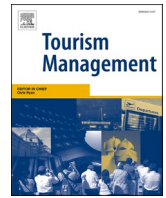


Contents lists available at [ScienceDirect](https://www.sciencedirect.com)

Tourism Management

journal homepage: www.elsevier.com/locate/tourman

Understanding how a commitment-based pledge intervention encourages pro-environmental tourist behaviour

Elizabeth Cooper^{a,*}, Sara Dolnicar^b, Bettina Grün^c^a Department of Management, Society and Communication, Copenhagen Business School, Dalgas Have 15, 2000, Frederiksberg, Denmark^b UQ Business School, The University of Queensland, Colin Clark, 39 Blair Dr, St Lucia, QLD, 4067, Australia^c WU Vienna University of Economics and Business, Welthandelspl. 1, 1020, Wien, Austria

ARTICLE INFO

Keywords:

Pro-environmental tourist behaviour
Behavioural intervention
Field experiment
Survey experiment
Psychological determinants of behaviour
Commitment
Pledge
Ascription of responsibility

ABSTRACT

Existing research shows that behavioural interventions can trigger pro-environmental behaviour change, but there is a lack of understanding around *how* these interventions change behaviour. In response to recent research that calls for studies to systematically test links between interventions and the psychological determinants of behaviour, this study 1) develops and tests a pro-environmental behavioural change intervention in the field, and 2) empirically investigates which psychological determinants the intervention triggers, using a survey experiment. Results indicate that the intervention promotes the pro-environmental target behaviour by increasing commitment. Commitment is predicted by beliefs (unaffected by the intervention) and ascription of responsibility (triggered by the intervention). The present study has practical significance by proving the effectiveness of an easily implementable intervention, as well as theoretical significance by providing empirical evidence about the hypothesised connections between interventions and the psychological determinants of behaviour.

1. Introduction

Several behaviour change interventions have proven to be effective in influencing pro-environmental behaviour (Nisa, Belanger, Schumpe, & Faller, 2019; Mertens et al., 2022; Souza-Neto et al., 2022; Greene, Demeter, & Dolnicar, 2024). Yet, in a recent synthesis of more than 50 existing reviews and meta-analyses on pro-environmental behaviour change, van Valkengoed et al. (2022) note that the psychological mechanisms underlying successful interventions are not well understood. They call for more research into the psychological determinants that trigger behaviour change. Specifically, van Valkengoed et al. (2022) argue that it is unclear which behaviour change interventions target which determinants of behaviour and identify an urgent need for systematic approaches of testing relationships between interventions and the psychological determinants of behaviour that they presumably trigger. As a foundation to this avenue of research, van Valkengoed et al. (2022) offer a classification linking interventions to determinants. The present study responds to this call by demonstrating that a commitment-based intervention (signing a pledge) significantly reduces the environmentally harmful behaviour of off-trail walking at a protected natural site, and by empirically testing four alternative

theoretical explanations for this (intervention-determinant relationships).

The context of our study is a protected natural area in Greenland, where visitor misbehaviour has been reported as a serious problem by local site managers (personal communication, 2022). The importance of mitigating visitor environmental impacts in protected natural areas is widely acknowledged across academia and industry (Bradford & McIntyre, 2007; Brown et al., 2010; Dragovich & Bajpai, 2022). Protection is critical because of the fragility of these environments, and their wildlife or cultural heritage. Recreational activity represents a major threat to protected natural areas, especially as tourism numbers increase (Bradford & McIntyre, 2007; Brown et al., 2010; Anderson et al., 2023). Managers of protected areas report as a specific problem visitor misbehaviour (Widner & Roggenbuck, 2000) that leads to flora destruction, fauna disturbance, habitat loss and host community disruption (Brown, 1999; Maréchal et al., 2016). One of the most damaging tourist behaviours is off-trail walking (Bradford & McIntyre, 2007; Lynn & Brown, 2003). Off-trail walking causes pollution, damages vegetation, disturbs wildlife (Bradford & McIntyre, 2007; Howard et al., 2021) and can create 'informal' trails, which are not professionally designed or maintained, and are therefore less environmentally

* Corresponding author.

E-mail addresses: eco.msc@cbs.dk (E. Cooper), s.dolnicar@uq.edu.au (S. Dolnicar), bettina.gruen@wu.ac.at (B. Grün).

<https://doi.org/10.1016/j.tourman.2024.104928>

Received 21 July 2023; Received in revised form 31 January 2024; Accepted 13 March 2024

Available online 10 April 2024

0261-5177/© 2024 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>).

sustainable (Milone et al., 2014). Preventing off-trail walking is essential for the preservation of protected natural areas.

Attempts to prevent off-trail walking in protected areas have traditionally used educational or interpretation-based interventions. The success rate of such approaches is low (Brown et al., 2010; Demeter et al., 2022; Grilli & Curtis, 2021), possibly because of a misguided assumption that visitors will spend time reading and absorbing the information (Bradford & McIntyre, 2007). More effective are ‘hard’ approaches, including sanction messages, prohibitive infrastructure, and human policing of behaviour (Fennell, 2001; Johnson & Swearingen, 1992). Such interventions are rarely practical because hiring staff and building infrastructure is expensive, and sanction messages are only powerful when it is realistic that the penalty will be carried out (Widner & Roggenbuck, 2000; Bradford & McIntyre, 2007). Previous research in natural area settings has suggested that, on sites covering a wide area or where presence of uniformed staff is lacking, visitors may perceive it as unrealistic that their misbehaviour will be witnessed, and sanction messages may as a result have limited effectiveness (ibid.).

What is urgently needed, therefore, is a ‘soft’ approach – a gentle behavioural change intervention that prevents off-trail walking and can realistically be implemented in protected natural areas. Developing, testing and understanding such an intervention is the aim of the present study. Specifically, this study develops a theory-informed pledge for tourists visiting the UNESCO World Heritage listed Ilulissat Icefjord in North Greenland. Particularly fragile in this area are the flora and cultural remains, and dangers associated with off-trail walking include the risk of tsunamis caused by calving icebergs, uneven ground and cliff edges, and the risk of getting lost. Off-trail walking has been reported as a problematic behaviour at this specific UNESCO site (personal communication, 2022). With the anticipated growth in tourism because of two new international airports opening in Greenland in 2024, concerns about off-trail walking are growing (ibid.), and the local tourism industry lacks the human and financial resources to implement hard measures.

A soft behaviour change intervention that has been used in the past is a pledge – a commitment typically expressed by signing a document. Some pledges have shown promise (Witvorapong & Watanapongvanich, 2020; Triyana & White, 2022; Webler & Jakubowski, 2016; Widner & Roggenbuck, 2000), but their effectiveness has not been proven using objectively measured behaviour, and the psychological determinants underlying them are not well understood. The current study contributes by systematically investigating the psychological determinants triggered by a pledge or commitment-based intervention. It thereby adds to theoretical understandings of the psychological processes behind behaviour change in response to interventions.

Methodologically, this study contributes to work investigating behavioural change interventions, by using an objective measure (GPS tracking) of the behaviour of interest (off-trail walking). Measuring the actual target behaviour – as opposed to relying on stated behaviour or proxy behaviours, such as signing the pledge – is necessary to determine with certainty whether a pledge-based commitment strategy works. The practical value of this study is immediate; if proven effective in the field, the pledge developed in this study can be deployed by natural sites globally as an affordable measure to prevent off-trail walking. In so doing, it can contribute to the achievement of United Nations Sustainable Development Goals 15 (“Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss”) and 12 (“Ensure sustainable consumption and production patterns”; United Nations, n.d.).

Commitment is defined as “a binding of the individual to behavioural acts” (Kiesler & Sakumura, 1966, p. 349). Commitment interventions involve individuals agreeing to perform a specific behaviour in advance of the opportunity to do so (Lokhorst et al., 2015; Wang & Katzev, 1990; Witvorapong & Watanapongvanich, 2020). The commitment can be mental, verbal or written, and made publicly or privately (Nisa et al.,

2017). Commitment-based interventions have been tested across various contexts: tax filers who pre-commit to saving their tax refund are more likely to do so (Roll et al., 2020); residents who commit to recycling paper are more likely to do so (Wang & Katzev, 1990); and hotel guests who commit to reusing towels are more likely to do so when their commitment is visible to other guests (Baca-Motes et al., 2013).

A pledge is a specific kind of commitment intervention in which commitment is usually expressed by signing a document. Although the overall effectiveness of pledges remains unclear (Heminger et al., 2016), they have shown promise in some behavioural contexts, including alcohol abstinence (Witvorapong & Watanapongvanich, 2020); smoking prevention (Triyana & White, 2022); deterring snorkelers from damaging corals (Webler & Jakubowski, 2016); and deterring visitors from stealing wood from a national park (Widner & Roggenbuck, 2000). However, none of these studies measured the target behaviour objectively, relying instead on self-reports (in the case of Witvorapong & Watanapongvanich, 2020), or on research assistants observing the target behaviour (in the cases of Triyana & White, 2022, Webler & Jakubowski, 2016; Widner & Roggenbuck, 2000). Also, the psychological determinants explaining the effectiveness of commitment-based pledge interventions have not been systematically investigated.

Because of their simplicity and cost-effectiveness, pledges are enjoying increased popularity. In the context of protecting natural areas, Iceland, Palau and Finland have all introduced a national destination pledge (Albrecht & Raymond, 2023). The effectiveness of these pledges has only been measured in terms of how many people have signed them (Medel, 2020). Their effect on behaviour is not known. In our field experiment, we test the actual effectiveness of a regional destination pledge on off-trail walking behaviour, measured via GPS tracking. We expect participants who sign the pledge to stray to a lower extent from the marked paths, and for less time, than participants who do not sign the pledge.

Additionally, we investigate the psychological determinants that drive the effectiveness of pledges on behavioural change, testing four alternative theoretical explanations that have been proposed in the literature.

- (1) Taking a pledge commits the pledger to the beliefs expressed in the pledge. To avoid the discomfort of cognitive dissonance, pledgers display the behaviour that aligns with the beliefs they have committed to, in line with Festinger’s (1957) cognitive dissonance theory.
- (2) Making a commitment increases the salience of an existing attitude or belief, increasing, in turn, the likelihood that this belief will guide subsequent behaviour (Halverson & Pallak, 1978).
- (3) Taking a pledge triggers injunctive norms which lead to pledgers adjusting their behaviour to align with the social expectations of their immediate peers, in line with Lewin (1947), Wang and Katzev (1990) and Triyana and White (2022).
- (4) Taking a pledge triggers ascription of responsibility in pledgers, making them feel personally responsible for the desired outcomes expressed in the pledge, in line with Heider’s (1958) attribution theory, and Alessa et al. (2003).

What is immediately apparent when comparing our conceptual model with that of van Valkengoed et al. (2022), is that our literature search links commitment-based interventions to different psychological determinants than van Valkengoed et al. (2022), who hypothesise that commitment-based interventions trigger personal norms and environmental self-identity. We find evidence in the literature that pledge interventions can work by creating cognitive dissonance, emphasising beliefs, triggering injunctive norms or ascription of responsibility. Van Valkengoed et al. (2022) define environmental self-identity as encompassing cognitive dissonance; they propose that pro-environmental behaviour can result from individuals striving for consistency between their actions and their self-image. The other psychological determinants

that we hypothesise can be triggered by pledge interventions (injunctive norms, ascription of responsibility and beliefs [made up of problem awareness and outcome efficacy, in line with Stern, 1999]) also appear in van Valkengoed et al.'s (2022) model, but are linked to different types of interventions. Perhaps the differences in the models produced by our respective literature searches can be attributed to the fact that, in the present study, we searched specifically for psychological determinants triggered by pledge interventions; van Valkengoed et al. (2022) use the broader category of commitment interventions, although they acknowledge that a pledge is an example of a commitment intervention. Regardless of the reasons behind them, these discrepancies go to show that existing literature is still unclear on the psychological processes underlying behaviour change in response to commitment-based interventions.

The four determinants proposed in our model have not yet been empirically tested, in terms of *if* and *how* they explain pledge interventions, and how they relate to the psychological construct of commitment. In a survey experiment, we investigate each of these theoretical determinants to assess the extent to which they may explain the effectiveness of a pledge. A secondary aim of the survey experiment is to serve as a manipulation check for our pledge intervention, testing if the pledge we developed is successful in increasing commitment. We expect respondents who are asked to sign the pledge to report higher commitment than respondents who are not asked to sign the pledge. We also expect respondents who are asked to sign the pledge, in line with the four alternative theoretical explanations, to report higher cognitive dissonance, beliefs, injunctive norms and ascription of responsibility than respondents who are not asked to sign the pledge. We expect the effects to differ across the four psychological determinants, and we also expect that the impacts of the psychological determinants differ when explaining the commitment levels of respondents who are asked to sign the pledge.

2. Materials and methods

2.1. Study context

Ilulissat is located on Greenland's west coast, 250 km above the Arctic Circle. It is Greenland's third largest town, and the nation's most popular tourist destination because of its proximity to the Ilulissat glacier – the most productive glacier in the northern hemisphere.

Situated about 40 km from the town itself, the glacier feeds icebergs into the Ilulissat Icefjord, which becomes significantly shallower at its mouth, where the town of Ilulissat is located. This results in hundreds of icebergs becoming stranded and easily observable just outside the town (see Fig. 1).

The Ilulissat Icefjord was inscribed as Greenland's first UNESCO World Heritage site in 2004. Its outstanding universal value is based on its contribution to our scientific understanding of glaciology and climate change, the rarity of the natural phenomenon that can be witnessed here, the fragility of the local ecosystem, and its heritage as a food source and settlement for thousands of years. The inscribed area of almost 400,000 ha encompasses some of the shore areas surrounding the icefjord, most notably the area known as Sermermiut, which is the context of the current study. This area was historically home to an Inuit settlement, and now offers the easiest way to visit the Ilulissat Icefjord on foot. Sermermiut is only 2 km from the town centre of Ilulissat and provides access to the edge of the icefjord via a 1.3 km long wooden boardwalk. Three other walking trails have been developed and marked nearby and are managed by the local municipality. Fig. 2 shows all walking trails.

Visitors walking off-trail has been reported as a problem by the local tourism industry. The new international airport in Ilulissat to be opened in 2024 will further exacerbate the severity of this problem (personal communication, 2022). The risks associated with off-trail walking include damage to vulnerable flora which takes a long time to regrow, damage to cultural remains including the historical Inuit settlement and Inuit graves, risk of exposure to tsunamis created by calving icebergs, and the risk of uneven ground and cliff edges which can be quickly obscured by inclement and unpredictable weather. The tourism industry in Greenland is developing and often lacks solid support from the national government (Cooper, 2023), making human and financial resources for site management scarce. For this reason, the local municipality is unable to implement infrastructural changes to make off-trail walking impossible (such as a fenced boardwalk along all trails). An infrastructure-heavy approach in natural areas may also clash with expectations of the tourist experience in Greenland, which is generally marketed as a remote and 'off the beaten track' destination (Ren & Cooper, 2021).

2.2. Field experiment

Data for the quasi-experimental field study was collected in the



Fig. 1. | The Ilulissat Icefjord. Source: Aningaaq Rosing Carlsen – Visit Greenland.

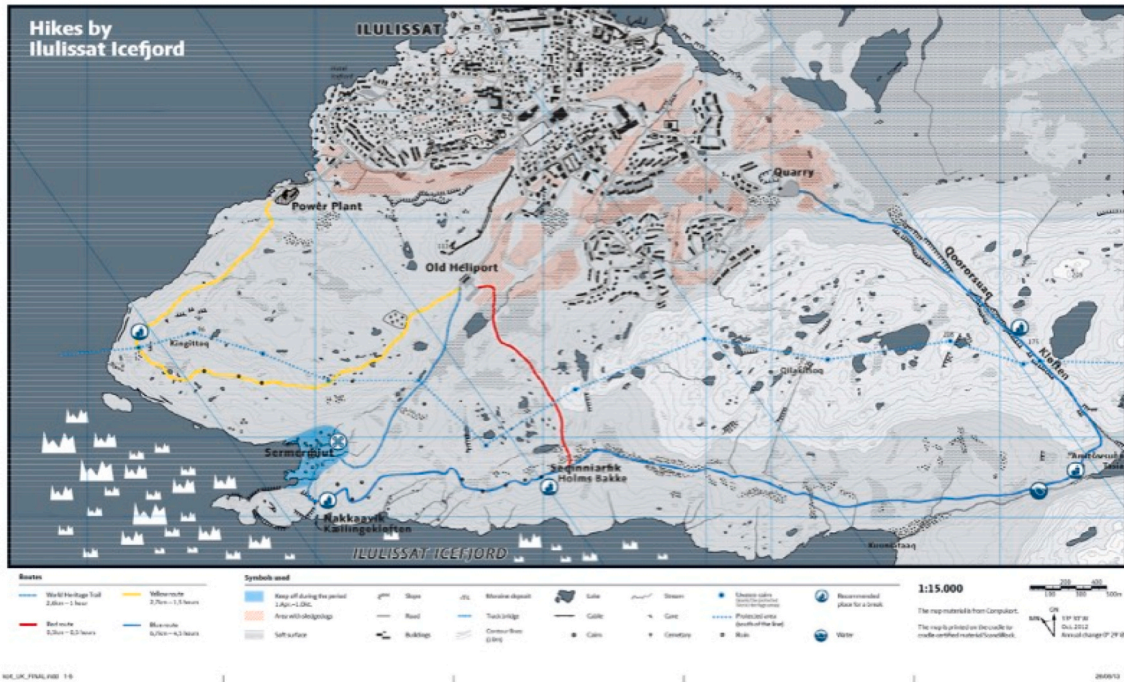


Fig. 2. | Map of marked walking trails in Sermermiut. Source: kangia.gl.

month of August 2022, on 11 different days, with 11 different cruise calls to Ilulissat. The study is quasi-experimental in nature because assignment of the experimental condition to study participants was performed on bus level. Relevant cruise companies were contacted in advance of the data collection, and the experiment was explained to them in detail, to secure their approval to approach their guests. Only one cruise company refused to participate; guests from this company were not approached. Ethics approval was obtained from the Ethics Council of the first author’s affiliated institution (approval number 22-030). The Government of Greenland and the local municipality of North Greenland also gave their approval after receiving a detailed description of the experimental design.

Upon docking in Ilulissat harbour, cruise passengers have the option of taking a shuttle bus from the harbour to the trailhead, where Sermermiut’s marked trails begin. These shuttle buses are hired by the cruise companies exclusively for each ship. The buses depart the harbour every 30 min for the duration of the time that a ship is docked – usually around 8 h. Very few passengers choose to walk from the harbour to the trailhead because this is a 2 km walk along some steep hills.

Each day, bus departures were randomly selected to be exposed to the experimental treatment condition of the tourist pledge. On those selected buses, a research assistant handed passengers a hard copy of The North Greenland Pledge (see Fig. 3) and a pen as they entered. The research assistant introduced herself as a representative of the local municipality, and, during the drive to the trailhead, briefly explained the pledge as a new initiative from the local municipality. She asked passengers to sign their pledges with their initials and the date, and hand them back to her. The presentation followed a script to ensure consistency. The assistant collected the signed pledges personally from passengers as they exited the bus and did not experience any instances of a passenger refusing to sign the pledge or leaving the bus without returning a pledge.

When passengers disembarked the shuttle buses at the trailhead, they were greeted by the first author, who introduced herself as a researcher studying how far cruise tourists walk. She asked for volunteers to wear GPS trackers while they walked around the area. Uptake on

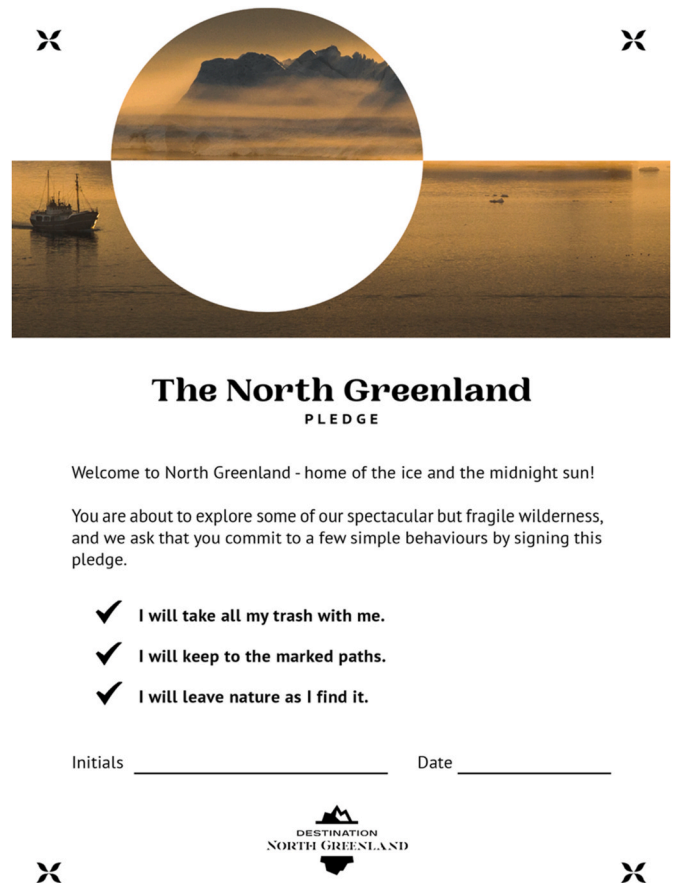


Fig. 3. | The North Greenland pledge.

wearing the trackers was high, and there was no apparent suspicion from passengers that this research was connected to the pledge initiative. The presentation of the GPS tracking research was repeated until approximately half of the GPS trackers had been accepted by passengers who had signed the pledge, and the remaining trackers had been accepted by passengers who had not been presented with the pledge. The study began with 75 trackers. Not all trackers were used every day because the number of passengers per ship varied, the weather differed, and some passengers engaged in activities other than visiting the icefjord. Each tracker had a red sticker or a blue sticker. Passengers in the pledge condition received a tracker with a red sticker; passengers in the control condition received a tracker with a blue sticker.

After distributing as many GPS trackers as possible, the first author waited at the harbour for passengers to return to the ship, where they returned their trackers. Upon returning their trackers, passengers were offered a souvenir to thank them for their participation. Participants remained anonymous; the pledge only asked for their initials, and signed pledges could not be connected to specific GPS tracks.

Ensuring that there was a control group and a treatment group from each participating cruise ship allowed us to avoid biasing results due to other variables that inevitably influence tourist walking behaviour, such as weather, variations in port briefings, and the time spent in port.

Based on theoretical models of commitment and empirical investigations of the comparative effectiveness of different commitment interventions, we designed The North Greenland Pledge (Fig. 3) in a way that can be expected to be as strong as possible. The pledge lists very specific desired behaviours that are simple to display (Baca-Motes et al., 2013; Wright & Kacmar, 1994). The signing of the pledge is publicly visible (Barata et al., 2017; Burn & Oskamp, 1986; Kiesler & Sakumura, 1966; Pallak & Cummings, 1976), thus triggering normative beliefs (Demarque & Girandola, 2017). Tourists are in full control of whether to display each of the desired behaviours or not (Kiesler & Sakumura, 1966). The pressure imposed on tourists to commit to the listed behaviours is low (Kiesler & Sakumura, 1966). The pledge is made by each tourist individually (Wang & Katzev, 1990) by signing a hard copy of the pledge (Burn & Oskamp, 1986; Pardini & Katzev, 1983).

Although the pledge asks participants to commit to three behaviours, only one of these behaviours serves as dependent variable. The two additional behaviours were added to make the pledge convincing as a real initiative, and to reduce the likelihood of participants making the connection between the pledge and the GPS tracking research. We chose additional behaviours that fitted the context of the site but are not considered to be problematic, to reduce the likelihood of them interfering with the target behaviour by inducing a licensing effect. For example, if trash was a noticeable problem at the site, it is possible that participants might engage in picking up trash to the extent that they mentally excuse themselves from engaging in the other behaviours they have committed to. Since we judged that neither taking their trash with them nor refraining from disturbing the landscape are likely to entail much effort from participants, we judged it unlikely that participants would mentally release themselves from the commitment of sticking to the trails.

The dependent variable is whether participants kept to the marked trails. This was measured using GPS trackers that tourists wore voluntarily, usually around their necks or in a coat pocket. The GPS trackers record coordinates every 5 s, measuring tourist movements in time and space. The devices used were so small and lightweight that participants often quickly forgot that they were wearing them.

Although sampling bias was reduced during the delivery of the treatment by making the pledge appear obligatory, there is potential for bias in terms of who volunteered to wear a tracker, in that it is possible that those who volunteered to take a tracker were those who were predisposed to staying on the trails. We do not expect any potential bias from this to be material because the GPS research was presented to passengers in groups, and uptake was very high, so that those who were initially not eager to take a tracker often took one after they saw that

most others were taking one. Additionally, the wearing of the tracker may have influenced behaviour, in that, knowing they were being observed, some participants perhaps behaved better than they otherwise would have (Cingolani et al., 2016; Hardy et al., 2017). However, this concern is alleviated by the fact that this is an experiment and would have equally affected participants in the control as well as the experimental condition.

2.3. Survey experiment

We conducted a survey experiment using as respondents panel members on Prolific, an online survey recruitment tool. In total, 200 respondents completed the survey; they were randomly allocated to either the experimental or control condition, splitting the sample in half. Respondents spent a median time of 8 min completing the survey. They received GBP 1.50 in compensation. We placed demographic restrictions on who could participate, to reflect the characteristics of the typical traveller to Greenland. Greenland is an expensive and off-the-beaten-track destination, appealing to tourists who are wealthy, well-educated, and older (Visit Greenland, 2021). Study participants, therefore, had to be at least 50 years old, hold an undergraduate degree or higher, and self-assess as being at level 5 or above on the socioeconomic ladder ranging from 1 to 10. We also restricted participation to English-speaking countries, to avoid bias resulting from translation, but included only English-speaking countries that are one of Greenland's top source markets for tourism (UK, USA and Canada). By implementing demographic restrictions based on recent market statistics (Visit Greenland, 2021), we generated a panel sample that is representative of typical travellers to Greenland in terms of age, education, socio-economic status, and country of residence. Table 4 in the Appendix provides the socio-demographic characteristics of the sample.

At the beginning of the survey, we primed all participants by immersing them in a hypothetical scenario that attempted to recreate the experience of the field experiment as far as possible. We asked respondents to imagine going on a cruise to Greenland, arriving at the town of Ilulissat and having the opportunity to visit the icefjord area. We included pictures and an interactive map of the area to immerse participants as deeply as possible in the scenario. Respondents were then asked to imagine boarding a shuttle bus to go to the icefjord area. Respondents who were randomly selected into the experimental condition experienced an extension to this scenario, in which, on the bus, a representative of the local council introduced the pledge to them. They saw a picture of the same pledge used in the field experiment and were asked to sign it using their computer mouse.

We then measured commitment and ascription of responsibility for respondents in both the control and the experimental condition. We measured commitment using an existing 4-item scale developed and validated by Klein et al. (2014). We measured ascription of responsibility using a single item measure which is unambiguous and concrete. The items measuring commitment and ascription of responsibility were randomised within a battery including 4 other distraction items, intended to disguise the researchers' expectations, which, if obvious to survey participants, could influence responses. Respondents answered all items on a sliding scale from 0 ("Not at all") to 100 ("Extremely").

Respondents then completed a series of questions related specifically to one of the three behaviours mentioned in the pledge. This series of questions was repeated for all three of the behaviours in the pledge. We attempted to mitigate social desirability bias by normalising unsustainable behaviours (e.g., "Because exploring the Ilulissat walking trails is considered a once-in-a-lifetime experience by most visitors, it is perfectly understandable that they don't always behave in ways the local council likes to see").

We measured cognitive dissonance by using a single item for each of the three behaviours. Cognitive dissonance is defined as a psychologically uncomfortable state (Festinger, 1957). In the survey, we

attempted to arouse cognitive dissonance in respondents by describing a scenario in which they decide to behave in a way that clashes with one of the encouraged behaviours. An example of this dissonance arousal is as follows: “Now please imagine that you have found a spot to take the perfect photograph, which requires you to leave the marked trail a bit. You decide to do this. How does this make you feel?” Respondents answered on a sliding scale from 0 (“I feel OK about it”) to 100 (“I feel uncomfortable about it”).

We measured beliefs using two items for each behaviour, in line with Stern’s (1999) value-belief-norm theory. The item “To what extent do you feel that [e.g., leaving the marked paths] harms the wilderness area you are visiting?” measured awareness of consequences/problem awareness, while the item “To what extent do you feel that you can protect this wilderness area by [e.g. keeping to the marked paths]?” measured perceived ability to reduce the threat/outcome efficacy. Injunctive norms were measured using a clear, single item for each behaviour. Respondents recorded their answers on a sliding scale from 0 (“Not at all”) to 100 (“Very much so”).

All survey items are provided in Table 5 in the Appendix. This research adheres to the Australian National Statement on Ethical Conduct in Human Research. Human ethics approval was granted prior to data collection from the second author’s affiliated institution (ethics approval number: 2022/HE002413).

2.4. Analysis

The GPS tracks were cleaned (using gpx.studio, an online GPX editor), so that they only contained measurements in the trail region. Coordinates of the marked trails and known pirate trails were recorded similar to the GPS tracking data. Then, the tracks were analysed for each participant separately, using the R environment for statistical computing and graphics (R Core Team, 2023). The distance of each GPS track measurement to the recorded points of marked trails or known pirate trails was determined and the measurement was classified as on-track if the closest point was from a marked trail and within 25 m, as on a pirate trail if the closest point was from a pirate trail and within 25 m and unclassified otherwise. A tolerance of 25 m was used to account for inaccuracy of tracking measurements based on exploratory analysis and visual inspection of the data. The length walked and the duration between two successive GPS measurements was determined and assigned the classification of the latter GPS measurement. This information determined for each participant the total length walked, the total duration of the walk, the length walked off-track (combining classifications as walking on pirate trails with those which are unclassified) as well as time walked off-track. This was then used to derive if a participant ever walked off-track and the proportion of walking length as well as walking duration off-track.

To account for a day-specific or cruise-specific effect, all comparisons between treatment groups were performed based on mixed-effects regression models with random intercepts for day/cruise. Mixed-effects models are typically utilised in scenarios involving non-independence issues or repeated data. For the experimental data analysed, a non-independence issue arises due to potential cruise-specific or day-specific effects. The experimental design, with assignment to control and treatment group being random on bus-level within cruises/days, aims to ensure that there is no bias in the treatment effect estimate. However, the non-independence of observations may impact inference by inducing correlations between observations for the same cruise/day. These correlations are accounted for by including a random effect.

Depending on the nature of the dependent variable as metric (walking length, walking duration, proportion of length walked off-track, proportion of time walked off-track) or binary (ever walked off-track), a linear or logistic mixed-effects regression model was fitted using maximum likelihood estimation (Bates et al., 2015). The treatment group served as independent variable in the regressions. Likelihood ratio tests compared the mixed-effects models with and without treatment group indicator as independent variable to assess significance of the

effect. Confidence intervals for the estimated treatment effects were obtained based on the profile likelihood. We assessed treatment effects as statistically significant if the 95% confidence interval did not cover zero. The additional independent variables such as weather condition and walking length were also assessed in the same way by adding them to the mixed-effects regression models. The significance of improvement in goodness-of-fit by adding the independent variables was assessed using likelihood ratio tests at the 5% significance level. Goodness-of-fit of the fitted models is measured using the Akaike information criterion (AIC), the Bayesian information criterion (BIC), the adjusted and conditional Intra-class Correlation Coefficient (ICC) and the conditional and marginal R^2 value (Lüdtke et al., 2021). Results are obtained and compared for the linear mixed-effects models using maximum likelihood as well as restricted maximum likelihood estimation.

The survey data was analysed in the following way. For each multi-item construct a score was obtained by averaging over the single item values. The average values of each of the constructs between the treatment groups were compared using Welch t -tests and statistical significance was determined at the 5% significance level. The effect sizes were assessed using Cohen’s d . The predictive performance of the constructs for commitment was evaluated using simple and multiple linear regression based on ordinary least squares estimation. The significance of the effects was based on t -tests for the regression coefficients at the 5% significance level. The relative importance (RI) of the constructs was determined based on the contribution to the proportion of explained variance of the constructs when averaged over orderings among regressors.

3. Results

Fig. 4 depicts off-trail walking measured via a GPS tracker for the control condition (without a pledge) and the experimental condition (with a pledge). In Fig. 4, green indicates compliant behaviour of walking along the official trails; red indicates that people moved more than 25 m off the trail; orange indicates that people used unofficial trails, so-called pirate trails, which are also considered off-trail walking.

The random-effects model with random intercepts for day which accounts for differences in ships, weather, and other situational circumstances shows that tourists in the experimental group who signed the pledge on the bus ride to the walking trails ($n = 253$) displayed less off-trail movement behaviour than those in the control group ($n = 274$). Members of both the control and the experimental group were recruited from each of six cruise ships that visited Ilulissat on 11 different days (with 11 different sets of passengers). There was no difference in the time tourists in these two groups dedicated to exploring the trails on average (1.5 h in both groups; p -value = 0.144) and in how far they walked on average (3.8 km in both groups; p -value = 0.796).

Detailed results on the goodness-of-fit of the different models fitted as well as the treatment effect estimates together with 95% confidence intervals are given in Tables 1 and 2 in the Appendix.

3.1. Proportion of tourists who left the trail

Of the tourists who did not sign the pledge, 96% left the trail by 25 m or more at some point during their hike. Of the tourists who did sign the pledge, only 92% left the trail at least once. A logistic mixed-effects model shows that the proportion of tourists walking off-trail decreased significantly in log-odds by 0.769 (95% CI: [-1.572, -0.017]) for the experimental group of tourists who signed the pledge.

3.2. Proportion of distance walked off-trail

Participants who did not sign the pledge walked off-trail for 6% of their total distance walked, on average, while participants who did sign the pledge walked off-trail for an average of 3% of their total distance walked. A linear mixed-effects model shows that the proportion of the

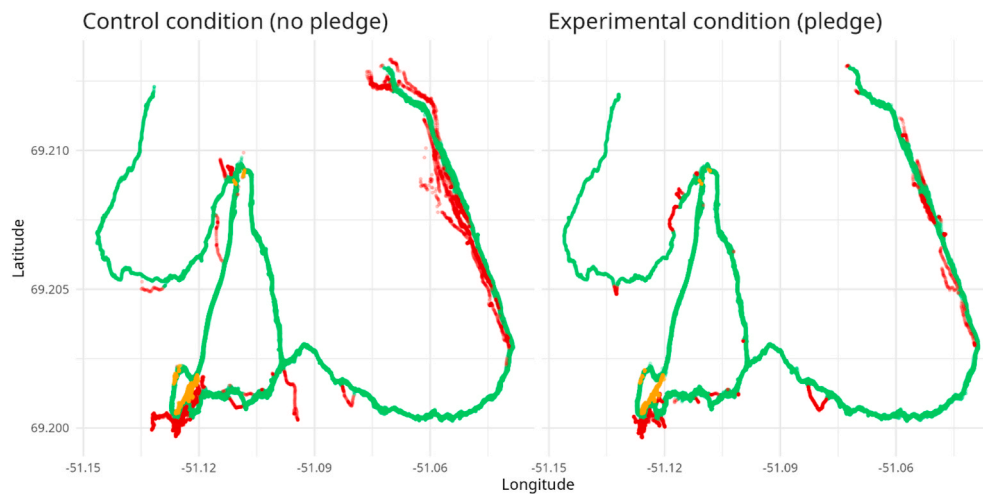


Fig. 4. | Off-trail walking behaviour. Green colour indicates people moving along the official walking trails. Red colour indicates walking off-trail. Orange colour indicates walking on so-called pirate trails created through repeated off-trail movements by tourists over time. (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

total distance walked off-trail decreased significantly in average proportion by 0.023 (95% CI: $[-0.030, -0.015]$) for the pledge group.

3.3. Time spent off-trail

Participants who did not sign the pledge spent 12% of their total time off-trail, on average, while participants who did sign the pledge spent an average of 8% of their total time off-trail. A linear mixed-effects model shows that the total time walked off-trail decreased significantly in average proportion by 0.042 (95% CI: $[-0.059, -0.025]$).

3.4. Influence of weather on the effect of the intervention

Previous research has established that visitors are likely to stay closer to park infrastructure on rainy days (Wilkins et al., 2021). Therefore, the difference in the strength of our intervention could be affected by weather. We categorised weather in two different ways: as a binary variable (good, bad), and as a variable with three possible values (good, medium, bad). Including weather in the analysis of proportion of distance walked off-trail and proportion of time spent off-trail did not significantly improve model fit for weather formulated in two or three categories (proportion of distance: p -value = 0.763 for the binary variable, p -value = 0.459 for the 3-category variable; proportion of time: p -value = 0.989 for the binary variable, p -value = 0.966 for the 3-category variable), suggesting that weather conditions do not affect the strength of our pledge intervention.

3.5. Influence of walk length on the effect of the intervention

There is evidence that visitors to national parks disperse more in less crowded areas (D'Antonio & Monz, 2016). Because most visitors to our study site start their walk at the same place, those who walk further tend to access more isolated areas. We expect, therefore, that the effectiveness of the pledge intervention may vary depending on how far people walk. We transformed walk length in metres to an ordinal variable (short, medium, long), and included it in the analysis of proportion of time spent off-trail. The model fit did not significantly improve (p -value = 0.299). When analysing the proportion of distance walked off-trail the model did significantly improve (p -value = 0.019). This improvement is due to differences in the proportion of distance walked off-trail in the control group. Tourists in the control group doing a long walk walked a larger proportion off-trail than those doing a short walk, with an average increase of 0.025 in the proportion walked off-trail (95% CI $[0.001,$

0.049]). The effect was insignificant for tourists in the control group when comparing short to medium walks (effect from short to medium: -0.009 with 95% CI $[-0.023, 0.006]$). Walking length had no impact in the experimental group where both effects were insignificant (effect from short to medium: 0.002 with 95% CI $[-0.012, 0.015]$; effect from short to long: -0.002 with 95% CI $[-0.022, 0.018]$). We can conclude, therefore, that our pledge intervention was more effective in influencing the behaviour of tourists who walked further.

3.6. Theoretical determinants explaining the effectiveness of pledges

To ensure that the pledge intervention increased commitment (manipulation check), we compared commitment in the survey study control group that was not exposed to the pledge ($Mean = 82.4, SD = 20.3$) with commitment in the survey study experimental group that was exposed to the pledge ($Mean = 90, SD = 15.4$). Commitment was significantly higher in the experimental group (p -value = 0.003) with a medium effect size (Cohen's $d = 0.423$), confirming that the pledge intervention has the intended effect: it increases the commitment to protect the wilderness area.

To determine if the pledge affects the four psychological determinants proposed in the literature as explanations for pledge interventions (cognitive dissonance, belief activation, injunctive norms, ascription of responsibility), we compared the mean values of these determinants across the control and experimental group of the survey study. Psychological determinants that do not change as a result of exposure to the pledge cannot explain why pledges work. Fig. 5a shows that injunctive norms and ascription of responsibility are significantly higher in the experimental group than in the control group (p -value = 0.004, p -value < 0.001, respectively) with medium effect sizes ($d = 0.409, d = 0.577$, respectively), with ascription of responsibility demonstrating a more distinct increase. Cognitive dissonance and beliefs do not significantly differ across the control and experimental conditions.

To determine which of the psychological determinants predicts different levels of commitment to protect the wilderness area, we ran a multiple regression analysis on data from the experimental group only, using commitment as the dependent variable and the four alternative determinants as explanatory variables. Results indicate that all explanatory variables, in isolation, are significantly associated with commitment. After including all four determinants in the multiple regression analysis, cognitive dissonance and injunctive norms are no longer significant, leaving only beliefs (p -value = 0.004) and ascription of

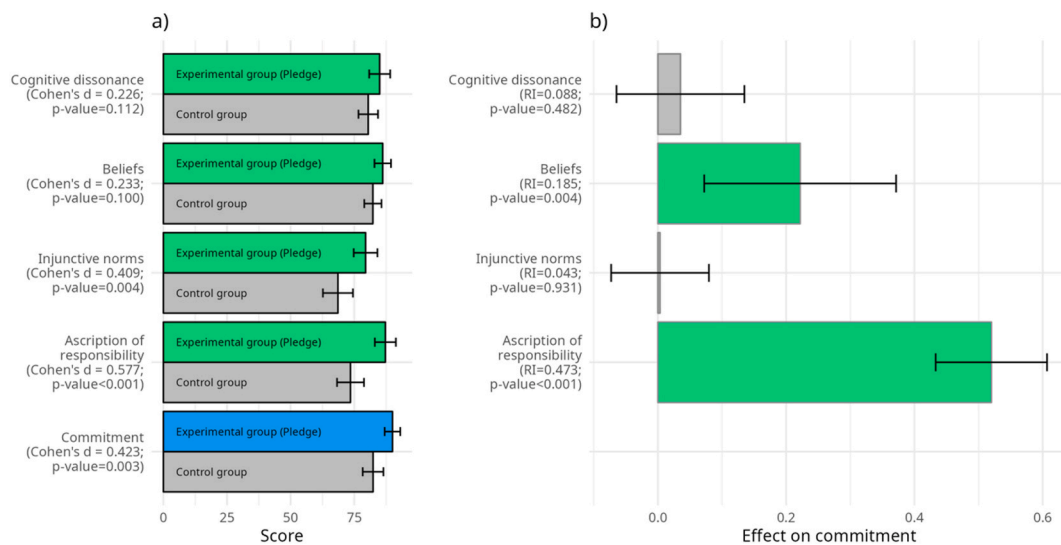


Fig. 5. | A comparison of alternative theoretical explanations of the effectiveness of pledge-based commitment strategies. a) Difference across control group (grey) and experimental group (colour) in commitment (significant) and the four psychological determinants hypothesised in prior work to drive increased commitment resulting from pledges: cognitive dissonance (insignificant), beliefs (insignificant), injunctive norms (insignificant), ascription of responsibility (significant). b) Regression coefficients on commitment in a multivariate regression accounting for multiple effects of psychological determinants hypothesised in prior work to drive increased commitment resulting from pledges: cognitive dissonance (insignificant), beliefs (significant), injunctive norms (insignificant), ascription of responsibility (significant). (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

responsibility (p -value < 0.001) as predictors of commitment, with the latter having a much larger relative importance as measured by the average contribution to the explained variance ($RI = 0.473$ compared to $RI = 0.185$). Fig. 5b depicts the multiple regression coefficients. Table 3 in the Appendix contains additional numerical results for the survey experiment; Table 4 in the Appendix provides an overview of the sociodemographic characteristics of the respondents.

4. Discussion

Commitment-based pledges have emerged as a popular behavioural change approach in the context of protecting wilderness areas that attract a lot of tourist traffic, because they are easy and cheap to deploy. Yet, empirical evidence of the effectiveness of pledges in changing consumer behaviour is scarce, because objective measures of actual behaviour are typically unavailable and there is disagreement on the nature of the theoretical process that occurs when consumers are exposed to a pledge. In our study, a pledge to protect a wilderness area significantly affects actual consumer behaviour: tourists who make a pledge leave the official walking trail less frequently and for shorter periods of time, and walk less far off-trail when they do. Variations in weather condition were not found to influence the effect of the pledge. This is a positive finding in the context of outdoor recreation, where variations in weather are guaranteed.

Walk length did influence the effect of our pledge on the proportion of distance walked off-trail, with the pledge being more effective when tourists walked further: tourists in the control group who walked longer distances displayed a higher extent of off-trail behaviour than those who walked shorter distances. This could be explained by tourists who walk longer distances being physically fitter, and possibly more able to negotiate the rocky and sometimes elevated off-trail areas at the site. Alternatively, it could be due to a paradox identified by Alessa et al. (2003): visitors to a national park who had more knowledge of ecology engaged in more depreciative behaviours. The authors speculate that more knowledgeable visitors get closer than is acceptable to flora and fauna because they are motivated by curiosity about them (Alessa et al., 2003). Assuming participants who hike long distances are likely to have a keen interest in nature (Mayer & Lukács, 2021), our findings offer empirical evidence in support of this interest-paradox.

The theoretical contributions of the present study relate to the psychological process behind our pledge intervention. We find that commitment increases significantly with a medium effect size when people take a pledge, supporting our assumption that this is a commitment-based intervention. The pledge also activates injunctive norms and triggers ascription of responsibility – a feeling of personal responsibility for protecting the wilderness area. Examining the psychological determinants that specifically predict commitment, we find that injunctive norms – while they increase as a result of the pledge – do not emerge as a significant predictor of commitment. The two significant predictors are beliefs and ascription of responsibility. Given that the pledge does not activate beliefs, these results suggest that a person's base beliefs drive commitment, which in turn leads to the desired behaviour. In contrast, ascription of responsibility, the most important predictor of commitment, can effectively be triggered by pledges. Of the four alternative theoretical explanations put forward in existing literature as to why pledges work, ascription of responsibility is most supported by the empirical data in this study.

Van Valkengoed et al. (2022) include ascription of responsibility as a determinant of pro-environmental behaviour. However, in their classification, the authors do not link this determinant to commitment interventions, proposing that it is only triggered by information-based interventions. Our study provides evidence in favour of linking commitment-based interventions with ascription of responsibility. According to van Valkengoed et al. (2022), commitment interventions trigger personal norms and environmental self-identity, although the authors acknowledge that personal norms can be strengthened by ascription of responsibility. This may suggest that the mechanism driving behaviour change in response to commitment interventions is more complicated than implied by van Valkengoed et al. (2022), whose classification suggests that it is mediated by a single determinant variable. Indeed, it may be the case that commitment interventions trigger ascription of responsibility, which in turn triggers personal norms, which in turn drives pro-environmental behaviour. In this conceptualisation of the mechanism, ascription of responsibility and personal norms would appear as two separate mediating variables. Further research is needed to deconstruct the relationships between these determinants and to shed more light on the psychological process through which commitment-based interventions lead to behavioural change.

Our study reveals nuances which further complicate conceptualisations of the psychological process underlying behaviour change. In our survey experiment, commitment to performing a pro-environmental behaviour was triggered by beliefs that were unaffected by the intervention: in other words, by an individual's pre-existing beliefs. Also, our intervention triggered a determinant (injunctive norms) that is not significantly related to a feeling of commitment to performing the pro-environmental behaviour. This suggests that pledge interventions do not simply represent a 'subtype' of commitment intervention, as suggested in previous literature (Chou et al., 2020; Wang & Katzev, 1990; Witvorapong & Watanapongvanich, 2020) but may in fact be more accurately conceptualised as a combination of intervention types. Indeed, the treatment delivered in this study consisted not only of participants signing the pledge, but also a short presentation by a municipal representative, to which participants in the control condition were not exposed. It is possible that this presentation was responsible for setting in motion other psychological mechanisms that became intertwined with the effect of actually signing the pledge. Therefore, when we discuss our treatment, we cannot separate the effect of signing the pledge from the effect of the pledge being presented by the municipal representative. Previous experiments with pledge interventions have also included an element of information delivery as an integral part of the pledge intervention. Pledges have been delivered in a booklet (Witvorapong & Watanapongvanich, 2020), as part of a text message campaign which also offered regular advice for avoiding the undesired behaviour (Heminger et al., 2016), or even following a video message highlighting the problematic behaviour (Webler & Jakubowski, 2016). In these studies, the informational element of the treatment was in no case separated from the actual signing of the pledge. This suggests that references to pledge interventions in existing literature actually refer to a type of intervention which combines commitment, information and perhaps additional intervention types as well. Future studies should experiment with deconstructing and separately examining the various aspects of pledge interventions, in order to further uncover their nuances.

In terms of the study's practical contributions, Fig. 4 provides a visual overview of where treated participants left the trail, and can be a useful tool for site managers, who can cross-reference the map with points of interest or changes in topography to shed light on why treated participants still left the trail at particular points. At areas of the site where off-trail walking behaviour is most damaging, managers may need to consider the addition of 'harder' interventions, such as signage or physical infrastructure to further deter undesired behaviour.

It is perhaps surprising that 92% of participants who signed the pledge still walked at least 25 m away from the trail at some point during their visit. In some places (for example, the area on the right-hand side in Fig. 4), this could be due to the trail being particularly hard to discern and participants leaving it inadvertently or choosing to avoid the cognitive effort of following it. In other places (for example, the bottom left area in Fig. 4), this could be attributed to the visual spectacle of the site, which offers a 'once-in-a-lifetime' experience for many (Ren & Cooper, 2021). Because we know that tourists can forgive themselves for deviant behaviour by leveraging the exceptional quality of an experience (Juvan & Dolnicar, 2014), there is presumably a large incentive to avoid the target behaviour if it involves getting a better view of a rare phenomenon. In other words, drawing on Schultz (2002), the perceived benefit to self from performing the misbehaviour far outweighs any benefit to others or to the planet achieved by refraining from it.

These considerations have implications for contexts and destinations beyond that of this specific study. For example, more academic attention should be paid to destinations that offer 'once-in-a-lifetime' experiences and that simultaneously have particularly fragile environments, as our results suggest that in these destinations there might both be high baseline levels of misbehaviour, but also the opportunity to create behavioural change. On an even broader level, a tourist pledge is a cheap and easy-to-implement intervention that has potential for combatting

other kinds of damaging tourist behaviours in tourist destinations more generally (although the impacts of context should always be carefully considered). Although our pledge was delivered on paper because of practical considerations, such a pledge could also be delivered online or on an electronic device to further reduce costs and make it even more easy to implement.

The present study makes a substantial contribution to behaviour change research in three main ways. Firstly, we have shown for the first time using objectively-measured behaviour that a pledge – a cheap and easy-to-implement intervention – can be effective in producing significant behaviour change. This means that changing tourist behaviour is possible even in contexts that lack the human and financial resources required to introduce infrastructural or policy interventions. Secondly, we are the first to provide evidence around *how* pledges work on a psychological level. This knowledge is an important contribution to achieving behaviour change because a deeper understanding of the nature of pledge interventions and the psychological processes they trigger allows future pledge interventions to be designed in the most effective way. Thirdly, this research responds to urgent calls within the pro-environmental behaviour change literature to understand the links between psychological determinants and behavioural interventions. Although behavioural interventions have shown promise in changing behaviour, their effectiveness can vary considerably (van Valkengoed et al., 2022). Enabling researchers and practitioners to choose the most appropriate intervention for their target behaviour will result in behaviour change efforts becoming more effective and efficient, by saving both time and money and ensuring that the positive results of pro-environmental behaviour change manifest sooner and with greater impact. Specifically, our study uncovers the psychological processes driving behavioural responses to pledge interventions, allowing scholars and practitioners to make more informed choices around whether a pledge intervention is likely to be appropriate or effective in their context.

5. Limitations

A limitation of the current study is the fact that the effect of the intervention on actual behaviour and the psychological mechanisms triggered by the intervention were measured in different contexts: the former in a field experiment and the latter in a hypothetical survey experiment. Although we designed the survey experiment to reflect the actual experience as much as we possibly could, we cannot conclude with certainty that the behaviour change seen in the field experiment was driven by the same psychological mechanisms that we identified in the survey experiment. Nevertheless, in behavioural intervention studies it is common to use a similar approach, in which scholars test the psychological mechanism triggered by an intervention using a survey-based manipulation check, and test the practical effect of the intervention in a separate field experiment (Dolnicar et al., 2017; Viglia & Dolnicar, 2020; Demeter et al., 2022).

In our survey experiment, we did measure behavioural intention, and found that the experimental group reported a significantly higher intention to keep to the marked paths (Wilcoxon rank sum test, $p = 0.03$), with the self-stated intention to stay on the marked trail being in general high in both groups (control: median = 90; experimental: median = 100). Although behavioural intentions are an unreliable measure of behaviour, this finding further supports our proposition that the pledge intervention works in a similar way in the field. Ideally, we would have measured the psychological determinants during the field experiment, using questionnaires or interviews; however, this was not a feasible research design in the context of this study because we were targeting large groups of tourists who were on holiday (and therefore prioritising hedonic goals), who were short on time and who were distracted by an upcoming 'once-in-a-lifetime' experience. Asking participants to self-report psychological states or to spend time being interviewed would at the very least have pushed response rates so low

that we would not have achieved a large enough and representative sample to make reliable and valid conclusions about the effect of our intervention. Additionally, conducting interviews on-site may have given away the experimental nature of the study; since participants wearing GPS trackers walked freely around the site for many hours and often engaged in conversations with each other, the risk of a tracked participant's behaviour being contaminated by observing another participant being interviewed, or by talking to a participant who had previously been interviewed, was too high for this to be a valid approach. When designing future behavioural field experiments, researchers should consider ways to incorporate the measurement of psychological determinants, in order to generate more accurate data on how interventions are received in the field.

Another limitation of this study relates to the broader context of pro-environmental behaviour change and the environmental significance of behaviour. We must acknowledge that deterrence of our target behaviour is low-impact relative to the impact caused by travelling to Greenland on a cruise ship in the first place. We must also, therefore, consider the potential for self-licensing created by the pledge intervention. In other words, it is possible that the pledge was perceived by participants as an opportunity to 'compensate' for the environmentally detrimental behaviour they had previously engaged in by travelling to Greenland, and that this in some way increased the incentive for them to comply with the desired behaviours expressed in the pledge. In this way, 'extraordinary' destinations such as Greenland may facilitate more compliance with pro-environmental behavioural interventions (at least if the target behaviour requires little effort), because they enable visitors to easily dissolve any cognitive dissonance that they might feel as a result of travelling to such a remote place for pleasure. Further research should test the effect of interventions on deviant behaviour at other 'extraordinary' sites, in order to shed more light on the uptake of pro-environmental behavioural interventions in these contexts.

6. Conclusion

In the present study, we have presented 1) a field experiment that develops and tests the effect of a pro-environmental behavioural change intervention on off-trail walking behaviour at a protected natural site, and 2) a survey experiment that empirically investigates which psychological determinants the intervention triggers. Results show that the pledge was successful in reducing off-trail walking behaviour, in terms of frequency of leaving the trail, time spent off-trail, and proportion of distance walked off-trail. Weather does not affect the strength of the intervention, but the intervention is more effective on visitors who walk longer distances overall.

On a practical and managerial level, our results indicate that pledge interventions can be an effective management tool for destinations who need to take action to protect fragile wilderness areas, but do not have the resources to police delinquent behaviour. On a theoretical level, this study has begun to empirically explore proposed theoretical links between intervention types and psychological determinants of behaviour, in some places finding agreement, while in some places revealing more nuances in how behavioural interventions and psychological determinants relate to each other. Our survey experiment confirms that a pledge is a commitment-based intervention, and suggests that the commitment element of the intervention works by triggering ascription of responsibility in pledgers. However, our results also suggest that pledges encompass other types of interventions, which calls for further research on the links between psychological determinants and interventions, and to deconstruct the specific elements making up a pledge

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.tourman.2024.104928>.

intervention.

Limitations of the current study include, firstly, that the effect of the intervention on actual behaviour and the psychological mechanisms driving the intervention were measured in separate experiments, meaning that our arguments about how the intervention works in the field are interpretations based on the best available evidence. Secondly, we acknowledge that the intervention could generate potential for self-licensing in tourists, which could in turn compensate for or 'licence' other environmentally damaging behaviours.

Declaration of competing interest

None.

Impact statement

This research has practical impacts for protected areas around the world, as it proves the effectiveness of a cheap and easily implementable behavioural intervention (a pledge) on deterring harmful visitor behaviours. This protects the fragile environment in such places, while also meeting visitor expectations of an untouched wilderness experience. The pledge intervention tested in this study can be adapted and applied to other contexts and behaviours, in order to encourage more sustainable tourist behaviours in different environments. Knowledge generated in this research about the psychology behind pledge interventions can assist tourism managers in designing effective pledges for use in their own destinations. On a broader level, the context of this study is an Arctic wilderness area which has significance for the global climate (specifically in terms of its fragile flora which is crucial for CO₂ capture). The protection of these environments is crucial for the planet and human society.

CRediT authorship contribution statement

Elizabeth Cooper: Writing – review & editing, Writing – original draft, Resources, Project administration, Methodology, Investigation, Funding acquisition, Data curation, Conceptualization. **Sara Dolnicar:** Writing – review & editing, Writing – original draft, Supervision, Resources, Methodology, Investigation, Funding acquisition, Data curation, Conceptualization. **Bettina Grün:** Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Methodology, Investigation, Formal analysis, Data curation, Conceptualization.

Acknowledgements

The authors are extremely grateful for the cooperation of all industry partners who made this research possible: Avannaata Municipality, Greenland Cruises, Saaleeraq, Ilulissat Icefjord Centre, Hurtigruten, Ponant Cruises, Silversea, Lindblad Expeditions and Adventure Canada. Funding for this research was kindly provided by Innovation Fund Denmark, Visit Greenland, the Nordic Research Council (*Mapping the Beaten Track*), the Australian Research Council (*Low Harm Hedonism Initiative*), and the Austrian Science Fund (FWF) [DOI:10.55776/14367]. Thanks are due to Meike Janssen, Szilvia Gyimothy, Sebastian Zenker and Xavier Font for their constructive input throughout the development of this study, and to those who provided assistance in the field: Rachel Monnier, Michelle Spinei, Asbjørn Dissing Bargsteen, and Andrew Orawiec.

Appendix B. Supplementary results and information

Table 1

Goodness-of-fit measures for linear and logistic mixed-effects models. Number of estimated parameters (# pars), AIC, BIC, adjusted and conditional Intra-class Correlation Coefficient (ICC) and conditional and marginal R² values for different mixed-effects models fitted using maximum likelihood (ML) and restricted maximum likelihood (REML) for different dependent variables and explanatory variables as indicated by Model: Null model – no explanatory variables; Treatment group – control versus treatment group; Treatment group by distance walked – Interaction model with control versus treatment group and categorised distance walked (short, medium, long).

Dependent variable	Estimation method	Model	# pars	AIC	BIC	adj. ICC	cond. ICC	cond. R ²	marg. R ²
Time spent walking	ML	Null model	3	1110.7	1123.5	0.159	0.159	0.159	
		Treatment group	4	1110.6	1127.7	0.162	0.161	0.165	0.003
	REML	Null model	3	1113.6	1126.4	0.173	0.173	0.173	
		Treatment group	4	1117.3	1134.3	0.176	0.175	0.179	0.003
Distance walked	ML	Null model	3	9377.0	9389.8	0.198	0.198	0.198	
		Treatment group	4	9378.9	9396.0	0.198	0.198	0.198	0.000
	REML	Null model	3	9363.9	9376.7	0.214	0.214	0.214	
		Treatment group	4	9354.0	9371.0	0.214	0.213	0.214	0.000
Proportion of tourists who left the trail	ML	Null model	2	235.2	243.7	0.120	0.120	0.120	
		Treatment group	3	233.2	246.0	0.128	0.123	0.160	0.038
Proportion of distance walked off-trail	ML	Null model	3	-1695.1	-1682.3	0.076	0.076	0.076	
		Treatment group	4	-1723.6	-1706.6	0.079	0.074	0.127	0.053
	REML	Treatment group by distance walked	8	-1727.4	-1693.3	0.080	0.074	0.147	0.073
		Null model	3	-1686.3	-1673.5	0.084	0.084	0.084	
Proportion of time spent off-trail	ML	Treatment group	4	-1705.5	-1688.5	0.087	0.083	0.135	0.052
		Treatment group by distance walked	8	-1678.3	-1644.2	0.088	0.082	0.154	0.072
	REML	Null model	3	-906.8	-894.0	0.151	0.151	0.151	
		Treatment group	4	-928.3	-911.2	0.158	0.152	0.189	0.038
	REML	Null model	3	-900.1	-887.3	0.165	0.165	0.165	
		Treatment group	4	-913.9	-896.8	0.172	0.165	0.202	0.037

Table 2

Coefficient estimates of linear and logistic mixed-effects models. Estimates (Est.) obtained using maximum likelihood (ML) for linear and logistic regression models as well as restricted maximum-likelihood (REML) in the linear regression case are reported together with the lower (LB) and upper bounds (UB) of the 95% confidence intervals.

	Coefficient	Maximum-likelihood			Restricted maximum-likelihood		
		Est.	LB	UB	Est.	LB	UB
Proportion of tourists who left the trail	Intercept	3.362	2.642	4.281			
	Treatment effect	-0.769	-1.572	-0.017			
Proportion of distance walked off-trail	Intercept	0.056	0.046	0.067	0.056	0.046	0.067
	Treatment effect	-0.023	-0.030	-0.015	-0.022	-0.030	-0.015
Proportion of time spent off-trail	Intercept	0.120	0.090	0.150	0.120	0.090	0.150
	Treatment effect	-0.042	-0.059	-0.025	-0.042	-0.059	-0.025
Influence of walk length on intervention effect	Intercept	0.061	0.045	0.076	0.060	0.045	0.076
	Treatment effect	-0.028	-0.045	-0.011	-0.028	-0.045	-0.011
	Medium distance walked	-0.009	-0.023	0.006	-0.009	-0.023	0.006
	Treatment effect: Medium distance walked	0.002	-0.012	0.015	0.002	-0.012	0.015
	Long distance walked	0.025	0.001	0.049	0.025	0.001	0.049
	Treatment effect: Long distance walked	-0.002	-0.022	0.018	-0.002	-0.022	0.018

Table 3

Comparison of answer distributions for all constructs across control and experimental groups in the survey. *p*-values are for a Welch *t*-test comparing the mean values across experimental conditions.

Construct	Experimental condition	Mean	Standard deviation	Median	1st Quartile	3rd Quartile	<i>p</i> -value
Commitment	Control	82.38	20.32	90.00	72.50	97.50	0.003
	Experiment	90.00	15.35	97.50	87.50	100.00	
Cognitive dissonance	Control	80.47	19.22	86.67	66.67	96.67	0.112
	Experiment	84.97	20.65	93.33	76.67	100.00	
Beliefs	Control	82.30	16.89	88.33	72.92	95.00	0.100
	Experiment	86.17	16.23	90.00	81.25	98.33	
Norms	Control	68.57	29.48	76.67	53.33	93.33	0.004
	Experiment	79.43	23.32	86.67	73.33	93.33	
Internal attribution of responsibility	Control	73.50	26.49	80.00	60.00	100.00	<0.001
	Experiment	87.20	20.65	100.00	80.00	100.00	

Table 4
Demographic characteristics of survey respondents.

Variables	Value	Frequency	Percentage
Gender	Male	96	48%
	Female	104	52%
Age groups	50–59	118	59%
	60–69	63	31.5%
	70+	18	9%
	Unknown	1	0.5%
Socioeconomic status (self-reported on a 'socioeconomic ladder' from 1 to 10)	5	40	20%
	6	57	28.5%
	7	67	33.5%
	8	31	15.5%
	9	4	2%
	10	1	0.5%
Country of residence	UK	44	22%
	USA	150	75%
	Canada	6	3%
Highest completed education	Undergraduate degree	130	65%
	Graduate degree	60	30%
	Doctorate degree	10	5%

Table 5
Survey items.

Commitment (4 items)

- How committed are you to protecting this wilderness area?
- How dedicated are you to protecting this wilderness area?
- To what extent do you care about this wilderness area?
- To what extent have you chosen to be committed to this wilderness area?

Cognitive dissonance (3 items)

- Now please imagine that you have found a spot to take the perfect photograph, which requires you to leave the marked trail a bit. You decide to do this. How does this make you feel?
- Now please imagine that you take a rest on a bench and eat a yoghurt that you brought with you from the ship. After finishing the yoghurt, you realise that you don't want to put the messy yoghurt pot in your bag with your expensive camera and other belongings. You decide to leave the yoghurt pot on the ground. How does this make you feel?
- Now please imagine that you spot your best friend's favourite flower in a huge bed of flowers next to the trail. There are literally hundreds of them. You decide to take one of them so you can bring it to your friend. How does this make you feel?

Beliefs (6 items)

Awareness of consequences (3 items)

- To what extent do you feel that leaving the marked paths harms the wilderness area you are visiting?
- To what extent do you feel that leaving trash behind harms the wilderness area you are visiting?
- To what extent do you feel that moving or taking something from nature harms the wilderness area you are visiting?

Perceived ability to reduce threat (3 items)

- To what extent do you feel that you can protect this wilderness area by keeping to the marked paths?
- To what extent do you feel that you can protect this wilderness area by taking your trash out of the area with you?
- To what extent do you feel that you can protect this wilderness area by leaving nature as you found it?

Norms (3 items)

- Do you worry that other tourists on the walking trails will disapprove of you if you do NOT keep to the marked paths?
- Do you worry that other tourists on the walking trails will disapprove of you if you do NOT take all your trash with you?
- Do you worry that other tourists on the walking trails will disapprove of you if you do NOT leave nature as you found it?

Internal attribution of responsibility (1 item)

- To what extent do you feel responsible for protecting this wilderness area?

References

- Albrecht, J. N., & Raymond, E. M. (2023). National destination pledges as innovative visitor management tools—social marketing for behaviour change in tourism. *Journal of Sustainable Tourism*, 31(3), 859–876. <https://doi.org/10.1080/09669582.2022.2037620>
- Alessa, L., Bennett, S. M., & Kliskey, A. D. (2003). Effects of knowledge, personal attribution and perception of ecosystem health on depreciative behaviors in the intertidal zone of Pacific Rim National Park and Reserve. *Journal of Environmental Management*, 68(2), 207–218. [https://doi.org/10.1016/s0301-4797\(03\)00068-9](https://doi.org/10.1016/s0301-4797(03)00068-9)
- Anderson, A. K., Waller, J. S., & Thornton, D. H. (2023). Partial COVID-19 closure of a national park reveals negative influence of low-impact recreation on wildlife spatiotemporal ecology. *Scientific Reports*, 13(1), 687. <https://doi.org/10.1038/s41598-023-27670-9>
- Baca-Motes, K., Brown, A., Gneezy, A., Keenan, E. A., & Nelson, L. D. (2013). Commitment and behavior change. *Journal of Consumer Research*, 39(5), 1070–1084. <https://doi.org/10.1086/667226>
- Barata, G., Gama, S., Jorge, J., & Gonçalves, D. (2017). Studying student differentiation in gamified education: A long-term study. *Computers in Human Behavior*, 71, 550–585. <https://doi.org/10.1016/j.chb.2016.08.049>
- Bates, D., Mächler, M., Bolker, B., & Walker, S. (2015). Fitting linear mixed-effects models using lme4. *Journal of Statistical Software*, 67(1), 1–48. <https://doi.org/10.18637/jss.v067.i01>
- Bradford, L. E., & McIntyre, N. (2007). Off the beaten track: Messages as a means of reducing social trail use at St. Lawrence Islands National Park. *Journal of Park and Recreation Administration*, 25(1), 1–21.
- Brown, T. J. (1999). Antecedents of culturally significant tourist behaviour. *Annals of Tourism Research*, 26(3), 676–700. [https://doi.org/10.1016/s0160-7383\(99\)00004-3](https://doi.org/10.1016/s0160-7383(99)00004-3)
- Brown, T. J., Ham, S. H., & Hughes, M. (2010). Picking up litter: An application of theory-based communication to influence tourist behaviour in protected areas. *Journal of Sustainable Tourism*, 18(7), 879–900. <https://doi.org/10.1080/09669581003721281>

- Burn, S. M., & Oskamp, S. (1986). Increasing community recycling with persuasive communication and public commitment. *Journal of Applied Social Psychology*, 16(1), 29–41. <https://doi.org/10.1111/j.1559-1816.1986.tb02276.x>
- Chou, E. Y., Hsu, D. Y., & Hernon, E. (2020). From slacktivism to activism: Improving the commitment power of e-pledges for prosocial causes. *PLoS One*, 15(4), 1–21. <https://doi.org/10.1371/journal.pone.0231314>
- Cingolani, A. M., Barberá, I., Renison, D., & Barri, F. R. (2016). Can persuasive and demonstrative messages to visitors reduce littering in river beaches? *Waste Management*, 58, 34–40. <https://doi.org/10.1016/j.wasman.2016.08.028>
- Cooper, E. (2023). Making sense of sustainable tourism on the periphery: Perspectives from Greenland. *Tourism Geographies*, 25(5), 1303–1321. <https://doi.org/10.1080/14616688.2022.2152955>
- D'Antonio, A., & Monz, C. (2016). The influence of visitor use levels on visitor spatial behavior in off-trail areas of dispersed recreation use. *Journal of Environmental Management*, 170, 79–87. <https://doi.org/10.1016/j.jenvman.2016.01.011>
- Demarque, C., & Girandola, F. (2017). Commitment and pro-environmental behaviors: Favoring positive human-environment interactions to improve quality of life. In G. Fleury-Bahi, E. Pol, & O. Navarro (Eds.), *Handbook of environmental psychology and quality of life research* (pp. 197–210). Cham: Springer. https://doi.org/10.1007/978-3-319-31416-7_11
- Demeter, C., Fechner, D., & Dolnicar, S. (2022). Progress in field experimentation for environmentally sustainable tourism – A knowledge map and research agenda. *Tourism Management*, 94, Article 104633. <https://doi.org/10.1016/j.tourman.2022.104633>
- Dolnicar, S., Knezevic Cvelbar, L., & Grün, B. (2017). Do pro-environmental appeals trigger pro-environmental behavior in hotel guests? *Journal of Travel Research*, 56(8), 988–997. <https://doi.org/10.1177/0047287516678089>
- Dragovich, D., & Bajpai, S. (2022). Managing tourism and environment—trail erosion, thresholds of potential concern and limits of acceptable change. *Sustainability*, 14(7), 4291. <https://doi.org/10.3390/su14074291>
- Fennell, D. (2001). A content analysis of ecotourism definitions. *Current Issues in Tourism*, 4(5), 403–421. <https://doi.org/10.1080/13683500108667896>
- Festinger, L. (1957). *A theory of cognitive dissonance*. Stanford University Press. <https://doi.org/10.1515/9781503620766>
- Greene, D., Demeter, C., & Dolnicar, S. (2024). The comparative effectiveness of interventions aimed at making tourists behave in more environmentally sustainable ways: A meta-analysis. *Journal of Travel Research*, 63(5), 1239–1255. <https://doi.org/10.1177/00472875231183701>
- Grilli, G., & Curtis, J. (2021). Encouraging pro-environmental behaviours: A review of methods and approaches. *Renewable and Sustainable Energy Reviews*, 135, Article 110039. <https://doi.org/10.1016/j.rser.2020.110039>
- Halverson, R. R., & Pallak, M. S. (1978). Commitment, ego-involvement, and resistance to attack. *Journal of Experimental Social Psychology*, 14(1), 1–12. [https://doi.org/10.1016/0022-1031\(78\)90056-2](https://doi.org/10.1016/0022-1031(78)90056-2)
- Hardy, A., Hyslop, S., Booth, K., Robards, B., Aryal, J., Gretzel, U., & Eccleston, R. (2017). Tracking tourists' travel with smartphone-based GPS technology: A methodological discussion. *Information Technology & Tourism*, 17(3), 255–274. <https://doi.org/10.1007/s40558-017-0086-3>
- Heider, F. (1958). *The psychology of interpersonal relations*. John Wiley & Sons Inc. <https://doi.org/10.1037/10628-000>
- Heminger, C. L., Boal, A. L., Zumer, M., & Abrams, L. C. (2016). Text2Quit: An analysis of participant engagement in the mobile smoking cessation program. *The American Journal of Drug and Alcohol Abuse*, 42(4), 450–458. <https://doi.org/10.3109/00952990.2016.1149591>
- Howard, S., Buttke, D. E., Lovejoy, T. E., Clark, K. A., Ashby, E. J., & Alonso Aguirre, A. (2021). The Loop Trail “Quest”: Use of a choice-based digital simulation, an interactive video, and a booklet to communicate and analyze decision-making of park visitors. *Environmental Communication*, 15(8), 1025–1044. <https://doi.org/10.1080/17524032.2021.1927129>
- Johnson, D. R., & Swearingen, T. C. (1992). *The effectiveness of selected trailside sign tests in deterring off-trail hiking at Paradise Meadows, Mt. Rainier National Park*. *Vandalism: Research, Prevention and Social Policy*. United States Department of Agriculture: Forest Service. Retrieved from govinfo.gov/content/pkg/govpub-a13-purl-gpo46347/pdf/govpub-a13-purl-gpo46347.pdf.
- Juvan, E., & Dolnicar, S. (2014). The attitude-behaviour gap in sustainable tourism. *Annals of Tourism Research*, 48, 76–95. <https://doi.org/10.1016/j.annals.2014.05.012>
- Kiesler, C. A., & Sakumura, J. (1966). A test of a model for commitment. *Journal of Personality and Social Psychology*, 3(3), 349–353. <https://doi.org/10.1037/h0022943>
- Klein, H. J., Cooper, J. T., Molloy, J. C., & Swanson, J. A. (2014). The assessment of commitment: Advantages of a unidimensional, target-free approach. *Journal of Applied Psychology*, 99(2), 222–238. <https://doi.org/10.1037/a0034751>
- Lewin, K. (1947). Group decision and social change. *Readings in Social Psychology*, 3(1), 197–211.
- Lokhorst, A. M., Staats, H., & Van Iterson, J. (2015). Energy saving in office buildings: Are feedback and commitment-making useful instruments to trigger change? *Human Ecology*, 43(5), 759–768. <https://doi.org/10.1007/s10745-015-9783-8>
- Lüdecke, D., Ben-Shachar, M., Patil, I., Waggoner, P., & Makowski, D. (2021). performance: An R package for assessment, comparison and testing of statistical models. *Journal of Open Source Software*, 6(60), 3139. <https://doi.org/10.21105/joss.03139>
- Lynn, N., & Brown, R. (2003). Effects of recreational use impacts on hiking experiences in natural areas. *Landscape and Urban Planning*, 64, 77–87. [https://doi.org/10.1016/S0169-2046\(02\)00202-5](https://doi.org/10.1016/S0169-2046(02)00202-5)
- Maréchal, L., MacLarnon, A., Majolo, B., & Semple, S. (2016). Primates' behavioural responses to tourists: Evidence for a trade-off between potential risks and benefits. *Scientific Reports*, 6(1), Article 32465. <https://doi.org/10.1038/srep32465>
- Mayer, K., & Lukács, A. (2021). Motivation and mental well-being of long-distance hikers: A quantitative and qualitative approach. *Heliyon*, 7(5), Article e06960. <https://doi.org/10.1016/j.heliyon.2021.e06960>
- Medel, I. L. (2020). The Palau legacy pledge: A case study of advertising, tourism, and the protection of the environment. *Westminster Papers in Communication and Culture*, 15(2), 178–190. <https://doi.org/10.16997/wpc.380>
- Mertens, S., Herberz, M., Hahnel, U. J., & Brosch, T. (2022). The effectiveness of nudging: A meta-analysis of choice architecture interventions across behavioral domains. *Proceedings of the National Academy of Sciences*, 119(1), Article e2107346118. <https://doi.org/10.1073/pnas.2107346118>
- Milone, K., Abbe, D., & Burrows, R. (2014). *Informal trail status along the Denali park road, 2012–2013*. *Natural resource data series NPS/DENA/NRDS—2014/687*. Fort Collins, Colorado: National Park Service.
- Nisa, C. F., Belanger, J. J., Schumpe, B. M., & Faller, D. G. (2019). Meta-analysis of randomised controlled trials testing behavioural interventions to promote household action on climate change. *Nature Communications*, 10, 4545. <https://doi.org/10.1038/s41467-019-12457-2>
- Nisa, C. F., Varum, C., & Botelho, A. (2017). Promoting sustainable hotel guest behavior: A systematic review and meta-analysis. *Cornell Hospitality Quarterly*, 58(4), 354–363. <https://doi.org/10.1177/1938965517704371>
- Pallak, M. S., & Cummings, W. (1976). Commitment and voluntary energy conservation. *Personality and Social Psychology Bulletin*, 2(1), 27–30. <https://doi.org/10.1177/014616727600200105>
- Pardini, A. U., & Katzev, R. D. (1983). The effect of strength of commitment on newspaper recycling. *Journal of Environmental Systems*, 13(3), 245–254. <https://doi.org/10.2190/6pn9-mxfp-3bff-chhb>
- R Core Team. (2023). *R: A language and environment for statistical computing*. Vienna, Austria: R Foundation for Statistical Computing. <https://www.R-project.org/>
- Ren, C., & Cooper, E. (2021). Being online off the beaten track: Rhythms of connectivity and user-generated content in the marketing of Greenland. In K. Andriotis, & D. Styliadis (Eds.), *Tourism marketing in Western Europe* (pp. 191–209). CAB International. <https://doi.org/10.1079/9781789248753.0010>
- Roll, S., Grinstein-Weiss, M., Gallagher, E., & Cryder, C. (2020). Can pre-commitment increase savings deposits? Evidence from a tax-time field experiment. *Journal of Economic Behavior & Organization*, 180, 357–380. <https://doi.org/10.1016/j.jebo.2020.10.011>
- Schultz, P. W. (2002). Inclusion with nature: The psychology of human-nature relations. In P. Schmuck, & W. P. Schultz (Eds.), *Psychology of sustainable development* (pp. 61–78). Springer. https://doi.org/10.1007/978-1-4615-0995-0_4
- Souza-Neto, V., Marques, O., Mayer, V. F., & Lohmann, G. (2022). Lowering the harm of tourist activities: A systematic literature review on nudges. *Journal of Sustainable Tourism*, 30(1), 1–22. <https://doi.org/10.1080/09669582.2022.2036170>
- Stern, P. C. (1999). Information, incentives, and proenvironmental consumer behavior. *Journal of Consumer Policy*, 22(4), 461–478. <https://doi.org/10.1023/a:1006211709570>
- Triyana, M., & White, J. S. (2022). Non-monetary incentives for tobacco prevention among youth in Indonesia. *Journal of Health Economics*, 83, Article 102620. <https://doi.org/10.1016/j.jhealeco.2022.102620>
- United Nations. (nd). Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss. <https://sdgs.un.org/goals/goal15>. (Accessed 17 November 2022).
- Van Valkengoed, A. M., Abrahamse, W., & Steg, L. (2022). To select effective interventions for pro-environmental behaviour change, we need to consider determinants of behaviour. *Nature Human Behaviour*, 6(11), 1482–1492. <https://doi.org/10.1038/s41562-022-01473-w>
- Viglia, G., & Dolnicar, S. (2020). A review of experiments in tourism and hospitality. *Annals of Tourism Research*, 80, Article 102858. <https://doi.org/10.1016/j.annals.2020.102858>
- Visit Greenland. (2021). Tourism statistics report 2021. <http://tourismstat.gl/>. (Accessed 20 March 2023).
- Wang, T. H., & Katzev, R. D. (1990). Group commitment and resource conservation: Two field experiments on promoting recycling. *Journal of Applied Social Psychology*, 20(4), 265–275. <https://doi.org/10.1111/j.1559-1816.1990.tb00411.x>
- Webler, T., & Jakubowski, K. (2016). Mitigating damaging behaviors of snorkelers to coral reefs in Puerto Rico through a pre-trip media-based intervention. *Biological Conservation*, 197, 223–228. <https://doi.org/10.1016/j.biocon.2016.03.012>
- Widner, C. J., & Roggenbuck, J. (2000). Reducing theft of petrified wood at Petrified Forest National Park. *Journal of Interpretation Research*, 5(1), 1–18. <https://doi.org/10.1177/109258720000500101>
- Wilkins, E. J., Howe, P. D., & Smith, J. W. (2021). Social media reveal ecoregional variation in how weather influences visitor behavior in US National Park Service units. *Scientific Reports*, 11(1), 2403. <https://doi.org/10.1038/s41598-021-82145-z>
- Witvorapong, N., & Watanapongvanich, S. (2020). Using pre-commitment to reduce alcohol consumption: Lessons from a quasi-experiment in Thailand. *Socio-Economic Planning Sciences*, 70, Article 100723. <https://doi.org/10.1016/j.seps.2019.06.008>
- Wright, P. M., & Kacmar, K. M. (1994). Goal specificity as a determinant of goal commitment and goal change. *Organizational Behavior and Human Decision Processes*, 59(2), 242–260. <https://doi.org/10.1006/obhd.1994.1059>



Elizabeth Cooper is a PhD Fellow at Copenhagen Business School, Denmark. In her PhD research, she aims to understand the psychology of visitors to extraordinary places, and use this knowledge to encourage more sustainable tourist behaviour in destination. Elizabeth's general research interests include sustainable tourist behaviour, tourist psychology, and tourism to peripheral and extraordinary places, such as the Arctic and Antarctica.



Bettina Grün (WU Vienna University of Economics and Business) is an applied statistician with specific expertise in the analysis of field experiments. Bettina's core research interests include finite mixture models and their application in model-based clustering including estimation as well as implementation in statistical software, and quantitative methods in economics, marketing and tourism.



Sara Dolnicar is Professor of Tourism at The University of Queensland. Her primary research interest is the improvement of measures used in social science research. She applies her work primarily to tourism, but also social marketing challenges, such as environmental volunteering, foster care and public acceptance of recycled water. She currently leads the Low Harm Hedonism Initiative: <https://business.uq.edu.au/research/low-harm-hedonism>.