Introduction

Why do we conduct this systematic review:

- Leisure settings today, such as parks, zoos, and aquarium, provide millions of visitors with tremendous opportunities to enjoy and learn about nature.
- At the same time, leisure settings employ a wide range of communication interventions to encourage those visitors’ pro-environmental behaviors. Communication interventions include on-site personal interpretation, on-site videos, on-site interpretive signs, handouts, post-visit resources, and social media posts.
- A number of empirical studies have explored the effectiveness of these communication interventions to promote visitors’ pro-environmental behavior. Each selected study examines the performance of one or more communication interventions. A collection of findings from these empirical studies provides valuable insights regarding the impact of communication interventions on visitors’ pro-environmental behavior.

What research questions guided our project:

- RQ1: What communication interventions have been most effective to promote specific pro-environmental behavior (e.g., wildlife watching behavior, responsible hiking behavior)?
- RQ2: What common approaches have been used to assess the behavioral outcomes of environmental communication interventions?

Process of the systematic review

- To address our research questions, we developed search terms based on three themes: communication interventions, pro-environmental behavior, and settings.
- Search terms of this research topic were searched in the following nine databases: Academic Search Complete, Scopus, PsycINFO, Web of Science, Environment Complete, Hospitality and Tourism Complete, Leisure Tourism, Communication & Mass Media Complete, and Education Multi-Database Search (ProQuest). Titles, key words, and abstracts were included in the search. We also conducted two hand searches to see if we missed any relevant articles out.
- This systematic review only included empirical studies, English, peer reviewed journal articles between 2000 to 2020.
- In total, over 2,000 search results showed up. Using pre-determined inclusion criteria co-assessment by three readers, 51 articles were finally selected in the systematic review.
- The following criteria were used for co-assessment: (1) post-measurement conducted; (2) measuring behaviour-related outcomes: behavioural intentions and actual behaviour; (3) nature-focused.

Core findings: RQ 1

- RQ1-Finding 1: To promote easy pro-environmental behaviours (e.g., donating money, revisiting the park, telling others about the park), the following tools were reported as effective:
  1. Personal interpretation (Powell & Ham, 2008; Stern & Powell, 2013; Powell & Stern, 2013; Jacobs & Harris, 2014; Maltsh et al., 2016; Añó et al., 2017; García-Cegarra & Pacheco, 2017)
  2. Podcast (e.g., Kang & Greifzel, 2012)
- RQ1-Finding 2: To promote pro-environmental behaviours at home, post-visit action resources are most effective (Hughes, 2011; Whaiston et al., 2016; Buadakiel & Van Windek, 2017; Ballantyne et al., 2018; Mann et al., 2018).
- RQ1-Finding 3: To promote responsible wildlife viewing behaviour, the following communication interventions were reported as effective:
  1. Teleological signs, which feature instructions with explanation (e.g., Marshall et al., 2017), and signs with educational messaging (e.g., Marion et al., 2008)
  2. A campaign developed based on a persona-benefit message (e.g., Abrams et al., 2020)
  3. Personal contact with park staff (e.g., Marion et al., 2008)
  4. A short video (e.g., Finkler et al., 2019)
- RQ1-Finding 4: To promote responsible hiking behaviour, the following communication interventions were reported as effective:
  1. Personal contact with park staff (Kid et al., 2015)
  2. A combination of barrier and messaging (Hockett et al., 2017; Schwartz et al., 2018)
  3. An educational message using video and written statements (Guo et al., 2017)

Core findings: RQ 2

- RQ2-Finding 1 (see Figure 2): Quantitative research methods (i.e., survey and experimental design) are the main approach used to measure behavioral outcomes in current studies. Among the 51 articles we reviewed, 46 articles (90%) of them employed a quantitative research method. Five articles were mixed methods studies.

  In those quantitative studies, researchers usually quantified pro-environmental behavior. The common ways to understand the behavioural outcome are:
  1. The likelihood of performing a behaviour (i.e. behavioural intentions).
  2. The frequency of performing a behaviour
  3. The number of behaviour has been performed

  Based on current studies, we confirm that quantitative research methods are useful to understand the effectiveness of a communication intervention. However, future studies adopting a qualitative evaluation to better understand how (i.e., process) environmental communication influences visitors to facilitate social and behavior change.

- RQ2-Finding 2 (see Figure 3): Among the 51 articles, 30 articles investigated behavioural intentions. It is very common for current studies to ask visitors how likely they would like to perform a pro-environmental behaviour. However, the gap between intentions and actual behaviours was reported in many studies (e.g., Kolmossa & Agyeman, 2002; Jovan and Dolinar, 2014).

  Among the articles we reviewed, 21 of them (21%) studied actual pro-environmental behaviour or behavioural change. Approaches used to understand actual behaviour or actual behavioural change are:
  1. Longitudinal study: 9 studies
  2. Observation: 10 studies
  3. GPS device: 1 study
  4. Reporting behaviour to a website regularly (failed): 1 study

  More studies are needed to understand visitors’ actual behaviour. We recommended researchers who have funding support make a greater commitment to longitudinal studies or participant observation (combined with visitor survey) studies.

  We also observed a high attrition rate longitudinal studies; this is no uncommon in other fields of study. Based on recommendations from public health research, mobile apps may help record and remind visitors to perform pro-environmental behaviour at home regularly (e.g., Zhao, Freeman, & Li, 2016; Smyth, de Bloom, Symk, et al., 2020).