

Using web and mobile technology to motivate pro-environmental action after a nature-based tourism experience

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Nature-based tourism provides an ideal context for motivating pro-environmental action, as it draws travellers interested in the natural world and showcases unique, and often threatened, environments. This study examines efforts to motivate environmentally related behaviour in tourists' everyday lives using a technology-based intervention following an elephant seal viewing tour at California's Año Nuevo State Park. A total of 362 visitors completed pre-tour and post-tour surveys, with 94 visitors completing a final survey three months after the tour. We found that, although the intervention had little influence on conservation action overall, it was effective for a social media-related action. Post-tour conservation actions were significantly affected by emotional connection to wildlife during the tour and repeat visitation to either the same or another state park. We found that visitors' connectedness to nature increased during the three-hour tour, but returned to pre-visit levels three months later. Practical implications include that parks should encourage repeat visits, suggest an assortment of other experiences that support connecting to nature, and link their conservation messaging to visitors' close, personal, and emotional experiences with fauna. We suggest that one simple, yet effective, way to do this is through maintaining the visitor–park experience through a social media community.

Keywords: nature-based tourism; pro-environmental behaviour; technology; environmental attitudes

Introduction

Motivating and sustaining pro-environmental behaviour is essential to creating a more sustainable society that monitors the collective impacts of today's human activities on tomorrow's ecosystems. Nature-based tourism (NBT) – or tourism focusing on the natural world – provides a particularly ideal context for considering pro-environmental behaviours as it draws visitors interested in nature; showcases unique environments that may be under threat; and provides emotional, awe-inspiring experiences, sometimes in a relatively short period of time.

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Research suggests that many participants come to nature-based tours already sympathetic to environmental issues and open to environmental messaging (Wight, 2001). Moreover, through direct observation of plant and animal species in their natural settings, NBT can inspire a sense of wonder and awe, as well as motivate interest in environmental learning (Ardoin et al., 2015; Ballantyne, Packer, & Sutherland, 2011; Mayes & Richins, 2009). Similarly, through interpretation and environmental education, these place-based experiences can stir a beneficial sense of responsibility (Ardoin et al., 2015; Ballantyne, Packer, & Hughes, 2009; Coghlan, Fox, Prideaux, & Lück, 2011).

Many visitors leave nature-based tours poised to take some kind of pro-environmental action (Ballantyne et al., 2009; Powell & Ham, 2008). Yet, few existing tours provide meaningful follow-up opportunities, or activities that serve to extend the environmental activities from the tour into other settings (Ardoin et al., 2015; Ballantyne & Packer, 2011; Powell, Kellert, & Ham, 2008). Thus, a key opportunity is missed to convert NBT's "mountaintop experiences" into sustained environmental behaviours that benefit not only the tourism site, but also the visitors' home environment. This paper explores that missed opportunity by examining efforts to motivate environmentally related behaviour, bringing it into tourists' everyday lives by implementing a technology-based intervention after visits to an elephant seal (*Mirounga angustirostris*) viewing tour at California's Año Nuevo State Park. By building on earlier studies (cf. Ardoin et al., 2015), this study improves our understanding of the link between motivation from NBT, visitors' willingness to engage in new environmental behaviours, and the degree to which technology may influence the likelihood of visitors actually following through with such behaviour.

Research connecting nature-based tourism to attitudes, knowledge, and behavioural intentions: a literature review

Previous research demonstrates that NBT experiences can facilitate increases in environmental attitudes, knowledge, and behavioural intentions (Ardoin et al., 2015; Ballantyne et al., 2009; Hughes & Morrison-Saunders, 2005; Madin & Fenton, 2004). Studies suggest that these attitudinal and cognitive "spikes" result from the opportunity to see natural history in a personal way, often facilitated by interpretation and environmental education. Numerous factors have been found to precipitate and enhance positive outcomes among nature-based tourists, with natural history interpretation being salient across deeper understanding, pro-environmental attitudes, and behavioural intentions. Interactive interpretive materials, prior knowledge, and education level have been linked with increased knowledge (Powell, Kellert, & Ham, 2009; Tubb, 2003), while interpretation, guides, and active encounters with wildlife have been linked with increased pro-environmental behavioural intentions (Coghlan, et al., 2011; Powell, Kellert, & Ham, 2009).

Interpretation has also been found to increase visitors' positive attitudes towards the place they visited (Ardoin et al., 2015; Coghlan et al., 2011). Powell and Ham (2008), for example, found that high-quality interpretation with NBT was related to increases in Galapagos tourists' natural history knowledge of the park, positive attitudes towards park management, and intentions to undertake pro-environmental behaviours, generally. In addition, they found a high percentage of visitors who took a specific environmental action near the end of their tour, supporting Galapagos' conservation through a philanthropic donation. Similarly, Powell, Kellert, and Ham (2009) found significant changes in tourists' natural history knowledge and behavioural intentions following multi-day rafting trips in the Grand Canyon.

Coupled with natural history interpretation, NBT also may increase tourists' sense of inclusion in nature (namely, the sense of connectedness, caring, and commitment;

Schultz, 2002). Inclusion in nature has only recently been explored in relation to NBT programmes. Burbach, Pennisi, West, and Ziegler-Chong (2012) found that visitors who participated in interpretive programmes, such as guided walks or education programmes conducted by a state park ranger, had significantly higher levels of connectedness to nature than visitors who participated in unstructured recreation activities, such as wildlife viewing, kayaking, and backpacking on their own.

Repeat visitation has been found to have mixed results in regard to changes in visitors' environmental knowledge, attitudes, and behaviour. Hughes and Morrison-Saunders (2002) found that repeat visitors to a treetop walk in Western Australia had significant gains in knowledge after the addition of interpretative trail signs when compared with before-sign installation, while first-time visitors did not. The authors surmised, however, that repeat visitors may be looking for additional "points of focus," as the repeat visitors did not perceive their experience to be associated with learning, while the first-time visitors generally did. In additional research at the same site and at a penguin rookery, Hughes and Morrison-Saunders (2005) found no significant changes in environmental attitude with repeat visitation. By contrast, Ballantyne et al. (2011) found repeat visitors to have more positive attitudinal changes concerning conservation and nature appreciation than first-time visitors; however, first-time visitors reported significantly more positive changes in environmental behaviours four months after the tourism experience.

Although strong evidence exists of spikes in pro-environmental attitudes, knowledge, and behavioural intention during NBT experiences, research suggests that increases are short-lived. Tourists showing a surge in behavioural intention immediately following a cruise to Antarctica reported no increases in pro-environmental behaviours three months later (Powell, Kellert, & Ham, 2008). Ham (2003) argues that new knowledge will dissipate unless the tourism experience incorporates "meaning making" that provokes wonder in visitors.

In their studies related to marine wildlife tourism, Ballantyne and colleagues (2009, 2011) unpacked factors related to how these experiences can support conservation learning and action. First, tourists appear to be more open to site-specific conservation messaging that includes practical, actionable information, rather than to general natural history and conservation facts (Ballantyne et al., 2009). Second, an emotional component to wildlife experiences, plus personal reflection on those experiences, correlates with increased concern and eventual action (Ballantyne et al., 2011). Not surprisingly, the third factor is that visitors' prior environmental advocacy is a significant predictor of long-term attitudinal and behavioural changes (Ballantyne et al., 2011).

Based on these and other findings, Ballantyne and Packer (2011) call for using "post-visit action resources" to promote long-term environmental stewardship after NBT experiences. In taking up this call, Hughes, Packer, and Ballantyne (2011) worked with visitors to a marine turtle park and found that post-visit resources (e.g. kits with fact and trivia sheets, activities, colouring pages, and quizzes; weekly emails about wildlife activity and conservation issues specific to the site) facilitated positive changes to visitors' long-term environmental knowledge, attitudes, and engagement in conservation action. Our research was designed to build on this research regarding post-visit environmental stewardship.

Theoretical framework of behaviour change

Our research builds on a framework for addressing environmental behaviour that emphasizes three components: motivation (a desire to act), the ability to carry out said action (the cognitive and skills-based elements of motivation), and the prompts or triggers that stimulate the action (Fogg, 2009; Ryan & Deci 2000). This framework draws on social

cognitive theory (with the guidance of Bandura, 2004), combined with motivation theory (Ryan & Deci, 2000) and components from social marketing (e.g. McKenzie-Mohr, Lee, Schultz, & Kotler, 2011).

Motivation

Within the framework adopted here, motivation is key to engaging people in environmentally related (and other) behaviours, and also is critical in maintaining those behaviours over the longer term. This desire to act can arise from a variety of factors often present in nature-based tourism experiences, including participation in educational and interpretive programs (e.g. Orams, 1997; Powell, Kellert, & Ham, 2008), direct connections with wildlife (e.g. Mayes & Richins, 2009; Skibins, Powell, & Hallo, 2013; Tisdell & Wilson, 2005), and the development of attachment to particular places (e.g. Ramkissoon, Smith, & Weiler, 2013; Tonge, Ryan, Moore, & Beckley, 2014).

The desire to specifically undertake pro-environmental behaviour can also be seen through one's commitments to action, as well as one's perceived connection to nature. Commitment to enact a particular behaviour, such as making a donation to an environmental organization, has been shown to stimulate behaviour change (Lokhorst, Werner, Staats, van Dijk, & Gale, 2013; Osbaldiston & Schott, 2012). In addition, researchers (e.g. Schultz, 2002; Schultz, Shriver, Tabanico, & Khazian, 2004) have found that a sense of "connectedness to nature" correlates with increased behavioural intention. Similarly, Mayer and Frantz (2004) found that connectedness to nature correlates positively with self-reported pro-environmental behaviour. Nevertheless, motivation is a necessary, but not sufficient, condition for pro-environmental action.

Ability

Although motivation is critically important for pro-environmental behaviour, people also must have the ability to perform a given behaviour; yet, this ability can often be limited by barriers (Fogg, 2009; Monroe, 2003). Constraints, such as lack of information and time, are frequently viewed as impediments to fostering environmental behaviour (McKenzie-Mohr & Smith, 1999; Schultz & Oskamp, 1996). Barriers also may be cognitive, such as one's belief about how difficult a specific behaviour is to execute (Ajzen, 2002), or they may be institutional, such as lack of infrastructure to support an action (Blake, 1999).

One important aspect of ability relates to self-efficacy (Bandura, 2000), which describes a person's belief about whether she or he can be effective at taking an action. Self-efficacy, particularly as related to ability, is mediated by functional knowledge of the issue, knowledge of the skills and steps needed to address an issue or topic, and the physical or mental capacity to undertake the action. Bandura (2000) notes that perceived efficacy "plays a key role in human functioning because it affects behaviour not only directly, but by its impact on other determinants, such as goals and aspirations, outcome expectations, affective proclivities, and perception of impediments and opportunities in the social environment" (p. 75).

Researchers in persuasion and social marketing (Fogg, 2009; McKenzie-Mohr et al., 2011) specifically emphasize principles of ability and efficacy within the context of barriers. Removing barriers, educating people about the removal of those barriers, and enhancing normative support once those barriers have been removed may work concurrently to increase motivation and feelings of competency (Gardner & Stern, 2002; Monroe, 2003). As tourism audiences are often one-time and fleeting, it remains challenging to know which barriers they may encounter when returning home and how best to

provide social supports once those barriers have been diminished or removed. Thus, it is important to facilitate overcoming barriers by providing information on how to make a behavioural commitment and then undertake a chosen behaviour, information that reduces the time and effort required and provides a choice in behaviours to pique interest among different tourists.

Prompting or triggering

As noted previously, even when strong motivation and high ability are present, pro-environmental behaviours do not always occur. Often a prompt or a trigger – “something that tells people to perform a behaviour now” – is needed (Fogg, 2009). In a meta-analysis of intervention studies examining pro-environmental behaviour, Osbaldiston and Schott (2012) found that prompting was one of the most effective elements in stimulating new environmental behaviour. Prompting was particularly effective when combined with making a behaviour easy to perform (e.g. providing the necessary tools to a community, such as energy-saving light bulbs).

Prompts for promoting pro-environmental behaviours often take the form of posted signs or instructions. Such prompts can be beneficial for encouraging activities, such as recycling and composting (Austin, Hatfield, Grindle, & Bailey, 1993; Sussman, Greeno, Gifford, & Scannell, 2013; Werner, Rhodes, & Partain, 1998), as well as for promoting health outcomes. In recent systematic health-science reviews (Fry & Neff, 2009; Webb, Joseph, Yardley, & Michie, 2010), technological prompts (e.g. emails, text messages, and texts combined with Internet-based interventions) were found to promote positive health behaviours. These technologically based prompts not only offer a convenient and low-cost mode of delivering messages (Fry & Neff, 2009), but they also can be persuasive and interactive (Fogg, 2002).

To date, research on the role of technology in tourism has almost exclusively focused on tourists’ use of technology to plan excursions or develop follow-up blogs (Bosangit, Dulnuan, & Mena, 2012; Litvin, Goldsmith, & Pan, 2008; Xiang & Gretzel, 2010). The influence of technology for prompting and maintaining post-trip behaviour change has received little attention in the tourism context, yet research elsewhere has indicated that online social networking activity is closely linked to both social and political activism (Conroy, Feezell, & Guerrero, 2012; Rainie, Smith, Schlozman, & Verba, 2012); thus, these examples provide indications that social media activity may also be linked with environmental activism. Kristofferson, White, and Peloza (2013), for example, found that when people publicly displayed support for causes on social networks, they were more likely to take meaningful action than when they did not post that information publicly.

Similarly, the presence of “Likes” on Facebook can subtly influence the attitudes of others in one’s social network (Egebark & Ekstrom, 2011; Schöndienst, Kulzer, & Günter, 2012); in such a way, this may influence differential valuation of the liked content. These prompts, or “nudges,” can be effective for stimulating the behaviour of others in a network (e.g. Harris & Dennis, 2011), creating an effect that researchers acknowledge may be even stronger among close ties in one’s social network. With the rise of “social buttons” as a means of tracking activity and implied behaviour (Gerlitz & Helmond, 2013), research on the ways that “Liking” activity is both prompted – and prompts subsequent activity – is, indeed, timely. NBT, in particular, may provide ripe territory for encouraging and supporting pro-environmental behaviours, while mobile or Internet platforms may further scaffold and support the engaging, enjoyable, educational, and exciting aspects of a nature-based experience, providing additional means for stimulating those behaviours.

Method

Applying these approaches and heeding the call for post-visit “action resources” (from Ballantyne & Packer, 2011), we worked with Año Nuevo State Park in California (USA) to motivate subsequent environmentally related behaviour among visitors. Our research addresses the question: how does technology-based behavioural messaging after a nature-based tourism experience affect individual, everyday, pro-environmental behaviour?

We pursued this overarching research question through four sub-research questions:

- (1) Among tourists visiting Año Nuevo State Park, are there positive changes or spikes in connectedness to nature, environmental attitudes, and self-efficacy immediately following the park visit, and do those positive changes persist after a three-month intervention?
- (2) Will tourists who experience such a spike during their visit be more likely to commit to pro-environmental behaviour after their visit?
- (3) Will tourists who agree that prominent aspects of their visit were engaging, enjoyable, educational, and exciting be more likely to commit to undertaking environmentally related behaviour after their visit?
- (4) Will tourists who receive a post-visit behavioural intervention be more likely to actually undertake such behaviour?

Study site

This study took place at Año Nuevo State Park, located on California’s rocky Central Coast. Año Nuevo is well known for the opportunities it provides to see large colonies of the charismatic northern elephant seal. Año Nuevo offers a structured tourism experience, guided by highly trained volunteer docents,¹ to the park’s 150,000 annual visitors, the majority of which arrive during the peak season of December through February (California State Parks, 2008). The visitors participate in a 2.5-hour tour to view the lively elephant seal rookeries.

During the study, our researchers observed the docents’ presentations, documented the conservation and sustainability messages presented by the docents to the visitors, and reviewed the Año Nuevo State Park docent training manual (California State Parks, 2011). In alignment with that manual, tours focus on natural and cultural history with topics including ecology; marine mammal (primarily elephant seal) life cycle, behaviour, and physiology; geology; and various local human settlements. Park administrators encourage docents to include conservation messaging that connects with themes of the site, such as leaving beaches and trails trash-free and promoting responsibility for the natural world by protecting areas like Año Nuevo. Correspondingly, docents and park rangers were frequently observed taking care to control visitor impact, enforcing restrictions on activity to avoid disturbing the elephant seals, and explicitly educating visitors about the importance of these site-specific and seal-specific practices. On the docent-led tours observed, though, conservation messages, and specific behaviours or actions that visitors may take, either on site or once returning home, were rarely emphasized during the tour experience. However, given the large number and diversity of docents, as well as the docent training manual’s recommendation to include conservation messaging, it is quite likely that many docents do indeed highlight conservation action options.

Research design

Our research, which took place during four weekends in January and February 2012, followed a quasi-experimental design with three stages (Figure 1). In Stage I, we employed a purposive sampling technique to recruit participants to complete pre-tour and post-tour surveys in the docent-led tours. During the first weekend, we piloted our data collection methods and refined our survey instruments. The main study (including the results reported in this article) took place over the following three weekends.

After completing the post-tour survey on site, we asked visitors to consider committing to one of six environmentally related actions once they returned home. (See subsequent section on “Action Commitment”.) Thus began Stage II of the study, which consisted of an intervention aimed at supporting visitors’ pro-environmental behaviours. Invoking Fogg’s behavioural model (2009), this intervention included the on-site commitment by visitors to take environmental action, followed by persuasive messaging over a five-week post-visit period. Next, the research team entered survey data, contact information, and visitors’ selected actions into a database. The research team then randomly assigned visitors to either an experimental or a control group for follow-up messaging.² The messaging occurred via either email or text message, depending on each visitor’s stated preference. Because more than half of the visitors indicated a commitment to taking more than one post-visit action, we randomly chose one of each person’s selected actions as the action of interest for our follow-up prompts. Two weeks following the park visit, participants in the experimental group received the first message prompting them to take their selected action. The experimental group received up to three additional prompts, spaced one week apart. Participants who responded confirming that they had taken the action or requesting that they be dropped from the study received no further prompts. Participants in the control group received no prompts.

Stage III consisted of a delayed post-tour survey (i.e. “final survey”). At the conclusion of the three-month time window for completing their selected action, participants in both the experimental and the control groups were contacted to complete the final survey online.

Participants

A total of 516 visitors completed the pre-tour survey and 440 completed the post-tour survey (Table 1). There were 362 visitors who completed both pre-tour and post-tour surveys. Of the 362 who completed both surveys, 229 committed to take action and provided valid contact information. Of those, 94 completed the final survey, thus participating in all three stages of the study. The 94 participants represented slightly more than 40% of participants who committed to do the post-visit behavioural intervention.

	<u>Stage I</u> (2-3 hour park tour) →			<u>Stage II</u> (3-month intervention) →		<u>Stage I</u> (online follow-up)
	Pre-Tour Survey	Guided Tour	Post-Tour Survey	Action Commit	Action Prompts	Final Survey
Experimental	x	x	x	x	x	x
Control	x	x	x	x		x

Figure 1. Research design.

Table 1. Number of participants in each stage of the study, overall, and for panel participants (in parentheses).

Stage I				Stage II			Stage III
Pre-survey	Tour	Post-survey	Both pre- and post-survey		Action commitment	Treatment prompts	Final survey
516 (94)	516 (94)	440 (94)	362 ¹ (94)	Experimental group	169 (67)	169 (67)	67 (67)
				Control group	60 (27)	NA (NA)	27 (27)
				Total	229 (94)	229 (94)	94 (94)

¹ The number 362 reflects visitors who completed both the pre-tour and post-tour survey. The sample size is higher for each individual survey (pre- or post-) because some visitors only completed the pre-tour survey and some only completed the post-tour survey.

The analyses presented here focus primarily on the latter group, as shown in parentheses in Table 1 ($n = 94$). We focus on these panel participants because we can consider their change in environmental behaviours, attitudes, self-efficacy, and connectedness to nature over the duration of the study. (See Table 2 for panel participant demographics.)

Instrument design

Our surveys gathered data about visitors' environmental behaviour, attitudes, self-efficacy, connectedness to nature, demographics (age, gender, education), experiences during the Año Nuevo tour, and the intervention. We also asked with whom the participants had taken the tour, whether they had visited Año Nuevo State Park or other California State Parks previously, and how many times per year they visit California State Parks (in total).

Table 2. Participant demographics and prior visits to state parks for panel participants.

Age (≥ 18)	($n = 91$)*
Mean (sd)	Mean = 40 (sd = 14)
	Range: 19–72
Gender	($n = 94$)
Female	66.0%
Male	34.0%
Education level	($n = 94$)
High school and/or some college	13.8%
College degree or higher	86.2%
Past visit to another CA State Park?	($n = 94$)
No	4.3%
Yes	95.7%
First visit to Año Nuevo?	($n = 94$)
No	46.8%
Yes	53.2%

Note: * n varies from total n due to missing data.

A sample survey is included in Supplemental Data in the online version of this paper, as is other additional material.

Environmental behaviour

We collected data on visitors' general environmental behaviours in the pre-tour and final surveys. Visitors were asked to circle how often, in the past year, they undertook each behaviour using a five-point Likert-type scale, with "Not Applicable" being one option. Self-reported environmental behaviour items were modified from existing research (Dierking, Adelman, Ogden, Lehnhardt, Miller, & Mellen, 2004; Powell & Ham, 2008; Schultz, Gouveia, Cameron, Tankha, Schmuck, & Franěk, 2005). In addition, we included 15 specific items related to the behaviours in our intervention. These items, which functioned as an inventory of various commonly described environmental behaviours, had strong reliability ($\alpha = .854$, $n = 362$).

Environmental attitudes and self-efficacy

Visitors' environmental attitudes and self-efficacy were queried on pre-tour, post-tour, and final surveys. To develop these items, we modified an existing instrument from Ballantyne et al. (2011), whose items have been used in previous studies. They used the instrument to study visitors' attitudes, awareness, and understanding of environmental protection and wildlife conservation during a visit to a marine wildlife park. We modified their instrument to our context by including statements about concern for marine wildlife, interest in wildlife protection, understanding the impact of one's actions, and perceived ability to conserve resources. Three of the items focused primarily on attitudes about wildlife conservation, and one item focused on self-efficacy in conservation action (Bandura, 2004).³ We asked participants about their level of agreement on a seven-point Likert-type scale. The reliability of the attitude scale was strong, with $\alpha = .777$ (three items, $n = 354$).⁴ Self-efficacy was addressed through only one item, so scale reliability cannot be reported.

Connectedness with nature

We inquired about visitors' connectedness to nature on all three surveys. We used Schultz's "Inclusion of Nature in Self" (INS) scale to explore participants' relationship with nature (Liefländer, Frölich, Bogner, & Schultz, 2013; Schultz, 2002). This single-item graphical depiction includes a seven-point range of intersection between two circles, one representing "self" and the other representing "nature." The item's instructions state, "Please circle the picture [below] that best describes your relationship with the environment (nature) (self = you; nature = the environment)". On one end of the scale, the circles are separate but touching; on the other end of the scale, the circles overlap entirely. Although the scale is only a single item, Schultz (2001) found it to correlate significantly with self-reported environmental behaviour ($r = 0.41$, $p < .001$) and concern for living beings ($r = 0.31$, $p < .001$). In addition, Mayer and Frantz (2004) found the INS scale to be an acceptable measure of connectedness to nature when compared with their Connectedness to Nature (CNS) scale.

Tour experience

In the post-tour survey, we measured visitors' experiences at Año Nuevo with items adapted from Ballantyne et al. (2011). The 11-item Likert-type scale measured

participants' level of agreement on items such as having a good view of the animals, having an enjoyable experience, having an engaging docent, and learning new things about marine mammals and conservation issues. The reliability was acceptable (11 items, $\alpha = .731$, $n = 353$).

Action commitment

After adult visitors completed the post-tour survey, we asked them to complete an "Action Commitment" sheet. In selecting the environmentally related actions to include, our research team followed a five-step process.

In Step 1, our research team used prior research on pro-environmental behaviour (e.g. Stern, 2000) to create a taxonomy of behaviours based on various types and spheres of behaviour, including personal action, community action, and national action. In Step 2, we narrowed the list to focus on actions related to Año Nuevo; for example, "Support an environmental organization" became "Donate \$5 online to support Año Nuevo State Park." In Step 3, we focused on making the behaviours very specific and actionable (Fogg, 2009) such that the behaviour "Pick up litter", for example, became "Pick up five pieces of litter around your neighbourhood sometime in the next two weeks". This aligns with theoretical arguments that behavioural options should be specific, accessible, and doable (Fogg, 2009; Monroe, 2003), and also aligns with other theoretical perspectives emphasizing the importance of behaviours being defined clearly in terms of target audience, action, context, and time (e.g. McKenzie-Mohr et al., 2011).

In Step 4, we prioritized the behaviours based on this matrix of criteria: impactful for the environment, relevant to both their home environment and the Año Nuevo experience, and feasible to undertake (Ardoin, Heimlich, Braus, & Merrick, 2013; Fogg, 2009; Steg & Vlek, 2009). In Step 5, we reduced the number of potential actions to six to fit the criteria of being feasible for visitors to undertake and relevant to both their home environment and the Año Nuevo experience. The final actions selected for the intervention were as follows:

- Visit another California State Park within the next month. (A social behaviour with a direct, place-based connection to a natural-resource/conservation-related place);
- "Like" the Año Nuevo State Park Facebook page. (An electronic, online behaviour with a normative, community-building element);
- Write to your representative about the importance of supporting California State Parks. (Sample letter provided.) (A political, activist behaviour);
- Donate \$5 online to support Año Nuevo State Park. (A philanthropic behaviour);
- With your child, pick up five pieces of litter around your neighbourhood sometime in the next two weeks. (A direct eco-management behaviour);
- Return to Año Nuevo with one friend within the next three months. (A social behaviour with a direct, place-based connection to this natural-resource/conservation-related place).

Treatment prompts

The post-trip intervention consisted of mobile and email "triggers" that participants received after their visit (see Supplementary Online Materials). These prompts were designed to remind the visitors of their commitment and tailored to the visitors' selected actions.

The mobile and email prompts contained hyperlinks to websites where participants could take action directly. Three of the actions, namely "Return to Año Nuevo with one

friend”; “With your child, pick up litter”; and “Visit another California State Park”, hyperlinked to websites that the research team created for the intervention. For the action “Visit another California State Park”, for example, participants were hyperlinked to a website that provided direct links to six parks close to Año Nuevo. The other three actions (“Like Año Nuevo Facebook page”; “Donate \$5 online to support Año Nuevo State Park”; and “Write your representative about the importance of supporting California State Parks” included hyperlinks to established websites, specifically Facebook, the association collecting donations for Año Nuevo State Park, and the California State Park Foundation page, which provided a template for an email and letter, respectively.

Analysis

We used SPSS Version 21 to analyse data. Due to pairwise exclusions in analyses tests, the actual sample sizes vary slightly from the total sample. We conducted non-parametric tests, as appropriate for skewed data; these tests are more conservative and do not assume normally distributed values. We used a variety of non-parametric tests to examine our hypotheses, including Friedman’s ANOVAs (with Wilcoxon for follow-up pairwise comparisons), Kruskal–Wallis, Mann–Whitney, and/or Pearson’s chi-square. The positive skew of items related to visitors’ enjoyment of their tour experience is not unusual (Ryan, 1995). Data skewed in the positive direction were not surprising; we assumed that visitors participating in this type of park experience would enjoy being in nature, with a unique wildlife experience and well-trained interpreters.

Results

We divide the results into three main categories that align with the study’s research questions: Spikes, Commitment to Take Action, and Action Taken.

Spikes

Based on prior literature, we anticipated that there would be spikes in connectedness to nature, environmental attitudes, and self-efficacy immediately following the visit to Año Nuevo State Park. We were interested to see if these spikes persisted after the three-month intervention. They were measured through increases in the relevant measures from the pre to post to final surveys ($n = 94$). Although the majority of the measures revealed no significant change (see Table 4), we found that visitors’ connectedness to nature did change significantly throughout the study.

Connectedness to nature

Visitors’ connectedness to nature changed significantly during the study ($\chi^2 = 18.200$, $df = 2$, $p < .001$, $n = 91$), indicating a temporary spike. Although not substantial, visitors’ pre-tour connectedness to nature was significantly lower than their immediate post-tour connectedness ($M = 5.00$ and $M = 5.00$, respectively, $Z = -2.298$, $p = .022$, $n = 91$). Although the medians are the same between pre-tour and post-tour, the slight increase between pre-tour and immediate post-tour can be seen in visitors who reported completely overlapping circles of self and nature (14.3% and 15.4%, respectively). Visitors’ immediate post-tour connectedness to nature was significantly higher than their connectedness to nature three months after their tour at Año Nuevo ($M = 5.00$ and $M = 4.000$, respectively, $Z = 2.928$, $p = .003$, $n = 91$). We found no significant difference

between initial pre-tour connectedness to nature and connectedness three months post-tour ($M = 5.000$ and $M = 4.000$, respectively, $Z = .630$, $p = .529$, $n = 91$).

Environmental attitudes and self-efficacy

Although visitors' environmental attitudes also changed significantly at the end of the three-month intervention ($\chi^2 = 8.957$, $df = 2$, $p = .011$, $n = 90$), there was no evidence of a spike in environmental attitudes, either temporary or long-lasting. There was no significant difference between visitors' immediate pre-tour attitudes and their post-tour attitudes ($Z = -1.453$, $p = .146$, $n = 90$), nor were there any differences between pre-tour attitudes and their attitudes three months post-tour ($Z = .783$, $p = .434$, $n = 90$). However, visitors' immediate post-tour attitudes were significantly more positive than they were three months post-tour ($M = 6.667$ and $M = 6.333$, respectively, $Z = 2.2336$, $p = .025$, $n = 90$). There was no significant change in self-efficacy over the course of the study ($\chi^2 = 1.060$, $df = 2$, $p = .588$, $n = 88$).

Commitment to take action

We postulated that tourists who experienced a spike in connectedness to nature, environmental attitudes, and/or self-efficacy during their visit to Año Nuevo State Park would be more likely to commit to action than those who did not experience a spike. Because all panel participants ($n = 94$) committed to action, we tested this hypothesis with the larger sample of participants who completed both the pre-tour and post-tour surveys ($n = 362$).

As shown in Table 3, the percentage of visitors who committed to action differed depending on whether they showed an increase, decrease, or no change in their connectedness to nature, environmental attitudes, and environmental self-efficacy. Significant differences existed in visitors' commitment to action with respect to connectedness to nature ($\chi^2 = 6.348$, $df = 2$, $p = .042$, $n = 350$). As postulated, commitment to take action was significantly more common among those visitors who had an increase in connectedness to nature, compared with those whose connectedness stayed the same (89.6% and 76.7%, respectively, $Z = -2.457$, $p = .042$). Owing to the extremely small sample size ($n = 11$), the few visitors whose connectedness decreased did not significantly differ in terms of action commitment from either those visitors whose connectedness stayed the same (72.7% and 76.7%, respectively, $Z = -.320$, $p = 1$, $n = 273$) or increased (72.7% and 89.6%, respectively, $Z = .196$, $p = .587$, $n = 88$).

Environmental attitudes and self-efficacy

The majority of visitors "stayed the same" in terms of both environmental attitudes (45.8%, $n = 356$) and self-efficacy (63.7%, $n = 353$; see Table 4). Visitors' commitment to action did not differ significantly with regard to changes in their pro-environmental

Table 3. Percentage of visitors who *committed to action* in relation to type of change in their connectedness to nature, environmental attitudes, and environmental self-efficacy.

	Increased (%)	Stayed the same (%)	Decreased (%)
Connectedness to nature ($n = 350$)	89.6	76.7	72.7
Attitudes ($n = 356$)	72.2	81.0	84.7
Self-efficacy ($n = 353$)	85.2	79.1	74.3

Table 4. Effect of action prompts: Comparing the experimental and control groups.

	% Took action: experimental group (<i>n</i> = 67)	% Took action: control group (<i>n</i> = 27)	χ^2 (1)	<i>p</i>
Visit another California State Park within the next month	74.1% (<i>n</i> = 27)	91.7% (<i>n</i> = 12)	1.580	.394
“Like” the Año Nuevo Facebook page	93.8% (<i>n</i> = 16)	50.0% (<i>n</i> = 6)	5.620	.046*
Write your representative about the importance of California State Parks	100% (<i>n</i> = 5)	50.0% (<i>n</i> = 2)	2.920	.286
Donate \$5 to support Año Nuevo State Park	63.6% (<i>n</i> = 11)	0% (<i>n</i> = 2)	2.758	.192
With your/a child, pick up five pieces of litter around your neighbourhood sometime in the next two weeks	75.0% (<i>n</i> = 4)	66.7% (<i>n</i> = 3)	.058	1.000
Return to Año Nuevo with a friend within the next three months	50.0% (<i>n</i> = 4)	0% (<i>n</i> = 2)	1.500	.467

Note: * Significant at $p < .05$. Given that some of the contingency tables for actions analysed separately had counts less than five in one of the cells, we used Fisher’s exact test to calculate significance.

attitudes ($\chi^2 = 5.058$, $df = 2$, $p = .080$, $n = 356$) or self-efficacy ($\chi^2 = 2.218$, $df = 2$, $p = .330$, $n = 353$).

Tour experience

Analysis of the post-tour survey data indicated that most visitors enjoyed the tour ($M = 6.182$, $n = 361$). As postulated, we found that visitors who found the experience more engaging, enjoyable, educational, and exciting were significantly more likely to commit to taking action ($U = 12,364$, $Z = 2.183$, $p = .029$). In analysing each item individually, three items were significantly related to commitment to take action, and all the items centred on the visitors’ emotional experiences with the wildlife they encountered during the tour. The three items were (1) “It was exciting to see live animals” ($Z = 2.39$, $p = .017$, $n = 361$); (2) “I felt an emotional connection with the animal/s I saw” ($Z = 2.87$, $p = .004$, $n = 359$); and (3) “Something I saw in relation to the wildlife made me feel sad” ($Z = 2.287$, $p = .023$, $n = 361$).

Action taken

Overall, 73.4% of the panel took the “assigned” action ($n = 94$). As discussed previously, some of the visitors selected multiple actions. However, due to study logistics, we prompted them only on one of the actions they selected (i.e. their “assigned” action). Figure 2 shows the frequencies of actions visitors either selected or were assigned randomly (if they chose multiple actions), and the frequency of actions taken by them. Figure 3 shows the corresponding percentage for each action taken.

Experimental versus control

The experimental and control groups had 67 and 27 visitors, respectively ($n = 94$). There was no significant difference in the percentage of those who took their selected action

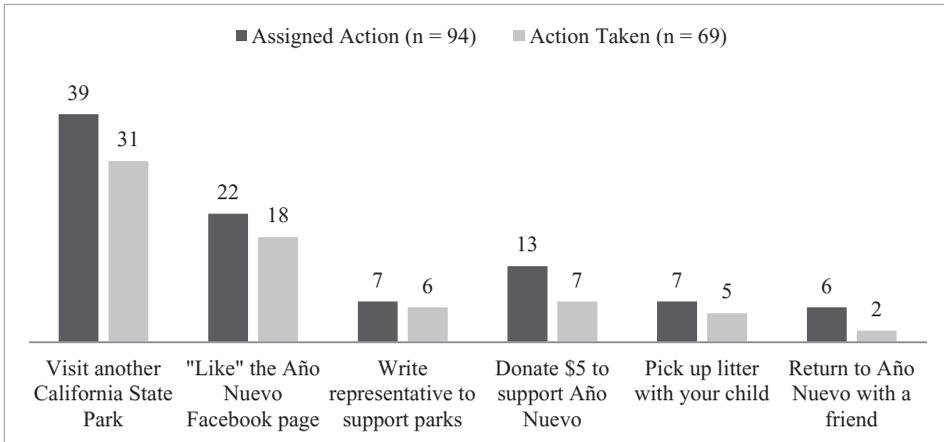


Figure 2. Number of visitors assigned to each action and number who then took action.

between the experimental and control groups (77.6% vs. 63.0%, $\chi^2 = 2.12$, $df = 1$, $p = .146$, $n = 94$). However, when we analysed the actions separately (see Table 4), the experimental group was significantly more likely than the control group to have taken one of the actions, namely to “Like the Año Nuevo Facebook page” ($\chi^2 = 5.620$, $df = 1$, $p = .046$, $n = 22$; see Table 4). Only one of the actions, “Visit another California State Park within the next month”, showed a higher percentage in the control group, though not significantly so. However, note that this set of comparisons is affected overall by the small sample size of the control group.

To better understand what motivates visitors to take pro-environmental action, we conducted several exploratory *post hoc* analyses in relation to demographics, tour experience, and repeat visitation. As reported in the literature review, prior studies suggested that these aspects of nature-based tours are, at times, important for motivating environmental action, and, thus, were potentially interesting variables to consider.

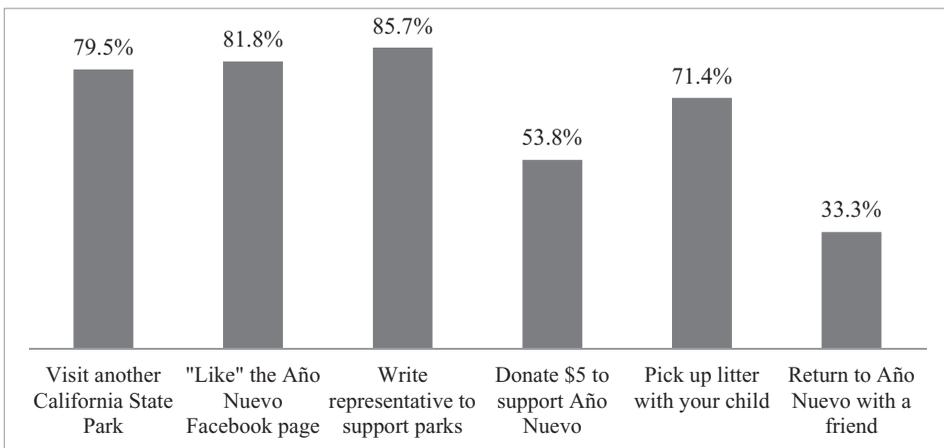


Figure 3. Percentage of actions taken for each action among panel participants ($n = 94$).

Tour experience

When we analysed the 11-item tour experience as one scale ($\alpha = .680, n = 94$), visitors were not significantly more likely to take action when reporting their tours, overall, as engaging, enjoyable, educational, and exciting ($U = 1.504, p = .220, n = 94$). However, when we analysed each item individually, visitors were significantly more likely to take action in association with two items: “I had an enjoyable experience” ($U = 4.011, p = .045, n = 94$) and “It was exciting to see live animals” ($U = 4.931, p = .026, n = 94$).

Repeat visits and demographics

Repeat visitors to Año Nuevo State Park were significantly more likely to take action than first-time visitors ($\chi^2 = 4.839, df = 1, p = .028, n = 94$). In addition, visitors who had visited other California State Parks were more likely to take action than visitors who had not been to another California State Park ($\chi^2 = 5.014, df = 1, p = .025, n = 94$).

Discussion

In this study, we explored the effects of a technology-based behavioural intervention with nature-based tourists. Overall, we found that although our intervention was not particularly effective in influencing all of the desired actions, it was effective for one: the act of “Liking” the Año Nuevo Facebook page. This finding is not surprising given that “Liking” a Facebook page is a very simple action, takes little time, and – similar to our intervention, – is, itself, technology-based. Our finding supports Fogg’s (2009) technology-related behavioural model and other research on environmental behaviour change (e.g. Lehman & Geller, 2004; Schultz & Kaiser, 2012), suggesting that prompting is most effective when the action is simple and can be taken in the moment when the person is prompted, even on the device from which the person is prompted. In this case, “Liking” can be done immediately from the device on which visitors received the email or text message.

Although the Facebook action may initially seem more passive and less effective than the other behaviours with regard to its effect on the environment, this action has an interesting functionality. Its ability to persist over time may act as both a “push” and “pull” strategy (Kitchen & Schultz, 2009). Once a visitor “Likes” the Año Nuevo page, the park’s updates appear in the visitor’s Facebook news feed, providing a “push” and reminding the visitor of his or her connection to Año Nuevo, whether it has been one month or two years since the initial park visit. If the visitor desires to read more about Año Nuevo’s update, such as the birth of the first elephant seal pup of the season, and clicks on the update, the visitor “pulls” himself or herself to the Año Nuevo home page, seeing all of Año Nuevo’s posts, in addition to comments from other visitors. This helps maintain and grow a community of visitors interested in Año Nuevo (Rainie et al., 2012), and nudge them towards supporting Año Nuevo (Harris & Dennis, 2011). If the visitor comments on the park’s update, then the post appears in the visitor’s newsfeed, increasing the park’s profile to all of the visitor’s “friends”.

Building on this theme, the “Liking” action makes visible one’s interests and activist commitments (Conroy et al., 2012; Rainie et al., 2012) to all of that Facebook user’s friends. In the process, the approval and broadcasting of the park’s conservation message by a visitor provide a type of injunctive social norm, itself a powerful influence on behaviour change (Reno, Cialdini, & Kallgren, 1993). In addition, by “Liking” the park, a visitor projects an identity of favourable association with Año Nuevo State Park, and of state

parks, in general (Zhao, Grasmuck, & Martin, 2008). Finally, tourists who are pleased with their Facebook relationships with a tour operator, in this case, the posts by Año Nuevo State Park's rangers and/or docents, tend to show loyalty to that tour operator (Senders, Govers, & Neuts, 2013), thereby increasing the visibility of the operator, or as is the case here, Año Nuevo State Park's conservation message.

Although we found, overall, that neither the prompting intervention nor changes in connectedness to nature, attitudes, or self-efficacy were significant in visitors' taking action, two other interesting influences surfaced. First, taking action may clearly be motivated by one's relationship with the place. In this vein, we found that repeat visitors to Año Nuevo State Park, as well as to other California State Parks, were significantly more likely both to commit to engaging in new environmental behaviours and to actually follow through with taking action.

Second, while we found that, overall, visitor experience was not significantly associated with taking action, as others have also reported (e.g. Ballantyne et al., 2011; Falk & Dierking, 2000; Orams, 1997), we did find that survey items addressing emotional connections to wildlife were related to both behavioural intention and taking action. Research has shown that animals invoke the human desire to engage socially and form relationships (Myers & Saunders, 2002) with the non-human world. Visitors' excitement at seeing live animals may stir a sense of care and a desire to protect animals and their habitats; this feeling may lead to further conservation learning and behaviour (Ballantyne, Packer, Hughes, & Dierking, 2007; Myers & Saunders, 2002; Zeppel, 2008). Furthermore, it may be that the type of animal influences the strength of emotional response and, thus, the probability of action. In the case of Año Nuevo State Park, northern elephant seals – being impressive, charismatic, and unusual both physically and physiologically – may act as a flagship species (Walpole & Leader-Williams, 2002), promoting awareness for conservation issues.

Our study produced mixed results with regard to spikes in environmental connectedness, attitude, and self-efficacy. We found that, while connectedness to nature increased during the nature-based tour, that same connectedness decreased three months later. This finding reconfirms the importance of physical exposure to natural places, even if the exposure is short-lived. Indeed, we feel it is impressive that a 2.5-hour visit to a coastal state park was sufficient to strengthen visitors' relationship to nature. We found that pro-environmental attitudes and self-efficacy stayed roughly at the same level throughout the experience. Given the pre-existing high median values of these variables, the lack of spikes was not particularly surprising.

Limitations

The logistics of the site prevented collection of a randomized sample. We invited every adult visitor who arrived at the staging area at least 10 minutes before their tour to participate in the study, resulting in a purposive intercept sample. However, approximately one-third of visitors arrived to the park just prior to their tour, leaving little time to complete a pre-tour survey.

In addition, we relied on self-reported environmental behaviour data, rather than tracking actual performance of these behaviours. This is a challenge common to many studies of environmental behaviours (e.g. Camargo & Shavelson, 2009; Corral-Verdugo, 1997). Since we focused on visitors' behaviours once they returned home, direct observation of behaviour changes was not feasible.

Conclusions and implications

This study contributes to the modest body of scholarship that assesses environmental behaviour change as a result of nature-based tourism experiences. It is also one of the few to employ a technology-based behavioural intervention and a delayed follow-up survey. Our findings are aligned with prior research suggesting that post-visit action resources can be a critical element in supporting certain pro-environmental action after NBT experiences (Hughes, 2011; Hughes, Packer, & Ballantyne, 2011), although effectively scaffolding, extending, and maintaining those new behaviours remain a challenge. In addition, our findings suggest that pro-environmental action among the visitors in our sample resulted from a combination of factors, including easy-to-enact social-media-focused behaviours, repeat visitation, and tours that fostered an emotional connection to animals. The idea that a combination of factors can motivate and support behaviour change is well documented (Lokhorst et al., 2013; Osbaldiston & Schott, 2012) and may produce a synergistic effect for supporting pro-environmental behaviours.

These findings have implications for the design of tours and interpretive experiences in various contexts for nature-based tourism and informal environmental education. For example, our results imply that parks would do well to link their conservation messaging to visitors' close, personal experiences with fauna, especially in situations where an emotional connection occurs. Also, given the effect of repeat visitation on taking action, NBT sites would also do well to suggest other places for departing tourists to visit, providing an ecology of experiences⁵ that support connecting to nature. In these suggestions and possibilities for connection with other sites and experiences, we also note that interesting links occur with the place attachment literature (e.g. Lewicka, 2011; Trentelman, 2009).

In addition, parks may want to provide simple actions that relate directly to the visitors' experiences and remind visitors regularly of those experiences and commitments. In this way, social media – such as Twitter, Facebook, and Instagram, among others – may be effective in helping parks capitalize on the push–pull strategies that are designed into technology platforms. Social media also provides a place to build community and norms around a place or an issue. Moreover, as handheld technologies, such as smartphones, become more ubiquitous during all phases of the tourism experience, they may be particularly useful for educating and supporting visitors (Wang, Park, & Fesenmaier, 2012). Great potential exists for leveraging these technology-based tools to enhance the visitor experience and nurture commitment to environmental action among nature-based tourists. In this way, parks, reserves, and other NBT sites can capitalize on the excitement, enthusiasm, and passion that are generated in these environments. Finally, it is important to note that discussion of encouraging environmentally friendly behaviours amongst visitors, during and beyond the tourism experience, is becoming an important issue in the promotion of more sustainable forms of tourism, in general (Higham, Cohen, Peeters, & Gössling, 2013). This paper adds to that discussion by providing findings valuable beyond the confines of nature tourism.

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Supplemental data

Supplementary information associated with this article can be accessed here.

Notes

1. A title used in the United States for people who serve as guides, facilitators, and educators in museums, heritage sites, and parks, usually on a voluntary basis.
2. We did not create evenly sized control and experimental groups, as we wished to employ the persuasive messaging intervention with as many participants as possible. In this case, 20% of the entire sample was randomly assigned to the control group.
3. Two additional action-related knowledge items were eliminated from analysis, as their reliability index was low.
4. For all scales, pre-survey reliability is reported, except for the case of Visitor Experience, which was only measured in the post-tour survey.
5. Research shows that people develop their interests or fluency in a topic or skill through “learning ecologies”, a variety of contexts (such as tourism, museums, school, work, peers, virtual spaces) that offer occasions for learning (Barron, 2006; Falk & Dierking, 2012).

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