Children's attention toward tourism photos: Comparison of cartoon-executed and normal photos

ABSTRACT

The study is intended to examine the effect of cartoon execution on children's attention toward and preferences for tourism photographs. A 3 (photo categories) × 2 (photo effects) × 2 (display order) repeated-measures experiment was designed to compare children's fixation counts, fixation duration, and dwell time between normal and cartoon-executed photos of tourism attractions in culture, nature, and recreation categories. Follow-up interviews were conducted to triangulate experimental findings. Results indicate that cartoon execution, as a common advertising tactic, can effectively increase children's attention to tourism photographs, but the effects vary by category. Findings from this study contribute to the body of knowledge on advertising effectiveness and tourism and provide insight for destination marketing organizations.

Keywords: Tourism photographs, Children, Eye tracking, Visual attention, Advertisement

1. INTRODUCTION

Photography is widely recognized as intrinsically connected to tourism, enabling people to develop spontaneous impressions of and visual experiences with destinations or attractions (Lo, McKercher, Lo, Cheung, & Law, 2011). Several studies have focused on the functions and benefits of photographs in tourism (e.g., Matteucci, 2013) including in constructing memory and self-identity (Garlick, 2002), cultivating relationships (Larsen, 2005), and attracting viewers' attention in destination marketing. Studies in marketing and advertising have suggested that pictures are more effective than text in drawing viewers' attention (Choi, Yoon, Kim, & Kim, 2019). The placement, content, and features of pictures significantly influence customers' ability to locate and process product information (Mazzoni, Vannucci, & Batool, 2014), which shapes the effectiveness of advertisements for tangible products such as food (e.g., Lagomarsino & Suggs, 2018).

Recent decades have witnessed children's increasing engagement in family purchase decisions, empowered by a democratic parenting style (Chaudhary, 2018). A growing body of work has investigated children's desires and preferences, especially regarding their understanding of tangible product marketing and advertising (e.g., toys and food) (e.g., Mallalieu, Palan, & Laczniak, 2005; Spielvogel, Matthes, Naderer, & Karsay, 2018; Warren, Wicks, Wicks, Fosu, & Chung, 2008). Because children are inherently interested in cartoons and animation, the use of popular cartoons as pictures in children-centric marketing has been found to provide a competitive edge since the 1980s (Van Auken & Lonial, 1985). Advertising experts have noted that more positive advertising outcomes can be evoked by using cartoons that establish friendly connections with children and construct a fantasy world for them (Rose, Merchant, & Bakir, 2012); however, whether this argument holds true with intangible products such as tourism destinations remains unexplored.

The growing importance of the family travel market and children's substantial influence on the decision-making process around family holidays, especially in deciding where to go and what to

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do, have drawn great attention from practitioners and researchers (M. Li, Wang, Xu, & Mao, 2017). Nevertheless, research has been criticized for its focus on family travel from adults' points of view (e.g., S. Kim & Lehto, 2013; Lehto, Choi, Lin, & MacDermid, 2009). Scarce studies have considered children's travel behavior with an emphasis on children's trip experiences (e.g., Carr, 2011; Hilbrecht, Shaw, Delamere, & Havitz, 2008; Poria, Atzaba-Poria, & Barrett, 2005; Rhoden, Hunterjones, & Miller, 2016; Wu, Wall, Zu, & Ying, 2019); accordingly, little is known about children's perceptions of and attitudes toward advertisements.

The present study seeks to address the aforementioned research gaps. Specifically, this work aims to investigate the effectiveness of cartoon tactics on tourism photographs in eliciting children's attention and preferences. We expect findings from this research to contribute to the body of knowledge on advertising effectiveness and children-centric tourism.

2. THEORETICAL BACKGROUND AND HYPOTHESIS DEVELOPMENT

2.1 Photos and tourism advertising effectiveness
Pictures and photographs are pivotal tools in tourism marketing and have been used extensively to promote destinations or attractions through virtual experiences (Q. Li, Huang, & Christianson, 2016). Tourism photographs reproduced in different formats comprise a large portion of tourism marketing and promotional materials, such as advertisements, posters, and brochures (Garrod, 2009). Photographs are thought to be essential in forming a destination image when people view tourism advertisements, and a positive image can influence consumers' attitudes and intentions to patronize a specific tourism product or destination (Feighey, 2003). Thus, tourism attractions represent core components of a destination and are often portrayed visually in advertising to attract visitors (Hem, Iversen, & Grønhaug, 2003). The extent of photograph use has been considered one of the most important factors when designing tourism advertising content (Rasty, Chou, & Feiz, 2013). Photograph selection is therefore critical because it may result in diverse responses to tourism materials in practice (Q. Li et al., 2016).

Statistics from the U.S. Travel Association (USTA) indicated that the total budget for tourism offices reached $878 million between 2017 and 2018, of which the proportion dedicated to advertising and promotion totaled $525 million or roughly 60% of the overall budget (USTA, 2019). Concomitant with substantial investments in tourism advertising, industry professionals and researchers have begun to evaluate the efficacy of such advertising (Park, Nicolau, & Fesenmaier, 2013) and emphasize creative and novel approaches to improve advertising effectiveness (Butterfield, Deal, & Kubursi, 1998). As effective advertising is consistently related to viewers' attention, recall, and intentions (D. Kim, Hwang, & Fesenmaier, 2005), the ability to capture viewers' attention is a key aspect of advertising effectiveness (Goel & Upadhyay, 2017) and ultimately maximizes viewers' engagement with photos (Viglia, Pera, & Bigné, 2018).

Psychological studies have identified visual attention as the starting point of information acquisition, as suggested by hierarchical processing models such as the destination advertising response (Choe, Stienmetz, & Fesenmaier, 2014) or attitude-interest-desire-action model (Barry, 1987). More importantly, attention is a pivotal coordinating mechanism for processing

information and other tasks over time (Wilson, Baack, & Till, 2015). Individuals' visual attention to tourism advertisements is closely tied to brand choice (Atalay, Rasolofoarison, & Bodur, 2012), persuasive power (Hem et al., 2003), and likelihood of consumption (Krajbich, Armel, & Rangel, 2010) and is a pertinent factor for travelers when processing messages from marketing materials to select targets of interest (Wang & Sparks, 2016). Nevertheless, most scholars investigating destination attractiveness have focused on the quality of an attraction or destination (Hem et al., 2003), leaving the effectiveness of advertising on destination marketing underexplored.

In the marketing and advertising fields, a large body of research has addressed the influences of message format and content creativity on advertising effectiveness. For example, in a comparison between augmented reality hypermedia (ARH) print ads, quick response code hypermedia (QRH) print ads, and traditional print ads, Yaoyuneyong, Foster, Johnson, and Johnson (2016) found that ARH print ads yielded higher perceptions of originality and informativeness, QRH print ads were perceived as annoying, and traditional print ads resulted in greater time-related effort. Photo content has been deemed another important influence on customers' attitudes and behavioral intentions (Lazard et al., 2018). In tourism, Decrop (2005) revealed a significant relationship between message format and advertising effectiveness: pictures and text were identified as prevailing elements used to attract travelers, convey information, and arouse travel intentions, whereas advertising logos or headlines were less important. In a similar vein, Duchowski (2007) found that color, size, and position affected viewers' visual attention to tourism advertisements. Ryu, Lim, Tan, and Han (2007) pointed out that pictorial advertising placed on the left-hand side of a website was evaluated more positively than that placed on the right-hand side. Consequently, advertisers should use photos and texts in advertisements appropriately and position them effectively (Rasty et al., 2013).

2.2 Cartoons and children-centric marketing
Research interest in children as consumers has expanded in recent years (Calvert, 2008; Šramová, 2015), mainly due to children's increasing importance as consumers and their impacts on the family environment (Mayo & Nairn, 2009). In acknowledging children's agency as active individuals in decision making, studies have primarily considered two broad areas: children's ability to process marketing messages, and tactics that could be used to bolster marketing effectiveness. Preston (2016) argued that even preschool children (3–4 years old) can recognize the commercial aims of television advertising and identify differences between various brands. Age was also found to play a vital role in children's responses to commercials (Hudders & Cauberghe, 2018). For example, children aged 19 months could associate products in a shop with the corresponding commercial (Valkenburg & Cantor, 2001). Children between 2 and 4 years old can begin to make sense of pictures and symbols and are becoming more interested in media contents (Kirkorian, Wartella, & Anderson, 2008); however, children under 4 years old believe that all information presented in advertisements is true (Šramová, 2014). Most children begin to critically consider the differences between reality and commercials around 7 years old or older (Acuff, 1997). Children aged 12 or above can understand the persuasive nature of commercials (Calvert, 2008), but attention to advertising becomes more easily distracted as children grow older (Greer et al., 1982). Stutta and Hunnicutt (1987) suggested that marketing content should feature lively action, sound effects, and loud music to attract and hold children's attention. Consistent with this proposition, Greer, Potts, Wright, and Huston (1982) argued that preschoolers (54.83 months

old on average) are particularly interested in commercials that incorporate loud music, sound effects, and action.

Cartoons are widely used as visual images, particularly in children-centric marketing (Goel & Upadhyay, 2017). Weber, Story, and Harnack (2006) pointed out that roughly 96% of children's websites featured cartoon styles and elements to symbolize brands and were designed to be funny and friendly toward children (Kraak, Gootman, & McGinnis, 2006). In an advertising context, *fantasy cues* refer to executional elements of visual stimuli intended to persuade children to imagine another world; thus, the use of cartoons is thought to create fantasy cues that draw children into an animated or fantasy world and infuse a sense of fun and adventure into their experiences (Rose et al., 2012). As children are inherently interested in fantasy such as cartoons, manga, and animated appearances, they tend to be willing audiences and react positively to visual materials rooted in fantasy (Rose et al., 2012). Therefore, extensive research has explored tactics in children's marketing, including the use of cartoon characters, creation of fantasy worlds, and animation of product situations (Warren et al., 2008; Wicks, Warren, Fosu, & Wicks, 2009). For example, in Australia, three-quarters of confectionery product marketing involves cartoon characters (Chapman, Nicholas, Banovic, & Supramaniam, 2006). The use of cartoon characters in children-centric advertising also helps to draw children's attention to warning information on product packaging such as cigarettes, alcohol, and junk food (Boyland et al., 2016) and has been found to offer competitive advantages for marketers (Van Auken & Lonial, 1985).

2.3 Research hypotheses

The importance of content design in influencing viewers' attention is substantiated by Groves and Thompson's (1970) dual-process theory. According to this theory, an individual's response to a stimulus depends on sensitization and habituation, which are determined by stimulus characteristics (i.e., contrast, complexity, and functionality). This model can elucidate the relationship between stimulus features and processing fluency (Graf & Landwehr, 2015). Accordingly, stimuli with unique or distinct features are thought to foster fluent processing of information, which can then generate a sense of affection and elicit closer attention (Rosenkrans, 2009).

Attention has been conventionally measured via self-report methods, memory tests, and subjective indicators. More recently, however, technological developments have enabled researchers to access the rapid attentional processes occurring during visual exposure (Wedel & Pieters, 2008). Eye-tracking techniques have risen to prominence as a uniform approach to tracking visual effectiveness in marketing and advertising (Wedel & Pieters, 2008). Several indicators are used in eye-tracking assessment, including fixation counts, fixation duration, and dwell time (Scott, Zhang, Le, & Moyle, 2017). *Fixation counts* refer to the number of fixations on an image or area of an image, with fixation counts and their locations providing information about which elements of an image are visually important (Wang & Sparks, 2016). *Fixation duration* indicates how long a viewer maintains higher-level focus on the same region to allow for extraction of visual details. *Dwell time*, otherwise called total visit duration (Bebko, Sciulli, & Bhagat, 2014), indicates the total time participants spend looking at an area of interest (AOI), including return gazes to the area; such time is thought to be associated with image properties

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(e.g., whether images are shocking or novel). The corresponding heat map is color coded to visualize areas that observers viewed more or less intensively (Scott et al., 2017).

Research on tourism attractions and photographs often distinguish nature, culture, and recreation (Decrop, 2005). Among the range of studies focusing on the content of tourism marketing materials, about 32% of visual representations present natural landscapes, 36% depict culture attractions, and 32% display recreation attractions or services (Dann, 1988; Dilley, 1986). However, a viewer's attitude will likely differ by photograph category; for example, Decrop (2007) indicated that people pay more attention to and prefer nature and recreation photos over culture photos. Photographs of natural scenery readily attract more attention than those showing a built environment, as suggested by attention restoration theory (Wang & Sparks, 2016).

Based on the preceding literature review, we conclude that children's attention, as evidenced by fixation counts, fixation duration, and dwell time, varies among photographs displaying different attractions (culture, recreation, and nature) and effects (normal and cartoon). The following hypotheses are thus proposed:

H1: Cartoon-executed photographs attract more attention than normal photos
      H1a: Cartoon-executed photographs elicit higher fixation counts than normal photos.
      H1b: Cartoon-executed photographs elicit longer fixation durations than normal photos.
      H1c: Cartoon-executed photographs elicit longer dwell times than normal photos.

3. METHODOLOGY

3.1 Research design
Our research objectives were addressed through a sequential mixed-method design. An eye-tracking experiment was first conducted to record participants' eye movement, followed by structured interviews to investigate children's attitudes toward cartoon tactics on tourism photos. As Mayr, Knipfer, and Wessel (2009) suggested, combining eye tracking with other methods such as interviews and questionnaires can help researchers more effectively explain scan patterns and clarify the underlying mechanisms of attention patterns revealed in experiments.

This experiment involved a 3 (photo categories: culture vs. nature vs. recreation) × 2 (photo effects: normal vs. cartoon) × 2 (display order: Sequence 1 vs. Sequence 2) eye-tracking experiment, taking photo categories and photo effects as within-subject effects and display order as a between-subject effect. Repeated measures were applied to analyze eye-tracking data using multivariate analysis of variance (MANOVA) in SPSS 24. As eye scanning usually follows a left-to-right pattern, two experiments were designed with different orders to present either cartoon-executed photos or normal photos of tourism attractions to minimize research bias. In the first experiment, normal photos were displayed on the left side of the screen and photos with cartoon effects were displayed on the right; in the second experiment, the stimuli placement was reversed. Tests of within- and between-subjects effects were expected to unveil connections among photo categories, photo effects, and display order. As the purpose of this experiment was to compare children's visual behaviors and attention patterns when viewing cartoon-executed and normal photos, two AOIs were delineated for the within-group experiment. Three indicators

were used for data collection and analysis, namely fixation counts, fixation duration, and dwell time.

3.2 Participants

We recruited 51 children aged 10–13 through a primary school in mainland China in November 2017. According to Piaget and Inhelder's (1969) developmental theory, children's cognitive abilities develop with age, and children in this age range (i.e., pre-adolescence) can consciously express their feelings and opinions in interviews (Carr, 2011). Moreover, children around this age can generally organize retrieval and use available information from visual stimuli (Moore & Lutz, 2000). Data were collected in a large classroom of the primary school with three children in the room at the same time (one participating in the experiment and the other two in interviews). The experiment and interviews were conducted far enough apart to prevent disturbance to either process.

3.3 Apparatus

SMI REDn Scientific, a portable remote eye tracker, was used to record eye movement as participants viewed each tourism photograph. As all participants in this study were schoolchildren, a remote eye tracker was most appropriate because it could be easily set up and was relatively unrestrictive. As a lightweight and reliable instrument, REDn Scientific is robust and simple to use when conducting eye-tracking studies in any environment. This arrangement is particularly advantageous when conducting research with children or participants from specific locations, as participants are not required to come to a laboratory (Niehorster, Cornelissen, Holmqvist, Hooge, & Hessels, 2018). The current generation of remote eye trackers also allows for a certain degree of head movement from participants without compromising data quality (Conklin, Pellicer-Sánchez, & Carrol, 2018). Recent eye-tracking algorithms can ensure accurate and reliable results. SMI BeGaze, a software program to analyze visual gazes and patterns, was used to process eye-tracking data.

3.4 Stimuli selection

Hong Kong was ranked second among the top 10 family travel destinations in China (Ctrip, 2017); the region has become a popular tourism destination for family travelers, especially from mainland China. Accordingly, tourism photographs representing nature, culture, and recreation attractions in Hong Kong were used in this study. Based on the popularity of tourism attractions according to Ctrip (2017), photos of Tiantan Buddha (culture attraction), Lamma Island (nature attraction), and Hong Kong Disneyland (recreation attraction) were chosen as visual stimuli for the experiment.

Insert Figure 1 here

Visual stimuli conditions (e.g., number of elements, order of presentation, and display time) can substantially influence participants' fixation gaze or attention; as such, stimuli were strictly designed and controlled in the eye-tracking experiment. To provide insights on cartoon effects on tourism photographs, we investigated children's eye-tracking data using normal and cartoon-executed photos depicting the same tourism attractions. Inspired by prior research investigating the distinctiveness effects of cartoon caricatures in print advertisements in a between-subjects experiment (Heiser, Sierra, & Torres, 2008), our study employed the same method to digitally manipulate photos from a normal version into a cartoon or sketched version. Specifically, visual

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stimuli in our experiment included a normal photo (Cn) and cartoon photo (Cc) in the culture category, normal photo (Nn) and cartoon photo (Nc) in the nature category, and normal photo (Rn) and cartoon photo (Rc) in the recreation category. The stimuli arrangement is displayed in Table 1.

Insert Table 1 and Figure 2 here

3.5 Procedure
A calibration test was conducted before the experiment to ensure the average deviations of two directions were less than 1°. Forty-five children (16 boys and 29 girls) remained in the study, 14 of whom had visited Hong Kong in the past. The experiment was conducted in a meeting room under controlled conditions to ensure the experiment was not disrupted by a noisy environment with distractors or by direct sunlight (Conklin et al., 2018). The eye tracker (SMI REDn Scientific) at a sampling rate of 60 Hz was attached beneath the laptop screen (13.3-inch monitor) with a resolution of 1920 × 1080 pixels. Participants were positioned approximately 70 cm from the monitor. Then, the default calibration settings of the SMI eye tracker were used to run the calibration. A 5-point calibration and 4-point validation routine were used for the SMI device, which reported an offset of less than 1° and thus indicated successful calibration. Because instruction can affect viewing patterns (Müller, Kappas, & Olk, 2012), participants were informed they would be viewing three groups of tourism photographs, but no specific tasks or instructions were assigned after positioning and calibration. The order in which photos was presented was randomized among participants, and photos within each category were displayed for 10 seconds. Figure 3 presents the experimental setting.

Insert Figure 3 here

3.6 Qualitative method
Although eye tracking can accurately record the location and duration of visual attention, thereby offering a precise and objective measurement (Duchowski, 2007), it cannot offer insights into cognitive processing (Graham, Orquin, & Visschers, 2012). Therefore, structured interviews were conducted after the experiment to evaluate participants' attitudes toward cartoon execution on tourism photographs. Structured interviews were chosen for two reasons. First, structured interviews with standardized questions are often used to facilitate and supplement quantitative designs (Minichiello, Aroni, Timewell, & Alexander, 1990). Second, structured interviews are effective with children, as asking direct questions can control information variance (Hodges, 1993). Participants were asked "Do you like normal photos or cartoon photos of culture attractions, nature attractions, and recreation attractions, respectively, and why?" and were then asked to select and explain their preferences from each category when shown photographs on the laptop screen. Interviews lasted 10 minutes on average.

We adopted a deductive coding process to analyze interview transcripts. Five main categories generated by Tuohino and Pitkänen (2004) were used to investigate children's reactions: functional-social, physical environment, aesthetic, cultural, and symbolic. The functional-social category related to attributes of recreation activities and socializing. The physical environment category included items related to objects, nature, and landscapes, whereas the cultural category encompassed culture, history, and traditions. Attributes referring to the colors, format, layout,

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and composition of photographs comprised the aesthetic category. The symbolic category included tourism photograph attributes with mythical or enigmatic content.

3.7 Ethical concerns
Ethical concerns have been cited as a main reason for not conducting social science research with children (Poria & Timothy, 2014). Common issues include power relations, informed consent, and confidentiality (Punch, 2002). Before conducting this experiment, the researchers sought ethical clearance for the study through their home university. Consent forms detailing the study background and research methodology were sent to and signed by participants' parents/guardians. Parents/guardians were also assured that their children's participation was voluntary, and all information collected was confidential and would only be used for academic research. Participants were informed of the background of the study at the beginning of the experiment. The experiment was performed in a large classroom in a primary school; the children were familiar with this setting. Use of remote eye-tracking technology meant the participants were not physically touched. Photo-elicitation interviews, as an entertaining and child-friendly method, were employed to develop rapport with children, stimulate dialog, and extend a conversation for interviews (Matteucci, 2013). Children were reassured that the interview was not an exam, and the research questions had no 'correct' answers.

4. RESULTS

Basic participant information is listed in Table 2. Over half of the participants (27 children) reported themselves as frequent cartoon or animation viewers. About 25 children said they had noticed tourism advertising before; most advertisements they mentioned involved theme parks like Disneyland, Fangte, and Chimelong.

Insert Table 2 here

4.1 Manipulation checks
Normal photos versus cartoon-executed photos of three tourism attractions were used in the main study phase. A manipulation check was necessary, and 5-point surveys were conducted to validate the cartoon effects of three tourism photographs in the experiment. Participants were asked "Do you agree this is a cartoon-executed photo?" for each photo and indicated their extent of agreement on a 5-point Likert-type scale (1 = strongly disagree, 5 = strongly agree). A MANOVA was performed to assess respondents' perceptions of cartoon effects on tourism photographs in a 3 (photo categories) × 2 (photo effects) design after manipulation. A significant difference was identified between the mean value of normal tourism photos and that of cartoon tourism photos ($M_{normal\ photo}$ = 1.59 vs. $M_{cartoon\ photo}$ = 4.06, $p < .001$, $F = 310.956$). These results indicated that intended stimuli were manipulated successfully in the experiments.

4.2 Data analysis
Fixation counts
Fixation counts were recorded as children viewed photos. The MANOVA results (Table 3 and Figure 4) revealed no main within-subjects effects for photo categories per the number of fixation counts ($p > .05$), indicating that different tourism photograph categories did not influence the number of fixation counts. However, a significant difference in the main within-subjects effect indicated the influence of photo effects on fixation counts ($p < .05$), supporting

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Hypothesis 1. More fixation counts were recorded from cartoon-executed photos ($M = 12.33$) compared with normal photos ($M = 11.13$), suggesting that cartoon effects on tourism photographs drew children's attention more than normal photos depicting the same content. Data analysis also revealed no interactive effects of photo categories × photo effects, photo categories × group, or photo categories × photo effects × sequence, implying that tourism photo categories and the order of presentation did not influence the cartoon effects of tourism photographs.

Insert Table 3 and Figure 3 here

Fixation duration
Regarding participants' fixation durations, MANOVA results (Table 4 and Figure 5) indicated a main effect of cartoons on total fixation duration. A longer fixation duration was recorded for cartoon-executed photos ($M = 4.49$ s) compared with normal photos ($M = 4.00$ s). A significant interaction effect was also found between photo categories and photo effects. Therefore, simple-effects tests (Table 5) were performed for the photo categories × photo effects interaction and photo effects × photo categories interaction. Results indicated that culture and recreation photos with cartoon effects both elicited a longer fixation duration ($M_{\text{culture cartoon}} = 4.77$ s vs. $M_{\text{culture normal}} = 3.85$ s, $p < .001$; $M_{\text{recreation cartoon}} = 4.60$ s vs. $M_{\text{recreation normal}} = 3.87$ s, $p < .001$), partially supporting Hypothesis 2. No significant difference emerged between cartoon-executed and normal photos of nature attractions. Furthermore, no interaction effect was found for photo categories × photo effects or photo categories × sequence of presentation.

Insert Tables 4–5 and Figure 4 here

Dwell time
In terms of participants' dwell time, statistical analysis (Table 6 and Figure 6) indicated a main effect of cartoon execution on dwell time duration. A longer dwell time was recorded for cartoon-executed photos ($M = 4.68$ s) than normal photos ($M = 4.11$ s). In addition, a significant interaction effect was observed between photo categories and photo effects; therefore, simple-effects tests (Table 7) were performed for the photo categories × photo effects interaction and photo effects × photo categories interaction. Longer dwell times were identified for culture and recreation photos with cartoon versions ($M_{\text{culture cartoon}} = 4.95$ s vs. $M_{\text{culture normal}} = 3.98$ s, $p < .001$; $M_{\text{recreation cartoon}} = 4.81$ s vs. $M_{\text{recreation normal}} = 4.01$ s, $p < .001$), partially supporting Hypothesis 3. The cartoon versions of nature photos had shorter dwell times than normal nature photos ($M_{\text{nature cartoon}} = 4.36$ s vs. $M_{\text{nature normal}} = 4.35$ s). Therefore, the effects of cartoon execution varied among tourism photo categories. Additionally, no interaction effect was identified between photo categories and photo effects or photo categories and sequence. Table 8 summarizes the overall results of data analysis.

Insert Tables 6–8 and Figure 6 here

4.3 Heat maps
In the context of this study, heat maps were color coded on a red–green spectrum to illustrate participants' visual attention and patterns when viewing tourism photographs (Q. Li et al., 2016; Scott et al., 2017). SMI BeGaze generated a final heat map by stacking maps from each participant. Shades on the color spectrum highlighted areas on the basis of fixation gaze or attention; red denotes the longest fixation time, whereas green represents the shortest fixation

time. We could therefore easily identify areas that garnered more or less attention from participants. Participants generally focused on similar areas in cartoon-executed and normal photos of the same attraction as shown in Figures 6–8.

In culture photos, participants' major focus was the head of the Buddha; the heat map shows that the cartoon-executed photo evoked more attention than normal photo regardless of the order of presentation (Figure 6). For recreation photos, participants concentrated on the castle, which occupied nearly half the photo, and partial attention was paid to the inverted reflection in water (Figure 7). With respect to nature photos, the heat map shows that participants looked at various areas with no particular part highlighted. Surroundings of the landscape (e.g., trees, hills, clouds, the sea, and houses) also captured participants' gazes (Figure 8).

Insert Figures 6–8 here

Cartoon effects on tourism photographs varied in drawing children's attention depending on the tourism attraction category. Results of eye-tracking measurement revealed that cartoon-executed photos of culture, recreation, and nature attractions could significantly increase children's fixation counts compared with normal photos. Although cartoon-executed photos and normal photos of each tourism attraction contained identical visual elements, participants demonstrated more fixation counts on cartoon-executed photos, implying that they noticed more content or elements than in normal photos. However, compared with the mean differences of cartoon-executed photos and normal photos on culture and recreation attractions, the cartoon execution exerted less influence upon fixation counts when viewing nature photos. The interaction effects of fixation duration between photo categories and photo effects further demonstrated that cartoon effects on photographs varied among types of tourism attractions. The fixation duration of cartoon-executed photos was significantly longer than normal photos for culture and recreation attractions, indicating that participants fixated for longer on cartoon-executed culture and recreation photos. Similarly, cartoon effects influenced dwell time such that the dwell time between photo categories and photo effects varied. Participants were willing to spend more time on cartoon-executed culture and recreation photos, whereas no significant influence was revealed for photos of natural attractions. Consequently, cartoon execution was identified as an effective strategy to increase children's attention to tourism photographs, particularly for culture and recreation attractions (Figure 9).

Response to the use of cartoon effect
Although cartoon-executed photos and normal photos of attractions displayed the same content, elements were depicted differently in this study. The results of structured interviews indicated that children's preferences for cartoon execution varied depending on the types of tourism attractions. Specifically, 49% of children preferred cartoon effects in recreation photos, 20% in culture photos, and only 4% in nature photos. As expected, about half of the children expressed positive attitudes and interest toward cartoon versions of recreation photographs, particularly the man-made castle. They enthusiastically described the magical, fantasy world portrayed in the image, and the use of colors and an animated scene especially seemed to capture their attention. When viewing a cartoon-executed photo of a theme park, some children said they could imagine characters in cartoons like Snow White and could even recall the plot of the story. Moreover, the cartoon-executed photo was consistent with the original in children's minds. Another advantage children mentioned was that the cartoon-executed photo differed from reality, enabling them to

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construct a dream world. One respondent remarked, *"I like this cartoon-effect Disneyland. By staring at it, I feel like someone must be living inside the castle!"* The cartoon effect made these photos more unique, which increased children's interest and enhanced the novelty of relevant advertisements.

Insert Table 9 here

Among children's comments regarding normal photos, most pertained to the aesthetic (83%) and functional-social (13%) categories. By contrast, comments from children who enjoyed the cartoon-executed photos reflected the aesthetic (58%) and functional-social (24%) categories. Cartoon-executed photos could also bring children into a dream or cartoon world, reflecting the symbolic (15%) category. Regarding nature attractions, most children preferred the normal photos because they depicted the actual landscape, which was similar to reality. For instance, when comparing the normal photo of Lamma Island with the cartoon-executed version, one respondent said, *"I prefer the normal photo that shows the blue sky and green scenery. The cartoon one looks rather distorted."* Original photos also reminded children of picturesque scenery. Participants noted that the details of normal photos were easier to recognize, whereas cartoon manipulations were more difficult to view and diminished the natural beauty of nature attractions: *"Things with similar colors seem messy…Especially the sky and the sea on this picture. [They are] difficult for me to distinguish."* Consequently, children more strongly preferred cartoon execution in recreation photographs compared with culture and nature photographs based on the digitally manipulated conditions.

5. CONCLUSIONS AND DISCUSSION

This study examined the effectiveness of cartoon effects on tourism photographs in capturing children's attention. A mixed-method technique was adopted, using an eye-tracking experiment and structured interviews with 45 children between ages 11 and 13. A 3 (photo categories: culture vs. nature vs. recreation) × 2 (photo effects: normal vs. cartoon) × 2 (display order: Sequence 1 vs. Sequence 2) within- and between-subjects experiment was designed to test three hypotheses generated from the literature, and structured interviews were conducted to provide in-depth insight into our experimental findings. Consistent with distinctiveness theory, MANOVA results revealed that cartoon manipulation of photos capturing culture or recreation attractions significantly increased children's attention span as indicated by fixation counts, fixation duration, and dwell time. This finding was also supported by children's descriptions of cartoon photos as funny, fantasy-like, and dramatic. In addition, cartoon-executed photos of recreation and culture attractions evoked children's imagination around specific interests, such as cartoon characters or plot. Furthermore, a longer dwell time objectively indicated that children spent more time viewing recreation and culture photographs with cartoon features. However, significant interaction effects were observed between fixation duration and dwell time when children viewed nature photographs, indicating that cartoon execution exerted little influence on children's attention.

This study contributes to the body of knowledge on advertising effectiveness in tourism and children's tourism behavior in theoretical and methodological aspects. First, while prior research has mostly focused on advertisements of tangible products such as food and toys, our findings contribute to the literature on the effectiveness of children-centric advertising by adding an

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intangible and more complex perspective based on tourism destinations. Second, although photographs play vital roles in tourism marketing, only a handful of studies have investigated factors influencing the effectiveness of tourism photographs or advertisements, such as text and photos (e.g., Babakhani, Ritchie, & Dolnicar, 2017; Q. Li et al., 2016; Scott, Green, & Fairley, 2016) and image characteristics (e.g., Wang & Sparks, 2016). Given the importance of creativity in advertising and the widespread adoption of cartoon execution in children-centric marketing, this study underscores the usefulness of cartoon effects on tourism photographs in attracting children's attention and building a children-friendly image.

Another contribution of this study lies in its participants. Children have been largely ignored in tourism studies due to conceptual, ethical, and methodological obstacles (Poria & Timothy, 2014). The present study treated children as active agents and examined their travel behavior in the pre-trip stage (i.e., their attention to and preferences for tourism attractions). Different from adult travelers' preferences (e.g., Wang & Sparks, 2016), recreation attractions such as theme parks are highly appealing to children, which is consistent with Gram (2005) in that children have distinct interests in tourism experiences. Our work has also addressed methodological challenges in conducting research with children as suggested by Poria and Timothy (2014). Using a mixed-method research design, we investigated children's attention patterns to tourism photos using eye-tracking techniques. Interviews with participants facilitated interpretation of children's attention patterns and provided a more in-depth understanding of their perceptions of tourism photos. Findings from the eye-tracking experiment and interviews were consistent, framing children as active agents in research in their own right. Combining a scientific experiment with qualitative methods resulted in a more comprehensive understanding of our research questions.

Methodologically, we employed a mixed-method design to extend innovations of this research approach. Among existing studies involving eye-tracking measurement in tourism, quantitative methods such as self-report surveys have often been employed to examine relationships between attention patterns and consumer behavior. A qualitative method, as a follow-up exploration of what triggers individuals' perceptions and attitudes, was used in this study to obtain a deeper understanding of the phenomenon of interest. The findings of structured interviews reflected children's feelings when exposed to different tourism photographs and revealed their attitudes and triggers on the basis of their own interpretations, providing a foundation for subsequent research using quantitative methods. Moreover, the use of creative methods to digitally execute visual stimuli extends manipulation methods in tourism-related experiments, especially when comparing visual representations with different designs.

Destination marketing organizations can benefit from the findings of this research in effectively designing marketing materials for the children and family market. As the literature has suggested, cartoon effects in advertising are especially welcomed by children (Rose et al., 2012). Per our results, creative execution including cartoons or sketches could be applied to visual representations or tourism marketing materials to attract the eyes and interest of young tourists. For instance, cartoon-executed photos or sketches of man-made and/or cultural attractions can be used in print advertisements or other types of out-of-home media. Such tactics could further be applied to enhance children's travel experience with cultural and heritage attractions; cartoon features may appeal more to children thanks to aligning better with their interests. Postcards with

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cartoon effects, sketched maps, or guidebooks could also be used to stimulate children's willingness to explore.

However, children did not perceive all cartoon executions as attractive. Our research offers new insights into the appeal of cartoon effects, which depends on attraction categories. We therefore recommend that destination marketers seek to distinguish products and employ cartoon execution under clear advertising objectives. For instance, cartoon execution can be used with culture and recreation attractions considering potential fulfillment of functional-social, aesthetic, and symbolic marketing goals. However, such execution on nature attractions apparently reduces the originality of the physical environment. As such, the match between an attraction and corresponding marketing materials should be considered prior to cartoon execution.

Despite its contributions, the study was limited in the following aspects. Methodologically, to control experimental conditions in the eye-tracking study and minimize confounding factors, tourism photographs as visual stimuli were digitally executed into cartoon versions to retain the same elements and content on the basis of manipulation experiences in earlier research. Nevertheless, participants' responses revealed that the effects of such manipulation had several limitations, including on aesthetic appearance, detail processing, and whole animated images; these comments indicated distance between cartoon-executed photos and animated or sketched tourism photos in reality. Moreover, the laboratory design may have affected children's observations of photographs; discrepancies between a laboratory setting and daily life cannot be completely avoided.

Given these constraints, subsequent research should examine children's attention to tourism advertisements in real-life settings using advanced techniques. Children's visual patterns in search behaviors can also be investigated by providing specific tasks or instructions. Additionally, children's attention to other media types (e.g., video) in normal and cartoon-executed forms can be examined in future studies.

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Figure 1. Tourism photographs in the study.

Figure 2. Visual stimuli.

Figure 3. Eye-tracking experiment.

Figure 4. Mean fixation count of tourism photographs.
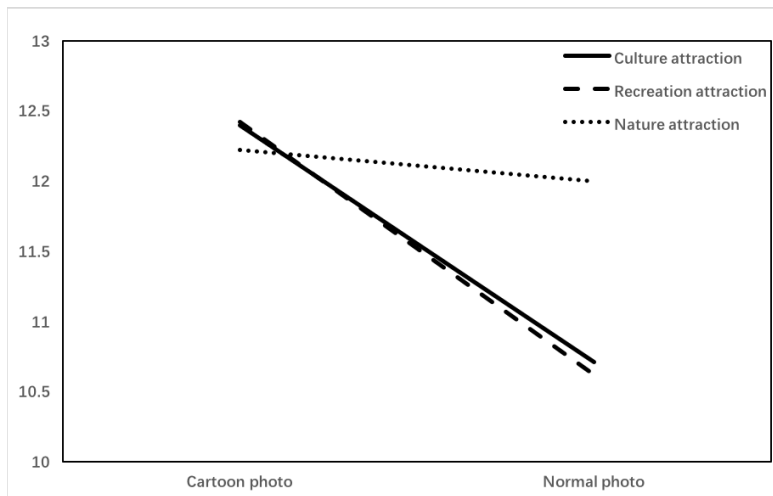
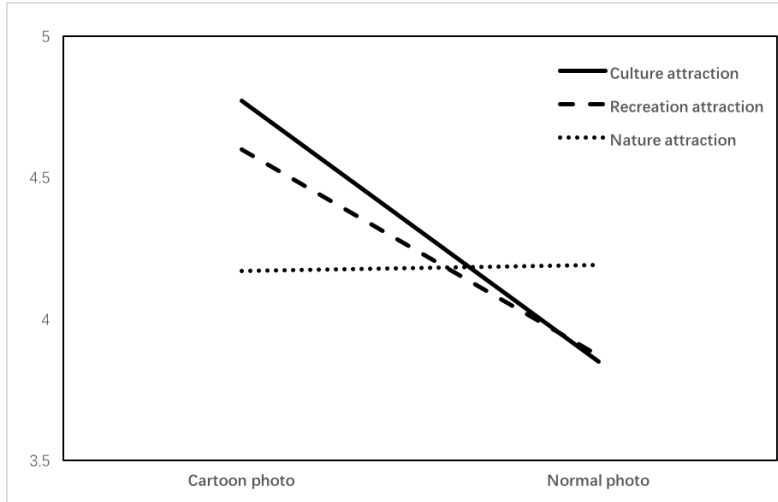**Figure 5. Mean fixation duration of tourism photographs.**

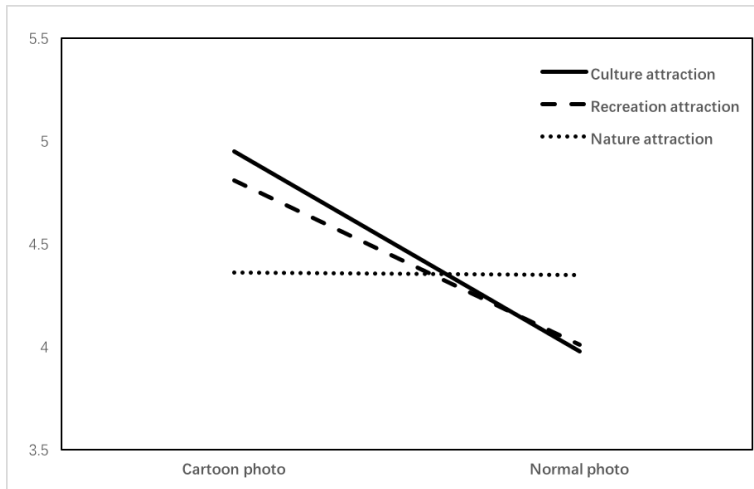**Figure 6. Mean dwell time of tourism photographs.**

Figure 7. Heat maps of visual attention: cultural attraction

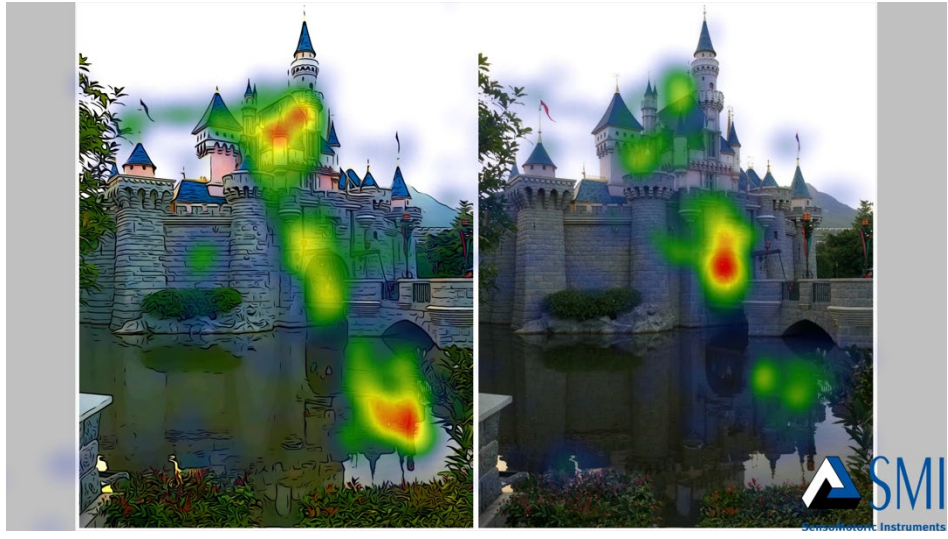**Figure 8. Heat maps of visual attention: recreation attraction**

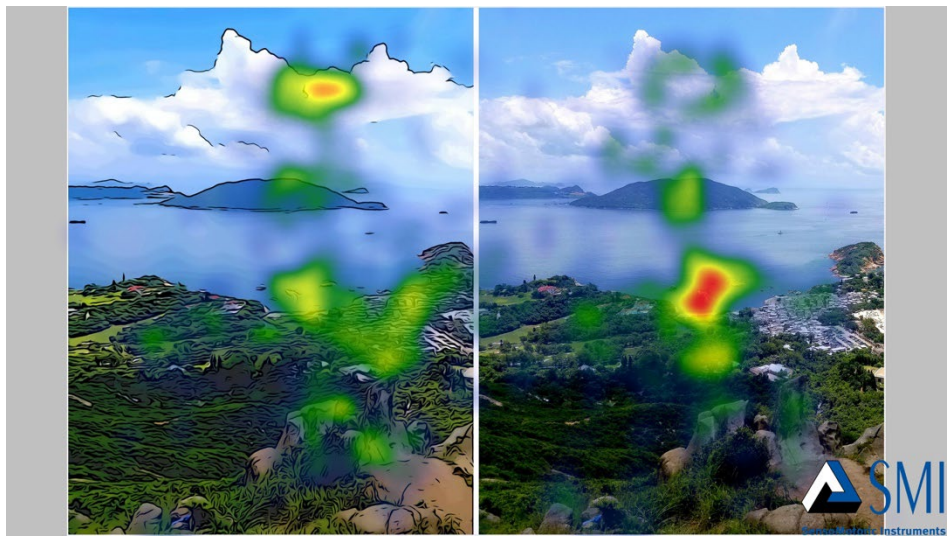**Figure 9. Heat maps of visual attention: natural attraction**

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Table 1. Experiment and sequence.

Experiment 1		Experiment 2	
Left side	Right side	Left side	Right side
Cn	Cc	Cc	Cn
Nn	Nc	Nc	Nn
Rn	Rc	Rc	Rn

Table 2. Respondent profile.

Demographic			Frequency
Gender	Male		16
	Female		29
Age	Mean age (12.04)		
Prior travel experience (times)	0		6
	1–2		19
	3–4		11
	>5		9
Visited Hong Kong before	Yes		14
	No		31
Cartoon or animation viewer	Yes		27
	No		18
Travel advertising viewer	Yes (25)	Theme park	14
		Attraction	5
		City destination	2
		Other	4
	No		20

Table 3. Results of multivariate test for fixation count.

Factors	F	Sig.	Partial Eta Squared
Categories	1.550	.218	.035
Effects	4.233	.046*	.090
Categories × Sequence	.324	.724	.007
Categories × Effects	1.888	.158	.042
Effects × Sequence	.358	.553	.008
Categories × Effects × Sequence	1.360	.262	.031

Table 4. Results of multivariate test for fixation duration.

Factors	F	Sig.	Partial Eta Squared
Categories	1.130	.328	.026
Effects	4.952	.031*	.103
Categories × Sequence	.612	.545	.014
Categories × Effects	4.647	.012*	.098
Effects × Sequence	1.150	.289	.026
Categories × Effects × Sequence	1.718	.185	.038

Table 5. Results of simple-effect test for fixation duration

Factors	F	Sig.
Categories Within Cartoon Effect	5.18	.007**
Categories Within Normal Effect	ns	.130
Effect Within Culture Category	10.30	.003**
Effect Within Recreation Category	5.51	.024*
Effect Within Nature Category	ns	.948

Table 6. Results of multivariate test for dwell time

Factors	F	Sig.	Partial Eta Squared
Categories	.910	.406	.021
Effects	5.272	.027*	.109
Categories × Sequence	.415	.662	.010
Categories × Effects	4.271	.017*	.090
Effects × Sequence	.980	.328	.022
Categories × Effects × Sequence	1.873	.160	.042

Table 7. Results of simple-effect test for dwell time

Factors	F	Sig.
Categories Within Cartoon Effect	4.89	.010**
Categories Within Normal Effect	ns	.129
Effect Within Culture Category	10.25	.003**
Effect Within Recreation Category	5.77	.021*
Effect Within Nature Category	ns	.975

*p < .05; **p < .01

Table 8. Summary of test results

		Culture attraction	Recreation attraction	Nature attraction
Cartoon photo	Fixation counts	12.40	12.42	12.22
	Fixation duration	4.77	4.60	4.17
	Dwell time	4.95	4.81	4.36
Normal photo	Fixation counts	10.71	10.62	12.00
	Fixation duration	3.85	3.87	4.19
	Dwell time	3.98	4.01	4.35

Table 9 Comparison of cartoon photos and normal photos.

	Functional-Social	Physical Environment	Aesthetic	Symbolic	Culture
Cartoon	24%	3%	58%	15%	0%
Normal	13%	4%	83%	0%	0%