of ordinary recreation activities rather than tourism-related activities. Finally, TripAdvisor data on the top 233 tourist attractions, including location and aggregate-level review volume, were collected to measure place curiosity and control variables.

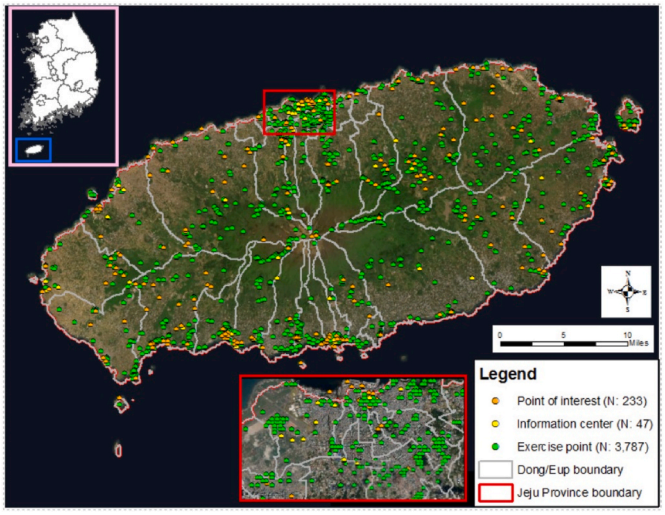

Fig. 1. Study area.

Table 1 reports the exercise characteristics of the tourist and resident samples. Tourists who traveled to Jeju Island preferred hiking for their exercise travel (54.2%), and residents on the island engaged with walking (68.4%). Most tourists started their activities in the morning (65.4%) and finished in the afternoon (67.3%), whereas residents started in the morning (50.5%) but finished at various times (morning: 39.2%, afternoon: 32.5%, evening: 28.0%). Both tourists and residents engaged in exercise travel across the four seasons.

3.2. Variables

As dependent variables of exercise visitor engagement, we measured (1) the length (in hours) of time a visitor spends (exercise time) and (2) the distance (in kilometers) a visitor travels during an exercise activity (Falk & Storksdieck, 2005). These variables represent the behavioral engagement level of resident or tourist visitors. Hence, four dependent variables—2 (exercise time, exercise distance) x 2 (tourist, resident)—were measured in the final model.

The main independent variables comprise situational and artifactual affordances. We employed place curiosity as the situational affordance of travel, which is measured by the distance (in kilometers) from the activity's starting point to the nearest tourist attraction (among 233 attractions on Jeju Island). As an artifactual affordance, we used social recognition, which is measured by the number (in 10,000s) of points that a visitor has accumulated by performing exercises since he or she installed the app (Jang, Kitchen, & Kim, 2018a, 2018b; Li, 2018).

This study also controlled for four variables that may affect exercise visitor engagement. First, exercise starting time was controlled for because morning exercisers tend to perform more exercises than evening exercisers (Brooker et al., 2021). Second, as rest breaks can mitigate objective performance declines attributable to time on task (Ross, Russell, & Helton, 2014), we controlled for the length of break time per exercise activity. Third, destination popularity was measured by the aggregated volume of reviews about the nearest tourist attraction to the starting point. Finally, overall satisfaction with the focal destination was measured by the overall rating of the nearest tourist attraction.

Table 1
Sample characteristics.

Exercise description		Tourist sample (N = 2447)	Resident sample (N = 1340)
Type	Walking	881 (36.0%)	916 (68.4%)
	Hiking	1326 (54.2%)	194 (14.5%)
	Bicycling	172 (7.0%)	67 (5.0%)
	Jogging	41 (1.7%)	157 (11.7%)
	Other	27 (1.1%)	6 (0.4%)
Starting time	Dawn	76 (3.1%)	56 (4.2%)
	Morning	1601 (65.4%)	677 (50.5%)
	Afternoon	650 (26.6%)	427 (31.9%)
	Evening	120 (4.9%)	180 (13.4%)
Ending time	Dawn	17 (0.7%)	4 (0.3%)
	Morning	519 (21.2%)	525 (39.2%)
	Afternoon	1647 (67.3%)	436 (32.5%)
	Evening	264 (10.8%)	375 (28.0%)
Season	Winter	755 (30.9%)	273 (20.4%)
	Spring	519 (21.2%)	328 (24.5%)
	Summer	432 (17.7%)	324 (24.2%)
	Fall	741 (30.3%)	415 (31.0%)

3.3. Data analysis

This study conducted multiple data analyses, including aspatial and spatial models. First, an ordinary least squares (OLS) regression was performed to investigate the global relationships between visitors' gamified experiences and exercise engagement as follows:

$$y_i = \beta_0 + \sum_{j=1}^{k} \beta_j \ x_j + \varepsilon \quad (1)$$

where y_i denotes the dependent variable that comprises (1) tourist exercise time, (2) resident exercise time, (3) tourist exercise distance, and (4) resident exercise distance of activity $i \in \{1,2, \ldots,n\}$; x_j denotes independent variable $j \in \{1,2, \ldots,6\}$; β_j denotes the jth parameter estimate; and ε denotes the error term. Next, a geographically weighted regression (GWR) was run to examine spatially varying relationships between independent and dependent variables. Different from OLS regression, GWR captures spatial variations in the regression coefficients (Lee et al., 2020). The GWR model is as follows:

$$y_i = \beta_0(u_i, v_i) + \sum_{j=1}^{k} \beta_{ij}(u_i, v_i)x_{ij} + \varepsilon_i \quad (2)$$

where (u_i, v_i) are the coordinates at activity i's starting point. By using the bisquare kernel with adaptive bandwidth, the GWR model fit was maximized. We determined the optimal kernel size using iterative optimization processes that minimize the corrected Akaike information criterion (Fotheringham, Brunsdon, & Charlton, 2003). Finally, the GWR outputs, such as local coefficients, were visualized to capture how the effects of visitors' gamified experiences on exercise engagement might individually vary across activities in a clustered way.

4. Results

Figs. 2 and 3 present the descriptive statistics and spatial distribution of the dependent and independent variables. On average, tourists spent 4.06 h (Fig. 2A) for 17.72 km (Fig. 2C) participating per exercise travel, whereas residents spent 1.99 h (Fig. 2B) for 10.28 km (Fig. 2D). However, exercise behavioral engagement varied spatially according to the type of engagement (exercise time and exercise distance) and the type of visitor segment (tourist and resident). Regarding situational affordances, tourists (Fig. 3A) and residents (Fig. 3B) displayed their place curiosity with an average of 0.81 km and 1.35 km, respectively, from the nearest tourist attraction. Concerning artifactual affordances, tourists on average accumulated 18.91 points since app installation (Fig. 3C), whereas residents accumulated 32.19 points (Fig. 3D). Finally, the highest variance inflation factor was 1.454, indicating the absence of multicollinearity in the final model.

Table 2 reports the results of eight OLS regression and GWR models. Overall, tourist visitors who showed a higher place curiosity (−0.084) and a higher social recognition (−0.005) decreased their exercise times (Model 1). Interestingly, resident visitors with a higher social recognition (−0.031) increased exercise times (Model 3), whereas a lower place

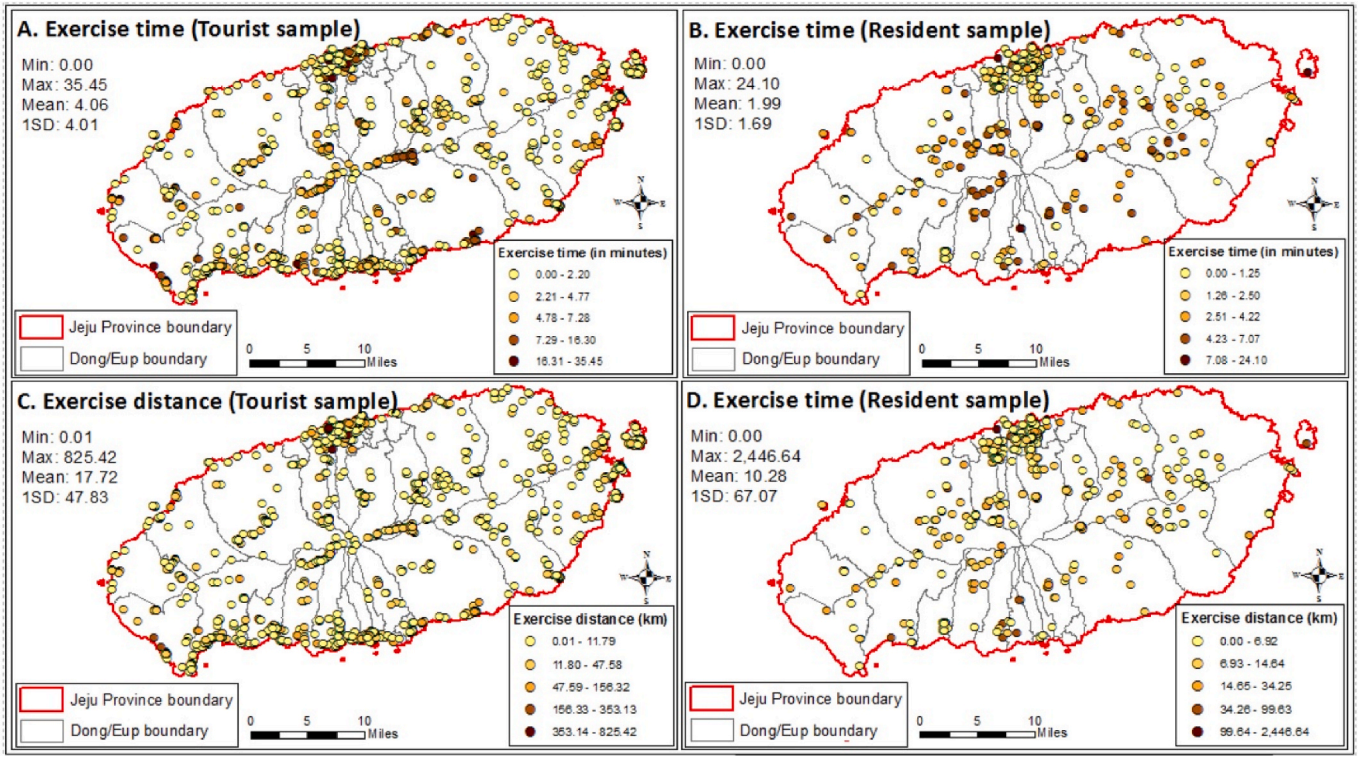

Fig. 2. Spatial distribution of dependent variables used in the models.

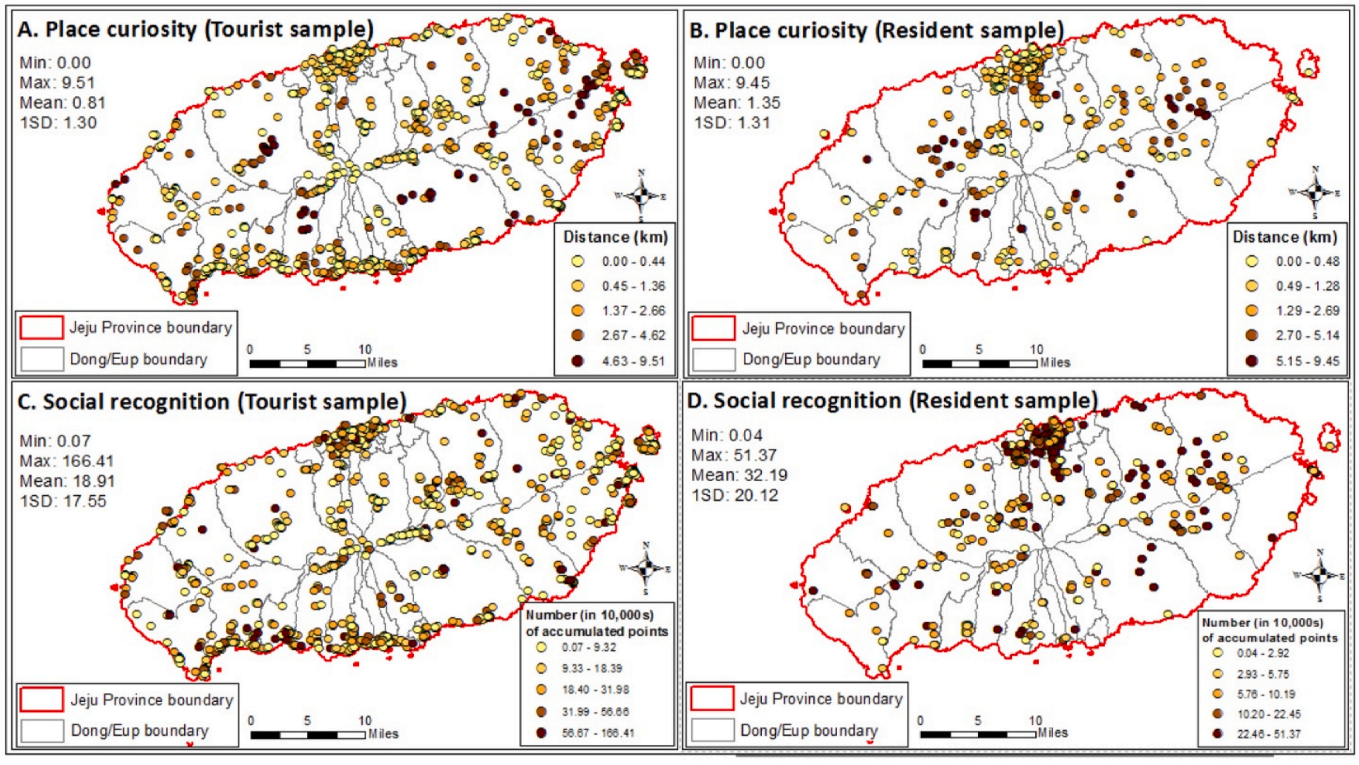

Fig. 3. Spatial distribution of independent variables used in the models.

curiosity (−3.783) and a higher social recognition (0.338) increased exercise distance (Model 7). These findings indicate the differential roles of situational and artifactual affordances in encouraging exercise behavioral engagement among tourist and resident visitors. For example, the situational feature of proximity to the tourist attraction (lower place curiosity) and the artifactual feature of fewer accumulated points contribute to the exercise times of tourist visitors who fly to the island, whereas lower place curiosity and more accumulated points increase exercise distance among local residents.

The results of the two GWR models demonstrate the presence of

Table 2
Estimates of OLS and GWR models using the dependent variables of exercise time and exercise distance.

Variable	Dependent variable: Exercise time								Dependent variable: Exercise distance							
	Tourist sample				Resident sample				Tourist sample				Resident sample			
	Model 1 (OLS)	Model 2 (GWR)			Model 3 (OLS)	Model 4 (GWR)			Model 5 (OLS)	Model 6 (GWR)			Model 7 (OLS)	Model 8 (GWR)		
		Min	Mean	Max		Min	Mean	Max		Min	Mean	Max		Min	Mean	Max
Place curiosity	−0.084*	−1.288	−0.217	0.634	−0.009	−0.176	−0.102	0.113	26.150	−1.682	22.920	288.902	−3.783*	−7.897	−2.724	0.750
Social recognition	−0.005*	−0.075	−0.003	0.038	−0.031*	−0.017	−0.007	0.012	2.476	−0.051	1.009	6.393	0.338*	−0.184	0.414	0.744
Start time	−0.183*	−0.510	−0.178	0.243	1.297*	−0.325	−0.021	0.001	22.600*	−1.121	8.326	51.849	1.106*	−1.765	0.363	1.882
Break time	1.456*	1.109	1.382	3.449	0.002*	0.800	1.247	1.643	209.331*	1.831	76.329	594.230	70.281*	−1.978	79.903	104.530
Review volume	0.003*	−0.045	0.000	0.028	0.080*	−0.001	0.002	0.004	0.021	−0.133	0.027	0.319	−0.048*	−0.097	−0.068	0.004
Rating	0.043	−0.510	0.275	1.576	−0.009*	0.026	0.067	0.546	−28.787	−223.620	−24.130	5.185	0.948	−0.549	2.504	3.610
Intercept	4.013	0.720	4.602	10.022	1.924	0.075	1.832	4.954	−313.138	−1164.961	−170.296	23.903	−26.039	−39.631	−22.113	29.472
R^2	0.682	0.293	0.702	0.963	0.626	0.314	0.632	0.693	0.042	0.008	0.221	0.501	0.544	0.068	0.636	0.793
Condition number		6.801	13.087	29.957		10.622	11.971	28.596		8.801	11.015	14.586		10.622	11.971	28.596

*P < 0.05.

spatial heterogeneity when examining the relationships between visitors' gamified experiences and exercise engagement. In the tourist segment (Model 3), place curiosity, on average, was negatively related to tourists' exercise time (−0.217), but the relationship between and exercise time can vary from −1.288 to 0.634 across activity locations. Heterogeneous local coefficients were also present in the resident segment, ranging from −0.176 to 0.113. From the exercise distance perspective, local coefficients varied from −1.682 to 288.902 in the tourist segment and from −7.897 to 0.750 in the resident segment.

To better understand the spatially heterogeneous coefficients, Figs. 4 and 5 visualize the spatial distributions of GWR-based local coefficients for place curiosity and social recognition, respectively, across all four models. Furthermore, the clustered relationship of gamification and exercise travel engagement was examined by employing the global Moran's I statistic and local indicators of spatial association (LISA) statistic. The LISA subclusters often consist of (1) hot spots (high-high), (2) spatial outliers (high-low), (3) spatial outliers (low-high), (4) cold spots (low-low), and (5) nonsignificant figures (Jang & Kim, 2022; Lee et al., 2020). Specifically, tourists with higher place curiosity increased their exercise times across the island-wide (red-colored) areas (Fig. 4A and B), whereas residents with higher place curiosity increased their exercise times in the center and southern areas (Fig. 4C and D). Interestingly, tourist visitors with greater social recognition increased exercise times in the central areas (Fig. 5B), where in contrast, socially recognized residents decreased their engagement (Fig. 5D). The results of individual and subcluster-level GWR coefficients indicate that the effect of gamified experiences on exercise engagement varies based on the type of behavioral engagement (exercise time vs. exercise distance), the type of visitor (tourist vs. resident), and individual and clustered activity locations.

5. Discussion and implications

This study demonstrated the usefulness of mobile exercise app data for understanding whether quantified visitors' behavioral engagement is influenced by gamified experiences in different places. Specifically, we explored the spatially heterogeneous relationships among tourist/resident visitors' gamified experiences and exercise engagement on a famous tourist island. Using novel data on exercise app-tracked activities and gamified experiences and spatial analytical methods, we examined (1) whether and how situational and artifactual gamified experiences (i.e., place curiosity and social recognition) influence visitors' behavioral engagement (i.e., exercise time and exercise distance) and (2) where visitor gamification-engagement relationships vary across the types of gamified experiences and the types of visitors at the individual and group levels. The results of OLS regression models show that place curiosity decreased tourists' exercise times and residents' exercise distance. Interestingly, social recognition decreased the exercise times of both tourists and residents but increased residents' exercise distance. In addition, the results of GWR models and visualization show that the visitor gamification-engagement relationship was spatially heterogeneous according to specific gamified experiences and specific locations where activities occurred.

5.1. Implications and future research

The implications of this study are threefold. First, this study extends our knowledge on visitor engagement by examining visitors' behavioral aspects that might be affected by experiences with gamified features amid visits to destinations and performing physical activities. Although visitor engagement includes cognitive, affective, and behavioral elements (Hollebeek, 2011), scholars have focused more on the cognitive and affective dimensions (Taheri et al., 2014; So et al., 2014) and less on the behavioral dimension. Measuring behavioral engagement is critical in tourism and gamification research because intrinsic and extrinsic motivations and gamified features are closely related to health

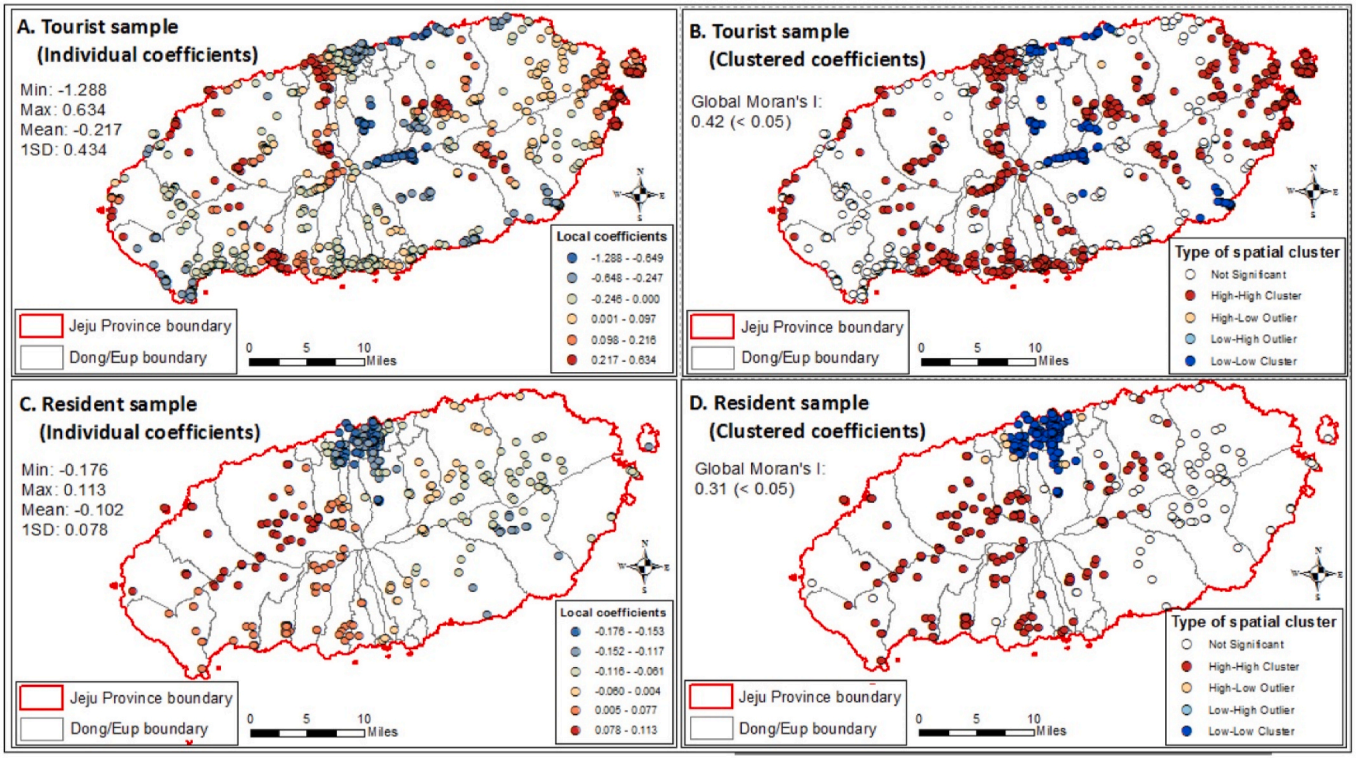

Fig. 4. Spatial distribution of local GWR coefficients for place curiosity (DV: exercise time).

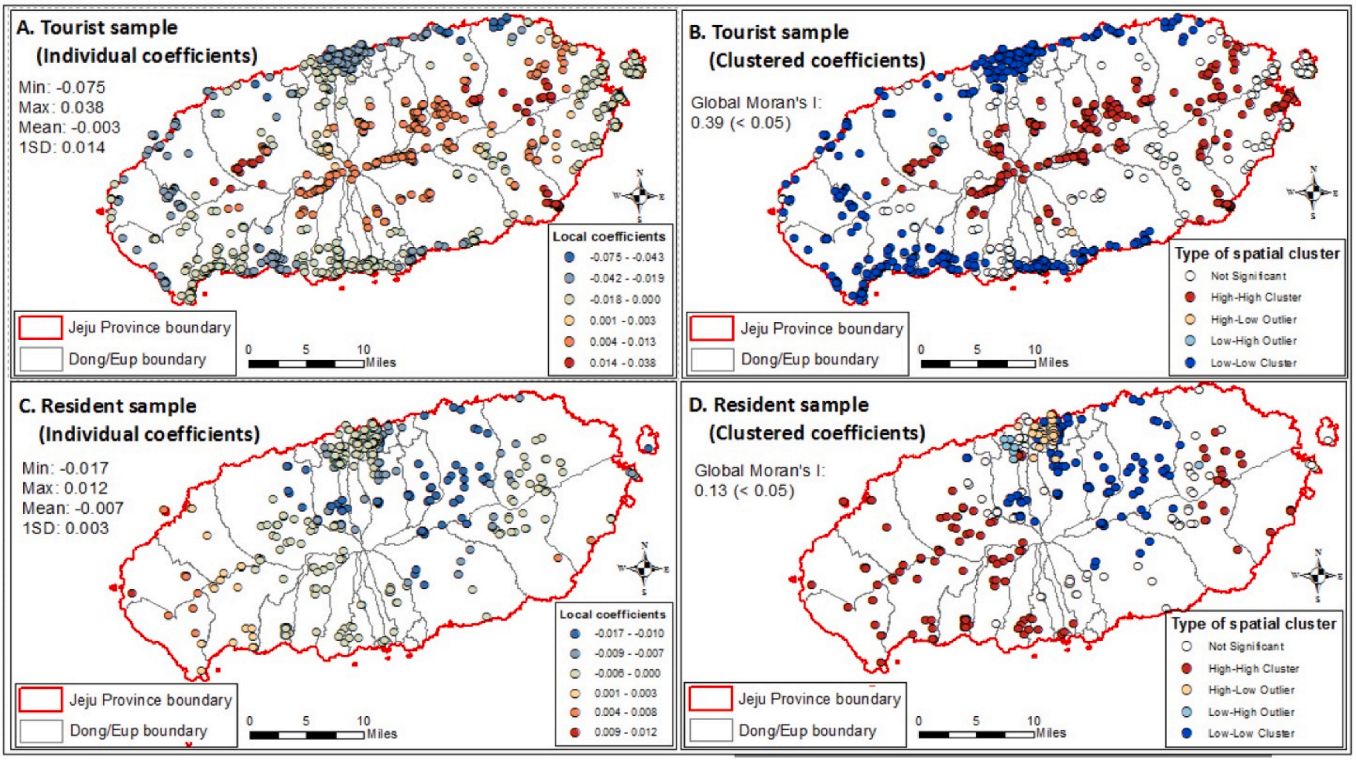

Fig. 5. Spatial distribution of local GWR coefficients for social recognition (DV: exercise time).

behaviors (Johnson et al., 2016). Thus, the use of actual behavioral data can identify both visitors' on-site experiences and their objective and authentic engagement levels.

Second, as visitor engagement may vary according to engagement actors and contexts (Brodie et al., 2011), our study offers place-based visitor engagement management (Hall & Page, 2009). Our spatial approach to the visitor gamification-engagement relationship enables destination managers to not only better understand

gamification-triggered visitor activities but also effectively communicate their existing tourism products and services to visitors to increase behavioral engagement. For example, destination managers can work closely with exercise app providers to monitor how social recognition tools (e.g., points and badges) can be integrated across destinations to engage tourist or resident visitors more fully with their activities. Fig. 6 illustrates how each destination (cultural, natural, or both) can design a point reward system to maximize the time engagement of tourists (6A) and residents (6B). Nature-based attractions located at the center of the island (e.g., Hallasan National Park) and culture-based attractions located at the western island (e.g., theme parks and museums) can target tourists and residents, respectively, with more points (greater social recognition) because they tend to demonstrate high exercise times.

Finally, this study emphasizes the importance of managing and targeting tourists and residents separately in gamified destinations. Our findings imply that destination managers should understand that the effects of gamified features and experiences on exercise visitor engagement vary among tourists and residents. Local residents have greater knowledge of the destination than tourists, and the two visitor segments may have different points of interest across attractions. Due to the importance of understanding the psychological forces underlying resident-tourist conflicts (Chien & Richie, 2018), destination managers could monitor how intrinsic and extrinsic gamification elements motivate residents and tourists to visit different attractions, which could also reduce any overcrowding problems. As such, this study can guide tourism planners to design collaborative projects that involve exercise app providers and multiple attractions within a particular destination to enhance visitor experiences; such collaboration can serve as the foundation for smart tourism design. Regarding engagement, both destinations and app providers share a common goal: to enhance customer engagement during visits to a particular destination.

The limitations of the present research offer researchers an

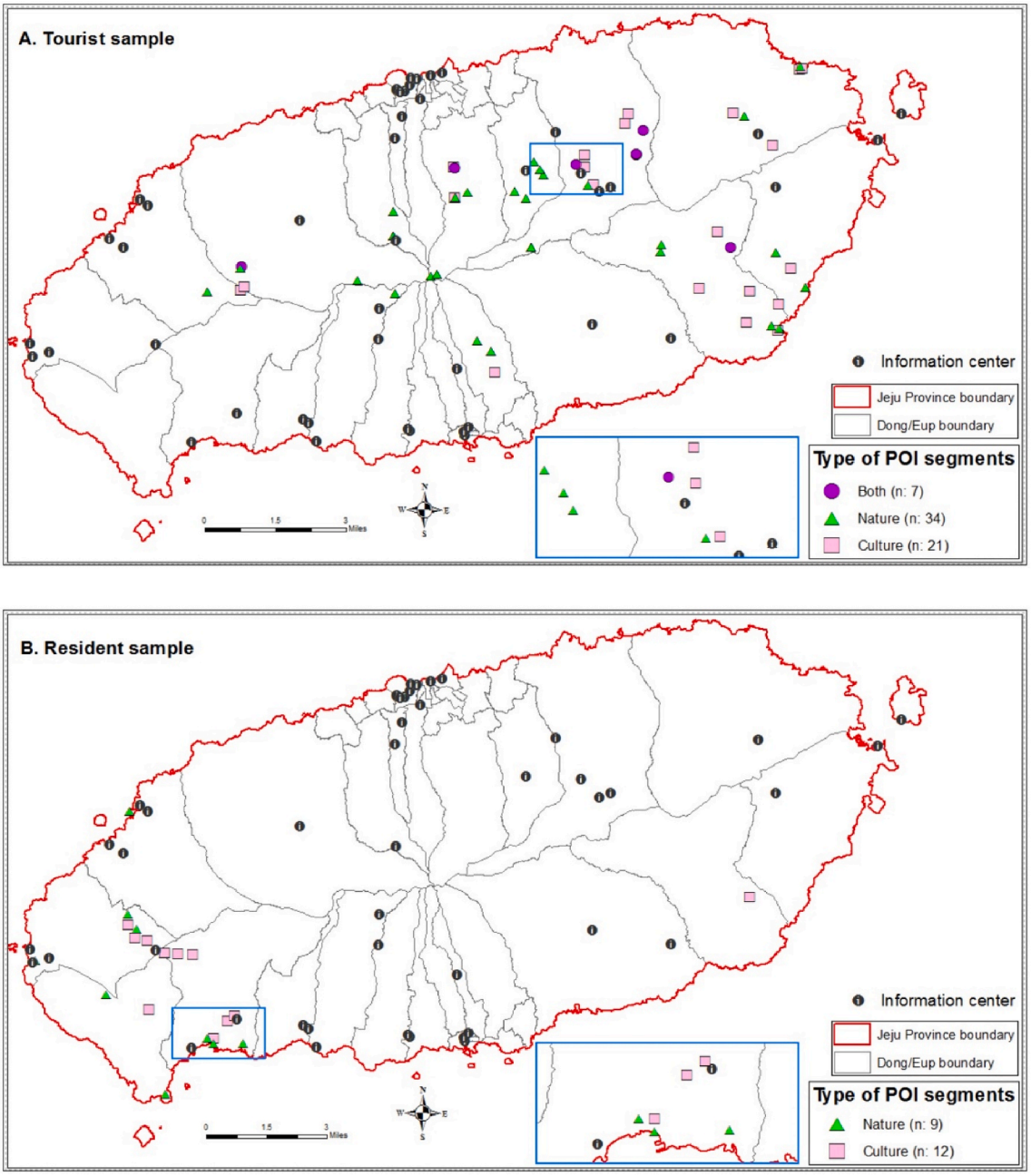

Fig. 6. Spatial segmentation of positive GWR coefficients for social recognition (DV: exercise time).

opportunity to explore new research topics. First, although the behavioral dimensions of gamification and visitor engagement were measured, this study did not measure other dimensions, such as psychological outcomes or cognitive and affective engagement. Since gamification and engagement are multidimensional constructs that vary across actors and contexts, future research can measure additional elements to examine how the visitor gamification-engagement relationship can be heterogeneous among different constructs. Second, the present research utilized novel data regarding mobile app-tracked gamification and exercise behaviors that occurred on South Korea's most popular tourist island in 2015. Although the empirical data reveal information that is relevant to gamification-engagement research, the representativeness and generalizability of our findings are limited due to the age of the data age and limited study area. These limitations offer future studies the opportunity to collect recent data, before and during the COVID-19 pandemic, from different countries (e.g., Western cultures) to examine how the visitor gamification-engagement relationship functions in different and novel situations, including social distancing and lockdown measures and cross-cultural influences.

Impact statement

This paper provides an interdisciplinary framework for better understanding how gamified experiences influence visitors' behavioral engagement during exercise travel across locations. The use of mobile exercise app users' real activity data and spatial analytical methods contributes mainly to the tourism management research by demonstrating an integrated view of smart tourism design elements regarding mobile app-based gamifications and quantified visitor behaviors. In addition, the application of geographically weighted regression and GIS methods to a gamification setting offers a dynamic and place-based paradigm for business and destination managers who intend to customize gamified products and services by targeting different visitor segments in various locations. Finally, this paper contributes to social science research on wellness and exercise tourism that is powered by smart technology, which has become an important tourism and leisure phenomenon amid the COVID-19 pandemic.

Declaration of competing interest

None.

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