

Recreation activities in protected areas: bridging the gap between the attitudes and behaviour of snowshoe walkers

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Abstract

In recent years the frequency of outdoor recreation activities has increased considerably. This is particularly the case for snowshoe walking in the subalpine area of Switzerland. Disturbances caused by these activities can be critical for sensitive wildlife populations, especially in winter. In a case study with a quasi-experimental design, we evaluated the influence of steering instruments, which aim to channel snowshoeing to marked trails. Our intervention involved providing visitors with infrastructure and on-site information. We used a three-step design to evaluate its effects, where we observed behaviour, recorded tracks and surveyed visitors. The results indicate that steering efforts are compatible with the attitudes of snowshoe walkers. However, snowshoe walkers tend to report their behaviour too optimistically in questionnaires. Protected areas are often not respected if only basic information is provided. Our data show that the consistency between the attitude protected areas should be avoided and the observed behaviour can be significantly increased by providing additional information, appeals and rationales. But in order to maintain positive effects already achieved it is necessary to repeat efforts and to combine on-site information with active communication and education before people start their trip.

Keywords: winter sport, Alps, use conflicts, behavioural intervention, attitude-behaviour consistency, quasi-experimental design, observation, social psychology, wildlife

1 Introduction

1.1 Background

The frequency and diversity of outdoor activities in western society have increased significantly in recent years, and it is predicted that people will continue to have more leisure time (MÜLLER 2001; MÜLLER *et al.* 1997). We can expect that outdoor activities will also grow accordingly (SCHEMEL and ERBGUT 2000) and that there will be increasing potential for conflicts between outdoor-recreation activities and ecological conservation (BAUR 2003).

A typical example of such an outdoor activity growth area is snowshoeing. Snowshoeing has recently become very trendy in many countries offering winter sports and is particularly popular in Switzerland. Of the 1340 participants in a nation-wide survey 8.5% reported having been snowshoe walking in 2003. Thus snowshoe walking has reached, within only a few years, the same frequency level as classic mountaineering (8.5%) and ski touring (9.7%) (ZEIDENITZ 2005), and the trend seems to be towards a further increase with an undiminished rate of growth (RADÜ 2004).

This development is certainly very positive for social health and from the point of view of tourists and the local economy, but such outdoor sports may also negatively affect sensitive wildlife, e.g. by disturbing bird populations (FINNEY *et al.* 2005). Snowshoe walkers are especially problematic as they like half-open forest, which provides a habitat for rare species like grouse (Tetraonidae) (INGOLD 2004). This ecological conflict is accentuated by the fact

that snowshoe walking often takes place in previously untouched areas and that is not restricted to infrastructure such as prepared pistes or paths.

Recreation managers try to solve these conflicts not by introducing strict regulations, but by attempting to reduce disturbance and actively steer the public by providing education, information and infrastructure. For example, they try to reduce recreational conflicts between snowshoeing and wildlife by defining a limited number of trails for visitors to use. However, it is unclear how snowshoe walkers really react to such so-called steering efforts and whether they cooperate not only in attitude but also in behaviour.

Our overall aim was therefore to conduct a case study in a social psychological framework to evaluate the impact of such steering efforts. We did not focus on the planning process or the ecological component, but on analysing behaviour and behavioural change in an applied and natural setting.

1.2 State of research

Extensive research has been done describing and analysing social and ecological conflicts regarding outdoor activities (KLINE 2001; MANNING 1999; MOORE 1994; RAMTHUN 1997; SCHNEIDER 2000; SCHNEIDER and HAMMITT 1995; WESSLEY 2000b). Guidelines and rules have also been developed to deal with ecological conflicts, often based on empirical data gained in case studies (AMMER and PRÖBSTL 1991; KNAPP and BENTON 2004; MANNING 2003; MARION and REIS 2007). However, the literature and data have up to now mostly focused on the planning process in a conflict solution (MÖNNECKE *et al.* 2005; VOLK *et al.* 1995; WALLENTIN 2001), on observations reported by experts (BERNASCONI *et al.* 1998), and on the self-reported behaviour of visitors (ZEIDENITZ 2005), or on the (also self-reported) social acceptance of restrictions imposed for nature conservation (SEELAND *et al.* 2002).

Systematic analyses of observed behavioural changes during an intervention focusing on the solution of an ecological conflict are still rare in outdoor recreation research, at least in Europe. An exception is certainly the North American literature focussing on the effectiveness of education, communication strategies and interventions in outdoor areas to promote compliance and reduce depreciative behaviour (DUNCAN and MARTIN 2002; KNAPP and BENTON 2004; MANNING 2003; OLIVER *et al.* 1985; SMITH-JACKSON and HALL 2002; WIDNER and ROGGENBUCK 2000; WIDNER WARD and ROGGENBUCK 2003). This literature can serve as a base of knowledge, methodological inspiration and source of interpretation. However, it does not refer to the specific conditions in Alpine areas (in legal, ecological and cultural terms) and no intervention studies referring to snowshoe walking could be found in this body of literature.

It is rather new for snowshoe walking to be so popular and widespread, but there has already been some research on the attitudes of snowshoe walkers (AUTENRIETH 2005; RADÜ 2004). A survey of Swiss snowshoe walkers found that they are willing to avoid protected areas if they are informed about them (RADÜ 2004) and they think it makes sense to install signposts to inform and sensitise visitors. On the other hand, from a survey of roughly 350 foresters it seems that forest visitors often ignore signposts and other steering efforts and that snowshoeing still causes severe ecological problems, especially in subalpine areas (FREULER and LIECHTI 2006). Thus there appears to be a gap between snowshoe walkers' reported willingness to behave ecologically and the unecological behaviour of visitors reported by foresters, local managers, and researchers. To explain this it is insufficient to analyse data based only on the responses of visitors. We need information on the reasons for this discrepancy between attitudes and behaviour and methods to bridge it. Our study is intended to contribute to elucidating this.

In social psychology there is an extensive body of research attempting to explain attitudes, behaviour, behavioural change, and their interrelationships (FLURY-KLEUBLER and GUTSCHER 2001; KAISER and GUTSCHER 2003; STAATS 2003; ZIMBARDO and LEIPPE 1991). A broad range of methods known as intervention studies have been developed to investigate such research questions in an empirical framework (LIU and SIBLEY 2004; MOSLER and GUTSCHER 1998; STAATS *et al.* 2000). These selected interventions to influence people's behaviour are conducted to assess and explain their effects (or the absence of effects). Behavioural interventions have, among other things, often focused on pro-environmental attitudes and behaviour (DWYER *et al.* 1993). Research has helped to identify numerous drivers and constraints of such pro-environmental behaviour. However, social psychological research also indicates that self-reports of pro-environmental behaviour and attitudes are often inconsistent with actual observed behaviour (STAATS 2003).

Intervention studies are often conducted in an artificial setting or in surroundings that are rather different from outdoor recreation settings, e.g. public transport, urban littering, environmental behaviour in households, and companies (DWYER *et al.* 1993; STAATS 2003). Moreover intervention studies in outdoor recreation largely refer to the North American context (MANNING 2003; OLIVER *et al.* 1985; WIDNER and ROGGENBUCK 2000) where other ecological issues are more topical. People in North America and Europe may well react differently to particular communication strategies, rules and regulations. Moreover the legal situation is different (e.g. regarding open access to land and rights of way).

Thus despite the quite extensive body of research in different fields on which we can draw on in our research, these instruments and approaches still need to be adapted to the context of snowshoeing in protected areas. Here intervention studies promise to be very useful.

1.3 Research questions

We focus on the following research questions in our case study:

- I. Can the behaviour of snowshoe walkers be influenced by steering efforts?
- II. Are the observed behaviour of snowshoe walkers, their self-reported behaviour and their attitudes towards protected areas consistent?
- III. If not, how can they be made more consistent?

1.4 Hypotheses

Previously conducted surveys among snowshoe walkers indicate a high willingness to behave ecologically (RADÜ 2004). They seem to be willing to accept protected areas and some behavioural constraints. Steering seems to be compatible with the attitudes of snowshoe walkers. Therefore, our first hypothesis is:

- I. The behaviour of snowshoe walkers can be influenced in a positive way by steering efforts.

Attempts to encourage pro-environmental behaviour in outdoor activities have shown that steering efforts, e.g. message content, need to fulfil certain requirements (ABSHER and BRIGHT 2004; MANNING 2003; OLIVER *et al.* 1985; SMITH-JACKSON and HALL 2002; STAATS 2003; WESSLEY 2000a). People need to be informed appropriately about why they should behave in a certain way and they need information about how they can behave in this way.

Otherwise the attitude-behaviour consistency will probably remain low (STAATS 2003). We draw on these findings in the following hypothesis:

- II. Attitude-behaviour consistency will be low if trails are only marked and if people are not provided with additional on-site information. If appropriate additional information is provided, attitudes and behaviour will become more consistent.

2 Method

We planned and implemented in cooperation with the local authorities several snowshoe trails in the region of Ibergereg, a subalpine area in the centre of Switzerland. One of these trails provided the basis for our quasi-experimental interventions.

We chose a multi-methodological research design including an on-site questionnaire survey to assess attitudes, observation of behaviour (including visitor counts and route analysis) and recording tracks. Unlike many social-psychological studies, data collection was not limited to self-reported behaviour or to an artificial setting, but included monitoring snowshoe walkers' behaviour in a natural setting. Other studies in visitor monitoring have shown the value of such integrated approaches to analysing activity patterns in outdoor areas (ARNBERGER and HINTERBERGER 2003; CESSFORD and MUHAR 2003).

2.1 Intervention

In order to investigate the effect of different levels of on-site information and infrastructure, we conducted an intervention in a three-step design to analyse how visitors react to different levels of steering. First we marked trails and installed signposts at the starting points with basic information about the trail and maps indicating protected areas (setting A). During a second phase, we combined this basic marking with additional signposts with behavioural appeals (not to leave the trail), ecological information (sensitivity of wildlife in winter), and map information about the protected area and alternative trails (setting B). In a third step, we additionally installed signposts as a reminder at critical deviation points on the trail where we had observed that snowshoe walkers tended to leave the trail (setting C).

2.2 Data collection

2.2.1 Attitude measurement: survey

Towards the end of the season we delivered 200 questionnaires on site. This happened on several weekends and at different points in the area to make sure that the sample covered a wide variety of people. In order not to influence how people selected their trails, delivery points were situated after critical deviation points. People were provided with a questionnaire and a stamped addressed envelope so that they could answer the mainly standardised questions at home after completing the whole trip. The survey aimed to collect data on attitudes, satisfaction, trip information and personal attributes like age, gender and domicile. The data was intended to help us interpret visitor behaviour and to give us feedback on questions that cannot be clarified through observation (e.g. visitor satisfaction, acceptance). Furthermore we needed to confirm the assumption from previously made surveys that the self-reported willingness of people to behave ecologically also applied to our particular sample.

2.2.2 Behaviour measurement

a) Observation of behaviour

The central methodological part of our study was observing actual behaviour in a natural setting. Visitors' behaviour was observed for about four to five hours a day and on three weekend days during each of the three described intervention settings to reduce the influence of situational factors such as weather, snow conditions and local holidays. Altogether we collected observation data on nine days.

In all three intervention settings we assessed whether people stayed on the trail or not and whether the percentage of snowshoe walkers who deviated changed with the setting. We had first chosen three critical points where people had often left an unmarked trail during previous seasons. After testing these points over one week, we decided to limit the observations to one point because the deviation frequencies at the other two points were not high enough to obtain sufficient data, i.e. at least forty people for each observation setting. To make sure people were not influenced by our presence we observed them from the opposite side of the valley using field glasses. We also counted ski tourers to assess overall visitor numbers, but their behaviour is not further analysed in this article.

b) Track records

We monitored the tracks of snowshoe walkers along one trail about 2 km in length to assess behaviour and behaviour change not only at one point but also over a bigger area. This trail was inspected three times during the winter season to assess any changes in the pattern of the tracks, i.e. whether more or fewer tracks deviated from the trail over the season. The first assessment was conducted at the beginning of winter season before the trail was marked (stage 1). By the time of the second assessment, the trail has been marked (stage 2) and at the third the marking had been combined with additional signpost at the starting points and at critical deviation points along the trail (stage 3)¹.

Tracks were recorded on site on a map and in three categories: single track, track made by 2 to 4 people, track made by 5 or more people. To interpret the results more easily and compare the different stages on a more formal level, we accumulated all the tracks for each stage by estimating the number of people for each category and summing them (single track = 1 person; track of 2 to 4 people = 3 people; track of 5 or more people = 6 people). These values are only estimates for the observed tracks. We have no information on actual group size and the temporal dispersion of visitors.

The track records also do not tell us the total number of people who stayed on the trail, so that we cannot give an exact rate or percentage of people leaving the trail. However, we tried to ensure that visitor numbers were comparable by recording the tracks after the same number of days with good weather after the last snowfall (5 days), and always included a weekend.

2.3 Analysis

Survey data was analysed with SPSS 11 for MAC, focussing on descriptive statistics. The characteristics of the dependent and the independent variable meant that relatively small case numbers were involved and the conditions for parametrical tests were not fulfilled. The observed behaviour changes were therefore checked for significance with the Pearson

¹ Note: These three stages are not identical to the previously described intervention settings A, B and C in section 2.1.

χ^2 -test (SPSS 11), which tested the statistical significance of frequency differences in the three settings where behaviour was observed.

The records of the track patterns were analysed qualitatively and by interpreting any changes during the three stages with the help of local recreation experts. To analyse them on a more formal level, visitor numbers were estimated and summed for each stage and the significance of frequency differences between the three stages was tested with Pearson χ^2 -test in SPSS 11 (DIEHL and STAUFENBIEL 2001).

3 Results

3.1 Survey

200 surveys were delivered on site. Almost 95 % of all people asked agreed to take a survey home. 103 individuals (52 %) completed the survey and sent it back to us. The survey data covers aspects relevant for local managers and the future development of steering efforts (see Fig. 1 for some examples of survey questions). Respondents all claimed to have enjoyed their tour very much, but these self-reported aspects are only relevant in this article insofar as they can be compared with the results of our observations.

Almost 90 % of the snowshoe walkers who responded to the questions about protected areas said they avoided them if they knew about them (Fig. 1). The same percentage said they were willing to take a longer path to avoid protected areas. When asked what was most important for them when they went snowshoe walking, most said enjoying the beautiful scenery and being safe (Mean response = 3.61 for both items, $n = 103$)². In contrast, adventure ($M = 1.77$) and group experience ($M = 1.79$) they found the least important factors. “The absence of regulations” was also surprisingly unimportant ($M = 1.92$).

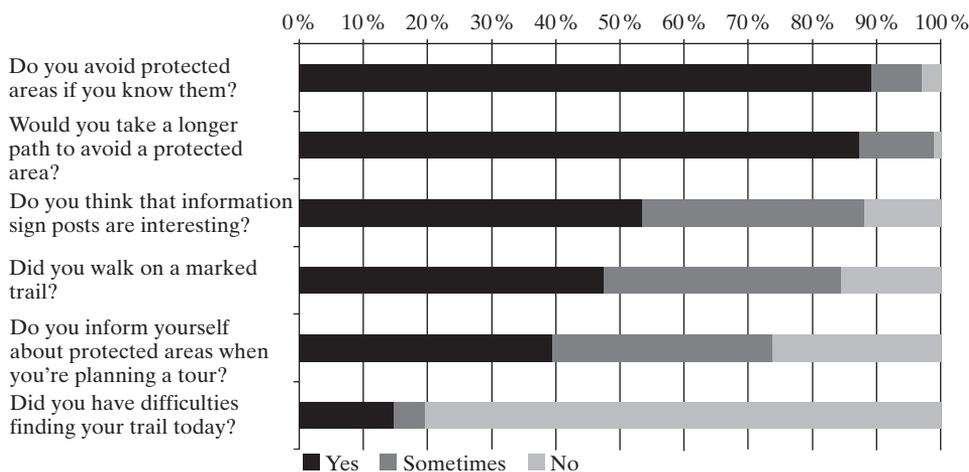


Fig. 1. Results of our survey regarding tour experiences and self-reported behaviour of snowshoe walkers (N = 103).

² 5-point Likert scale ranging from 0 (not important) to 4 (very important).

The questions about pro-environmental attitudes included the item “When I’m doing outdoor activities it is important for me not to disturb wildlife”, where the mean response was 3.57³. The item “It makes sense that some areas are closed in winter to protect wildlife” also scored high ($M = 3.56$). Many people agreed that it makes sense to have marked trails to steer walkers ($M = 3.18$) and most did not feel disturbed at all by signposts installed along the trails ($M = 0.73$).

Snowshoe walkers tend to plan their route in advance and hardly ever change it once they have started their trip. Only 20 % took a different route from the one planned, mainly due to weather or snow conditions.

3.2 Observation of behaviour

In setting A, where steering involved only small signposts along the trail to mark it and starting signposts with basic information, the results differ greatly from what we could expect looking at previous results regarding self-reported attitudes, behaviour and the survey data. Many snowshoe walkers still left the marked trail and crossed the protected area, and only 32 % stayed on the trail (Fig. 2). So the percentage of visitors who respected the protected area was much lower than those who said they would avoid protected areas in the survey. Thus there was considerable inconsistency between reported and observed behaviour in setting A.

In setting B, where we installed additional signposts at the starting points with appeals and information on ecological aspects, protected areas and alternative trails, the number of visitors who stayed on the trail and respected the protected area increased to 81% and came very close to the level of 90 % of people who stated in the survey that they would avoid protected areas if they knew about them. In setting C (additional signposts at critical deviation points) we found fewer people staying on the trail (49 %), though still considerably more than in setting A. Statistical analyses (χ^2 -test) showed that the differences in frequency of snowshoe walkers who stayed on and off the trail in the three settings are highly significant with a probability of error (p) lower than 0.01⁴ (Table 1). The number of people (including ski tourers) was about the same for each setting ($n \approx 65$).

Table 1. Counted individuals according to activity and trail-choosing behaviour. Ski tourers were counted to assess overall visitor numbers in the area to check whether these numbers remained about constant, but they were not further analysed in this article. Pearson χ^2 -test confirmed the significance of the differences in frequency of the snowshoe walkers who stayed on and off the trail in the three settings.

	Snowshoeing			Ski touring			Total Visitor numbers
	On trail	Off trail	Total	On trail	Off trail	Total	
Setting A	8	17	25	2	38	40	65
Setting B	21	5	26	5	18	23	47
Setting C	27	28	55	5	7	12	67
Pearson	χ^2 -value	df	Sig. (2-tail.)				
χ^2 -test	12.806	2	.002				

³ 5-point Likert scale ranging from 0 (I don’t agree at all) to 4 (I totally agree).

⁴ 0 cells have expected count less than 5. The minimum expected count is 11.79.

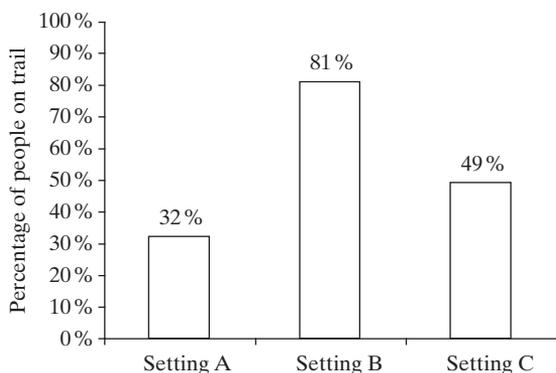


Fig. 2. Percentage of snowshoe walkers who stayed on the trail, assessed in three settings with different levels of information.

3.3 Track records

Figure 3 shows the monitored trail with the assessments at the three different stages. With stage 1 (no markings or signposts at all) the trail was used but there were many deviations at critical points where people went into the protected area. Deviating trails were heavily used with frequent tracks made by five or more people. With stage 2 (trail equipped with basic markings) there were still deviations and in addition parallel tracks to the trail were made. The overall number of deviating tracks was even higher than in stage 1, but with only a few entering the protected area. In stage 3 (with additional signposts containing information and appeals not to leave the trail), parallel versions disappeared and deviations at critical points were still made but not so frequently.

To compare the intensity of deviation on a formal level, the number of people was estimated for each kind of track (as described in the method section) and summed for each stage (Table 2)⁵. The highest number was reached with stage 2, where the trail was marked but no additional signposts were installed. An estimated 70 people left the trail. With stage 1 58 people left the trail, with stage 3 only 11. Pearson χ^2 -test confirms the significance of the differences between the estimated total numbers of people leaving the trail with the three different stages ($p < 0.001$).

Table 2. Number of deviating tracks recorded along the trail with all three stages. Numbers of persons were estimated for each track category (values in brackets) and summed for each stage. Pearson χ^2 -test confirms the significance of differences between the estimated total numbers of people leaving the trail with the three different stages ($p < 0.001$).

	Stage 1	Stage 2	Stage 3
Tracks of 1 person	5 (5)	4 (4)	5 (5)
Tracks of 2 to 4 people	2 (6)	4 (12)	2 (6)
Tracks of 5 or more people	8 (48)	9 (54)	0 (0)
Total no. of deviating tracks; (estimated no. of people leaving the trail in brackets)	14 (58)	17 (70)	7 (11)
Pearson χ^2 -test for differences between the estimated total number of people leaving the trail with the three stages	χ^2 -value 41.971	df 2	Sig. (2-tail.) .000

⁵ These values were estimated according to records of the different categories of tracks and, unlike with the observation of behaviour, not numbers of individuals actually counted. See the methods section (2.2.2) for further details.

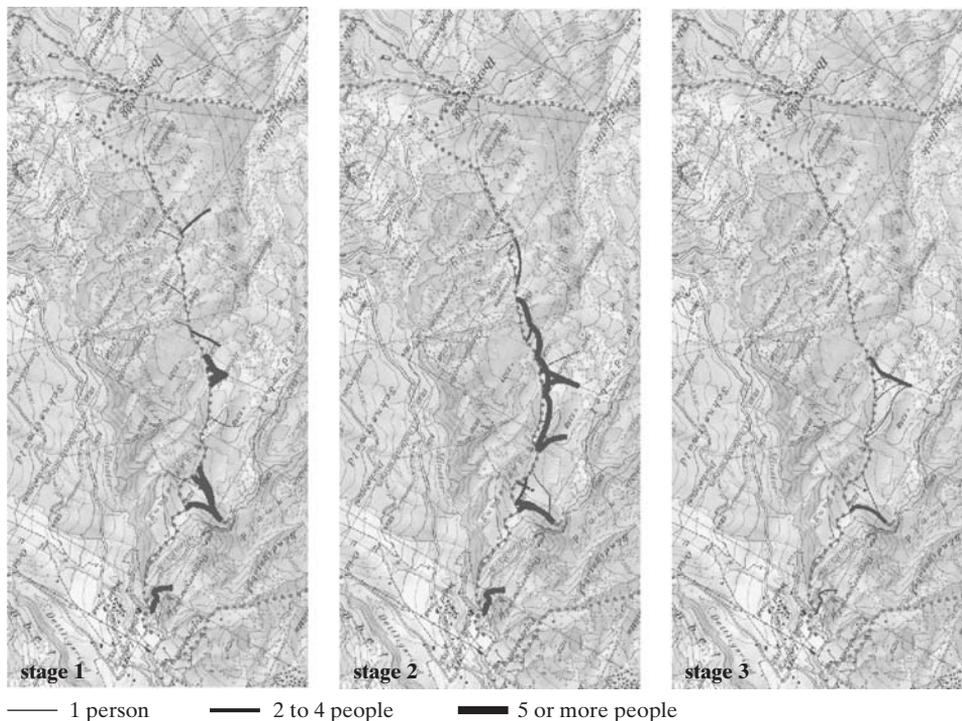


Fig. 3. Track patterns assessed at different stages. For each stage, tracks were recorded after the same number of days after the last snowfall and categorised into three types according to the estimated number of walkers.

4 Discussion

4.1 Methods used: pros and cons

We selected a multi-method design to collect data and to analyse the attitudes and actual behaviour of snowshoe walkers from different points of view. The combination of methods had proved useful in earlier studies involving visitor monitoring (ARNBERGER and HINTERBERGER 2003; CESSFORD and MUHAR 2003) and is generally recommended if one method seems to be insufficient to illuminate the subject. Survey data helped us to interpret our observations and to obtain some insights into snowshoe walkers' thinking. Recording snowshoe tracks made it possible to explore the effects of steering efforts on a larger scale and observing walkers helped us to compare survey data with actual behaviour in a natural setting. Such triangulation helps to answer questions that are difficult to study from only one point of view.

We were able to draw on previously conducted surveys (RADÜ 2004), but it was still necessary to verify earlier findings and see how they applied in our specific area. Radü's questionnaires were not handed out on site but via sport shops, clubs and tour guides. This can lead to biases in the sample. We distributed questionnaires on site, at different points in the area, on different days and under different weather conditions, which means we can assume that our sample is representative of all snowshoe walkers in our study area. Since

this area is popular and typical for snowshoe walking, and is in an environmentally sensitive area, we suggest that the results can be generalised to all other snowshoe areas with comparable conditions (e.g. free access and sensitive wildlife).

Observing behaviour and recording tracks helped us to go beyond self-reported behaviour. The fact that we conducted our intervention in a real setting improves the external validity of our findings. Unlike in a laboratory experiment, people did not take decisions in an artificial or experimental situation where they knew that they were being observed. However, there are not only advantages to using a realistic setting: We could control some variables such as the level of steering efforts, but there are many influences that could not be fully controlled. We tried to take this into account by collecting data on several days for each setting in order to aggregate it and make it more independent of situational and local factors like weather or snow conditions.

Our study involved relatively small numbers of people, so that a single large group of snowshoe walkers who left the trail would have a strong effect on the results. This could be controlled for by recording not only individuals but also groups as one decision unit. This would require further research on group' decision-making processes of snowshoe walkers, so for this study we decided to focus on counting individuals.

4.2 Interpretation of main findings

4.2.1 Reported attitudes

Our survey results confirm previous findings that snowshoe walkers tend to be very pro-environmental and willing to behave ecologically (RADÜ 2004). These results are consistent with earlier findings concerning the high willingness of outdoor recreationists to perform their outdoor activities in an ecological way (WESSLEY 2000a; ZEIDENITZ 2005). The survey data suggests that snowshoe walkers tend to be more environmentally friendly than the average person. Moreover, snowshoe walkers are not doing a trend sport for thrills but more because they enjoy beautiful scenery and want to be safe.

In traditional European leisure science it has been claimed that the absence of regulations, rules and coercion is an important factor or even a defining element of recreational activities (OPASCHOWSKI 2006). This could lead to the assumption that steering efforts might not be well accepted by snowshoe walkers. However, this did not apply to our survey sample. People agree that it is necessary to protect wildlife and therefore accept access restrictions, judging by their survey responses. This corresponds with other surveys regarding the readiness to accept restrictions of leisure activities to protect nature (SEELAND *et al.* 2002). We suggest that respondents' positive ecological attitudes contribute to regulations being perceived not as limiting recreational aims but as a necessary factor to allow the activity to take place in a sensitive region. Steering efforts, such as marking trails and informing people about the environment in a subalpine area in winter tend to be compatible with snowshoe walkers' self-reported attitudes.

However, survey responses might be partly pushed into a positive direction by social desirability. People then answer in a way they think the researcher and/or society expect them to (EDWARDS 1957). We did not control this factor in our survey systematically, but our results are comparable with findings from studies of similar target groups. Moreover, our observations of people's actual behaviour helped us to estimate the accuracy of the responses to the questionnaire survey.

4.2.2 Observations of behaviour

People tended to behave differently in the three different settings. In setting A at the beginning of the winter season, only about a third of the snowshoe walkers stayed on the trail, although 90 % of the respondents stated in the survey that they would avoid protected areas if they knew about them. They also mostly maintained that it was important for them to protect wildlife during outdoor activities. Thus there is a marked inconsistency between reported attitudes/behaviour and the behaviour we actually observed. Such inconsistencies have often been reported in the field of environmental psychology, especially if people receive little information to increase knowledge and activate relevant norms (Dwyer *et al.* 1993; Marion and Reis 2007; Staats 2003).

In setting B we found many more people stayed on the trail, with a percentage close to the attitude level of 90 %. So attitudes and observed behaviour were more consistent in this setting, probably because people were provided with more information and additional signposts at the starting points of the trails. Signs that helped people to turn their attitudes into behaviour included: an appeal to stay on the trail, biological background information, a map of the protected area and a short text explaining, why one should not leave the trail. Findings in recreation research and social psychology have shown that appropriate information and education can affect ecological behaviour in a positive way if they are compatible with visitors values and if they are precise, and not too detailed and complicated (Absher and Bright 2004; Duncan and Martin 2002; Flury-Kleubler and Gutscher 2001; Manning 2003; Petty and Cacioppo 1986; Staats 2003; Zeidenitz 2005). Moreover, it is likely that there was a learning effect we were not able to control: Some time passed between assessing setting A and B. We know from our survey that many visitors return to the area and that people communicate with other friends and other guests about the existence of the marked trails. Thus we can assume that, when we assessed setting B, more people knew about the trails before setting out and had perhaps already planned to use the marked trails.

Roughly 81 % of the snowshoe walkers were observed to stay on the trail in setting B, which is close to the 90 % in self-reported behaviour in the survey. Thus their reported behaviour is not just a product of social desirability but can be achieved in natural settings under ideal communicative circumstances, as other studies have also shown for other outdoor activities such as camping, hiking and horseback riding (Marion and Reis 2007). Especially positive results were observed if the aim was to change behaviour based on uninformed decisions (as in our study), rather than to change illegal or careless behaviour (Manning 2003).

Contrary to our expectations, the percentage of people staying on the trail did not stay at a similar high level in setting C, but actually decreased to about 49 %. This is still significantly higher than in setting A, but here the steering efforts were even more intense than in setting B. We had therefore expected at least the level of setting B. Behaviour changes are, however, often not maintained, as other intervention studies also show (Dwyer *et al.* 1993; Marion and Reis 2007), especially if steering efforts aim to influence behaviour directly without addressing underlying variables such as attitudes, beliefs, and norms (Manning 2003). However, we still need to explain our own findings. In setting C there were even more signposts on the trail, located at critical deviation points to repeat information and to mark points where it was important not to leave the trail. In our survey people said they hardly ever change the route they had planned once they have started out. Therefore we assume that the signposts on the trail were too late to influence decisions about the route and hence had no more effect than the signposts at the starting points. This is supported by empirical results on decision-making theory, which suggests that information about planning a tour

must be provided early in the planning process or at least before arrival on the site (MARION and REIS 2007).

Another reason why fewer people stayed on the trail in setting C than in B could be that there was a general absence of positive feedback or reinforcement in this outdoor setting. Snowshoe walkers do not get any obvious reward or positive effects for showing the desired behaviour (except maybe a better conscience). Moreover, they do not see any obvious negative effects if they deviate from the tracks. Research on pro-environmental behaviour indicates that positive feedback on actions is important to develop and maintain new forms of behaviour (FLURY-KLEUBLER and GUTSCHER 2001; STAATS *et al.* 2004). The absence of feedback may lead to a decrease in the previously shown desired behaviour because it is not rewarded and because undesired behaviour is not sanctified. Other types of undesirable behaviour, such as stealing wood, littering, and wild camping, may occur because people consider the impact of their own particular actions or disturbance to be very small, and ecologically irrelevant and therefore acceptable (ERNST 1997; WIDNER WARD and ROGGENBUCK 2003).

Some local experts suggested that the decrease could be a form of reactance, i.e. people left the trail deliberately reacting negatively to the steering efforts, which inferred with their expectations and wishes for their tour. The survey, however, showed people generally had positive attitudes towards steering efforts and there were no negative reactions to signposts, so this explanation does not fit here. Moreover, snowshoe walkers' positive attitudes towards steering instruments was also confirmed by the survey results of RADÜ (2004).

4.2.3 Recording tracks

Recording tracks allowed us to assess data not only at one critical point but also on a larger scale. Since we did not assess the overall number of visitors using the whole trail during the three stages, it could be argued that the track patterns could also have been the result of varying visitor frequencies throughout the season. But our counts while observing behaviour showed that visitor numbers were more or less constant on weekends. And since we kept the number of days for each stage constant and always included one weekend, we assume that visitor frequencies were comparable.

We assessed the track patterns three times along one trail after the same number of days without snowfall, which gave us aggregated information about people's behaviour along the trail at three different stages. Results show that without any markings people used the trail, but also felt free to choose any other path (stage A). If the trail was marked but people are not provided with additional information (stage B), people used the trail but also chose a lot of parallel trails since the trail was interpreted as only a means of orientation and not as an instrument to reduce disturbances. Although people kept closer to the trail, we did not register a decline in the number of deviating tracks. Data from stage C indicate that these parallel trails disappear if signposts with additional information are installed along the trail. Thus, as others have also found, providing information can have an effect on behaviour if people already have the appropriate attitudes, as our respondents did, but lacked specific information in stage A and B (MANNING 2003; MARION and REIS 2007; PETTY and CACIOPPO 1986; ZEIDENITZ 2005). In setting B, people were often willing to use the trail but didn't see any reasons to remain close to it. Additional ecological information (as in setting C) on the sensitivity of wildlife in winter and maps showing the official trail helped them to behave as desired. In terms of the theory of planned behaviour, this could mean an increase in perceived behaviour control, which is – in addition to attitude, social norm and intention – necessary to actually perform behaviour: People do not only need to have the right attitudes and intentions to behave in a particular way, but also information on when, where, how and why to behave in that way (AJZEN and DRIVER 1992; STAATS 2003).

We found that signposts along the trail did not always inhibit people from choosing another route if they wanted to leave the trail, but snowshoe walkers would keep closer to the chosen trail if provided with appropriate information and be less likely to cause disturbances (FINNEY *et al.* 2005). In stage C there were still deviating trails, although these were mostly used by just one or two individuals. This shows that it is difficult to eliminate deviation at very critical points if people are used to choosing their own routes since many years. Many visitors have been coming to the region for many years, several times a year, and are used to using certain paths and routes, they told us in our survey. Previous research confirms that it is very difficult and takes more effort to change people's long-term habits (KAUFMANN-HAYOZ and GUTSCHER 2001; ROGERS 2003; ZIMBARDO and LEIPPE 1991). Therefore signposts should be complemented with other steering efforts. Rangers, it has been suggested, could be even more successful in promoting the desired behaviour than signposts (OLIVER *et al.* 1985). People were also very willing to obtain information over the Internet and brochures. Commercial guides and outfitters could also successfully provide clients with information to enhance ecological knowledge (MANNING 2003).

4.2.4 Hypotheses

Our observations of behaviour and track records confirm hypothesis I that the behaviour of snowshoe walkers can be influenced in a positive way by steering efforts.

Comparing our survey data and observation of behaviour in setting A clearly supported hypothesis II that attitude-behaviour consistency will be low if trails are just marked and no additional on-site information is provided. Basic steering efforts complemented with additional information as in setting B resulted in much more consistency between attitudes and behaviour than in setting A. However the number of people who stayed on the trail decreased in Setting C. Nevertheless it was still higher than in setting A, and this is compatible with this hypothesis.

5 Conclusion

Snowshoe walkers generally react in a positive way to steering efforts, and this is actually true for attitudes and self-reported behaviour. Our interventions were therefore basically compatible with their attitudes and opinions. Observations showed, however, that snowshoe walkers over-rate their ecological attitudes and their self-reported ecological behaviour in questionnaires. For example there was a large gap between the questionnaire data and our observations of behaviour to do with avoiding protected areas if trails have only basic marking and little information is provided. Attitudes and behaviour are not very consistent if people are not provided with additional steering support. Thus it is not sufficient to just mark trails to channel outdoor activities in order to protect wildlife. The gap between attitudes and behaviour can be reduced somewhat if snowshoe walkers are provided with appropriate information, ecological education, good arguments and appeals. It seems that information lowers barriers and thus helps people transform their attitudes into concrete behaviour. Since snowshoe walkers consider ecological information to be very useful, they should be able to obtain it easily, for example via the Internet, when they buy or rent their equipment or have a break in a restaurant.

This study shows that surveys about the behaviour of outdoor recreationists must be interpreted with care. Very positive pro-environmental attitudes and self-reported behaviour might be partly influenced by social desirability, but they can still be considered to show people are potentially willing to actually behave ecologically. It is important to support

people in bridging this gap between abstract attitudes and concrete behaviour by lowering barriers and providing them with appropriate information and infrastructure.

Additional signposts at critical deviation points do not increase the consistency between attitude and behaviour at these points, obviously because this information comes after they have chosen a certain route and already started. But additional signposts on the trail still make sense because people tend to stay closer to the trail and do not make parallel tracks. However, where there are frequently and traditionally used deviating paths, special effort will be needed to prevent people from using them because this involves changing their habits. Here blocking the path or having temporary rangers might be necessary. We also noticed a declining level of people staying on the marked trail in the third setting, where there were more steering efforts. This may be due to the absence of positive feedback for “good” behaviour and the lack of evident negative consequences for leaving the trail. Thus, desired behaviour should be reinforced – otherwise positive effects tend to disappear after a while. For example, articles could be published in the popular media about the positive effects of pro-environmental behaviour, or rangers and local managers could praise the desired behaviour or put up signposts that thank the visitor “for staying on the right path”. Rangers, articles in local newspapers, and sports outfitters could point out the negative consequences of leaving marked trails to discourage unecological behaviour. In addition, steering efforts must be reinforced continuously to avoid a decrease in the achieved positive effects. If outdoor-recreation managers combine these approaches, steering efforts are likely to be more successful in harmonising recreational and ecological aims.

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