Journal of Outdoor Recreation and Tourism 44 (2023) 100677

Contents lists available at ScienceDirect

Journal of Outdoor Recreation and Tourism

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

Research Article

Stand-up paddling: A case study on the effect and impact pathway of information and appeals to reduce ecological conflicts

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ARTICLE INFO

Keywords:
Stand-up paddling
Ecological conflicts
Behaviour change
Management measures
Campaign

ABSTRACT

Water bodies form important habitats for animals and plants. At the same time, they offer special recreational benefits, through nature experiences, their scenic quality or as a basis for sport activities. However, high visitor numbers and problematic behaviour can lead to disturbances in nature. To maintain the recreational benefits of such public spaces and to protect nature, campaigns are a useful means, in addition to spatial interventions and legal regulations. This study evaluates a campaign to reduce negative effects on nature due to the increasingly popular activity of stand-up paddling. A written pre-post survey of the treatment group at Lake Greifensee was completed by the stand-up paddlers on site on tablets or location-independently on their own device. The control survey took place at Lake Lauerzersee, but mainly via various disseminators and social media in German-speaking Switzerland, starting with the pre-survey and ending with the post-survey at Lake Greifensee. The total sample comprised 334 people. To evaluate the campaign, behavioural predictors - based on the theory of planned behaviour (TPB) (Ajzen, 1991) - and self-reported behaviour of stand-up paddlers with and without exposure to the campaign were compared. Exposure to the campaign influenced the predictor "perceived control" the most; the two variables "knowledge" and "self-assessed skills" increased significantly with exposure to the campaign. The poster, which was present on site throughout the campaign, was the communication tool most perceived by stand-up paddlers. The variables that best predicted self-reported behaviour were *behavioural knowledge, relevance,* and *self-assessed ability*. The results indicate that TPB-predictors tend to be positively influenced by campaign exposure, and they point to a relationship between TPB-predictors and behaviour. However, not all components of the TPB-predictors are statistically significantly improved by campaign exposure, nor do they all significantly influence self-reported behaviour. Nonetheless, the results show that persuasive work improves self-reported ecological behaviour and largely confirm the impact path for persuasion as it has been theoretically proposed.

Management implications:

- A combination of information and behavioural recommendations reduce conflicts between stand-up paddlers and nature. To improve all TPB-predictors, additional efforts such as persuasion on an emotion-related basis are recommended.
- Due to the low level of organization of the activity and because information is rarely obtained in advance, paddlers are best informed on site or in the beginning of their activity career (e.g., when buying/renting equipment).

1. Introduction

Stand-up paddling has become increasingly popular in recent years. The activity is performed in many ways on standing and gently flowing waters, on white water and on the sea.

With relatively little equipment and organisation required, it is easy to get started in the sport. In particular on still waters, stand-up paddling is quickly learned. Inflatable boards, which can be carried in a special backpack, make travel easier and increase mobility on the lakeshore. Neoprene and dry suits make it possible to practice it even outside the

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https://doi.org/10.1016/j.jort.2023.100677
Received 8 July 2022; Received in revised form 5 July 2023; Accepted 6 August 2023

warm season. In a recent representative survey of the Swiss population on activity and interest in sports, stand-up paddling was still mentioned as a performed sport by less than 0.4% of the respondents, too rare to find further mention in this report (Lamprecht et al., 2020, p. 64). Nonetheless, a high number of stand-up paddlers can be observed on several Swiss lakes during the warmest part of the year, which raises the concern that they cause disturbances to nature, e.g., endangering waterfowl and migratory birds (Graf, 2018). As with other water sports, strategies are needed to protect nature from human disturbances. Such a strategy was applied by the association "Natur & Freizeit" with the campaign "Aufs Wasser mit Rücksicht" (engl.: On the water with respect).

The aim of the campaigners was to provide information to make water sports enthusiasts aware of potential conflicts with nature and to reduce problem-relevant behaviour while stand-up paddling.

The goal of the study reported here was to measure the success of the above-described campaign of the association "Natur & Freizeit" and to gain more knowledge about the stand-up paddlers to enable targeting future campaigns more effectively.

2. State of knowledge and theories

Based on expert statements (Graf, 2018) and the development of the sport in recent years in the USA (Outdoor Foundation, 2019), strong growth can be expected for stand-up paddling in Switzerland. As the sport is new in Switzerland and the study area "Greifensee", no systematic data on stand-up paddlers are yet available (Graf, 2018; Lamprecht et al., 2020, p. 64).

2.1. Ecological conflicts

A large number of studies deal with the effect of different water-based activities on nature. Nevertheless further research efforts are necessary to identify the causes and the disturbance effect on different species and water bodies (Krauβ, 2007; Schafft et al., 2021). According to Krüger (2018) it can be assumed that the intensity of disturbance caused by water recreationists, depends on volume, unpredictability (e.g., due to uneven velocity), speed, residence time, and visibility. If a water body is heavily frequented by water sports enthusiasts, wildlife may avoid the area in the long term (Krüger, 2018).

Studies on the disturbance potential of the activity stand-up paddling on birds are largely missing. In a paper investigating the spatial behaviour of paddlers, Baker et al. (2021, p. 7) showed that stand-up paddlers move differently on the water than kayakers and canoers: "…. stand-up paddlers are more prone to contact the shoreline, their behaviour may manifest in undesirable levels of impacts, particularly in sensitive ecological areas, such as wetlands, that may not be accessible by trail." Moving along waterbodies near important bird habitat (e.g., riparian areas such as reed beds, sandbars, and gravel bars) or bird aggregations can lead to the cessation or interruption of vital behaviours such as foraging or breeding. Disturbance stimuli increase energy consumption through stress, evasive as well as flight reactions (Bull & Rödl, 2018; Krüger, 2018; Schafft et al., 2021). Bull and Rödl (2018) suggest that the upright posture of stand-up paddler makes the human silhouette particularly visible to birds, and therefore a response to stand-up paddlers as potential predators is likely. Due to the repeatedly proven disturbance effect of other water sports on birds-e.g. canoeing (Glover et al., 2015; Steven et al., 2011) or kite and wind surfing (Krüger, 2018; Schikore et al., 2013) and a first study on the effect of stand-up paddling (Bull & Rödl, 2018), as well as the assessments of the Swiss bird conservation organization "Bird Life Schweiz" (Müller, 2019, pp. 16–17), negative effects of stand-up paddling on nature have to be expected.

2.2. Effects of management measures

Management measures have the potential to reduce ecological conflicts (Bell et al., 2007; Hubschmid & Hunziker, 2018; Manning & Anderson, 2012; Marion & Reid, 2007). They can be divided into hard measures which are restrictive economic and physical regulations (e.g. bans) and soft measures which are in a broader sense educational efforts that provide knowledge and behavioural options (e.g. infrastructure, signage, guidance, education) (Elands & Wirth, 2010; Mason, 2005). It is assumed that soft measures meet with higher acceptance than hard measures such as fines and bans (Elands & Wirth, 2010; Mosler & Tobias, 2007; Zeidenitz, 2005). Persuasion a soft measure used by campaigns also seems to be effective in combination with hard measures or additional soft measures, such as zoning (Batey, 2013).

To understand the interaction of different factors influencing (nature-related) behaviour, the *theory of planned behaviour (TPB)* as described by Ajzen and Madden (1986) and Ajzen (1991) is often used as the basic model (Fig. 1). It describes three behaviour predictors: attitude, subjective norm, and perceived control. The components of the behaviour-predictors (TPB-predictors), as described by the TPB, can be improved through persuasive work like the imparting of knowledge and behavioural options and a change in actual behaviour might be achieved (Ajzen, 1991, 2012; Ajzen & Madden, 1986; Mosler & Tobias, 2007).

The effect of measures can be improved by an increase of their acceptance when they are communicated via multiplicators like experts and role models (Mosler & Tobias, 2007; Petty & Cacioppo, 1986).

Despite the relevance of managing the growing number of stand-up paddlers, there are hardly any studies in the field of recreation research on the activity in general and none on the effect of measures taken targeting stand-up paddlers to protect nature. However, the positive effect of persuasion on behaviour shown for other activities can principally also be assumed for stand-up paddlers, although different factors might influence the acceptance and effect of specific management measures (Hubschmid & Hunziker, 2018; Mosler & Tobias, 2007; Oh et al., 2012; Sorice et al., 2009). Thus, a certain measure does not necessarily be equally successful for all activities, as differences in attitude, behaviour, prevailing norms, ease of behaviour control, aims, and connectedness within the activity may exist between outdoor activities.

3. Objectives and research questions

First of all, information about stand-up paddlers had to be gained to enhance the planning and conduction of future campaigns. Thus, beside sociodemographic characteristics, the most important activity-related characteristics including behavioural attitudes and information behaviour were to be determined. To reach this objective we aimed at answering the following research question:

RQ1 What are the socio-demographic and activity related characteristics of the stand-up paddlers?

The main objective of the study was to evaluate the effect of an exemplary campaign (mentioned in the introduction and described as intervention in the method section) aiming at reducing ecological problematic behaviours of stand-up paddlers. To reach this objective we aimed at answering the following research questions:

RQ2 Was the campaign with its elements noticed?
RQ3 Does the campaign lead to increased implementation of the promoted behaviour among stand-up paddlers?
RQ3a Does campaign exposure have a positive effect on the TPB-predictors?
RQ3b Do the components of the TPB-predictors influence behaviour?
RQ4 Where and through what disseminators and elements did stand-up paddlers become aware about the campaign?
RQ5 Do the specific campaign elements leaflet, poster, and homepage influence TPB-predictor components?

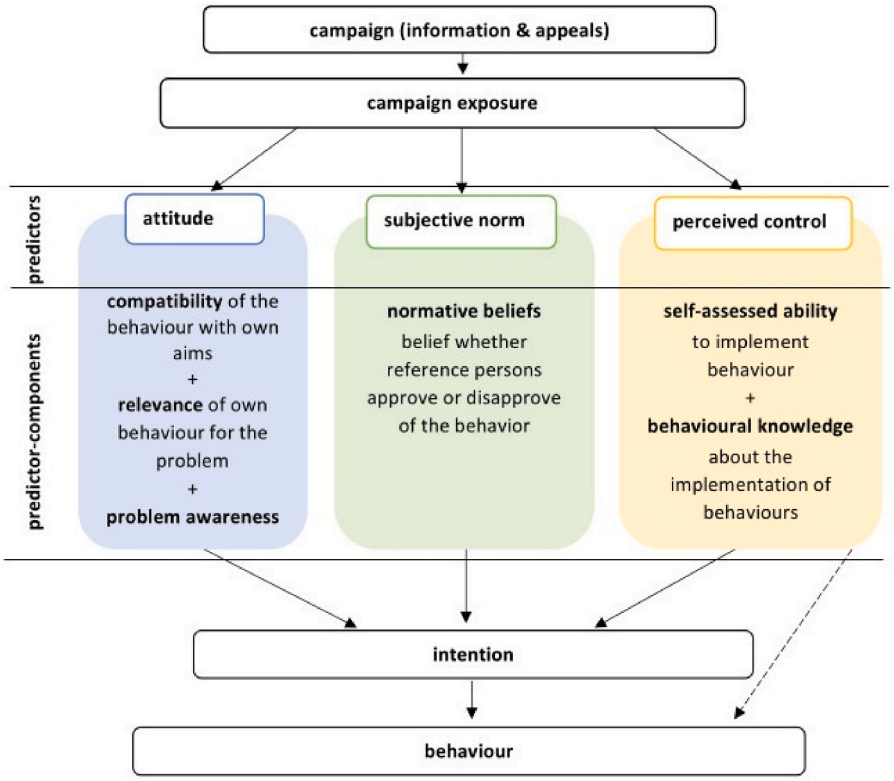


Fig. 1. Theory of planned behaviour-model for the campaign (own illustration based on Ajzen, 1991).

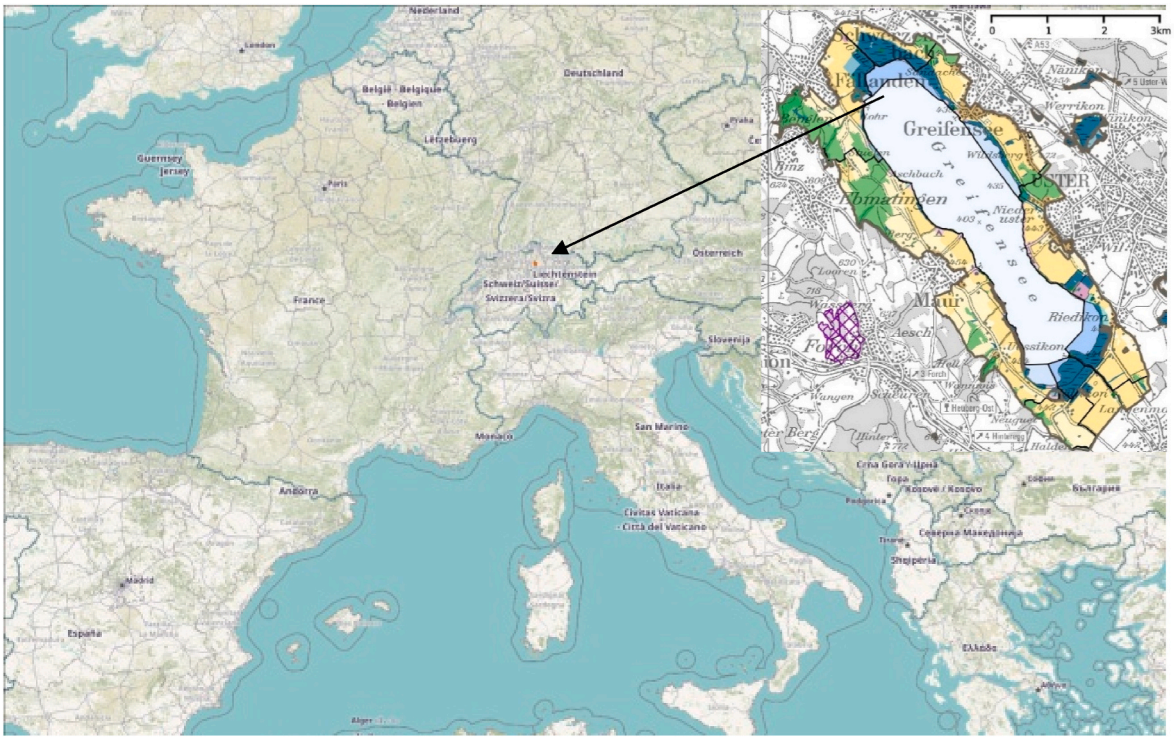


Fig. 2. Treatment area "Greifensee" (https://maps.zh.ch, 06.10.21, Topic: Schutzanordnungen Natur und Landschaft), section of Europe (https://www.openstreetmap.org, 06.10.21).

4. Method

To answer the research questions, we evaluated the before-mentioned exemplary campaign at one lake it was active. We interpreted the campaign of the NGO as an "intervention" and aimed at measuring its effect by applying a quasi-experimental approach.

4.1. The exemplary campaign serving as intervention

The campaign "Aufs Wasser mit Rücksicht", designed and driven by the NGO "Natur und Freizeit", provided information on the ecological and conservation-biological connections between stand-up paddling and the habitat requirements of wildlife, especially waterfowl and migratory birds. The aim was to sensitize water sports enthusiasts to possible conflicts with nature and to promote nature-friendly, especially bird-friendly behaviour.

After a pilot phase in 2020 on upper Lake Zurich and Lake Geneva, with remaining information on the association's homepage, the campaign entered a second active phase in 2021. Posters were put up at the lake shores and leaflets were distributed. The campaign was carried out in German at Lakes "Greifensee", "Türlersee", "Pfäffikersee" and upper Lake Zurich, and in French at Lake Geneva. The contents were published in German and French on the association's homepage. In addition, the campaign was spread through disseminators and relevant web portals.

The entire campaign leaflet and poster can be found in the appendix. The main part of the campaign consisted of appeals to encourage stand-up paddlers to change their behaviour (in the following translated from German to English):

- Keep your distance from the reeds. 100 m wherever possible. Many birds breed and hide in the reeds.
- Keep a large distance from bird gatherings. Do not stand-up paddle in water sections with bird gatherings in autumn and winter. Disturbances are possible from 1 km.
- Respect protected areas. Always stay outside the boundaries. These are sometimes marked with yellow buoys or signs and indicated on maps.

4.2. Study area

The "Greifensee" and its lake shore are a popular recreation area. It attracts different activity groups: Bikers, joggers, hikers, inline skaters, swimmers, wind surfers and in the last years also an increasing group of stand-up paddlers. Settlement areas such as the city of Uster (with about 36′000 inhabitants) directly adjoin the lake, which is also easily accessible from larger cities such as Zurich and Winterthur. The lake "Greifensee" is of national importance for migratory birds (BAFU, 1991). The reed beds along large stretches of shore provide suitable breeding sites for water birds, and two large, protected areas have been designated in the north and south of the lake (blue area in Fig. 2). Stand-up paddling is allowed outside the protected areas which are signed with buoys. From a distance of 300 m to the shore, one must carry a life jacket (BSV Art 134 Abs.4). In Switzerland there are a few stand-up paddling clubs on regional level, in the treatment area there is the "Greifensee dragonsclub" which is dedicated to dragon boating and stand-up paddling (Greifensee Dragons n. d.). Stand-up paddling has no own association on national level, it is part of the Swiss canoe club (Swiss Canoe n. d.).

4.3. Research design: quasi-experimental evaluation

To measure the effect of the campaign (interpreted as intervention) a quasi-experimental design was applied. In Table 1 we show timing and location of the campaign and the written survey.

4.4. Sampling procedure

4.4.1. Treatment group

We conducted a pre-and-post survey in the treatment area "Greifensee" (Fig. 2 and Table 1). The "Greifensee" area was a suitable study and treatment area because it attracts a high number of stand-up paddlers, and the above-mentioned campaign was carried out here in 2021. Since data on the characteristics of the target group of stand-up paddlers was missing, an opportunity sample was drawn, consisting of all stand-up paddlers reached and willing to complete the questionnaire in the treatment area. Here, participants were recruited by being personally asked to complete the questionnaire on a tablet or online on their own device, and by handing out and distributing flyers with a link to the online questionnaire.

Table 1
Overview intervention and sampling.

	Location	Method	Time	
Intervention: Campaign 2021	Lakeshore of Türlersee, Pfäffikersee, upper Lake Zurich, Lake Geneva	Provision (lido/rental stations) and distribution of leaflets on the lakeshore by staff and rangers, putting up posters at well-visited lake access points, Homepage, Dissemination of the campaign content or homepage link trough partner organisation		03.07.-09.09.2021
Treatment group (277 pers.)	Lakeshore of Greifensee and online	flyers with QR-code/web link of the survey were distributed and placed (lido/rental stations/restaurant/campsite), people were asked to make the survey on a tablet	Pre survey 24.06. - July 02, 2021 (136 pers.)	Post survey 28.08.-09.09.2021 (141 pers.)
Control group (57 pers.)	Lauerzersee	flyers with qr code/web link of the survey were distributed and placed (lido), people were asked to make the survey on a tablet	Sampling 26. and June 27, 2021 (7 pers.)	
	Online (50 pers.)	via disseminator (e.g., stand-up paddling instructor) or the Facebook group "SUP Stand Up Paddle Switzerland"	Sampling 28.06.-09.09.2021 (50 pers.)	

4.4.2. Control group

To control external influences not related to the campaign impact, a control group was surveyed. The chosen Control area "Lauerzersee" is located in the canton of Schwyz. It is a similar lake than the lake "Greifensee," although a bit smaller and more remote. The lake has protected areas and is also suitable for stand-up paddling. No campaign on nature conservation and stand-up paddling was conducted at this lake.

The control survey took place on site and mainly online, people (not visiting Greifensee) from all over the German-speaking part of

Switzerland (Table 1) were surveyed.

Of all questionnaires 36 were excluded from the evaluation mainly due to early dropout, so that a total of 334 completed questionnaires could be used for the data analysis.

4.5. Questionnaire

The first part of the questionnaire contained questions about the activity (e.g., skills and equipment) and about the self-reported behaviour. An existing survey from a study analysing the effect of persuasive measures for snow sport (Hubschmid & Hunziker, 2018) served as model to construct the measures as following: To measure the *self-reported behaviour* and its change due to campaign exposure, respondents were asked to indicate how often they adhered to the recommended behaviours.

The behaviour *distance to reed > 100 m* was supplemented by *distance to reed > 25 m* (legal minimum distance according to BSV Art. 53, 3.), so that finally four behaviours were asked. Code: (1) *never* to (4) *always*. The *stated general behaviour* summarizes all four behaviours into one mean score.

In a second part we asked if and how the stand-up paddlers got in contact with the campaign and its elements. This part was followed by questions about the TPB-predictors. One question per behavioural prompt was asked for the following five TPB-predictor components (Fig. 1): *behavioural knowledge* (whether respondents state to know the behavioural prompts), *self-assessed ability* (whether the respondents feel capable of implementing the behavioural prompts), *problem relevance of own behaviour* (stated perceived importance of acting in accordance with the prompts), *compatibility* (stated perceived restriction by the recommended behaviour), *normative beliefs* (stated believe that family and friends would comply with the behavioural prompts). The TPB-predictors component *problem awareness* was mapped by means of three statements about the problem relevance of water sports to bird conservation.

High scores indicate a positive *attitude* (*compatibility, relevance, problem awareness*), strong perceiving of *subjective norm* (*normative beliefs)* and the belief in a high own behaviour control (*self-assessed ability*, *behavioural knowledge*) of stand-up paddlers.

In the end we asked about the sociodemographic background of participants (i.e., age, level of education and gender).

4.6. Data analysis

The online questionnaires were coded and checked for statistical analysis with IBM SPSS 22. A general descriptive statistic was used to describe the characteristics of the recreational users.

To test different groups of the same population, e.g., people with and without exposure of the campaign, for differences in indicators relevant to the target behaviour and the campaign success, the (Welch's) *t*-test was applied for the comparison of two items and the (Welch's) Anova for the comparison of several items.

Multiple regression is applied to analyse the effect of the independent TPB-predictor components on the dependent variable self-reported general behaviour.

We used a simple regression to test whether the TPB-predictor components (individual dependent variables) are influenced by noticing the campaign elements leaflet, poster, and homepage (individual independent variables).

5. Results

5.1. Characteristics of the sample

RQ1: What are the socio-demographic and activity related characteristics of the stand-up paddlers?

This research question is answered in the following based on the description of the sample as it is assumed to be representative for the sampling universe, i.e., the whole population of stand-up paddlers.

5.1.1. Socio-demography

The majority (81%) of all respondents lived in the canton of Zurich. The results show that stand-up paddlers frequently visited lakes close to their place of residence. Many of the respondents interviewed in the study area "Greifensee" lived in the surrounding villages and towns (e.g., Uster 21.3%; Volketswil 6.1%, Greifensee 5.4%, Fällanden 2.5%) as well as larger cities such as Zurich (12.3%) and Winterthur (3.2%) that are not too far away.

In the overall sample, women were in the majority (57.8%) while men accounted for 41.3%. People from all age groups engage in stand-up paddling the mean age was 40 years, the youngest respondent was 11, the oldest 72 years old (n = 334).

39% of the stand-up paddlers had completed compulsory school or upper secondary school as their highest qualification. Of these, 6% had completed primary, secondary, or lower secondary school, 12% a (vocational) baccalaureate and 22% a vocational apprenticeship, commercial or trade school. 59% of the stand-up paddlers had a higher vocational education or university degree: technical, pedagogical university 15%; higher technical, vocational education, school of arts and crafts 23%; university, ETH 21%. The results indicate that the education level of stand-up paddlers is slightly higher than that of the entire Swiss population (BFS Bundesamt für Statistik, 2021).

5.1.2. Activity-related characteristics

On average, respondents had been engaging in the activity for three years, with a median of two years. 10% of all stand-up paddlers reported being a member of a water sports club, while 12% reported being a member of a conservation organization.

The majority (95%) stand-up paddled self-guided on lakes without instruction, 6% attended courses. 15% stand-up paddled on rivers and 4% participated in competitions. Also popular was stand-up paddling with a dog (6%) other uses (6%) mentioned were stand-up paddling on the ocean, surfing, foil, yoga, and acrobatics.

About 30% of all stand-up paddlers stated not to use any equipment other than a board and paddle. Most respondents used an easily transportable inflatable and therefore portable board (88%). Equipment included a life jacket for 56% of respondents, a leash for 46%, a transport device for 18%, a dry suit for 9%, and a wetsuit for 19%. A percentage of 22% of all stand-up paddlers did not own a board and paddle but rent or borrowed them. Boards and paddles were most often purchased from online sport stores (23%) or regional sport stores (29%) (Table 2).

On a four-point scale, over half of the stand-up paddlers ranked themselves as advanced, just a quarter considered themselves beginners, 17% experienced, and 3% professional (Fig. 3)

5.1.3. Information behaviour

When stand-up paddlers inform themselves about rules and regulations, it enables them to acquire trade knowledge, and it facilitates accessibility through persuasive efforts for more nature-friendly

Table 2
Board purchase (n = 334).

	N	share (%)
rent	29	8.7
received as a gift	12	3.6
borrowed from friends/family	45	13.5
bought used	19	5.7
bought at a wholesaler (Lidl, Galaxus, Migros, etc.)	43	12.9
bought in a regional sports store	78	23.4
bought at an online sport store	98	29.3
other	10	3.0

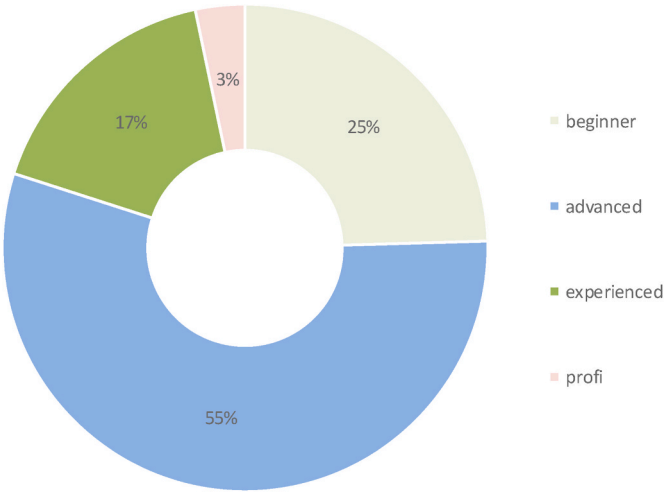


Fig. 3. Skill level (n = 334).

behaviour on the water. A relevant part of stand-up paddlers did not regularly inform themselves about protected areas and rules before engaging in their activity on a new water body (Table 3). Half of all stand-up paddlers relied on getting information about protected areas and rules on site. Various internet sources played an important role for stand-up paddlers, with 41% of stand-up paddlers obtaining information via the internet before embarking on a new body of water.

5.2. Campaign impact

5.2.1. Campaign exposure

RQ2 Was the campaign with its elements noticed?

5.2.1.1. Campaign exposure before and after campaign implementation 2021. The campaign did reach relevantly 30.9% in the pre- and 36.2% in the post-survey with 36.2%. According to the chi-square test, there was no statistically significant difference in campaign exposure between the two survey phases, χ^2 (1) = 0.87, p = .352. A (Welch-)T-test also showed no significant difference between the two surveys in terms of campaign exposure (95% CI [- 0.59, 0.17]), t (275.00) = 3.432, p = .353.

5.2.1.2. Campaign exposure in the treatment and control area. The chi-square test showed no statistically significant difference in campaign exposure between the two areas (treatment 36.2%/control 34.1%), χ^2 (1) = 0.063, p = .802.

Also a (Welch-)T-test showed no significant difference between the control and the treatment area in terms of campaign exposure (95% CI [-0.14, 0.18]), t (183) = 0.269, p = .803.

Table 3
Information behaviour « do you inform yourself about protected areas and regulations before stand-up paddling on a new water? » (n = 334).

	N	share (%)
always	130	38.9
often	95	28.4
rarely	72	21.6
never	37	11.1

5.2.2. Change of stated problem-relevant behaviour

RQ3 Does the campaign lead to increased implementation of the promoted behaviour among stand-up paddlers?

The previous chapter showed that no differences were detectable between the survey before and after campaign implementation or between the control and treatment group in terms of exposure to the campaign. Nevertheless, we examined the self-reported behaviour for differences between the pre- and post-survey and between the treatment and control area.

In addition, the effectiveness of the campaign was examined independently of its level of dissemination success by comparing people with and without campaign exposure.

5.2.2.1. Self-reported behaviour before and after campaign implementation. A comparison of stated general behaviour (regarding the behaviour prompts) in the treatment area showed no significant difference (95% CI [- 0.28, 0.06], t (254) = 0.1 p < .191) between the first (n = 129, M = 3.13, SD = 0.71) and the second survey (n = 127, M = 3.25, SD = 0.65). The before and after comparison of the self-reported behaviour regarding the individual prompts did not show any differences neither:

- Distance to reed belt >100 m; n = 271, M = 3.00 to 3.10 (95% CI [-0.36, 0.08]), t (269) = 0.003, p = .219
- Outside protected area; n = 270, M = 3.23 to M = 3.44 (95%-CI [-0.36, 0.13]), t (268) = 1.62, p = .363
- Distance to reed belt >25 m; n = 271, M = 3.39 to M = 3.41 (95%-CI [-0.24, 0.18]), t (269) = 0.036, p = .808
- Great distance from bird gatherings; n = 162, M = 2.87 to M = 3.02 (95%-CI [-0.39, 0.10]), t (260) = 2.21, p = .254

5.2.2.2. Self-reported behaviour in the treatment and control area. The comparison of stated general behaviour between the treatment and control area showed no significant difference. A (Welch-)T-test also showed no significant difference between the control and the treatment area in terms of self-reported behaviour (95% CI [- 0.38, 0.17], t (158.00) = 0.307, p = .526).

The comparison of the self-reported behaviour in the treatment and control area regarding the individual prompts did not show any differences neither:

- Distance to reed belt >100 m; n = 179, M = 3.10 to 3.14 (95% CI [-0.041, 0.16]), t (177) = 0.462, p = .800
- Outside protected area; n = 181, M = 3.44 to M = 3.66 (95% CI [-0.22, 0.16]), t (179) = 5.285, p = .178
- Distance to reed belt >25 m; n = 178, M = 3.41 to M = 3.57 (95% CI [-0.16, 0.16]), t (176) = 0.834, p = .307
- Great distance from bird gatherings; n = 163, M = 3.02 to M = 2.91 (95% CI [-0.11, 0.19]), t (161) = 0.001, p = .581

5.2.2.3. Self-reported behaviour with and without campaign exposure. The self-reported behaviour regarding the behavioural prompts was compared between persons with (34% of all respondents) and without campaign exposure. The (Welch-)T-test accounted for the unequal variances and examined the effect of noticing the campaign on self-reported behaviour.

Noticing the campaign had an effect on self-reported general behaviour (average of the four variables). In this regard, there was a statistically significant difference (95% CI [- 0.35, −0.03], t (270.17) = 11.573 p < .01) between individuals with (n = 105, M = 3.35, SD = 0.72) and those without (n = 196, M = 3.15, SD = 0.53) exposure to the campaign.

As the following results show, there was a trend toward positive

effect of campaign exposure on behaviour for all four behaviour prompts examined (Fig. 4):

- Distance to reed belt >100 m; n = 325, (95%-CI [-0.43, −0.16]), t (323) = 1.07, p = .034
- Outside protected area; n = 327, (95%-CI [-0.43, 0.02]), t (261.00) = 8.37, p = .052
- Distance to reed belt >25 m; n = 325, (95%-CI [-0.37, 0.01]), t (262.68) = 7.77, p = .063
- Large distance to bird aggregations; n = 308, (95%-CI [0.44, 0.00]), t (261.38) = 10.78, p = .053

5.2.3. Behaviour impact path

RQ3a Does campaign exposure has a positive effect on the TPB-predictors?

The Theory of Planned Behaviour (TPB) (Ajzen, 1991) postulates and previous studies (Hubschmid & Hunziker, 2018; Mosler & Tobias, 2007) show, at least in part, that persuasion improves behaviour predictors, attitude (= *compatibility, relevance, and problem awareness*), perceived behavioural control (= *self-assessed ability* and *behavioural knowledge)* and *subjective norm* (= *normative beliefs*), leading to a change in self-reported behaviour in stand-up paddlers (Fig. 4). We investigated if the campaign improves behaviour predictors like TPB postulates.

5.2.3.1. Effect of campaign exposure on the TPB-predictors. In this chapter, the TPB-predictors and their components are compared between people with and without exposure to the campaign. A further before-after and treatment-control comparison was omitted due to the results in chapter 5.2.1. As there only the noticing of the campaign showed a significant effect it was expected to be similar here. Based on these assumptions, this study focuses on differences between individuals with and without campaign exposure to analyse the impact of the campaign.

The components of attitude didn't change significantly with campaign exposure: *relevance* M = 4.55 to M = 4.45 (95%-CI [0.05, 0.26]) t (332) = 1.02, p < .200, *problem awareness* M = 3.68 to M = 3.79 (95% CI [−0.06, 0.28]) t (332) = 1.23, p < .220, *compatibility* M = 4.29 to M = 4.12 (95% CI [−0.38, −0.05]) t (192.91) = 4.09, p < .130.

For the components of perceived control *knowledge* and *self-assessed ability* the (Welch-) T-test showed a statistically significant difference in each case between individuals with and without exposure to the campaign: *behavioural knowledge* M = 3.28 to M = 3.94 (95%-CI [0.43, 0.90]) t (272.58) = 5.67, p < .001 and *self-assessed ability* M = 4.32 to M = 4.59 (95%-CI [0.11, 0.41]) t (328.20) = 3.48, p < .001.

The difference showed for individuals with (M = 4.18) and without (M = 4.01) campaign exposure was just not significant for the TPB-predictors component *normative beliefs* (95%-CI [0.03, −0.38]) t (332) = 1.70, p = .09.

Overall, for all TPB-predictor components except *compatibility*, there was a trend toward higher mean scores for individuals with campaign exposure, suggesting a positive effect of persuasion efforts undertaken through the campaign.

For each predictor *attitude*, *perceived control*, and *subjective norm* the associated TPB-predictor components were summarized into mean scores. Attitude did not change by *campaign exposure* (with, M = 4.15 and without, M = 4.14), (95% CI [-0.15, 0.12]) t (322) = 0.10, p = .816 (Fig. 5). In contrast perceived control was positively influenced (highly statistically significant) by campaign exposure (without, M = 3.80 and with, M = 4.26) (95%-CI [-0.63, −030]) t (296.06) = 10.98 p < .001 (Fig. 5). The difference shown for individuals with and without *campaign exposure* was just not significant for the third TPB-predictor *subjective norm* (Fig. 5).

RQ3b Do the components of the TPB-predictors influence self-reported behaviour?

5.2.3.2. Effect of TPB-predictor components on behaviour. Which TPB-predictor components affect the self-reported behaviour was analysed by a multiple regression.

The results of the multiple regression analysis showed that TPB-predictor components *behavioural knowledge, relevance*, and *self-assessed ability* had a significant effect on the *general self-reported*

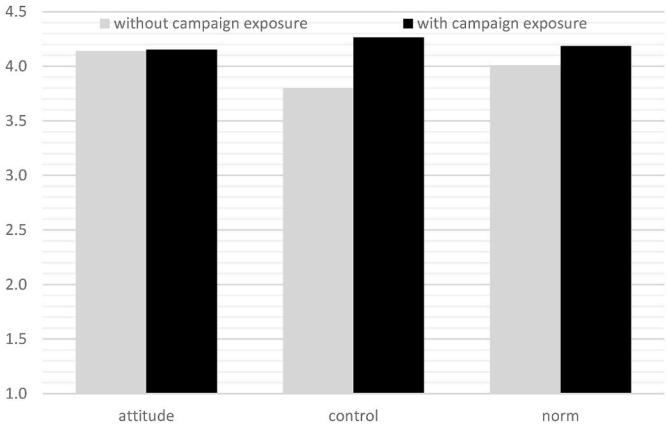
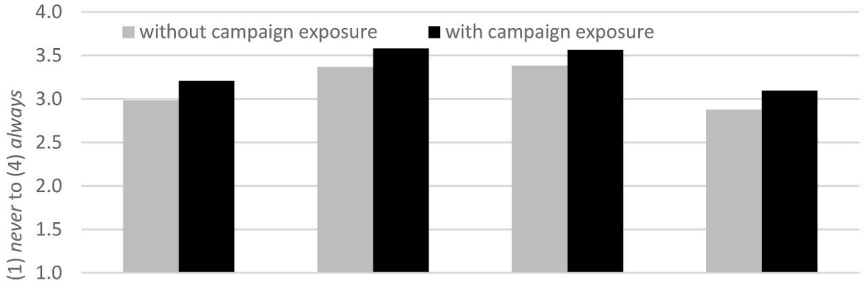


Fig. 5. Comparison of the TPB-predictors *attitude*, *perceived control*, and *subjective norm* without and with campaign exposure.



	distance >100 m to reed belt		outside the protected area		distance >25 m to reed belt		large distance to bird congregations > 1km	
	without	with	without	with	without	with	without	with
M	2.98 a	3.21 b	3.37	3.58	3.38	3.56	2.88	3.09
N	325		327		327		308	

Fig. 4. Self-reported behaviour with and without campaign exposure.

behaviour, F (3,297) = 38.95, p < .001, (Table 4). 28% of the variance in behaviour scores is explained by these three behaviour predictor components. A corrected r^2 = 0.28 corresponds to a large effect size according to Cohen (1992). As the analysis shows, *problem awareness* is barely not significant, while *belief about norms* and *compatibility* show a higher probability of error (Table 4).

RQ4 Where and through what disseminators and elements did stand-up paddlers become aware about the campaign?

5.2.3.3. Relevant channels for campaign dissemination. Knowing through which disseminators and channels stand-up paddlers learned about the campaign helps - just like knowledge about the impact and suitability of campaign elements - to make this and similar campaigns more effective and efficient in the future.

Table 5 shows through which channels or disseminators how many respondents in the treatment area learned about the campaign.

Of the three campaign elements, the poster had reached the most stand-up paddlers at 17.7% (n = 59), the homepage was known by 9.3% (n = 31), and the leaflet by 6.9% (n = 23) of the respondents. Overall, 26.9% of all respondents could be reached by one or more of these campaign elements (n = 334).

RQ5 Do the specific campaign elements leaflet, poster, and homepage influence TPB-predictor components?

To analyse the campaign's impact pathway, the role of each campaign element (leaflet, poster, homepage) in communicating the three behavioural prompts, as well as influencing the TPB-predictor components, was of interest. The campaign elements should appeal to the target audience and communicate the campaign message well. Therefore, the stand-up paddlers were asked to rate how well the campaign elements convey the message of the campaign, it was shown that leaflet M = 4.04, SD = 0.976, and homepage M = 3.87, SD = 0.718 performed better than the poster M = 3.59, SD = 0.934 (code: (1) very poor to (5) very good, n = 90).

Whether awareness of the campaign elements affected the TPB-predictor components was examined using simple regression. The TPB- predictor *behavioural knowledge* as review of the messages was significantly positively influenced by taking note of the campaign element: leaflet (F (1, 332) = 17.661, p < .001), poster (F (1, 332) = 11.240, p < .001), homepage: natur-freizeit. ch/wasser (F (1, 332) = 9.695, p < .01). 5.1% of the dispersion of *behavioural knowledge* can be attributed to contact with the leaflet, 3.3% with the poster, and 2.8% with the homepage which, according to Cohen (1992), corresponds to a weak effect in each case. For all other TPB-predictor components there was no significant effect of the campaign elements.

Table 4
Linear multiple regression analysis on the effect of TPB- predictors components on the self-reported behaviour (n = 301). knowledge, relevance, ability, norms, compatibility; coding: (1) *no* to (5) *yes*, problem awareness, coding: (1) *strongly disagree* to (5) *strongly agree*.

TPB-predictor components	beta	significance	collinearity statistics	
			tolerance	VIF
behavioural knowledge	0.214	0.000	0.703	1.423
behaviour relevance	0.156	0.007	0.724	1.382
self-assessed ability	0.112	0.042	0.593	1.687
problem awareness	0.097	0.057	0.921	1.086
belief abouts norms	0.056	0.349	0.675	1.481
compatibility	−0.012	0.832	0.800	1.251

Table 5
Locations or disseminators (n = 114, all respondents with campaign exposure).

location/multiplier	n	share
sup station	8	7.0%
open-air bath	11	9.6%
„Natur & Freizeit" association	12	10.5%
nature/animal protection association	9	7.9%
campaign elements known (but no location or multiplier named)	38	33.3%
water sports club	4	3.5%
sports store	4	3.5%
friends or family	12	10.5%
internet/social media	3/ 9	2.6%/ 7.9%
don't know	4	7.0%

6. Discussion

6.1. Limitations

The campaign had already been present since 2020 as a pilot project at various lakes and online. Due tobad weather conditions 2021, the first actual campaign year and the one our evaluation took place, the campaign could not be carried out in the desired increased intensity and, thus, didn't reach significantly more people than in the pilot-year 2020. As another consequence of the weather situation in 2021, we could not survey a sufficiently large control group at another lake without any active campaign, since only at the very popular "treatment-lake" enough stand-up paddlers showed up. Due to all these limitations, the intended study on campaign effectiveness based on a quasi-experimental approach with before-after comparison and a control-treatment-area comparison is only of limited value. Therefore, neither treatment-control nor before-after comparisons were considered as basis for the evaluation of the campaign, but the comparison of the self-reported behaviour between people with and without campaign exposure. This comparison considers the effectiveness of the campaign itself, independent of its distribution success.

Campaign content, framing and delivery have room for improvement. The success of the campaign in desired change of problem relevant behaviour could have been affected by length, complexity, and lack of scientific justification of the messages. In terms of content, behaviour is influenced by rational and emotional motives (Bamberg & Möser, 2007; Harth et al., 2013; Taufik & Venhoeven, 2018, pp. 189–197). As previous studies suggest (Hubschmid & Hunziker, 2018; Mosler & Tobias, 2007; Petty & Cacioppo, 1986; Wehrli et al., 2014), a stronger focus on emotional persuasion may have helped stand-up paddler to better remember how to behave appropriately and be more motivated to do so.

In the study, we used self-reported behaviour to measure campaign success. Obviously, it is not an exact one-to-one measure of actual behaviour change (Ardoin et al., 2020; Kormos & Gifford, 2014), but observation of behaviour seemed beyond the scope of this study (due to time, organisation and financial constraints). Self-reported behaviour has a strong association with actual behaviour, but tends to be more positive, mostly because of social desirability (Kormos & Gifford, 2014). We designed an anonymous and self-completion questionnaire to minimise the influence of social desirability on self-reported behaviour.

6.2. Findings

6.2.1. Characteristics of the sample and of the population of the stand-up paddlers

The socio-demographic structure found within the stand-up paddlers, show people with different education background nearly in every age. Our results tending in the same direction than those of a, study in the U.S. (Outdoor Foundation, 2019), slightly more women than men engage in stand-up paddling. Stand-up paddlers average age was similar

to canoeists or windsurfers, but this water sports attracts a higher rate of men. Regarding gender the stand-up paddlers are more comparable with swimmers which show a slightly higher average age but a similarly high proportion of women (Lamprecht et al., 2020, p. 64). As could be assumed from data on stand-up paddling, the activity has not been carried out for long by most respondents and there was only a small proportion of experienced (17%) and professional (3%) stand-up paddlers. In line with the findings of Graf (2018), who surveyed a small number of experts, our results show a low level of organisation within the activity (9.6% of stand-up paddler are members of a water sports club).

The use of inflatable, easily portable boards by most stand-up paddlers, allows them a nearly free choice of boarding locations at the water bodies. Since this study did not examine the extent to which this potential mobility is used and a study by Baker et al. (2021) indicates that stand-up paddlers do not move far from parking lots, this should be investigated further in the future. If the mobility on land is high, it could cause disturbance to previously rarely utilized sensitive shoreline areas. Also, effective measures such as informational signs or posters (Manning & Anderson, 2012) cannot be placed along the entire shoreline but only at a limited number of entry points.

About half of the stand-up paddlers did not inform themselves about rules and protected areas in advance. Either they did not inform themselves at all before setting off to a new lake, or they relied on finding information at the respective water body. This study results indicate that on-site persuasion, e.g., in open open-air baths and rental stations, is particularly important. However, it was also shown that a relevant proportion of stand-up paddlers obtain their information via the Internet e.g., via social media or the website “map.geo.admin.ch” and could be reached here at an early stage.

On average, the stand-up paddler had a good behavioural attitude, behavioural control, and subjective norm even without campaign exposure. However, like in other studies (Le Corre et al., 2013; Sterl et al., 2008) not all recreationists had a high awareness of the disturbance potential of their activity.

6.2.2. Campaign impact

6.2.2.1. Campaign exposure. Since campaigns can only be effective if they are noticed by the target group, we asked about the reach of the campaign. The results show that the campaign was already noticed by part of the target group after its first implementation in 2020 and through its online presence. During the active phase at Lake Greifensee in summer 2021 the campaign was not able to expand its reach in a relevant way. The content of the campaign was communicated with the help of the produced communication elements leaflet, poster, and homepage by the campaign operator (the association “Natur & Freizeit”), as well as by the partners acquired for the campaign such as other nature conservation associations, open-air baths, and stand-up paddling stations. Our results show that three campaign elements were noticed with varying frequency, with the poster being the most noticed element.

Information dissemination is considered a social process (Rogers, 2003) communication relationships in the immediate social environment plays an important role (Ester & Winett, 1982). The low organisation level in stand-up paddling could have hindered the diffusion of campaign messages within the stand-up paddling-community e.g. through sport clubs or role models (Mosler & Tobias, 2007; Zeidenitz, 2005), but a relevant proportion of respondents learned about the campaign through family and friends.

Besides personal contacts which tend to be effective (A. M. Kidd et al., 2015) there is an opportunity to provide campaign information via the Internet, especially social media (He et al., 2022). The focus of the campaign “Aufs Wasser mit Rücksicht” was not on social media. Nevertheless our results show that social media played a role in information gathering of stand-up paddlers and contributed probably in a second phase of self-diffusion (Kaufmann-Hayoz et al., 2001) to the dissemination of the campaign. These results come in line with the knowledge that the use of screen time (Pandya & Lodha, 2021) and social media during the covid-pandemic (Smith et al., 2022) increased. Compared with most other countries in Europe Switzerland has experienced a lower level of restrictions during pandemic in summer 2021, but it was recommended to reduce contacts (Mathieu et al., 2021).

6.2.3. Behavioural change and impact path

A positive benefit of persuasive work for a change in behaviour was assumed, based on theory and previous research (Bell et al., 2007; Hubschmid & Hunziker, 2018; Immoos & Hunziker, 2014; Manning & Anderson, 2012; Mosler & Tobias, 2007). The results confirm this assumption, the campaign led to a less disruptive (self-reported) behaviour while stand-up paddling. Although the second implementation of the campaign (summer 2021) did not further improve the self-reported behaviour, a general positive effect on self-reported behaviour was observed due to exposure to the campaign. Stand-up paddlers which noticed the campaign stated to follow the behaviour recommendations more often than those which did not notice the campaign.

All three campaign elements improved the behavioural knowledge about the rules of conduct, a statistically significant effect on the other TPB-predictor components could not be proven for any of the campaign elements. The leaflet was, in our study, the more effective communication tool than the poster. According to Park et al. (2008) one explanation for the weak effect of the poster could be that most people do not take the time to read posters carefully during outdoor activities. Similar to our result Oliver et al. (1985 as cited in Manning & Anderson, 2012) showed a combination of leaflet and personal contact with credible campaign staff as particularly effective in conveying information and educating people about conservation-related behaviours. Message delivery face-to face through campaign employees can have helped to remember appropriate behaviour through an emotional connection (Ardoin et al., 2020; Fernández-Llamazares et al., 2020; L. R. Kidd et al., 2019; Stern et al., 2014).

Like in other studies (Ardoin et al., 2020; Stern et al., 2014) a mixed but positive effect of the persuasive work on TPB-predictors could be shown. For both TPB-predictor components forming behavioural control, behavioural knowledge, and self-assessed ability, we found on average better values for persons with campaign exposure. For all other TPB-predictors except compatibility, there was a trend toward more positive scores for individuals with campaign exposure, but this was not statistically significant at the common error assumption of 5%.

According to the TPB attitude, as well as subjective norm and perceived behavioural control, influences intention and intention influences behaviour (Ajzen, 1991; Gu & Zhu, 2023). Our study like previous studies did not detect an effect on self-reported behaviour for all TPB-predictors.

An effect of the TPB-predictor components on the self-reported behaviour (Ajzen, 2012) could only be demonstrated partially. Similar than in previous studies (Osbaldiston, 2013; Zeidenitz, 2005) our results show the TPB components are meaningful for behaviour: 28% of the variance in the self-reported behaviour was explained by three TPB-predictor components, behavioural knowledge and self-assessed ability as well as relevance.

Different studies show different TPB-predictor components as relevant: Zeidenitz (2005), U. Immoos and Hunziker (2015), Galván-Mendoza et al. (2022) and Gamba and Oskamp (1994) reported an effect of behavioural knowledge on behaviour like our results do. Previous studies (Galván-Mendoza et al., 2022; Zeidenitz, 2005; Masud et al., 2016) have shown the effect of self-assessed ability on behaviour similar than our study. A systematic literature review (Stern et al., 2014) shows that the acquisition of environmental knowledge does not usually lead directly to a change in behaviour. Bamberg and Möser (2007) emphasize that knowledge is a prerequisite, but not a sufficient condition for the

development of further predictors such as norms and attitudes. The direct influence of perceived behaviour control on behaviour seems to be rather small, but it influences attitude, subjective norm and intention directly and tends to moderate the intention-behaviour relation (Hagger et al., 2022). We couldn't show a significant influence on self-reported behaviour through subjective norm like other studies did (Immoos & Hunziker, 2015; Masud et al., 2016; Zeidenitz, 2005). Our study proves the effect of a third variable *relevance*, a component of the TPB-predictor attitude, for the self-reported behaviour. Theory (Petty & Cacioppo, 1986; Moser, 2010) and previous studies (Immoos & Hunziker, 2015; Masud et al., 2016; Zeidenitz, 2005) emphasize the role which attitude plays for environmental behaviour. Similar to perceived behaviour control it influences the intention which is a direct predictor of behaviour (Bamberg & Möser, 2007), but barriers such as norms, costs and competing wishes or needs reduces the direct impact on behaviour (Ajzen, 2001; Antimova et al., 2012; L. R. Kidd et al., 2019; Stern et al., 2014).

7. Concluding management and research implications

As urban areas grow and become denser, an increasing number of people will use lakes and rivers looking for cooling and escape from urban heat in summer, as well as recreation all over the year. In addition, newer water sports that are still practiced by a rather small number of people in Switzerland – such as stand-up paddling or kite surfing, could continue to grow and provoke more disturbances with fauna and flora.

Considering the complex mechanisms of behaviour change, knowledge from different scientific fields on behaviour change (e.g., behavioural psychology, marketing, cognitive science) should be included and existing local knowledge for the target area and target group should be considered (Baynham-Herd et al., 2018). With the aim of evaluability and effectiveness, future campaigns should be designed based on existing theories such as TPB. To enable an increase in knowledge in this area, the isolation of potentially behaviour-influencing factors should be considered and aimed when designing interventions for future studies.

We call for further research on the factors that might be important for the success of environmental campaigns. The process of behaviour change takes place in a system where several factors influence each other and the behaviour directly or indirectly.

The knowledge gained from our study on stand-up paddling and the evaluation of the intervention are a first step to improve future campaigns for stand-up paddler. Further studies, including direct observations and counts of users, will be necessary to adapt the interventions. Contextual, social, situational, and personal factors play a role in how easily the desired behaviour can be achieved (Osbaldiston, 2013). We recommend getting a clear picture of local circumstances and of recreationists (and athletes) at the start of campaign planning and segmenting them by demographic, attitudinal or behavioural characteristics. Like Grzyb et al. (2021) mention, the availability of a vast amount of free data on social media (e.g., geographically located posts) can support future research in this regard. The extent and nature of ecological disturbance caused by stand-up paddlers should be described by biologists, social scientists should uncover cognitive and emotional reasons as well as external structures that may cause this problematic behaviour. We see such social and biological facts combined with local knowledge as a prerequisite for adopting an effective communication approach (L. R. Kidd et al., 2019), for targeting audiences and framing conflicts appropriately, for relevant content based on reliable scientific data (Baynham-Herd et al., 2018; A. M. Kidd et al., 2015; Mellish et al., 2019). Such knowledge is not only the basis for informing recreationists but also for reasoning why a behavior is effective and should be used, which, as Blye and Halpenny (2020) and Lawhon et al. (2013) point out, is important for behaviour change. If recreationists understand the positive or negative consequences of a behaviour for themselves or nature, they are more likely to intend to behave as recommended. Since most recreationists in our study came from the surrounding communities, an effort should be made to reach stand-up paddler via local channels and disseminators. Our results show that one focus should be to inform, sensitize and motivate the stand-up paddler in the very beginning of their activity career for the protection of nature. The presence on site seems to be particularly important for the campaign, but additional efforts are necessary to provide information in advance. Social media can be seen as a good tool to reach stand-up paddler before there activity, offering the potential to reach many people quickly with conservation information (Salazar et al., 2019). Social media can also support long time behaviour change setting prompts and reminders (He et al., 2022). The use of several platforms is recommended because the socio-demographic background of their users differ (Bergman et al., 2022). A cautious use minimizes disadvantages of social media like rapid spread of false reports and disincentive (Bergman et al., 2022). Communication on well-known and trustworthy platforms (González-Padilla & Tortolero-Blanco, 2020) at a time when most users are online is recommended.

Not only in social media but in general campaigns should empower people to change their behaviour through clear action-oriented messages and information (Ardoin et al., 2020; Fernández-Llamazares et al., 2020) as well as emotional messaging. On the same time campaigners should be aware to provide scientifically proven information and references (González-Padilla & Tortolero-Blanco, 2020).

Multifaceted interventions were found to be more effective than only social media (Jenkins et al., 2022). We recommend a combination of cognitive, emotional messaging delivered through multiple analogue and digital communication tools. If possible, such soft measures should be supplemented by technical and structural interventions which change the availability, costs, and benefits of actions (Baynham-Herd et al., 2018; Osbaldiston, 2013).

CRediT authorship contribution statement

Annick Kleiner: Writing – original draft, Conceptualization, Investigation, Formal analysis. **Marcel Hunziker:** Conceptualization, Supervision, Project administration, Writing – review & editing.

Declaration of competing interest

None.

Data availability

Data will be made available on request.

Acknowledgements

The Swiss association "Natur und Freizeit" conducted the campaign we evaluated, supported our research financially (contribution to the salary of one researcher) and with human resources (support of distributing questionnaires to stand-up paddler). The "Greifenseestiftung" as well as our civil servant also supported the project by helping to distribute questionnaires.

APPENDIX

Poster

Leaflet

References

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes, 50*(2), 179–211. https://doi.org/10.1016/0749-5978(91)90020-T

Ajzen, I. (2001). Nature and operation of attitudes. *Annual Review of Psychology, 52*, 27–58. https://doi.org/10.1146/annurev.psych.52.1.27. February 2001.

Ajzen, I. (2012). The theory of planned behavior. In *Handbook of theories of social psychology* (Vol. 1, pp. 438–459). https://doi.org/10.4135/9781446249215.n22

Ajzen, I., & Madden, T. J. (1986). Prediction of goal-directed behavior: Attitudes, intentions, and perceived behavioral control. *Journal of Experimental Social Psychology, 22*(5), 453–474. https://doi.org/10.1016/0022-1031(86)90045-4

Antimova, R., Nawijn, J., & Peeters, P. (2012). The awareness/attitude-gap in sustainable tourism: A theoretical perspective. *Tourism Review, 67*(3), 7–16. https://doi.org/10.1108/16605371211259795

Ardoin, N. M., Bowers, A. W., & Gaillard, E. (2020). Environmental education outcomes for conservation: A systematic review. *Biological Conservation, 241*(April 2019), Article 108224. https://doi.org/10.1016/j.biocon.2019.108224

BAFU. (1991). *Bundesinventar der Wasser- und Zugvogelreservate von internationaler und nationaler Bedeutung (Stand 2015). Bundesamt für Umwelt.* https://www.bafu.admin.ch/bafu/de/home/themen/biodiversitaet/fachinformationen/massnahmen-zur-erhaltung-und-foerderung-der-biodiversitaet/oekologische-infrastruktur/wasser–und-zugvogelreservate.html.

Baker, J., D'Antonio, A., Monz, C., Taff, D., Rice, W. L., Newton, J., Newman, P., Miller, Z. D., & Freeman, S. (2021). What's 'SUP' with paddlers? Integrating spatial, social, and ecological data to understand behavior among paddlesport users at a popular lake destination. *Applied Geography, 135*(August), Article 102531. https://doi.org/10.1016/j.apgeog.2021.102531

Bamberg, S., & Möser, G. (2007). Twenty years after hines, hungerford, and tomera: A new meta-analysis of psycho-social determinants of pro-environmental behaviour. *Journal of Environmental Psychology, 27*(1), 14–25. https://doi.org/10.1016/j.jenvp.2006.12.002

Batey, C. (2013). The effectiveness of management options in reducing human disturbance to wetland and coastal birds. *The Plymouth Student Scientist, 6*(2), 340–354. https://vt.hosts.atlas-sys.com/illiad/illiad.dll?Action=10&Form=75&Value=1415195.

Baynham-Herd, Z., Redpath, S., Bunnefeld, N., Molony, T., & Keane, A. (2018). Conservation conflicts: Behavioural threats, frames, and intervention recommendations. *Biological Conservation, 222*(January), 180–188. https://doi.org/10.1016/j.biocon.2018.04.012

Bell, S., Tyrväinen, L., Sievänen, T., Pröbstl, U., & Simpson, M. (2007). Outdoor recreation and nature tourism: A European perspective. *Living Reviews in Landscape Research, 1*. https://doi.org/10.12942/lrlr-2007-2

Bergman, J., Buxton, R., Lin, H.-Y., Lenda, M., Attinello, K., Hajdasz, A., Rivest, S., Tran Nguyen, T., Cooke, S., & Bennett, J. (2022). Evaluating the benefits and risks of social media for wildlife conservation. *FACETS, 7*, 360–397. https://doi.org/10.1139/facets-2021-0112

BFS Bundesamt für Statistik. (2021). *Bildungsstand der Bevölkerung – daten des Indikator*. https://www.bfs.admin.ch/bfs/de/home/statistiken/bildung-wissenschaft/bildungsindikatoren/themen/wirkung/bildungsstand.assetdetail.16324563.html.

Blye, C. J., & Halpenny, E. (2020). Do Canadians leave No trace? Understanding leave No trace attitudes of frontcountry and backcountry overnight visitors to Canadian provincial parks. *Journal of Outdoor Recreation and Tourism, 29*, Article 100258. https://doi.org/10.1016/j.jort.2019.100258. March 2017.

BSV, Binnenschifffahrtsverordnung, 1..

Bull, M., & Rödl, T. (2018). Stand Up Paddling (SUP): Eine neue Trendsportart als Problem für überwinternde und rastende Wasservögel? *Berichte zum Vogelschutz, 55*, 25–52.

Elands, B., & Wirth, V. (2010). Cross-European comparison. In U. Pröbstl, V. Wirth, B. H. M. Elands, & S. Bell (Eds.), *Management of recreation and nature based toursim in euopean forests* (pp. 141–174). Springer Berlin Heidelberg. https://doi.org/10.1007/978-3-642-03145-8.

Ester, P., & Winett, R. A. (1982). Toward more effective antecedent strategies for environmental programs. *Journal of Environmental Systems, 11*(3), 201–222. https://doi.org/10.2190/6m17-9nkd-c80c-2jwy

Fernández-Llamazares, Á., Fraixedas, S., Brias-Guinart, A., & Terraube, J. (2020). Principles for including conservation messaging in wildlife-based tourism. *People and Nature, 2*(3), 596–607. https://doi.org/10.1002/pan3.10114

Galván-Mendoza, O., González-Rosales, V. M., Leyva-Hernández, S. N., Arango-Ramírez, P. M., & Velasco-Aulcy, L. (2022). Environmental knowledge, perceived behavioral control, and employee green behavior in female employees of small and medium enterprises in Ensenada, Baja California. *Frontiers in Psychology, 13* (December), 1–19. https://doi.org/10.3389/fpsyg.2022.1082306

Gamba, R. J., & Oskamp, S. (1994). Factors influencing community residents' participation in commingled curbside recycling programs. *Environment and Behavior, 26*(5), 587–612. https://doi.org/10.1177/0013916594265001

Glover, H. K., Guay, P.-J., & Weston, M. A. (2015). Up the creek with a paddle; avian flight distances from canoes versus walkers. *Wetlands Ecology and Management, 23* (4), 775–778. https://doi.org/10.1007/s11273-015-9411-9

González-Padilla, D. A., & Tortolero-Blanco, L. (2020). Social media influence in the COVID-19 pandemic. *International Braz J Urol, 46*(Suppl 1), 120–124. https://doi.org/10.1590/S1677-5538.IBJU.2020.S121

Graf, O. (2018). *Freizeitaktivitäten in der Natur. Studie im Auftrag des Bundesamts für Umwelt BAFU und des Vereins Natur & Freizeit.* https://doi.org/10.13140/RG.2.2.20339.37928

Greifensee Dragons. (n.d.). Verein. https://www.greifensee-dragons.ch/.

Grzyb, T., Kulczyk, S., Derek, M., & Woźniak, E. (2021). Using social media to assess recreation across urban green spaces in times of abrupt change. *Ecosystem Services, 49*, Article 101297. https://doi.org/10.1016/j.ecoser.2021.101297

Gu, F., & Zhu, Z. (2023). *Analysis of factors of single-use plastic avoidance behavior* (Vols. 1–20).

Hagger, M. S., Cheung, M. W. L., Ajzen, I., & Hamilton, K. (2022). *Perceived behavioral control moderating effects in the theory of planned behavior: A meta-analysis*. Health Psychology. https://doi.org/10.1037/hea0001153. February.

Harth, N. S., Leach, C. W., & Kessler, T. (2013). Guilt, anger, and pride about in-group environmental behaviour: Different emotions predict distinct intentions. *Journal of Environmental Psychology, 34*, 18–26. https://doi.org/10.1016/j.jenvp.2012.12.005

He, M., Blye, C. J., & Halpenny, E. (2022). Impacts of environmental communication on pro-environmental intentions and behaviours: A systematic review on nature-based tourism context. *Journal of Sustainable Tourism*. https://doi.org/10.1080/09669582.2022.2095392

Hubschmid, E., & Hunziker, M. (2018). Wildtierfreundliches Freeriden von Wintersportlerinnen und -sportlern. Eine Analyse der Wirkung persuasiver Lenkungsinstrumente. *Naturschutz und Landschaftsplanung, 50*(4), 120–126. https://www.nul-online.de/Magazin/Archiv/Wildtierfreundliches-Freeriden-von-Wintersportlerinnen-und-sportlern,QUlEPTU3MzU1MTUmTUlEPTgyMDMw.html?UID=06441659DD40A01C53034194A933B41C660946DCBD3B23.

Immoos, U., & Hunziker, M. (2014). Wirkung von lenkungsmaßnahmen auf das verhalten von freizeitaktiven. *Naturschutz und Landschaftsplanung, 46*(1), 5–9.

Immoos, U., & Hunziker, M. (2015). The effect of communicative and on-site measures on the behaviour of winter sports participants within protected mountain areas - results of a field experiment. *Eco.Mont, 7*(1), 17–25. https://doi.org/10.1553/eco.mont-7-1s17

Jenkins, E. L., Brennan, L., Molenaar, A., & McCaffrey, T. A. (2022). Exploring the application of social media in food waste campaigns and interventions: A systematic scoping review of the academic and grey literature. *Journal of Cleaner Production, 360*, Article 132068. https://doi.org/10.1016/j.jclepro.2022.132068

Kaufmann-Hayoz, R., Defila, R., Di Giulio, A., Flury-Kleubler, P., Friederich, U., Garbely, M., Gutscher, H., Jegen, M., Mosler, H.-J., North, N., Ulli-Beer, S., & Wichtermann, J. (2001). *A typology of tools for building sustainability strategies*. https://doi.org/10.1007/978-3-0348-8314-6_3

Kidd, L. R., Garrard, G. E., Bekessy, S. A., Mills, M., Camilleri, A. R., Fidler, F., Fielding, K. S., Gordon, A., Gregg, E. A., Kusmanoff, A. M., Louis, W., Moon, K., Robinson, J. A., Selinske, M. J., Shanahan, D., & Adams, V. M. (2019). Messaging matters: A systematic review of the conservation messaging literature. *Biological Conservation, 236*, 92–99. https://doi.org/10.1016/j.biocon.2019.05.020

Kidd, A. M., Monz, C., D'Antonio, A., Manning, R. E., Reigner, N., Goonan, K. A., & Jacobi, C. (2015). The effect of minimum impact education on visitor spatial behavior in parks and protected areas: An experimental investigation using GPS-based tracking. *Journal of Environmental Management, 162*(July), 53–62. https://doi.org/10.1016/j.jenvman.2015.07.007

Kormos, C., & Gifford, R. (2014). The validity of self-report measures of proenvironmental behavior: Ameta-analytic review. *Journal of Environmental Psychology, 40*, 359–371. https://doi.org/10.1016/j.jenvp.2014.09.003

Krauß, M. (2007). Entwicklung von Freizeitschifffahrt und Wassertourismus – konfliktpotentiale mit dem Naturschutz. *NNA-Berichte, 20. Jg.(1)*(Integration von Wasserrahmenrichtlinie und Naturschutz – Bilanz der Umsetzung, Konfliktpotenziale und Lösungsansätze), 26–32 https://www.nna.niedersachsen.de/publikationen/nna_berichte/nna-berichte-137026.html.

Krüger, T. (2018). On the effects of kitesurfing on waterbirds - a review. *Naturschutz Informationsdienst Niedersachsen, 36*, 3–64.

Lamprecht, M., Bürgi, R., & Stamm, H. (2020). *Sport Schweiz 2020: Sportaktivität und Sportinteresse der Schweizer Bevölkerung*. Bundesamt für Sport BASPO. https://www.baspo.admin.ch/content/baspo-internet/de/dokumentation/publikationen/sport-schweiz-2020/_jcr_content/contentPar/downloadlist/downloadItems/296_1591280041472.download/Bro_Sport_Schweiz_2020_d_WEB.pdf.

Lawhon, B., Newman, P., Taff, D., Vaske, J., Vagias, W., Lawson, S., & Monz, C. (2013). Factors influencing behavioral intentions for leave No trace behavior in national parks. *Journal of Interpretation Research, 18*(1), 23–38. https://doi.org/10.1177/109258721301800103

Le Corre, N., Peuziat, I., Brigand, L., Gélinaud, G., & Meur-Férec, C. (2013). Wintering waterbirds and recreationists in natural areas: A sociological approach to the awareness of bird disturbance. *Environmental Management, 52*(4), 780–791. https://doi.org/10.1007/s00267-013-0118-5

Manning, R. E., & Anderson, L. E. (2012). Applying outdoor recreation management practices. *Managing Outdoor Recreation: Case Studies in the National Parks*, 49–59. https://doi.org/10.1079/9781845939311.0049

Marion, J. L., & Reid, S. E. (2007). Minimising visitor impacts to protected areas: The efficacy of low impact education programmes. *Journal of Sustainable Tourism, 15*(1), 5–27. https://doi.org/10.2167/jost593.0

Mason, P. (2005). Visitor management in protected areas: From "hard" to "soft" approaches? *Current Issues in Tourism, 8*(2–3), 181–194. https://doi.org/10.1080/13683500508668213

Masud, M. M., Al-Amin, A. Q., Junsheng, H., Ahmed, F., Yahaya, S. R., Akhtar, R., & Banna, H. (2016). Climate change issue and theory of planned behaviour: Relationship by empirical evidence. *Journal of Cleaner Production, 113*(December), 613–623. https://doi.org/10.1016/j.jclepro.2015.11.080

Mathieu, E., Ritchie, H., Ortiz-Ospina, E., Roser, M., Hasell, J., Appel, C., Giattino, C., & Rodés-Guirao, L. (2021). A global database of COVID-19 vaccinations. *Nature Human Behaviour, 5*(7), 947–953. https://doi.org/10.1038/s41562-021-01122-8

Mellish, S., Ryan, J. C., Pearson, E. L., & Tuckey, M. R. (2019). Research methods and reporting practices in zoo and aquarium conservation-education evaluation. *Conservation Biology, 33*(1), 40–52. https://doi.org/10.1111/cobi.13177

Mosler, H.-J., & Tobias, R. (2007). *Umweltpsychologische Interventions- formen neu gedacht* (pp. 35–54).

Müller, W. (2019). *Sanftes plätschern, jähe flucht. Ornis zeitschrift bird life Schweiz, 05 (vogelschutz)*. https://www.birdlife.ch/sites/default/files/documents/Ornis_SUP.pdf.

Oh, C. O., Lyu, S. O., & Hammitt, W. E. (2012). Predictive linkages between recreation specialization and place attachment. *Journal of Leisure Research, 44*(1), 70–87. https://doi.org/10.1080/00222216.2012.11950255

Osbaldiston, R. (2013). Synthesizing the experiments and theories of conservation psychology. *Sustainability, 5*(6), 2770–2795. https://doi.org/10.3390/su5062770

Outdoor Foundation. (2019). Outdoor participation report. In *Outdoor foundation*. https://outdoorindustry.org/resource/2018-outdoor-participation-report/.

Pandya, A., & Lodha, P. (2021). Social connectedness, excessive screen time during COVID-19 and mental health: A review of current evidence. *Frontiers in Human Dynamics, 3*(July), 1–9. https://doi.org/10.3389/fhumd.2021.684137

Park, L. O., Manning, R. E., Marion, J. L., Lawson, S. R., & Jacobi, C. (2008). Managing visitor impacts in parks: A multi-method study of the effectiveness of alternative management practices. *Journal of Park and Recreation Administration, 26*(1), 97–121.

Petty, R. E., & Cacioppo, J. T. (1986). The elaboration likelihood model of persuasion. *Advances in Experimental Social Psychology, 19*(C), 123–205. https://doi.org/10.1016/S0065-2601(08)60214-2

Rogers, E. M. (2003). In (5th ed.), *Vol. 5. Diffusion of innovations*. Free Press.

Salazar, G., Mills, M., & Veríssimo, D. (2019). Qualitative impact evaluation of a social marketing campaign for conservation. *Conservation Biology, 33*(3), 634–644. https://doi.org/10.1111/cobi.13218

Schafft, M., Wegner, B., Meyer, N., Wolter, C., & Arlinghaus, R. (2021). *Ecological impacts of water-based recreational activities on freshwater ecosystems: A global meta-analysis*. https://doi.org/10.1098/rspb.2021.1623

Schikore, T., Schröder, K., & Siedenschnur, G. (2013). *Auswirkungen des Kite- und Windsurfens auf Rastvögel an der Wurster Küste im Nationalpark Niedersächsisches Wattenmeer an den Standorten Dorum-Neufeld und Wremen. BIOS Gutachten i. A* (Vol. 72). Der Nationalparkverwaltung Niedersächsisches Wattenmeer.

Smith, I., Velasquez, E., Norman, P., & Pickering, C. (2022). Effect of the COVID-19 pandemic on the popularity of protected areas for mountain biking and hiking in Australia: Insights from volunteered geographic information. *Journal of Outdoor Recreation and Tourism, 41*(November 2022), Article 100588. https://doi.org/10.1016/j.jort.2022.100588

Sorice, M. G., Oh, C. O., & Ditton, R. B. (2009). Exploring level of support for management restrictions using a self-classification measure of recreation specialization. *Leisure Sciences, 31*(2), 107–123. https://doi.org/10.1080/01490400802685914

Sterl, P., Brandenburg, C., & Arnberger, A. (2008). Visitors' awareness and assessment of recreational disturbance of wildlife in the Donau-Auen National Park. *Journal for Nature Conservation, 16*(3), 135–145. https://doi.org/10.1016/j.jnc.2008.06.001

Stern, M. J., Powell, R. B., & Hill, D. (2014). Environmental education program evaluation in the new millennium: What do we measure and what have we learned? *Environmental Education Research, 20*(5), 581–611. https://doi.org/10.1080/13504622.2013.838749

Steven, R., Pickering, C., & Guy Castley, J. (2011). A review of the impacts of nature based recreation on birds. *Journal of Environmental Management, 92*(10), 2287–2294. https://doi.org/10.1016/j.jenvman.2011.05.005

Swiss Canoe. (n.d.). *SUP*. https://www.swisscanoe.ch/de/sup.

Taufik, D., & Venhoeven, L. (2018). Emotions and pro - environmental behaviou. In *r* (pp. 189–197). Environmental Psychology: An Introduction.

Wehrli, R., Priskin, J., Schaffner, D., Schwarz, J., & Stettler, J. (2014). Do sustainability-experienced travellers prefer a more rational communication of the sustainability of a tourism product? *WIT Transactions on Ecology and the Environment, 187*, 3–14. https://doi.org/10.2495/ST140011

Zeidenitz, C. (2005). *Freizeitaktivitäten in der Schweiz – wegen oder gegen natur und Landschaft? Eine umweltpsychologische studie zu motiven, einstellungen und lenkungsstrategien*. Eidgenössische Forschungsanstalt für Wald, Schnee und Landschaft WSL Birmensdorf.