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How to Enhance Tourist Perceptions of Environmental Issues Through Nature Images: An Importance-Performance Analysis

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Abstract

Environmental problems have been discussed as a serious issue across the world. To conserve nature, many environmental organizations have tried to facilitate tourists' environmental perceptions by using nature images on their websites. However, few guidelines have been introduced regarding how to select appropriate nature images. Given this gap, this study conducted an importance-performance analysis (IPA) which provides the specific guideline for the use of appropriate nature images through nature-related websites. A total of 526 participants were recruited through an online survey. The results revealed that 14 nature images were categorized as *Useful*, *Healthy*, and *Spontaneous* nature images and identified different environmental perspectives between website visitor and non-visitor groups. These findings can be a valuable reference for website designers and stockholders to select effective nature images in encouraging people's positive environmental perceptions. Moreover, the current study demonstrates the usefulness of IPA as a measurable tool in investigating what factors of nature images should be presented to enhance environmental perceptions through nature-related websites.

Keywords: nature images, environmental perceptions, nature-related websites, importance-performance analysis, quantitative research

Introduction

Environmental problems such as soil and water pollutions are considered one of the most serious issues in the tourist industry (Naderi, 2018). These issues are clearly related to tourists' interests and beliefs toward the environment (Park & Ha, 2012). From a tourism perspective, understanding individuals' sustainable behaviors is important since their activities have been mainly regarded as the major channels to tourism destinations. However, although tourists have been aware of the importance of sustainable tourism, they have a limited capacity to stimulate pro-environmental behaviors (Priskin, 2003). Specifically, their perceptions are not necessarily equal to responsible behaviors (Moyle et al., 2013).

Visual images play an important role in facilitating people's perceptions (Ritterband et al., 2009). Previous research studied the role of nature images and how the images affect individuals' perceptions. Tyrväinen et al. (2017) investigated international nature-based tourists' environmental expectations toward forest images in different seasons. Fyhri et al. (2009) investigated landscape perceptions of tourists using agriculturally related (e.g., sheep grazing and hay production) and reforested littoral nature images of northern Europe. Destination tourism organizations (DMO) and environmental organizations have been trying to promote positive environmental perceptions using photo-based activities (e.g., environmental campaigns and posters) for years (Dupré, 2005; Ebreo et al., 2003; Park & Ha, 2012; Piercy & Nikala, 2009). Another significant role of visual images is the delivery of its messages through websites and social media (Lazard & Atkinson, 2015; Rodríguez Estrada & Davis, 2015). For example, World Wide Fund for Nature (WWF) mixes peaceful and destructive images of nature and animals to alert the public to environmental problems such as endangered animals and global warming on the website. National Geographic also shows beautiful undersea life visuals on the website to aid in protecting ocean habitats. Presenting appropriate nature images is crucial on nature-related websites because it immediately arouses diverse people's environmental perceptions (Hoffmann & Krauss, 2004; Ritterband et al., 2009; Zettl, 2013). However, although existing nature-related websites have focused on presenting nature images, there are few guidelines on how to select appropriate images.

Understanding tourists' level of nature interest is essential to identify the different types of influences of nature images on nature-related websites. In particular, many researchers have regarded various individual characteristics and demographics (e.g., age, gender, education, and income) to identify user perceptions (Thang & Tan, 2003) and emotions (Hunter, 2006; Thang & Tan, 2003) on websites, but there are no studies to compare individuals' environmental perceptions between website visitor and non-visitor group, especially which elements could have adverse and positive effects on their perceptions. Therefore, comparing studies on visitor groups' study is necessary to discover problems and find answers for improving environmental perceptions regarding images and websites.

Importance-performance analysis (IPA) is a well-known, simple, and effective approach for evaluating user attributes such as images, related perceptions, satisfaction, and performance (Deng, 2007; Perdue, 2002). IPA identifies satisfaction and performance of a product or service to people (Martilla & James, 1977; Silva & Fernandes, 2011). By evaluating the mean importance and performance results for the product or service, individuals are visually able to identify the gaps between individuals' perception of the service and actual performance of the service (Boley et al., 2017). IPA has been used to evaluate the relationship between importance and satisfaction in various fields such as marketing (Chen & Lin, 2013), healthcare (Miranda et al., 2010), education (Silva & Fernandes, 2011), and tourism (Lee & Lee, 2008). However, studies of nature-related websites seem insufficient in both academic and industrial areas, even though interests and perceptions toward protecting nature are increasing (Anderson, 2017; Cone, 2009; Ebreo et al., 2003; Park & Ha, 2012).

Given the lack of guidelines regarding proper selection of nature images, this study investigates what types of nature images encourage positive environmental perceptions and should be presented on nature-related websites. To achieve this goal, we focus on (a) *importance* and *satisfaction* of 14 nature images (according to three descriptors *Useful*, *Healthy*, and *Spontaneous*)

through IPA to identify effective nature images and (b) a comparison of visitors and non-visitors to nature-related websites to examine their environmental perception differences toward nature images.

Literature Review

Understanding of Nature Images With Environmental Perception

Images serve several roles, including to generate emotional responses (e.g., positive, negative, and satisfied) and impact users' performance regarding actions associated with images (Cyr et al., 2009; Hunter, 2006; Ritterband et al., 2009; Whitenton, 2014). Research on the relationship between images and environmental perceptions has been studied broadly. For example, Hart and Feldman (2016) found that positioning solar panel images with text influenced people's perceptions of climate change and aroused positive behavioral change. Wu et al. (2018) revealed that the combination of image and icon presentation promoted positive waste-sorting performance when compared to a population's exposure to only a word presentation.

Nature images have been classified in terms of the usefulness of the nature depicted to humans (Fenton, 1985; Purcell, 1986, 1987, 1992; Van den Berg, 1999). This result has been found by analyzing nature images ranging from an anthropo-centric view, "when they perceive landscapes that are useful to humans as relatively typical examples of nature," (Van den Berg, 1999, p. 64) to an eco-centric view, "when they perceive landscapes that are useful to humans as relatively atypical examples of nature" (Van den Berg, 1999, p. 64). Anthropo-centric and eco-centric environmental views also can be based on individual differences and experiences (Van den Berg, 1999). According to previous research, people exhibit different environmental perceptions and decision-making approaches (Awaritefe, 2004; Dolnicar & Huybers, 2010) that depend on differences in experiences, interests (Awaritefe, 2004; Dolnicar & Huybers, 2010), and psychological environmental beliefs (Van den Berg et al., 2006).

Van den Berg (1999) divided nature images into three categories: *Useful*, *Healthy*, and *Spontaneous*. *Useful* nature can be illustrated from an anthropo-centric view, which is considered to be "a practical value to humans" (Van den Berg, 1999, p. 71). Fishing, wildlife viewing, and hiking are examples of useful nature and are related to human recreational activities in the natural environment. *Healthy* nature is the second category, representing "nature's (re)generative power and healing properties" (Van den Berg, 1999, p. 71). *Healthy* nature is connected to both anthropo-centric and eco-centric views and can be considered "nature with practical value to humans" and/or "nature with intrinsic values" (Van den Berg, 1999, p. 71). The third factor is *Spontaneous* nature that aligns with an eco-centric view concerning humans as part of nature (Van den Berg, 1999). It can also reflect potential danger to humans a dark forest, a sea or river over flow, and a forest fire are examples.

Importance-Performance Analysis

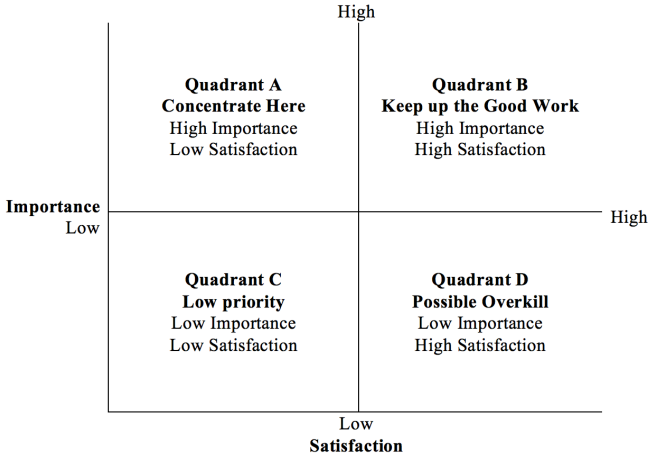
Importance-performance analysis (IPA) was first introduced by Martilla and James (1977) to measure client satisfaction with services for an automobile dealer (Silva & Fernandes, 2011). Since IPA is a simple and effective method for examining strengths and weaknesses of products and services (Chen & Lin, 2013; Linda & To, 2010) on a five-point Likert scale, many researchers

have adopted it as a strategic plan for study of user satisfaction in investigating enhancement opportunities (Chen & Lin, 2013; Wu & Shieh, 2009, 2010; Yavas & Shemwell, 2001). Although IPA includes several techniques for measuring importance and satisfaction, the Likert scale is generally adopted because it more effectively captures importance attributes than other measurement methods such as interviews and magnitude estimation (Bacon, 2003; Bottomley et al., 2000; Miranda et al., 2010).

IPA is also widely used to detect different group perceptions (Boley et al., 2017; Miranda et al., 2010). Chen and Lin (2013) adopted IPA to evaluate internal-marketing advantages in hospital management to understand employees' expectations and perspectives in Taiwan. To identify healthcare service quality, patients and managers were compared using IPA (Miranda et al., 2010). In education, Silva and Fernandes (2011) applied IPA to examine strengths and weaknesses of performance and quality of school service. In tourism, destination image has been studied to compare different destination behavior patterns between Korean and Japanese leisure travelers using IPA (Lee & Lee, 2008).

IPA presents four quadrants with different interpretations: Quadrant A, *Concentrate Here*; Quadrant B, *Keep Up the Good Work*; Quadrant C, *Low Priority*; and Quadrant D, *Possible Overkill*. The *Concentrate Here* quadrant (high importance and low satisfaction) explains that a product or service is very important. However, it may produce low satisfaction, meaning that an immediate action should be taken on such a product or service to improve it. The *Keep Up the Good Work* quadrant (high importance and high satisfaction) indicates that a product or service has been performing successfully to achieve competitive advantages. The *Low Priority* quadrant (low importance and low satisfaction) includes products or services that are not important and do not produce satisfaction, so additional attention and effort is not required. The *Possible Overkill* quadrant (low importance and high satisfaction) indicates that a user is satisfied with a product or service, even though the particular attribute is not important. A designer or manager should assign more attention to attributes residing in Quadrant A (Chen & Lin, 2013; Martilla & James, 1977). The X-axis reflects a product or service's importance, and the Y-axis appears the product or service's performance from a user perspective. Figure 1 shows the IPA matrix.

Figure 1. Importance-Performance Analysis Matrix



Source. Adopted from Martilla and James, 1977

Methods

Image Selection and Pilot Study

To select appropriate nature images for improving users' environmental perceptions, this study adopted Van den Berg's (1999) image examples. A total of 14 color nature images were selected from Getty images, an American stock photo agency (see Figure 2). A pilot study was conducted to verify the validity and reliability of the survey. The online survey was distributed to students, faculty members, and staff from various disciplinary backgrounds, including human-computer interaction, graphic design, landscape architecture, and hospitality management, who were interested in nature areas. From the feedback, survey content and structure were improved.

Figure 2. Selected 14 Nature Images

Source. Getty Images, n.d.

Sampling and Data Collection

Amazon Mechanical Turk, an online survey, was selected to engage a broad range of people within a short time. We recruited people who were over 18 years to answer the survey questions since people under the age of 18 may be too sensitive to make a good decision in their best interests (Lenhart, 2013). To ensure a suitable sample, this study incorporated two screen questions: First, *Have you visited any natural areas (e.g., mountain, lake, and park) in the past 12 months?* If a person responded *No* to the question, they were excluded on the data file. Second, if the person selected *Yes*, next question followed: *How many times have you visited a natural area(s) in the past 12 months?* A total of 526 participants were recruited.

To identify how participants' interests and experiences impact an evaluation of 14 nature images, the participants were asked to describe an experience visiting nature-related websites, and the question was posed *Have you visited any nature-related website(s) (e.g., National Geographic, Department of Natural Resources, etc.)?* If the participant responded *Yes*, a question of *How often do you visit nature-based website(s) (e.g., National Geographic, Department of Natural Resources, etc.)?*Was then posed along with five possible selections: *never*, *sometimes*, *about half the time*, *most of the time*, and *always*. However, if the participant answered *No*, they were moved to main question selection, importance and satisfaction regarding nature images, immediately.

Fourteen nature images with verbal descriptions of nature (e.g., smelling lavender) were assessed by participants on a five-point scale that ranged from 1*extremely unimportant* to 5I according to how important each image is to the environment. In addition, this study also rated the nature images based on the five-point scale of satisfaction (*extremely dissatisfied* to *extremely satisfied*). Finally, demographic information (e.g., gender, age, and education) was obtained. This study offered a 50-cent incentive to those who completely finished the survey.

Data Analysis

Exploratory factor analysis (EFA) with varimax rotation was applied to evaluate perceived *importance* and *satisfaction* in encouraging environmental perceptions using SPSS. This analysis required scanning 14 color nature images to create a group with commonalities and similarities. The grouping was based on Van den Berg's (1999) three nature image factors: *Useful*, *Healthy*, and *Spontaneous*. Cronbach's alpha coefficients were first calculated to check the reliability of the three nature image factors, and then IPA was applied to determine the status of the 14 images in terms of importance of and satisfaction with nature-based websites. An independent sample *t*-test was used to evaluate perceptions of website visitor and non-visitor groups.

Findings

This study had 526 participants, with more females (58.9%) than males (41.1%). Three hundred and thirty-one people (62.9%) had reported visiting nature-related websites (e.g., National Geographic, Department of Natural Resources, etc.), and among these, the majority (81.3%) responded that they visited these websites *sometimes*. Most participants were aged less than 40 years (58.8%), 40-49 (16%), 50-59 (12.9%), and 60-76 (6.5%).

Table 1. Demographics of Participants

Item		Category	Respondent (N = 526) *n*	Percentage %
Gender				
		Male	216	41.1
		Female	310	58.9
Age				
		19 - 29	146	29.5
		30 - 39	163	32.9
		40-49	84	17.0
		50 - 59	68	13.7
		60 or more	34	6.9
Education				
		Less than high school diploma	2	0.4
		High school diploma	129	24.6
		Associate degree	86	16.4
		Bachelor's degree	213	40.6
		Graduate degree (Master's, Ph.D., J.D., MD)	78	14.9
		Other	17	3.2
Questions				
	Have you visited any nature-related website(s)?	Yes	331	62.9
		No	195	37.1
	How often do you visit nature-based website(s)?	Never	3	0.9
		Sometimes	269	81.3
		About half the time	45	13.6
		Most of the time	11	3.3
		Always	3	0.9

EFA with varimax rotations was conducted to identify the underlying dimensions of the nature images. Table 2 shows that fourteen nature images were grouped into three nature factors (*Useful*, *Healthy*, and *Spontaneous*): three items for *Useful* nature, four for *Healthy*, and seven for *Spontaneous*. Factor loadings ranged from .65 to .88. The Kaiser-Meyer-Olkin (KMO) value for was .87 and the p-value of the Bartlett's sphericity test was almost zero. Moreover, Cronbach's alpha coefficients ranged from .69 to .91, well above the appropriate value of .60 (Lee et al., 2006). Consequently, these outcomes indicated that the data were suitable for EFA.

Table 2. Result of Exploratory Factor Analysis of 14 Nature Images

Nature Image Factor	Image Title	Factor Loading			Alpha
Useful Nature					.69
	Hiking	.81			
	Climbing	.70			
	Wildlife viewing	.68			
Healthy Nature					.81
	Forest in early morning mist		.77		
	Smelling lavender		.76		
	Tea field		.76		
	Yoga in nature		.70		
Spontaneous Nature					.91
	Flooding			.88	
	Landslide			.83	
	Sinkhole			.83	
	Drought			.81	
	Dirty ground of a green space			.79	
	Melting horizons			.78	
	Algal bloom			.65	

Table 3 shows the 14 nature images' mean values for importance and satisfaction. *Wildlife viewing* achieved the highest mean score (4.07) in importance to enhancing environmental perspectives and *hiking* received the highest mean score (4.24) in detecting high levels of satisfaction. On the other hand, *forest in early morning mist* and *dirty ground of a green space* produced opposite results; participants cited the *forest in early morning mist* image as lowest (3.22) in importance and the *dirty ground of a green space* image achieved the lowest average (2.22) for satisfaction among the 14 nature images.

Table 3. Mean Values of 14 Nature Images for Importance and Satisfaction

Nature Image Factor	Image Title	Importance (N = 526)		Satisfaction(N = 526)	
		M^a	*SD*	M^b	*SD*
Healthy Nature	Hiking	4.06	0.97	4.24	0.89
	Climbing	3.40	1.16	3.58	1.11
	Wildlife viewing	4.07	1.03	3.98	1.10
Useful Nature	Forest in early morning mist	3.22	1.27	3.35	1.27
	Smelling lavender	3.41	1.19	3.72	1.14
	Tea field	3.42	1.17	3.47	1.14
	Yoga in nature	3.32	1.32	3.55	1.27
Spontaneous Nature	Flooding	3.70	1.40	2.66	1.44
	Landslide	3.76	1.27	2.48	1.27
	Sinkhole	3.47	1.42	2.34	1.30
	Drought	3.72	1.35	2.58	1.35
	Dirty ground of a green space	3.92	1.43	2.22	1.35
	Melting horizons	4.03	1.26	3.02	1.45
	Algal bloom	3.45	1.21	2.69	1.21

Note: *[a] Means achieved by a five-point scale of Extremely unimportant (1) to Extremely important (5).*
[b] Means achieved from a five-point Likert scale of Extremely dissatisfied (1) to Extremely satisfied (5).
SD is Standard deviation.

An IPA matrix was used to investigate which nature images would be important and give high levels of satisfaction related to improvement of environmental perception. Fourteen images were plotted based on their mean values (see Table 3) using a vertical axis of *importance* and a horizontal axis of *satisfaction*. Figure 3 (Abalo et al., 2007; Hemmasi et al., 1994; Martilla & James, 1977; Miranda et al., 2010) presents the four quadrants with average scores of *importance* (3.64) and *satisfaction* (3.13).

The *Concentrate Here* quadrant appeared in five out of seven *Spontaneous* nature images (melting horizons, dirty ground of a green space, landslide, drought, and flooding) and the images were considered crucial, but not satisfaction images to be presented on nature-related websites. The *Keep Up the Good Work* quadrant presented two out of three *Useful* nature images (*wildlife viewing* and *hiking*) that participants considered significant and providing satisfaction on nature-related websites. The *Low Priority* quadrant reflected in two out of seven *Spontaneous* nature images. The two *Spontaneous* nature images were considered not crucial and should therefore not be placed on nature-related websites (sinkhole and algal bloom) appeared in this quadrant. The *Possible Overkill* quadrant showed all *Healthy* nature images (*smelling lavender*, *tea field*, *yoga in nature*, and *early morning forest mist*), and one out of three *Useful* nature images(climbing) was identified as being of low importance with relatively high satisfaction.

The differences between visitors and non-visitors on the nature images were tested by *t*-test. Table 4 provides the results from participants' responses to the question *Have you visited any nature-related website(s) (e.g., National Geographic, Department of Natural Resources, etc.) within the*

last 12 months? In *Healthy* nature images, non-visitors' satisfaction of *Forest in early morning mist* (M = 3.53) was higher than visitors (M = 3.25), but the differences was marginal (t (217) = 2.51, $p < .05$).

Figure 3. Results of Importance-Performance Analysis With 14 Nature Images

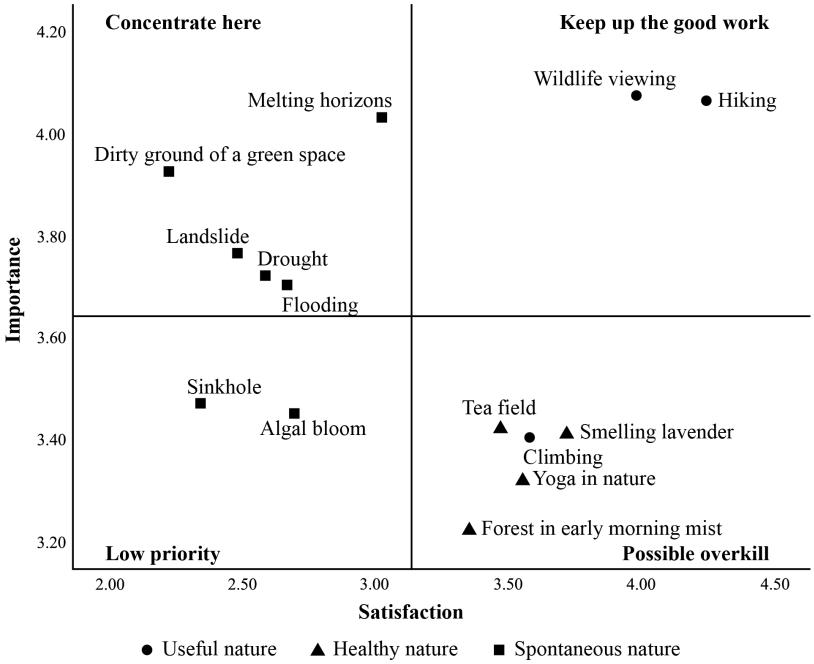


Table 4. Independent Sample T-test of Mean Importance and Satisfaction Scores for 14 Nature Images

Nature Image Factor		Importance (N = 526)			Satisfaction (N = 526)		
Response of Participant	**Image Title**	**Yes (n = 331)**	**No (n = 195)**	**Sig. 2-tailed**	**Yes (n = 331)**	**No (n = 195)**	**Sig. 2-tailed**
Useful Nature	Hiking	4.05	4.08	0.77	4.26	4.21	0.51
	Climbing	3.34	3.49	0.15	3.56	3.60	0.73
	Wildlife viewing	4.05	4.11	0.47	3.97	3.99	0.78
Healthy Nature	Forest in early morning mist	3.19	3.26	0.53	3.25	3.53	0.01*
	Smelling lavender	3.40	3.44	0.70	3.71	3.74	0.74
	Tea field	3.42	3.42	1.00	3.47	3.46	0.93
	Yoga in nature	3.28	3.38	0.40	3.49	3.66	0.15
Spontaneous Nature	Flooding	3.78	3.56	0.09	2.76	2.49	0.03*
	Landslide	3.81	3.67	0.24	2.59	2.30	0.01*
	Sinkhole	3.53	3.36	0.20	2.43	2.18	0.03*
	Drought	3.81	3.56	0.04*	2.68	2.39	0.02*
	Dirty ground of a green space	4.01	3.78	0.10	2.30	2.08	0.08
	Melting horizons	4.12	3.88	0.04*	3.14	2.82	0.02*
	Algal bloom	3.55	3.29	0.02*	2.80	2.51	0.01*

Note. *$p < .05$

In *Spontaneous* nature images, visitors had statistically higher perceptions of importance for three *Spontaneous* images, (drought, melting horizons, and algal bloom) than non-visitors, t(524) = 2.082, $p < .05$, t(524) = 2.087, $p < .05$, and t(524) = 2.416, $p < .05$, respectively. In addition, the visitor group exhibited higher satisfaction for six *Spontaneous* images (flooding, landslide, sinkhole, drought, melting horizons, and algal bloom)than the non-visitor group, t(524) = 2.142, p

< .05, $t(524) = 2.535$, $p < .05$, $t(524) = 2.218$, $p < .05$, $t(524) = 2.368$, $p < .05$, $t(524) = 2.421$, $p < .05$, and $t(524) = 2.670$, $p < .05$, respectively. The findings supported that people who had visited the nature-related website within the past 12 months showed higher importance and satisfaction for the *Spontaneous* images than those who had never visited the areas within the past 12 months.

Discussion and Conclusions

Conclusions

This study aimed to evaluate importance and *satisfaction* of 14 nature images with three nature image categorizations (*Useful*, *Healthy*, and *Spontaneous*) based on the four quadrants (e.g., *Concentrate Here, Keep Up the Good Work, Low Priority,* and *Possible Overkill*) by applying the IPA method. The findings revealed that five *Spontaneous* nature images (melting horizons, dirty ground of a green space, landslide, drought, and flooding) appeared in Quadrant A: *Concentrate Here.* Participants considered these images important for increasing positive environmental perceptions within the nature-related websites. However, the other *Spontaneous* nature images (sinkhole and algal bloom) were mapped into the Quadrant C: *Low Priority,* which means low importance and satisfaction to prompt environmental perceptions. Therefore, this study found that the *Spontaneous* nature images are not recommended to facilitate individuals' environmental awareness on the nature-related websites since those images are more likely to outweigh an eco-centric view for human benefits without environmental benefits (Van den Berg, 1999).Another finding regarding *Spontaneous* nature image indicated statistically significant differences for the images. For instance, negative emotional images (e.g., dried out landscape) had greater perception on climate policies such as minimizing CO_2 gas emission against global warming's risk (Leiserowitz, 2006). We assume that *Spontaneous* nature images with eco-centric environmental views impact tourists' environmental perceptions depending on their interests and beliefs (Van den Berg, 1999). Thus, the negative climate images could trigger individuals' environmental perceptions in a pro-environmental way.

Regarding *Useful* nature images, two images (wildlife viewing and hiking) appeared in Quadrant B: *Keep Up the Good Work*. The results showed that participants had a better understanding of the expectations related to outdoor recreation activities in wilderness images. Therefore, the two nature images are highly recommended for arousing environmental perceptions and could be presented on any general nature-related websites. In addition, one *Useful* nature image (climbing) and four *Healthy* nature images (smelling lavender, tea field, yoga in nature, and early morning forest mist) appeared in Quadrant D: *Possible Overkill*. These images were seen by participants as low importance, but high satisfaction. Even though individuals perceive the images as low importance, such images could be satisfactory for encouraging positive environmental perceptions. Therefore, if the nature images appeared frequently via various sources, such as websites, social media, and campaigns, people could perceive those images as important in arousing environmental perceptions. *Useful* nature images did not statistically show any differences. We suppose that since *Useful* nature images with anthropocentric environmental views are perceived as typical examples of nature, that nature is useful to humans (Van den Berg, 1999), our result presented statistically no differences.

This study also found that people who have experience visiting nature-related websites showed different ratings of importance and satisfaction for *Spontaneous* nature images. We assumed that

people who have visited nature-related websites are more likely to be aware of environmental perceptions and more satisfied with *Spontaneous* nature images related to an eco-centric view. This finding was consistent with previous studies indicating that respondents had different perceptions depending on their level of experiences and interests in nature (Awaritefe, 2004; Dolnicar & Huybers, 2010). Since *Healthy* nature images are part of an eco-centric view (Van den Berg, 1999), we assumed the *forest in early morning mist* image to be closer to an eco-centric than an anthropo-centric view. *Useful* nature images did not reflect any difference between website visitor and non-visitor groups, so we supposed that the anthropo-centric view is not affected by individuals' experiences and interests.

Theoretical Implications

The current study can contribute to growing body of literature by providing appropriate nature images of nature-related websites. Specifically, it was found that use of *Useful* nature images (e.g., wildlife viewing and hiking) was demonstrated not only to improve environmental perceptions but also to produce high levels of satisfaction. It can be valuable insights that people who have strong perception on the *Useful* nature can facilitate people's environmental perceptions in a positive way. On the contrary, people had less perception in improving people's environmental perceptions when they perceived *Healthy* nature images. That is, this study could contribute to the environmental psychology literature by producing different perceptions based on individuals' experiences with and interests in nature. In other words, the findings demonstrate that IPA is an effective method for identifying appropriate nature images and arousing positive environmental perceptions.

This research also demonstrated that IPA is a valuable tool to evaluate images. The nature images were displayed in the two-dimensional presentation (e.g., low and high) and interpreted that which nature images are perceived as *high importance and high satisfaction*, *high importance and low satisfaction*, *low importance and high satisfaction*, and *low importance and low satisfaction*. By simultaneously considering the level of importance and satisfaction of the nature images toward the environment, this study demonstrated various measurable outcomes among the four quadrants. Therefore, environmental and landscape researchers can understand the similarities and differences of individuals' environmental perception in terms of nature images' importance and satisfaction plotted in the four quadrants.

Practical Implications

This study suggests *Useful* nature images rather than *Healthy* and *Spontaneous* nature images are more significant in enhancing positive environmental perceptions and satisfaction. Therefore, *Useful* nature images should be used as major images for general nature-related websites such as government related and international environment organization websites that target a variety of groups. For example, we can recommend *Useful* nature images to National Geographic, Department of Natural Resources, and WWF to increase awareness involving the importance of protecting nature, which could be used to promote support of and donations for nature conservation through their websites.

Our findings may offer various potential guidelines to designers, managers, and researchers in using specific nature images to improve environmental perceptions for tourists who may have

different perceptions, experiences, and interests regarding nature. In other words, nature-related websites can present specific nature images based on the level of tourists' experiences with and interests in nature. Particularly, if nature-related websites' target audience is tourists with low interest in nature, we suggest websites provide *Useful* nature images rather than *Spontaneous* nature images to boost positive environmental perceptions. On the contrary, for tourists who already have a high interest in nature, both types of nature images are recommended, since *Useful* and *Spontaneous* nature images can continue to impact their environmental perceptions. This finding provides opportunities for double-checking nature images on existing websites and suggests the need for appropriate images for new nature-related websites.

Limitations and Future Research

Although this research successfully generated potential suggestions for application with nature organizations, some limitations were observed. First, the 14 images used as samples in this study were all in color, nature-related only, and incorporated nature images that included people. Since the aim of this study was to encourage environmental perceptions, we were concerned solely with flora-related natural elements, such as rivers and forests, instead of fauna-related elements, such as wild animals, or man-made elements, such as architecture, in nature. However, to further understand the use of images and their role in influencing humans visiting websites, additional types of images should be incorporated into future study. Second, although the present study focused on only images, other visual elements should be considered to detect human environmental perceptions in future studies. Lastly, our selected 14 nature images would not be generalized to investigate individuals' general environmental perceptions. For the future study, more diverse nature images should be used to cover this issue. In spite of such limitations, this study has various opportunities to extend these novel findings for further research.

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