

Article

# Can Social Comparison Feedback Affect Indicators of Eco-Friendly Travel Choices? Insights from Two Online Experiments

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**Abstract:** Two online experiments explored the effects of social comparison feedback on indicators of eco-friendly travel choices. It was tested whether the chosen indicators are sensitive to the information conveyed, and if this varies as a function of in-group identification. Study 1 ( $N = 134$ ) focused on unfavourable feedback (i.e., being told that one has a larger ecological footprint than the average member of a reference group). People who received unfavourable feedback reported stronger intentions to choose eco-friendly travel options than those who received nondiscrepant feedback, when in-group identification was high (not moderate or low). Perceived self- and collective efficacy were not associated with the feedback. Study 2 ( $N = 323$ ) extended the focus on favourable feedback (i.e., being told that one has a smaller ecological footprint than the average member of a reference group). Neither unfavourable nor favourable feedback was associated with behavioural intentions, self- or collective efficacy. This means that Study 2 failed to replicate the finding of Study 1 that behavioural intentions were associated with unfavourable feedback, given that in-group identification is high. The findings are discussed in light of the existing literature. Suggestions are made for future studies investigating social comparison feedback as a means to motivate people to make eco-friendly travel choices.

**Keywords:** sustainable tourism; travel choices; ecological footprint; feedback strategies; social comparison

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## 1. Introduction

The choices which people make, both before and during their vacation, can play an important part in creating a more sustainable tourism sector [1,2]. For example, choosing accommodation and transportation with low carbon dioxide (CO<sub>2</sub>) emissions, can place pressure on the tourism industry to supply products and services that help to satisfy these demands [1]. This calls for research on what motivates people to consider environmental issues when they choose between different vacation options.

There has been some discussion on whether online calculators, designed to give feedback on the environmental impact of certain lifestyles, can assist people in choosing vacation options considered to reduce negative impacts in this regard [3,4]. Feedback can instigate behavioural change because recipients are made aware of the consequences (positive or negative) associated with the targeted behaviour [5]. Whilst many studies attest to the effectiveness of feedback in promoting conservation behaviour, there is also evidence that effects vary as a function of how and to whom feedback is presented [6].

This paper focuses on social comparison feedback, which is when people receive feedback about their own ecological footprint relative to the ecological footprint of the average member of a reference group (cf. [7]). The aims were to investigate (i) whether the information conveyed through such feedback affects indicators of eco-friendly travel choices, along with (ii) whether these effects vary as a function of in-group identification.

### *1.1. Social Comparison Feedback and Pro-Environmental Behaviour*

Social comparison feedback has been proven effective for instigating behavioural change with environmental significance, most notably that associated with energy saving (e.g., [8,9]; for contrasting evidence, see e.g., [10]). For example, Brook [11] found that informing people that they have a larger than average ecological footprint can affect subsequent behaviour. Whilst people who based their self-esteem on environmentalism showed increases in pro-environmental behaviour, decreases were observed among those who did not base their self-esteem on environmentalism. Another study that used the ecological footprint for investigating responses to social comparison feedback comes from Toner et al. [12]. They measured the strongest pro-environmental intentions in response to individual feedback that was worse than that of the average member of an important peer group. People who received this information (presented as results from a bogus carbon footprint calculator) expressed stronger intentions than those who were informed that they were doing either similar to, or better than, their peers.

Aitken et al. [13] tested whether comparative feedback (own household vs. average household) can stimulate changes in residential water consumption. Those who learned that the average household was using less than them showed decreases in water usage after receiving such feedback, whereas households using far below-average responded with increases in water usage if no additional information was provided. Schultz et al. [14] made similar observations when they provided residents with feedback about the average energy consumption in the neighbourhood. This led to decreases in energy usage for above-average consumption households, and, unless accompanied by information indicating social approval of energy saving, increases in energy usage for below-average consumption households. This finding implies that feedback indicating below-average consumption may not only be ineffective in promoting desired behavioural change, but in fact, may sometimes result in “unintended and undesirable boomerang effects” [14] (p. 430). Henceforth, the term unfavourable indicates feedback that one’s own footprint is larger, and the term favourable describes feedback that one’s own footprint is smaller, when compared to the ecological footprint of an average reference group member. Based on the above studies, the following hypotheses (H1a and H1b) were formulated:

**H1a.** *Unfavourable (vs. nondiscrepant) social comparison feedback strengthens intentions to choose eco-friendly travel options.*

**H1b.** *Favourable (vs. nondiscrepant) social comparison feedback weakens intentions to choose eco-friendly travel options.*

### *1.2. Social Comparison Feedback and Perceived Efficacy*

People’s beliefs that they can affect desired changes through their own actions play a pivotal role in human functioning [15]. Research shows that these beliefs are also important for explaining variability in consumption motivated by sustainability concerns. For instance, consumers who believe that they can personally promote sustainability goals through their purchases also seem more likely to buy sustainable instead of conventional product alternatives, than consumers who question their abilities in this regard (e.g., [16–18]).

Different lines of research have used different terms to refer to these types of personal beliefs [17]. The present paper builds on the literature that construes issues of environmental sustainability as social dilemmas (e.g., [19]), and uses the term self-efficacy to refer to an individual’s perceived ability to personally contribute to collectively-beneficial outcomes (here: improvements in sustainable

development; see also [20]). Specifically, this paper focuses on whether a person feels confident that his/her choices as a tourist provide a significant contribution to protecting the environment (cf. [16]).

If a desired outcome can only be accomplished by collective efforts, perceptions of efficacy are derived from one's own as well as others' performances [15,21]. This makes collective efficacy an important determinant for individual responses to large-scale societal challenges, such as climate change [22]. Collective efficacy is less about whether each individual action provides a significant additive for the pursuit of a set goal. Instead, it captures beliefs about the group's joint ability for achieving a desired outcome [23]. Previous research has demonstrated that perceptions about the effectiveness of collective action are indeed characteristic of those willing to make personal efforts to tackle environmental problems [22,24], with some studies suggesting that collective efficacy could be more important than self-efficacy in this context [16,25].

Bandura [23] noted that comparing one's own performances with those of others (as a form of vicarious experience) constitutes an important source for perceptions of efficacy, especially when perceived similarity with the referent is high. Research indeed suggests that exposure to social comparison information can alter perceived self-efficacy and individual performances [26,27]. Information of this kind has been further identified as a contributing factor to group performances via its association with perceived collective efficacy [28].

Pro-environmental behaviour often requires individuals to set personal interests aside, knowing that this behaviour only matters when echoed by a sufficient number of others (cf. [29]). We suggest that people may rely on social comparison information as a source for estimating perceived efficacy, particularly when individual and group feedback are combined (see above). Unfavourable feedback is expected to have strengthening effects as other people may appear extra willing to make an effort to protect the environment, and favourable feedback is expected to have weakening effects as other people are seemingly less engaged than oneself. The underlying assumption is that the former decreases, while the latter increases, the perceived likelihood that personal efforts (e.g., choosing eco-friendly travel options in spite of being costlier) are rendered insignificant considering the behaviour shown by others. Hence, the following hypotheses (H2a and H2b) are presented:

**H2a:** *Unfavourable (vs. nondiscrepant) social comparison feedback strengthens perceived self- and collective efficacy.*

**H2b:** *Favourable (vs. nondiscrepant) social comparison feedback weakens perceived self- and collective efficacy.*

### 1.3. Social Comparison Feedback and In-Group Identification

The degree to which a person defines or views himself/herself as being a member of a given group has been described as in-group identification [30,31]. Research in this domain shows that people tend to ascribe similar characteristics to themselves as to their fellow group members (e.g., [32]) and evaluate in-group membership more positively than out-group membership (e.g., [33]). Moreover, making group membership salient promotes behaviours that focus on collective rather than personal welfare [34]. It has been further demonstrated that strong in-group identification increases the likelihood of behavioural adherence to norms that are dominant within that group, including those concerned with environmental issues (e.g., [35–37]).

Rabinovich and Morton [38] informed participants about their own carbon footprint (i.e., individual feedback) relative to that of an average citizen of the same nation (i.e., group feedback). They found that individual responses to discrepant feedback varied at different levels of identification with the reference group. For instance, negative group feedback combined with positive individual feedback only strengthened perceptions about the need for societal change when group identification was strong. Graffeo et al. [39] tested whether comparative feedback can motivate energy conservation among students residing on campus. In addition, the reference frame in which the feedback was provided was varied systematically (in-group vs. out-group, identified vs. unidentified). Feedback led to an increase in the intention to save energy compared to a non-feedback condition. Most effective in this regard was feedback involving a comparison with others from the same neighborhood without providing further details (i.e., in-group and unidentified). It was more effective than any other feedback, including the comparison with a statistically average household. Therefore, the following hypothesis (H3) is presented:

**H3:** *Effects of social comparison feedback vary as a function of in-group identification.*

## 2. Study 1

A 1 (individual feedback: highly negative) × 2 (group feedback: highly negative vs. moderately negative) between-subjects design was employed. The aim was to study the effect of unfavourable social comparison feedback; information indicating that one's own ecological footprint is larger than that of an average reference group member.

### 2.1. Materials and Methods

#### 2.1.1. Participants

The participants ( $M_{\text{age}} = 21.84$ ,  $SD_{\text{age}} = 3.49$ , 17–40 years, one person provided no age) were 134 students (91 female) from the same university who took part in return for a shopping voucher worth 100 NOK. Recruitment was conducted during lectures as well as through advertising the study on campus. Participants were told that the aim was to better understand how people in Norway think and feel about environmental issues, such as their personal ecological footprint. It can be assumed that they were naïve about the actual purpose of the study. Those consenting to participate signed up with an e-mail address on a recruiting webpage or on a paper-and-pencil sheet.

#### 2.1.2. Procedures

Participants received a standardized invitation e-mail that included a personalized link directing them to a webpage (one reminder). The webpage (page 1) included a brief description about the study's aims (e.g., to understand public opinions of environmental issues), practical issues (e.g., duration, possibility to quit at any time), and contact information. After providing information about their gender, age, and identification with other students at their university (page 2), participants were informed (page 3) that they would be presented with a list of different types of behaviour that can directly or indirectly impact the environment, that a calculator would estimate their personal ecological footprint based on their answers, and that they would get information about the ecological footprint of an average student at their university. These instructions concluded with a formal description of what the term ecological footprint stands for, as defined by the World Wide Fund for Nature [40].

Participants were told to choose the answer that best described their lifestyle (page 4). Questions about the respective behaviours were clustered under the following categories: food products (4 items: e.g., How often do you eat meat?), consumption (2 items: e.g., How often do you buy new clothes, shoes, and/or sport goods), energy and recycling (5 items: e.g., How much of the paper you use do you recycle?), as well as mobility and transportation (5 items: e.g., How often do you cycle or walk from one place to another (more than 2km distance)?). The covered behaviours were similar to those typically included in online footprint calculators (for an example, see [41]). After pressing a button labelled calculate, a dynamic graphic appeared, counting down from 15 s in order to simulate the calculation process (page 5). This was followed by the provision of bogus feedback, in which a participant's own ecological footprint was compared to that of an average student at their university (page 6).

Feedback information stated how many earths would be needed if everybody were to maintain a lifestyle similar to the one of the participant (i.e., individual feedback), and how many earths would be needed if everybody were to maintain a lifestyle similar to that of an average student at their university (i.e., group feedback). This information was also illustrated graphically (cf. [12]). Participants were randomly allocated nondiscrepant/highly negative (coded = 0) or discrepant/unfavourable (coded = 1) feedback:  $t(131)_{\text{age}} = -0.96$ ,  $p = 0.340$ ;  $\chi^2(1)_{\text{gender}} < 0.01$ ,  $p = 0.958$ ;  $t(132)_{\text{identification}} = 0.40$ ,  $p = 0.968$ . A detailed description of these conditions can be found in Table 1 and Appendix A. Similar to Toner et al. [12], we chose moderately negative rather than neutral feedback as a reference point for a relatively low environmental impact. This has been recommended as people are likely to think that their current behaviours have some sort of negative impact on the environment [11,12].

The following pages (page 7–9) included items for measuring the dependent variables and for running the manipulation checks. All participants were debriefed (page 10), before being provided with information about how to receive a shopping voucher as compensation (page 11).

**Table 1.** Summary for the different feedback conditions.

Study	Feedback Description	Individual Feedback	Group Feedback
Study 1			
Condition 1	nondiscrepant/high. negative	high. negative	high. negative
Condition 2	discrepant/unfavourable	high. negative	mod. negative
Study 2			
Condition 1	nondiscrepant/high. negative	high. negative	high. negative
Condition 2	discrepant/unfavourable	high. negative	mod. negative
Condition 3	discrepant/favourable	mod. negative	high. negative
Condition 4	nondiscrepant/mod. negative	mod. negative	mod. negative

Note: mod. negative = moderately negative; high. negative = highly negative.

### 2.1.3. Measures

In-group identification was assessed with the Inclusion of Ingroup in the Self measure from Tropp and Wright [32]. This single-item measure asks people to choose among seven pairs of circles (one reflects the self and one reflects the in-group) with varying degrees of overlap. Participants in this particular study were asked to think about students at their university as a group, and then to indicate the degree to which they identified with members of that group. Responses were coded from 1 (no overlap) to 7 (high degree of overlap), with higher numbers indicating higher levels of in-group identification (cf. [32]).

Participants received information that suggested a link between tourism and the environment. Specifically, it was stated that contemporary tourism activities are a significant factor considering negative impacts on the environment, mentioning the contribution to global climate change via CO<sub>2</sub> emissions as an example (see [2]). Participants were then asked to indicate the likelihood that they would perform a set of behaviours when it comes to their next travel (1 = Very unlikely, 10 = Very likely). It was explicitly stated that these were possible measures to reduce negative environmental impacts stemming from tourism activities. Each behaviour has been identified in the literature as an area for implementing behavioural change to reduce CO<sub>2</sub> emissions from tourism [1]. Higher scores on the respective items indicated stronger behavioural intentions (6 items,  $\alpha = 0.88$ ).

Perceived efficacy was operationalized similar to past studies on consumption preferences at home (e.g., [17]) and in tourism (e.g., [16]). Items asked participants to indicate their level of agreement with statements about the effectiveness of their own (i.e., self-efficacy; 3 items,  $\alpha = 0.87$ ) and tourists' (i.e., collective efficacy; 3 items,  $\alpha = 0.93$ ) actions (1 = Strongly agree, 10 = Strongly disagree). Responses were recoded so that higher scores indicated stronger perceived efficacy. Means and standard deviations are reported in Table 2. For a complete list of items, see Appendix B.

Two items asked participants to indicate, considering the feedback that they had just received, how many earths would be needed to sustain a lifestyle like their own, or to sustain the lifestyle of an average student at their university (nine answer options ranging from 1–2 ..., 9–10). Responses to each item were coded from 1 (1–2 earths) to 9 (9–10 earths). Another item asked participants to judge whether the information presented to them, concerning individual and group feedback, was trustworthy (1 = Very untrustworthy, 10 = Very trustworthy).

### 2.1.4. Statistics

Cronbach's alpha was calculated to explore the internal consistency of the item measures (see above). Independent *t*-tests explored perceptions regarding the information conveyed in the different feedback conditions. Descriptive statistics were inspected to explore whether the information was perceived as trustworthy. This was completed in IBM SPSS Statistics (v.23). Hypotheses were tested in a model of simple moderation (Model 1; [42]) with feedback condition as a categorical independent variable, and in-group identification as a continuous moderator variable. Significant interactions

were explored by simple slope analyses of low ( $M - 1 SD$ ), moderate ( $M$ ), and high ( $M + 1 SD$ ) values for the moderator variable [43]. There were some participants with missing values for the dependent variables; these cases were removed from the analyses:  $n = 4$  for behavioural intentions;  $n = 8$  for self-efficacy;  $n = 8$  for collective efficacy. These analyses were computed using v.2.15 of the PROCESS macro for SPSS [42].

**Table 2.** Means and standard deviations for the moderator and the dependent variables.

Study	Condition 1		Condition 2		Condition 3		Condition 4	
	<i>n</i>	<i>M (SD)</i>	<i>n</i>	<i>M (SD)</i>	<i>n</i>	<i>M (SD)</i>	<i>n</i>	<i>M (SD)</i>
Study 1								
In-group identification	69	3.58 (1.56)	65	3.57 (1.45)				
Behavioural intentions	68	3.91 (1.72)	62	4.54 (2.18)				
Self-efficacy	67	6.85 (2.25)	59	7.20 (2.17)				
Collective efficacy	67	7.37 (2.45)	59	7.24 (2.35)				
	<i>n</i>	<i>M (SD)</i>	<i>n</i>	<i>M (SD)</i>	<i>n</i>	<i>M (SD)</i>	<i>n</i>	<i>M (SD)</i>
Study 2								
In-group identification	76	4.01 (1.52)	82	3.94 (1.53)	87	4.33 (1.53)	78	4.12 (1.50)
Behavioural intentions	73	4.57 (2.03)	77	4.89 (2.12)	84	4.12 (2.07)	75	4.33 (1.96)
Self-efficacy	72	6.99 (2.05)	76	6.76 (2.18)	83	6.49 (2.23)	75	6.41 (2.21)
Collective efficacy	72	7.74 (1.75)	76	7.22 (2.22)	83	7.41 (2.43)	75	7.32 (2.14)

Note: Condition 1 = highly negative individual feedback and highly negative group feedback; Condition 2 = highly negative individual feedback and moderately negative group feedback; Condition 3 = moderately negative individual feedback and highly negative group feedback; Condition 4 = moderately negative individual feedback and moderately negative group feedback.

## 2.2. Results

### 2.2.1. Manipulation Checks

For perceptions about individual feedback, there was no significant difference between participants in the nondiscrepant/highly negative or discrepant/unfavourable condition,  $t(69.89) = 1.15$ ,  $p = 0.254$ . For perceptions about group feedback, participants who received nondiscrepant/highly negative feedback reported significantly higher ratings than those who received discrepant/unfavourable feedback,  $t(116.99) = 15.00$ ,  $p < 0.001$ . Trustworthiness ratings were close to the midpoint of the scale in both conditions: nondiscrepant/highly negative feedback,  $M = 6.54$ ,  $SD = 2.24$ ; discrepant/unfavourable feedback,  $M = 5.22$ ,  $SD = 2.32$ . In sum, participants recalled the presented information and trustworthiness ratings were acceptable.

### 2.2.2. Dependent Variables

Table 3 shows that feedback condition and in-group identification were not significantly associated with intentions to choose eco-friendly travel options. However, the interaction term of the two variables was significant. Simple slope analyses revealed that participants who received discrepant/unfavourable feedback reported stronger behavioural intentions than those who received nondiscrepant/highly negative feedback when in-group identification was high,  $B = 1.57$ , 95% CI (0.44, 2.71),  $t = 2.74$ ,  $p = 0.007$ , but not when it was moderate,  $B = 0.64$ , 95% CI (-0.05, 1.32),  $t = 1.84$ ,  $p = 0.069$ , or low,  $B = -0.30$ , 95% CI (-1.15, 0.56),  $t = -0.69$ ,  $p = 0.491$ .

Feedback condition and in-group identification showed no significant association with self-efficacy; neither was there a significant interaction. Results for collective efficacy were similar. There was no significant association with feedback condition or in-group identification, and no significant interaction. A detailed report of these results can be found in Table 3.

**Table 3.** Linear model of predictors of the dependent variables in Study 1 and Study 2.

Study	Behavioural Intentions			Self-Efficacy			Collective Efficacy		
	B	SE B	t	B	SE B	t	B	SE B	t
Study 1									
Constant	4.22 [3.88, 4.56]	0.17	24.65 ***	7.01 [6.61, 7.41]	0.20	34.71 ***	7.31 [6.88, 7.74]	0.22	33.42 ***
In-group identification (II)	0.04 [-0.21, 0.28]	0.12	0.30	<0.01 [-0.26, 0.26]	0.13	0.01	0.12 [-0.14, 0.38]	0.13	0.89
Condition 1 vs. Condition 2 (C1 vs. C2)	0.64 [-0.05, 1.32]	0.35	1.84	0.36 [-0.44, 1.16]	0.40	0.89	-0.13 [-1.00, 0.74]	0.44	-0.30
C1 vs. C2 x II	0.64 [0.14, 1.13]	0.25	2.52 *	<0.01 [-0.53, 0.53]	0.27	<0.01	-0.09 [-0.62, 0.43]	0.26	-0.35
	$R^2 = 0.08$ $F(3, 126) = 2.79 *$			$R^2 = 0.01$ $F(3, 122) = 0.26$			$R^2 = 0.01$ $F(3, 122) = 0.41$		
	B	SE B	t	B	SE B	t	B	SE B	t
Study 2									
Constant	4.57 [4.10, 5.05]	0.24	19.05 ***	6.99 [6.51, 7.48]	0.25	28.40 ***	7.74 [7.33, 8.15]	0.21	36.89 ***
In-group identification (II)	0.13 [-0.25, 0.51]	0.19	0.68	0.04 [-0.30, 0.38]	0.17	0.22	-0.06 [-0.33, 0.22]	0.14	-0.41
Condition 1 vs. Condition 2 (C1 vs. C2)	0.33 [-0.34, 1.01]	0.34	0.98	-0.22 [-0.91, 0.47]	0.35	-0.62	-0.52 [-1.18, 0.14]	0.33	-1.56
Condition 1 vs. Condition 3 (C1 vs. C3)	-0.47 [-1.12, 0.19]	0.33	-1.41	-0.53 [-1.21, 0.16]	0.35	-1.51	-0.34 [-1.01, 0.32]	0.34	-1.01
Condition 1 vs. Condition 4 (C1 vs. C4)	-0.25 [-0.90, 0.40]	0.33	-0.75	-0.57 [-1.27, 0.13]	0.36	-1.59	-0.43 [-1.07, 0.22]	0.33	-1.31
C1 vs. C2 x II	0.03 [-0.49, 0.54]	0.26	0.10	0.08 [-0.38, 0.55]	0.24	0.36	0.03 [-0.40, 0.45]	0.22	0.12
C1 vs. C3 x II	-0.07 [-0.53, 0.40]	0.24	-0.29	0.08 [-0.38, 0.53]	0.23	0.33	0.11 [-0.33, 0.55]	0.22	0.49
C1 vs. C4 x II	-0.21 [-0.65, 0.24]	0.23	-0.92	0.09 [-0.36, 0.54]	0.23	0.38	<0.01 [-0.44, 0.45]	0.23	0.01
	$R^2 = 0.03$ $F(7, 301) = 1.26$			$R^2 = 0.02$ $F(7, 298) = 0.79$			$R^2 = 0.01$ $F(7, 298) = 0.47$		

Note: Condition 1 = highly negative individual feedback and highly negative group feedback; Condition 2 = highly negative individual feedback and moderately negative group feedback; Condition 3 = moderately negative individual feedback and highly negative group feedback; Condition 4 = moderately negative individual feedback and moderately negative group feedback. Shown are unstandardized coefficients and 95% confidence intervals based on mean-centred products and heteroscedasticity-consistent SEs (cf. [44]). For behavioural intentions in Study 1:  $R^2_{\text{change}} = 0.06$ ,  $F(1, 126) = 6.37$ ,  $p = 0.013$ . \*\*\* $p < 0.001$ . \* $p < 0.05$ .

### 2.3. Discussion

Previous research suggests that individual responses to social comparison feedback can vary in relation to the degree to which recipients identify with the reference group (see e.g., [38]). Indeed, feedback indicating that one is doing worse than an average reference group member was effective in bringing about stronger behavioural intentions when it was met with high in-group identification, but not when it was met with moderate or low in-group identification. These findings suggest that unfavourable social comparison feedback can strengthen intentions to choose eco-friendly travel options, but that this effect depends on the level of identification with the reference group.

Social comparison information has been identified as an antecedent for perceived efficacy at an individual and group level (see e.g., [27,28]). Yet, our hypothesis that unfavourable social comparison feedback would strengthen perceived self- and collective efficacy was not supported by the data. Furthermore, other than for behavioural intentions, similar patterns emerged for all participants irrespective of the degree to which they identified with the reference group.

## 3. Study 2

It remains unclear from the reported results how participants would respond to favourable social comparison feedback; information indicating that one's own ecological footprint is smaller than that of an average reference group member. A 2 (individual feedback: highly negative vs. moderately negative)  $\times$  2 (group feedback: highly negative vs. moderately negative) between-subjects design addressed this.

### 3.1. Materials and Methods

#### 3.1.1. Participants

Recruitment was similar to Study 1. Participants were promised a shopping voucher (50 NOK) and a chance of winning an extra shopping voucher (500 NOK). This led to a sample of 323 students (224 female) from the same university ( $M_{\text{age}} = 21.99$ ,  $SD_{\text{age}} = 3.57$ , 18–48 years, one person provided no age).

#### 3.1.2. Procedures

Study invitations were sent out via e-mail (two reminders). Procedures were similar to Study 1, except for the use of additional questions as a base for calculating the ecological footprint. This was meant to increase the trustworthiness of the provided information as well as the salience of tourism as a contributor to environmental problems. Additional questions (5 items: e.g., How often do you choose to pay extra in order to compensate for carbon emissions generated from your air travel?) addressed domains considered important for lowering CO<sub>2</sub> emissions from tourism (see [1]).

Participants were randomly assigned nondiscrepant/highly negative (coded = 0), discrepant/unfavourable (coded = 1), discrepant/favourable (coded = 2), or nondiscrepant/moderately negative (coded = 3) feedback:  $F(3, 318)_{\text{age}} = 1.26$ ,  $p = 0.290$ ;  $\chi^2(3)_{\text{gender}} = 0.68$ ,  $p = 0.878$ ;  $F(3, 319)_{\text{identification}} = 1.07$ ,  $p = 0.361$ . A description for each condition is provided in Appendix A.

#### 3.1.3. Measures

In-group identification, dependent variables, and manipulation checks were similar to those of Study 1, with the exception of the use of different scale labels for items addressing self- and collective efficacy (1 = Strongly disagree, 10 = Strongly agree). Internal consistencies were  $\alpha = 0.88$  (behavioural intentions),  $\alpha = 0.83$  (self-efficacy), and  $\alpha = 0.90$  (collective efficacy). For a summary of the means and standard deviations, see Table 2.

#### 3.1.4. Statistics

Statistical analyses were similar to those in Study 1. Following recommendations in the literature (cf. [44]), feedback condition was dummy coded prior to the analysis with nondiscrepant/highly



negative feedback as the reference category. Participants with missing values for the dependent variables were excluded from further analyses:  $n = 14$  for behavioural intentions;  $n = 17$  for self-efficacy;  $n = 17$  for collective efficacy.

### 3.2. Results

#### 3.2.1. Manipulation Checks

For perceptions of individual feedback, participants who received highly negative information about their own footprint reported significantly higher ratings than those who received moderately negative information,  $t(304) = 27.92$ ,  $p < 0.001$ . For perceptions of group feedback, participants given highly negative information about the average footprint reported significantly higher ratings than those given moderately negative information,  $t(304) = 19.17$ ,  $p < 0.001$ . Trustworthiness ratings across conditions were comparable to Study 1: nondiscrepant/highly negative,  $M = 6.68$ ,  $SD = 2.27$ ; discrepant/unfavourable,  $M = 5.41$ ,  $SD = 2.13$ ; discrepant/favourable,  $M = 7.20$ ,  $SD = 1.99$ ; nondiscrepant/moderately negative,  $M = 6.76$ ,  $SD = 2.06$ . In sum, participants recalled the information communicated to them and levels of trustworthiness were acceptable.

#### 3.2.2. Dependent Variables

Feedback condition and in-group identification did not show a significant association with intentions to choose eco-friendly travel options; neither were any of their interaction terms significant (see Table 3). Results for the other variables were similar as self- and collective efficacy were not significantly affected by the feedback condition (see Table 3). In each case, there was no significant association with in-group identification, and the analysis did not reveal significant interactions for the variables.

### 3.3. Discussion

A central aim of Study 2 was to replicate our prior finding on the effect of unfavourable social comparison feedback. In contrast to Study 1, however, intentions to choose eco-friendly travel options were not strengthened in response to unfavourable social comparison feedback, with similar effects at varying levels of in-group identification. The same was reported in connection with self- and collective efficacy.

Some research (e.g., [14]) shows that feedback on environmental performances can make one's own consumption level increase, in cases when it indicates that one is already better off than the group average. Our hypothesis that favourable social comparison feedback would weaken intentions to choose eco-friendly travel options was not supported by the data; neither were there any differences due to in-group identification. Similar results were reported with self- and collective efficacy as dependent variables.

## 4. General Discussion

The present paper started by examining the literature on feedback to accomplish behavioural change for environmental causes. This literature shows that there are situations in which the provision of feedback is an effective means to motivate conservation behaviour [5,7]. Study 1 suggested that unfavourable social comparison feedback can affect intentions to choose eco-friendly travel options under certain conditions, namely when in-group identification is high. In that case, self-reported behavioural intentions were highest when participants received information indicating that their own ecological footprint is larger than (vs. similar to) that of an average reference group member. It is consistent with studies where group norms promoted pro-environmental attitudes and behaviours when referencing in-group behaviour, but not when referencing out-group behaviour [36,37].

Study 2 failed to replicate the effect of unfavourable social comparison feedback on intentions to choose eco-friendly travel options. This finding adds to an existing body of research where feedback employing social comparison failed to promote conservation efforts (e.g., [10]; see also [6]). One reason for why norm-based interventions may be ineffective is a lack of credibility of the conveyed information [45]. Consequently, we checked whether the feedback information was judged

equally trustworthy across the two studies in order to explore if this could have accounted for the null findings in Study 2. The fact that adding further items to the questionnaire led to a marginal increase in the trustworthiness rating, however, suggests that a lack of credibility alone does not offer a sufficient explanation for the different results.

Another plausible explanation concerns possible differences in sample characteristics. Norm-based interventions have greater potential for promoting behavioural change when there is attitudinal support for the targeted behaviour [45]. We cannot rule out that participants in Study 2 were less concerned about environmental issues than participants in Study 1, and that this may have affected their responses. This may also explain the null findings reported for the hypothesized effect of favourable social comparison feedback on intentions to choose eco-friendly travel options. Considering factors suspected to affect the receptiveness for normative messages, such as environmental attitudes, could allow an exploration into the importance of individual differences in this regard (for similar views, see [38,46]).

We gave an account of, and the reasons for, considering perceived efficacy in relation to social comparison feedback. It extends previous works suggesting that changes in perceived efficacy are a possible mechanism underlying feedback effects in the environmental domain [5,47]. We drew upon the more general notion that comparing one's own performance with that of others constitutes an important source for estimating these perceptions [23]. There was a match between the results from the two studies in that a participant's sense of self- and collective efficacy was not associated with the assigned feedback condition.

This is one of the first attempts to examine perceived efficacy in connection with feedback combining individual (e.g., ecological footprint of oneself) and group (e.g., ecological footprint of others) environmental performances. Yet, our results are compatible with another study that focused on group feedback as a strategy for encouraging energy conservation in organizational settings [47]. This study found group-level feedback to be effective in motivating conservation efforts among employees, despite there being no association between feedback exposure and the perception of whether changing group behaviour can increase energy savings. Without rejecting the idea that perceived efficacy may help to explain feedback effects in some contexts, there is room to consider alternative explanations. Other mechanisms that could account (at least partly) for the effects of norm-based interventions are that they induce negative emotions such as guilt or shame, particularly in public settings [45], or that they stimulate information-seeking behaviour [48].

## 5. Limitations

There are some limitations in the present investigation. First, participants were recruited from the local student population. This allowed us to rely on existing social structures for making social comparison more meaningful, as proposed by Kurz et al. [10]. It limits the generalizability of our findings as participants were not representative of the general public. Additional research with samples other than students is therefore recommended. Secondly, effects of social comparison feedback were tested on behavioural intentions and perceived efficacy; actual behaviour was not investigated. Including measures of actual behaviour would heighten the practical implications of research employing designs similar to the present investigation. This concurs with recent calls in the tourism literature for using objective instead of subjective behavioural measures, as these avoid problems such as social desirability bias [49]. Third, social comparison feedback may evoke stronger individual responses when the referents are identifiable rather than anonymous (see [10]; but see also [39]). The participant instructions explicitly stated that all information would be treated confidentially and would only be used for research purposes. This, in combination with the fact that participants allegedly received the feedback in private, could have affected their responses. Finally, a larger number of participants for each condition, and thus an increased statistical power, would have given extra credence to the findings.

## 6. Conclusions

This paper reported mixed results regarding the effects of social comparison feedback on indicators of eco-friendly travel choices. More research is needed to elucidate whether exposure to feedback involving social comparison information causally contributes to eco-friendly travel choices, and what factors may moderate this relationship. One promising avenue in this regard is to look at the characteristics of the reference group [7]. The two studies presented in this paper employed information about the ecological footprint of an average student at the same university, without providing any further indication of similarity with the recipient. Increasing perceived similarity, and probably the behavioural relevance of the feedback, might be accomplished by providing socio-demographics (like age or gender) that match the characteristics of the recipient. The underlying thinking is that social comparisons are more relevant for self-evaluative processes when perceived similarity with the referent is high [23,50]. If future studies do not demonstrate stronger effects on indicators of eco-friendly travel choices, and eventually actual behaviour, the provision of social comparison feedback may not be an efficient route to stimulate changes in the way in which people plan their vacation.

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**Author Contributions:** Rouven Doran and Daniel Hanss designed the studies and collected the data; Rouven Doran analysed the data and wrote the first draft of the manuscript. Torvald Øgaard commented on the data analyses. All authors read and approved the final draft of the manuscript.

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## Appendix A

### *Appendix A.1. Condition 1: Nondiscrepant/Highly Negative (Translated from Norwegian)*

Based on your answers to the questionnaire, if everyone living on earth had lived like you do now, we would have needed 4.46 earths to sustain this lifestyle (see picture 1). This means that you use 4.46 times as many resources as the earth actually can endure per individual.

Based on answers in earlier investigations among [university name] students, if everyone living on earth had lived like an average [university name] student is doing now, we would have needed 4–5 earths to sustain this lifestyle (see picture 2). This means that an average student at [university name] uses about as much resources as you.

### *Appendix A.2. Condition 2: Discrepant/Unfavourable (Translated from Norwegian)*

Based on your answers to the questionnaire, if everyone living on earth had lived like you do now, we would have needed 4.46 earths to sustain this lifestyle (see picture 1). This means that you use 4.46 times as many resources as the earth actually can endure per individual.

Based on answers in earlier investigations among [university name] students, if everyone living on earth had lived like an average [university name] student is doing now, we would have needed 2–3 earths to sustain this lifestyle (see picture 2). This means that an average student at [university name] uses fewer resources than you.

### *Appendix A.3. Condition 3: Discrepant/Favourable (Translated from Norwegian)*

Based on your answers to the questionnaire, if everyone living on earth had lived like you do now, we would have needed 2.46 earths to sustain this lifestyle (see picture 1). This means that you use 2.46 times as many resources as the earth actually can endure per individual.

Based on answers in earlier investigations among [university name] students, if everyone living on earth had lived like an average [university name] student is doing now, we would have needed 4–5 earths to sustain this lifestyle (see picture 2). This means that an average student at [university name] uses more resources than you.

#### *Appendix A.4. Condition 4: Nondiscrepant/Moderately Negative (Translated from Norwegian)*

Based on your answers to the questionnaire, if everyone living on earth had lived like you do now, we would have needed 2.46 earths to sustain this lifestyle (see picture 1). This means that you use 2.46 times as many resources as the earth actually can endure per individual.

Based on answers in earlier investigations among [university name] students, if everyone living on earth had lived like an average [university name] student is doing now, we would have needed 2–3 earths to sustain this lifestyle (see picture 2). This means that an average student at [university name] uses about as much resources as you.

## **Appendix B**

### *Appendix B.1. Behavioural Intentions Items (Translated from Norwegian)*

I am going to ...

... avoid transportation means that produce a lot of carbon dioxide (e.g., plane), even if the alternatives take longer time.

... use extra time in the planning stage of my travel to find out how to best take the environment into account.

... choose nearby holiday places (e.g., in Nordic countries) if this helps to stop environmental problems stemming from tourism activities.

... avoid transportation means that produce a lot of carbon dioxide (e.g., plane) even if the alternatives are more expensive.

... choose accommodation places that are certified as environmentally friendly (e.g., low energy use), even if conventional offers are cheaper.

... pay extra money to reduce negative impacts on the environment that can be linked to my travel (e.g., voluntary participation in “carbon offsetting”-programs).

### *Appendix B.2. Self-Efficacy Items (Translated from Norwegian)*

By avoiding transportation means that produce a lot of carbon dioxide (e.g., plane), I can contribute to stop environmental problems stemming from tourism activities.

By choosing accommodation places that are certified as environmentally friendly (e.g., low energy use), I can help to protect the environment.

By choosing nearby holiday places (e.g., Nordic countries), I can contribute to reduce negative impacts on the environment.

### *Appendix B.3. Collective Efficacy Items (Translated from Norwegian)*

By choosing transportation means with low negative impact on the environment, we as tourists can contribute to stop environmental problems.

By asking for environmentally friendly travel alternatives (e.g., low carbon dioxide emissions), we as tourists can make a difference when it comes to environmental preservation.

We as tourists can actively contribute to protect the environment by choosing nearby holiday places.

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