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Project Report

Exploration of Social Media for Observing Improper Tourist Behaviors in a National Park

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Abstract: The numerous visitors and shortages in funding and manpower of national parks in Taiwan present difficulties in the management of recreational uses, thereby resulting in issues regarding park sustainability. Using social media to describe and reconstruct travel experiences has become prevalent in recent years. Social media usage has also triggered the emergence of Internet surveillance. This study used social media to analyze the types of improper behavior among visitors at Yushan National Park in Taiwan, the message modes that visitors use to disseminate their improper behavior, and other Facebook (FB) users' responses to posts that involve improper behavior. Content analysis was adopted to evaluate the posts of FB users who visited Yushan National Park and logged into FB from Taiwan. The findings revealed that a total of 62 (7.3%) out of 852 FB users had engaged in improper behavior, which mainly involved illegal (40.3%) and careless (30.6%) actions. The message modes adopted for posting of improper behavior were predominantly texts and photos (48.4%) and photos only (43.5%). In general, other FB users consistently responded to the posts on improper behavior with Likes and commented on the majority of the posts. However, few posts received purely unsupportive Comments and Shares. Managerial suggestions based on these findings were provided to Yushan National Park.

Keywords: social media; surveillance; content analysis; improper behavior; park management

1. Introduction

National parks serve the functions of conservation and recreation and often become the favorite destinations for ecotourism. In Taiwan, national parks are popular spots for the general public to engage in recreational activities, and park visitors keep increasing [1]. However, these parks are experiencing shortages in funding and manpower, which make the management of visitors challenging [2,3]. Manning [4] stated that poor management of nature reserves can lead to improper behaviors among tourists and, subsequently, damage the natural environment and ecology. These improper behaviors include illegal, careless, unskilled, uninformed, and unavoidable actions [4].

In fact, tourism activities in Taiwan have a wide and far-reaching impact on the ecology of national parks [5]. Previous studies have shown that a number of species are substantially reduced due to recreational uses [6,7]. In addition, visitors' body odor, scents of objects, and loud noises cause wild animals to stay away or change their time of appearance [7]. Furthermore, a large amount of rubbish brought by visitors makes wild animals accustomed to human food, and improper feeding by visitors changes their foraging habits [8]. The presence of visitors and establishment of roads and recreational facilities interfere with the animal habitats, thereby resulting migration or disappearance of these animals [8].

In recent years, Web 2.0 has enhanced Internet participation and interaction, which enables people to share and interact with others and co-create information [9–11]. Moreover, the advent of Facebook (FB), Twitter, and other social networking sites (SNSs) has led users to influence one

another with messages [12]. The use of social media to describe and reconstruct travel experiences has gained prevalence in the tourism industry. Social media provides space for travelers to share travel information [13,14], which indirectly results in word-of-mouth influence [15] that is notable and occasionally more trusted than mainstream media [16].

The popularity of SNSs has led to the occurrence of many related phenomena. Many people deliberately plan their own marketing strategies to seek attention and dominance in Internet competition, thereby resulting in bragging behavior [17]. Users who brag on FB frequently expect to elicit numerous responses from other users through FB's "Like", "Comment", and "Share" features [18]. Generally, Likes express agreement on messages. Comments indicate willingness to provide opinions on messages. Shares mean agreement on messages, and believe the messages deserve to be known by others. Likes require the least efforts for action, Comments take time to express personal opinions, and Shares need the greatest social cost for action [19]. Studies have shown that FB users' willingness to like, comment, and share increases when a posted message triggers positive emotions [19,20]. In addition, people are substantially inclined to like and comment when they can obtain important recreational benefits from an FB message [21,22]. Users are also inclined to like, comment on, and share posts with photos and texts compared with those that show only a web link or a video on FB [15,21].

Web 2.0 and social media usage has prompted the emergence of Internet surveillance [23]. The rapid growth of enormous information and data-driven relationships in social media has created an opportunity for surveillance [24,25], which results in "liquid surveillance" [24]. The liquidity of surveillance can be viewed as the constant evolution of social media sites. In particular, the sites are impacted by flexible information flow when users and providers cooperate to develop a new mode of contact and identity construction [25]. Trottier and Lyon [24] used FB as an example to reveal the five surveillance features of social media, namely, collaborative identity construction, lateral ties, social ties, changing interfaces, and recontextualization. The first three features emphasize the interpersonal aspects of social media in social connection, whereas the last two highlight social life and institutional and cultural growth. Social media surveillance is the use of social media to observe the information, activities, and interactions among media users. The surveillance is executed virtually, and free from geographic and temporal constraints. This approach is important because its nature of unobtrusiveness makes the observation of information and activities, especially deviance, more feasible and economical.

Notably, a post that expresses misconduct is encouraged when it is supported or endorsed by other social media users [26]. Moreover, a remarkable consistency is observed between improper online and offline behaviors. Improper online behaviors are frequently imitated, and they reinforce the acceptability of misconduct in real life [26]. In recent years, social media usage as a surveillance tool has been adopted and discussed in various fields [27–32]. Governments or courts can track messages disseminated on the Internet to identify specific computer sites and locate cyber criminals [33]. However, the discussion and application of social media as a surveillance tool for the management of recreational uses in protected areas are rarely studied.

The numerous tourists, and shortages in funding and manpower of national parks in Taiwan present difficulties in the management of recreational activities. Nowadays, using social media to describe and reconstruct travel experiences has become popular. This study used FB as a tool to monitor visitors' improper behaviors. The following questions are investigated in this study.

(1) What are the types of improper behavior displayed by FB users who visited Yushan National Park and logged into FB from Taiwan? Different types of improper behavior create various impacts on the park. Knowing what types of improper behavior are likely to occur will help park managers identify the potential impact of specific behaviors, and adopt appropriate measures accordingly to alleviate the impact and prevent the occurrence of such behaviors.

(2) What are the message modes that the visitors used to post their improper behaviors on FB? FB messages can be presented by text, links, videos, and photos. Realizing which message modes are frequently used by visitors will direct park managers to specific modes, and make their observation of visitors' behaviors more efficient.

(3) What are the other FB users' responses and intensity of response to the posts that involve improper behaviors? FB responses include Likes, Comments, and Shares. These responses reflect users' different attitudes toward other's posts [19]. Moreover, improper online behaviors are frequently imitated offline, and the receiving of online support strengthens the acceptability of misconduct in real life [26]. Therefore, understanding FB users' responses and intensity of responses will alert park managers to the likelihood of occurrence of specific improper behavior in the park.

2. Methods

2.1. Study Setting

The setting of this study is Yushan National Park, which is located in a mountainous region of Taiwan. This park covers an area of 103,121.40 ha that span four counties, which makes it the largest mountain-type national park in Taiwan. This park also serves as a sanctuary for 11 endangered species and 51 rare bird and animal species [34]. In addition, the number of annual park visitors is more than 1 million with an increasing trend [35], which possibly results in a substantial impact on the park's environment and ecology.

2.2. Studied Content

FB began its operation in Taiwan in June 2008. At present, FB is the most widely used social network in Taiwan (90.9%), with over 18 million active users per month [36]. Moreover, Taiwan's FB utilization rate (ratio of active accounts to population) has reached 87.2% [37], which is higher than those of industrialized countries, such as the United Kingdom (59%), the United States (58%), and Singapore (66%). Such utilization indicates the high prevalence of FB in Taiwan.

This study adopted content analysis to evaluate only the public profile posts of FB users who visited Yushan National Park and logged into FB from Taiwan. In the past, content often referred to written material. However, the mode of information has changed, and the content has expanded to include pictorial material [38]. Social media is a combination of social and media tools that displays information in diverse forms. Thus, the use of content analysis to analyze social media messages is more comprehensive than that of traditional media analysis [39].

2.3. Data Collection

The length of time for data collection lasted for six months. The processes of content analysis are expressed as follows. First, a purposive sampling strategy was used. The posts of FB users who visited Yushan National Park and logged into FB from Taiwan were searched in the FB search page using Chinese keyword—Yushan National Park—in 2017. Then, the identified posts were reviewed. Second, posts that involved visitors' improper behaviors were identified and categorized into five types of actions, namely, illegal, careless, unskilled, uninformed, and unavoidable actions [4]. Third, the message modes of the posts, including status (text), link, video, and photo, were identified [15] and recorded. Status refers to pure text description, link is the URL address, video indicates personal or other linked videos, and photos refer to pictures. Fourth, the responses of other FB users (i.e., Likes, Comments, and Shares) to posts of improper behaviors were reviewed and recorded. Finally, the data sheets were cross-checked after coding was completed.

In this study, the content analysis was conducted on both textual and visual materials. The textual materials were analyzed based on the written descriptions and their underlying meanings. The visual materials were analyzed based on the activities shown on videos and photos, as well as the verbal messages on the videos. The results were recorded on excel workbook. The data were coded by three people who had received training in coding, including the researcher and two research assistants. The data sheets were cross-checked to ensure the reliability and validity of the results. When discrepancies among the coding results occurred, the corresponding posts were reviewed again by the researcher for judgement.

3. Results

The search results showed that the posts of 852 qualified FB users, who visited Yushan National Park and logged into FB from Taiwan, were identified and collected from 2011 to 2017. The number of qualified users was highest in 2015 (457, 53.6%), followed by 2017 (149, 17.5%), 2014 (127, 14.9%), 2016 (67, 7.9%), and only 51 (6%) between 2011 and 2013. Table 1 indicates that 62 (7.3%) out of 852 FB users engaged in improper behavior. The types of improper behavior mainly included illegal (40.3%) and careless (30.6%) actions. Table 2 shows the examples of the different types of improper behaviors. Most illegal actions pertained to camping or cooking in nondesignated camping areas and feeding or provoking wild monkeys. Careless actions mainly involved going near the monkeys, drinking alcohol while mountain climbing, and taking photographs or jumping at dangerous locations, such as the edge of a cliff or the top of steep rocks. Unskilled actions (4.8%) generally involved mountain climbing during a typhoon. Uninformed actions (9.7%) involved food exposure or rolling down car windows in areas frequented by Formosan macaques. Unavoidable actions (3.2%) frequently concerned monkeys snatching food or approaching visitors unexpectedly. The message modes adopted for posting improper behavior were generally text and photos (48.4%) and photos only (43.5%).

Table 1. Characteristics of improper behaviors and responses elicited from Facebook (FB) users.

Variables	Groups	Count	%
Types of improper behavior	Illegal action	25	40.3
	Careless action	19	30.6
	Unskilled action	3	4.8
	Uninformed action	6	9.7
	Unavoidable action	2	3.2
	Illegal, careless, and uninformed action	2	3.2
	Uninformed and unavoidable action	5	8.1
Message modes	Text	5	8.1
	Photo	27	43.5
	Text and photo	30	48.4
Number of Likes	0	0	0
	1–50	25	40.3
	51–100	16	25.8
	101–150	13	21.0
	151–200	4	6.5
	201–400	4	6.5
Number of Shares	0	57	91.9
	1–5	5	8.1
Types of Comments	None	6	9.7
	Supported	18	29.0
	Not supported	6	9.7
	Supported and not supported	32	51.6
Number of Comments	1–10	40	72.7
	11–20	10	18.2
	21–30	2	3.6
	31–40	2	3.6
	41 and above	1	1.8

Table 2. Examples of different types of improper behaviors.

Types of Improper Behavior	Examples
Illegal action	Camping in nondesignated camping areas, cooking in nondesignated camping areas, feeding wild monkeys, provoking wild monkeys
Careless action	Going near wild monkeys, drinking alcohol while mountain climbing, taking photographs at the edge of a cliff, jumping at the top of steep rocks
Unskilled action	Mountain climbing during a typhoon
Uninformed action	Food exposure in wild monkey frequented areas, rolling down car windows in wild animals frequented areas
Unavoidable action	Wild monkeys snatching food, wild monkeys approaching visitors unexpectedly

The findings indicated that other FB users constantly responded to the posts that contain improper behaviors with Likes. The number of received Likes for each post was generally in the range of 1 to 50 (40.3%), followed by 51 to 100 (25.8%), and 101 to 150 (21.0%). Only five posts (8.1%) of improper behavior were shared, and the number of Shares was in the range of 1 to 5 (8.1%). The number of Comments was primarily in the range of 1 to 10 (72.7%). The majority of the posts involving improper behavior received both supportive and unsupportive comments (51.6%), followed by supportive comments only (29.0%). Supportive comments had encouraging and cheering tones, such as "It is great," "Awesome," "Cool," "Come on," and "Funny." Unsupportive comments had disapproving and worried tones, such as "Don't do it again," "Calling police," "It is terrible," and "Watch your safety".

Cross-analyses on the types of improper behavior and message modes were conducted to understand the manner in which FB users presented their improper behaviors. Table 3 shows that texts and photos (48.4%) and photos only (43.5%) were the commonly used message modes for presenting illegal, careless, and uninformed actions. Text only (8.1%) was used to exhibit illegal, unskilled, and unavoidable actions. In summary, improper behaviors are frequently presented in picture format, and are slightly shown in a text narrative format.

Table 3. Cross-tabulation of types of improper behavior and message modes.

Types of Improper Behavior	Message modes	Text	Photo	Text and Photo	Total
Illegal action	Count	1	11	13	25
	% within improper behavior	4.0%	44.0%	52.0%	100.0%
Careless action	Count	0	11	8	19
	% within improper behavior	0.0%	57.9%	42.1%	100.0%
Unskilled action	Count	3	0	0	3
	% within improper behavior	100.0%	0.0%	0.0%	100.0%
Uninformed action	Count	0	3	3	6
	% within improper behavior	0%	50.0%	50.0%	100.0%
Unavoidable action	Count	1	1	0	2
	% within improper behavior	50.0%	50.0%	0.0%	100.0%
Illegal, careless, and uninformed action	Count	0	1	1	2
	% within improper behavior	0.0%	50.0%	50.0%	100.0%
Uninformed and unavoidable action	Count	0	0	5	5
	% within improper behavior	0.0%	0.0%	100.0%	100.0%
Total	Count	5	27	30	62
	% within improper behavior	8.1%	43.5%	48.4%	100.0%

Cross-analyses on the types of improper behavior and the number of Likes were conducted to understand the responses of other FB users to the posts on improper behaviors. Table 4 shows that all 62 posts on improper behaviors received Likes. Moreover, the number of Likes was generally in the 1 to 50 range (40.3%). The number of Likes that mainly ranged from 1 to 50 involved posts on illegal (44.0%), unavoidable (50.0%), careless, and uninformed actions (100.0%), and uninformed and unavoidable actions (80.0%). The number of Likes that ranged from 51 to 100 was allocated for the posts on careless (36.8%) and unskilled actions (33.3%). The number of Likes in the 51 to 100 range mainly involved posts on uninformed (33.3%) and unavoidable actions (50.0%). Only a few posts on illegal, careless, uninformed, and unavoidable actions gained over 100 counts of Likes from other FB users. Overall, other FB users constantly responded to the posts on improper behavior with Likes.

Table 4. Cross-tabulation of types of improper behavior the number of Likes.

Types of Improper Behavior	Number of Likes	1–50	51–100	101–150	151–200	201–400	Total
Illegal action	Count	11	6	6	0	2	25
	% within improper behavior	44.0%	24.0%	24.0%	0.0%	8.0%	100.0%
Careless action	Count	6	7	4	1	1	19
	% within improper behavior	31.6%	36.8%	21.1%	5.3%	5.3%	100.0%
Unskilled action	Count	0	1	0	2	0	3
	% within improper behavior	0.0%	33.3%	0.0%	66.7%	0.0%	100.0%
Uninformed action	Count	1	1	2	1	1	6
	% within improper behavior	16.7%	16.7%	33.3%	16.7%	16.7%	100.0%
Unavoidable action	Count	1	0	1	0	0	2
	% within improper behavior	50.0%	0.0%	50.0%	0.0%	0.0%	100.0%
Illegal, careless, and uninformed actions	Count	2	0	0	0	0	2
	% within improper behavior	100.0%	0.0%	0.0%	0.0%	0.0%	100.0%
Uninformed and unavoidable actions	Count	4	1	0	0	0	5
	% within improper behavior	80.0%	20.0%	0.0%	0.0%	0.0%	100.0%
Total	Count	25	16	13	4	4	62
	% within improper behavior	40.3%	25.8%	20.9%	6.5%	6.5%	100.0%

Table 5 shows the cross-analyses on the types of improper behavior and types of Comments, which revealed that other FB users generally provided supportive and unsupportive comments to the posts on improper behaviors (51.6%). Few posts on illegal, careless, uninformed, and uninformed and unavoidable actions gained supportive comments (29.0%). Meanwhile, few posts on illegal and careless actions received unsupportive comments (9.7%). Overall, other FB users tended to comment on most of the posts that involved improper behaviors. However, only few posts received purely unsupportive comments. Supportive comments for the posts on careless actions outnumbered those of other types of improper behavior.

Table 5. Cross-tabulation of types of improper behavior and types of comment.

Types of Improper Behavior	Types of Comment	None	Support	Not Support	Support and Not Support	Total
Illegal action	Count	2	7	5	12	26
	% within improper behavior	7.7%	27.0%	19.2%	46.1%	100.0%
Careless action	Count	1	8	1	9	19
	% within improper behavior	5.3%	42.1%	5.3%	47.4%	100.0%
Unskilled action	Count	0	0	0	3	3
	% within improper behavior	0.0%	0.0%	0.0%	100.0%	100.0%
Uninformed action	Count	0	2	0	3	5
	% within improper behavior	0.0%	40.0%	0.0%	60.0%	100.0%
Unavoidable action	Count	1	0	0	1	2
	% within improper behavior	50.0%	0.0%	0.0%	50.0%	100.0%
Illegal, Careless, and Uninformed actions	Count	1	0	0	1	2
	% within improper behavior	50.0%	0.0%	0.0%	50.0%	100.0%
Uninformed and Unavoidable actions	Count	1	1	0	3	5
	% within improper behavior	20.0%	20.0%	0.0%	60.0%	100.0%
Total	Count	6	18	6	32	62
	% within improper behavior	9.7%	29.0%	9.7%	51.6%	100.0%

Table 6 shows that the cross-analyses on the types of improper behavior and number of Shares indicated that the majority of the posts on improper behaviors were not shared by other FB users (91.9%). The five posts shared involved illegal, careless, and uninformed actions, and their number of Shares was in the 1 to 5 range. Overall, other FB users did not actively share posts on improper behaviors, and the number of their Shares was unremarkable.

Table 6. Cross-tabulation of types of improper behavior and number of Shares.

Types of Improper Behavior	Number of Shares	0	1–5	Total
Illegal action	Count	23	2	25
	% within improper behavior	92.0%	8.0%	100.0%
Careless action	Count	18	1	19
	% within improper behavior	94.7%	5.3%	100.0%
Unskilled action	Count	3	0	3
	% within improper behavior	100.0%	0.0%	100.0%
Uninformed action	Count	4	2	6
	% within improper behavior	66.7%	33.3%	100.0%
Unavoidable action	Count	2	0	2
	% within improper behavior	100.0%	0.0%	100.0%
Illegal, careless, and uninformed action	Count	2	0	2
	% within improper behavior	100.0%	0.0%	100.0%
Uninformed and unavoidable action	Count	5	0	5
	% within improper behavior	100.0%	0.0%	100.0%
Total	Count	57	5	62
	% within improper behavior	91.9%	8.1%	100.0%

4. Discussion and Suggestions

This study used an Internet-based social network (FB) to analyze the types of improper behavior of visitors at Yushan National Park, message modes used in presenting the posts that involve improper behaviors, and other FB users' responses to the messages. The findings indicated that the types of improper behavior of the park visitors primarily involved illegal actions, such as camping or cooking in nondesignated camping areas and feeding or provoking wild monkeys, and careless actions, such as going near the monkeys or taking pictures or jumping at dangerous locations. These actions might directly damage the physical and ecological environment of the park, change the behaviors of the monkeys, and cause serious harm to visitors. The findings reflected the phenomenon that social media users seek to attracted the attention of others through compelling information [18]. Furthermore, these users probably believed that they would not be monitored. Thus, they still posted such information on social media although their illegal actions violated the regulations of the national park. The findings also revealed that these visitors demonstrated their improper behaviors mainly by photos, and only slightly by text narrative. The results confirmed that social media is not a simple text platform, and many users started to include images in their posts to enhance the credibility of their messages [40]. Therefore, the park visitors who engaged in improper behaviors commonly use photos to highlight and prove their recreational experience at Yushan National Park.

The findings on other FB users' responses to the posts on improper visitor behavior suggested that they were expected to "like" the posts on improper behaviors. Users also commented on the majority of the posts that involved improper behaviors and supported these posts. These posts were "entertaining" in nature because they involved recreational activities and experiences in a national park. These results were consistent with previous findings, which indicate that entertaining FB messages tend to receive numerous Likes and Comments from viewers [21,22]. Furthermore, illegal and careless actions show unrestrained and unmindful attitudes, exhibit casual feelings, and depict a sense of relaxation. On the basis, these actions reinforce an entertaining effect, which results in numerous Likes. However, other FB users tended not to share posts that displayed improper behaviors. The limited number of Shares for the posts on improper behaviors reflected that the posts must not resonate with the viewers and elicit a high degree of agreement to generate intentions to share [20,41]. Accordingly, the posts on illegal actions did not necessarily motivate viewers to share the messages although they received many Likes.

The current study showed that only 62 (8.7%) of 852 posts involved improper behavior. This finding seems rather low considering that the annual park visitors are over one million. However,

the visitors who posted their recreational experiences on their FB accounts comprise only a small proportion of the millions of park visitors. Notably, the disclosed improper behaviors of park visitors are only the tip of the iceberg, and many similar behaviors may not be disclosed. These behaviors may threaten the ecological environment and public safety of the park. Furthermore, these behaviors may be imitated by other visitors through social media posts, especially those with supportive comments, which may increase the incidents of improper behaviors. Consequently, such behaviors may undermine the sustainability of national parks. In this study, several users tended to support posts involving improper behaviors. Therefore, park authorities must promptly terminate the inappropriate actions of visitors and adopt effective managerial measures to protect the ecological and recreational qualities of the park. Based on the findings of this study, the following suggestions are provided to Yushan National Park.

(1) Prompt monitoring and prohibition of illegal camping. The posts of park visitors indicated that the Tataka parking lot is a popular but a nondesignated camping site. This parking lot is a popular camping site because of convenience in terms of proximity to many recreational sites, beautiful scenery, and availability at no cost to the users. Given the park's insufficient workforce, patrolling in the parking lot is only conducted between 8:00 AM and noon. Many visitors take advantage of this period to use the Tataka parking lot as a free camping site. Thus, video cameras should be installed in this area for prompt and round-the-clock monitoring to prevent illegal camping. This would enable the park staff to locate improper behaviors promptly without patrolling the vast park in person. Therefore, manpower will be used more efficiently.

(2) Establishing camping sites in recreational areas. In recent years, camping has gained popularity in Taiwan, thereby resulting in an increase in frequency of such activities in the park. However, camping in nondesignated areas violates park regulations. Although 29 camping sites are provided within the park, the majority of these sites are situated at high latitude, which caters more to mountaineers than general visitors. Therefore, camping sites can be provided within the recreational area to accommodate general visitors given the availability of land.

(3) Providing affordable meals by flexible reservation. Many mountaineers cooked at the parking lot in the Dongpu recreational area. Mountaineers are frequently cold and hungry when they descend from the top of the mountain. Although they invariably pass by the Paiyun Lodge where hot meals are available, they prefer to cook in the nearby parking lot because meals served in the lodge are expensive. Moreover, the meals must be reserved and paid in advance, that is, 7–10 days before mountaineers begin their journey. This reservation policy is problematic for the mountaineers because they frequently cannot control their arrival time due to their physical condition and the constantly changing weather in the mountain. Therefore, advance reservation should be discussed to determine its necessity or minimize the required time. In addition, meal prices should be reevaluated to ascertain their reasonability.

(4) Informing visitors of consequences of improper behaviors through various approaches. Few visitors engaged in improper behaviors that are legal but inappropriate. Manning [4] indicated that careless, unskilled, and uninformed actions can be minimized through information education. Thus, the park can inform visitors about the consequences of these actions through various approaches, such as promotional videos and brochures at the Visitor Center, an official website, a FB fan page, and a list of "do's and don'ts" for mountain climbers. These approaches should similarly be applied to unavoidable actions, such as unexpected contact with wild animals. In addition, warning signs can be posted along the roads and parking lots in the Tataka area frequented by Formosan macaques.

5. Conclusions

The findings of this study are significant for academic and managerial implications. Academically, unobtrusive observation is expected to be more fruitful than questionnaire surveys or interviews in

the study on deviant behavior [42]. At present, social media usage is prevalent in many countries. Thus, events that occur in the real environment can be virtually observed. This circumstance makes social media an alternative tool for investigating improper behavior in leisure settings.

Regarding the practical importance, this study directly and specifically identified the improper behaviors of park visitors by examining the FB posts, and provided the park with managerial suggestions to prevent the occurrence of these behaviors. This efficient and economical approach seems promising for visitor management. Therefore, managers of national parks should consider FB not just a tool for marketing and information delivery, but also as a complimentary tool to monitor visitors' behaviors especially those that might impair the sustainability of parks.

This study has a limitation. Although FB posts can be shared with the general public, users can limit the sharing of their posts to only friends, family, or themselves. When users set their posts to private or do not log in, their posts cannot be identified. Thus, the posts analyzed in this study were limited to those of park visitors who logged in and publicly posted their experience at Yushan National Park publicly.

This study examined the types and numbers of other FB users' responses to the posts of improper behaviors at Yushan National Park. Future studies can examine the factors that might influence post response such as the number of followers (FB friends). Moreover, future studies can maximize the locative function of FB through geotagged photos to analyze the relationship between the spatial distribution of improper behaviors and the environmental characteristics of the sites where such behaviors occur. Subsequently, the potential impacts of visitors' behaviors on the park environment and ecology in specific locations can be identified.

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