Teaming up for sustainability: Promoting sustainable mobility behaviour through sports clubs in Switzerland

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Abstract

Individual behaviour plays an important role in sustainable transport, however, daily mobility habits are difficult to change. Collaborating with formal social groups such as sports clubs appears to be an effective strategy to motivate participation in behaviour change programmes, but there is a lack in empirical work that systematically compares targeting groups and targeting individuals in such efforts. This paper reports on a quasi-experiment in the field offering this comparison. It was implemented in a programme of a Swiss city motivating sportspeople to attend sports training sessions by bike instead of by car. The programme addressed sports teams (*n*=187) and individuals exercising at gyms (*n*=31). Surveying modes of transport before, during, directly after, and a few months following the programme revealed that team members significantly reduced car use to training sessions during the programme. Social norms impacted team members' decisions to travel by car less frequently. In contrast, individual participants' car use to attend gym sessions was not affected by the programme. We conclude that formal social groups such as sports clubs are potentially effective multipliers and motivators for environment-friendly mobility programmes. More research is needed on how behavioural changes during the programme translate into long-term habitual changes.

Keywords

field experiment; local context, behavioural change, mobility

1. Introduction

The transport sector contributes approximately a quarter of global energy-related carbon emissions and consumes about 30% of total end-use energy (Sims et al., 2014). Over 70% of greenhouse gas emissions in the transport sector can be attributed to road transport, and this share is even higher in OECD countries. Accordingly, the transport chapter in working group III's contribution to the fifth IPCC report (Edenhofer et al., 2014) concludes that "avoided journeys and modal shifts due to behavioural change, uptake of improved vehicle and engine performance technologies, low-carbon fuels, investments in related infrastructure, and changes in the built environment, together offer high mitigation potential" (Sims et al., 2014, p. 603). As such, individuals changing their regular mode of transport play an important role in transitioning towards more sustainable transport systems.

However, realizing changes in mobility behaviour is challenging; modes of transport are highly habitual (Gärling & Axhausen, 2003; Verplanken & Roy, 2016; Wood, Tam, & Witt, 2005) and strongly embedded in specific contexts, such as the distance between home and work or the availability of public transport (Danner, Aarts, & Vries, 2008). The latter gives rise to justice issues, when attempting changes in mobility patterns (Mattioli, 2016). Setting up programmes that encourage individuals to try out alternatives to driving, such as free public transit passes (Abou-Zeid & Ben-Akiva, 2012; Abou-Zeid, Witter, Bierlaire, Kaufmann, & Ben-Akiva, 2012; Fujii & Kitamura, 2003), or offering e-bike trials (Cairns, Behrendt, Raffo, Beaumont, & Kiefer, 2017; Fyhri, Heinen, Fearnley, & Sundfør, 2017; Moser, Blumer, & Hille, 2018) are effective in breaking mobility habits. Cities play an important role in such initiatives, as many of them run behaviour change programmes to reduce carbon emissions in mobility and transport (Davies, 2012; Heiskanen, Johnson, Robinson, Vadovics, & Saastamoinen, 2010; Jensen et al., 2018; Rose & Marfurt, 2007). When designing programmes, a key concern is identifying and reaching target groups with real potential to save energy (Davies, 2012). However, those who participate in such programmes are often already aware of their energy consumption and are active in saving energy (Sütterlin, Brunner, & Siegrist, 2011). One interesting approach for attracting new target groups when motivating behavioural change is collaborating with formal social groups, such as sports clubs (Seidl, Moser, & Blumer, 2017, Frick, Seidl, Stauffacher, & Moser, 2017).

Formal social groups are understood "as locally active groups whose members meet face-to-face on a regular basis and engage in collective action to pursue certain goals" (Frick et al., 2017, p. 1540, adapted from the definition by Schulz & Baumgartner, 2013). Examples of such groups are sports clubs, choirs, neighbourhood associations or political parties. Collaborating with formal social groups is a promising approach to reach target groups and motivate behavioural change. This is for four main reasons:

First, members of such groups often share trusting relationships. This is because they normally meet on a regular basis to reach a common goal, such as training for sports (Schulz & Baumgartner, 2013). Therefore, group members may react more positively towards energy-saving programmes when communicated by their own group rather than by a city administration. Accordingly, Frick et al. (2017) demonstrated in an online experiment that participants were more motivated to follow an energy-saving programme when addressed by their formal social group compared to being addressed by their municipal administration.

Second, formal social groups create an arena for sharing mobility-related experiences and for social learning about sustainable mobility practices (Axsen & Kurani, 2012). Because such groups can motivate and support their members to try sustainable transport options, they may reach individuals who would not otherwise commit to behavioural change.

Third, the social norms within formal social groups are developed, shaped and changed over time. Social norms have been recognized as having a powerful influence on behaviour (e.g., Theory of planned behaviour, Ajzen, 1991; Value-belief-norm theory by Stern, Dietz, Abel, Guagnano & Kalof, 1999; Miller & Prentice, 2016). Different types of norms can be distinguished: descriptive norms refer to what we observe others doing (e.g., I observe that members of my sports team often drive to training sessions by car), injunctive norms refer to what we think others expect us to do (e.g., I think that members of my group expect me to drive by car to training sessions; Cialdini, Kallgren & Reno, 1991). The influence of social norms in particular on energy-saving behaviour has been demonstrated empirically in various field experiments and described in literature reviews (Abrahamse, Steg, Vlek, & Rothengatter, 2005; Allcott, 2011; Schultz, Khazian, & Zaleski, 2008; Schultz, Nolan, Cialdini, Goldstein, & Griskevicius, 2007). For example, norms about cleanliness strongly impact how people use energy at home (Sahakian & Bertho, 2018). The effects of social norms can also be found in recent literature about the adoption of electric cars (Barth, Jugert, & Fritsche, 2016; Bobeth & Matthies, 2017) and rooftop photovoltaics (Curtius, Hille, Berger, Hahnel, & Wüstenhagen, 2018). By highlighting social norms or providing new information about social norms, behaviours can also be changed: Insights from large-scale field experiments indicate that information about social norms is even more powerful in changing behaviour than financial incentives (Delmas, Fischlein, & Asensio, 2013; Yoeli, Hoffman, Rand, & Nowak, 2013). Social norms, paired with social support in teams, are relevant in behavioural change at varying stages: they can help to raise awareness and motivate participation in programmes, promote behavioural change during such programmes and support the formation of more sustainable mobility habits once the programmes have ended (Ohnmacht, Schaffner, Weibel, & Schad, 2017).

Fourth, a large share of the population in Western Europe are already active members in formal social groups. For example, around one fifth of the populations in the Netherlands (23%), Denmark (22%), Germany (21%), Ireland (18%), France (17%) and Belgium (17%) were group members in 2013 (Eurobarometer, 2014). Hence, collaboration with such groups provides an opportunity to reach large sections of the population.

There are scientific papers and reports that discuss the potential of collaborating with groups for implementing different energy policy goals (Blumer, Wemyss, & Moser, 2015; Mourik & Rotmann, 2013; Müller et al., 2016; Parag & Janda, 2014). These publications often take a conceptual perspective or they focus on qualitative descriptions of case studies. Such works offer valuable reflections on collaborations, usually successfully concluded ones, with different groups. At the same time, they do not systematically compare these collaborations to other approaches. Therefore, it is difficult to estimate the effectiveness of formal social groups as multipliers based on these studies. One exception is the above-mentioned experiment by Frick et al. (2017), which compared the motivating potential of formal social groups and municipal administration in the promotion of energy-saving programmes. However, since this study took place online, it placed participants in a highly artificial and hypothetical setting that lacked real-life contexts and consequences. What is missing are field experiments that examine formal social groups' multiplier potential in a systematic and contextualized way.

The goal of the paper at hand is to address this research gap by inquiring if collaborating with formal social groups is a more effective strategy for propagating behaviour change programmes in mobility compared to targeting participants individually. Thus, we aim to systematically investigate if collaborating with formal social groups i) is an effective strategy for reaching potentially interesting target groups and ii) can better promote behavioural change in mobility compared to addressing participants individually. More specifically, we investigate the following research questions:

- *Encouraging participation:* What potential do formal social groups have in encouraging participation in an energy-saving programme?
- *Changing mobility behaviour:* Are there differences in how people change mobility behaviours when approached individually compared to being approached in a formal social group? Specifically, we are interested in changes transport choices to training sessions.
- *Role of social norms:* How are groups' social norms about sustainable transport related to behavioural changes?

The setting of this study is a behaviour change programme in mobility that has been co-designed with the Swiss city of Winterthur. The programme, which is called 'Luftaus.ch Team Cup and Fitness Cup', promoted cycling to sports training sessions instead of driving. It was

targeted to both sports teams and individuals exercising at gyms. The study can be considered a quasi-experiment in the field (Caniglia et al., 2017) allowing for a systematic comparison between targeting formal social groups and targeting participants individually.

Although this paper presents a single field study based in Switzerland it is relevant for an international audience. This is in particular for two reasons: First, many cities worldwide are currently running programmes to promote behavioural changes in the mobility domain and are struggling to reach target groups. The study at hand provides empirical insights into an innovative approach for doing so via formal social groups. Second, our field study systematically compares targeting individuals and groups for a behaviour change programme in mobility in a quasi-experimental setting. The gained insights are thus of high relevance for behavioural change research in the energy field.

2. Material and methods

2.1. The programme 'Luftaus.ch Team Cup and Fitness Cup'[1]

The key goal of the 'Luftaus.ch Team Cup and Fitness Cup' programme was to reduce inhabitants' car use for leisure mobility by motivating sportspeople to go to training sessions by bike. The programme took place in Winterthur, which is a Swiss city with 113,500 inhabitants as of 2018, during six weeks in the summer of 2016. The programme addressed formal social groups, namely sports teams and individual sportspeople who exercise in gyms. It entailed two competitions: 'Team Cup' for sports teams and 'Fitness Cup' for gym members. Participation was incentivized with a prize of 500 CHF (approx. 430 Euros) for the sports team with the highest ratio of bike trips to training sessions or three months of free gym membership for the individual who cycled to the gym the most.

To recruit sports teams, all sports clubs in Winterthur were identified by the city sports department. According to the sports department, there are around 80 sports clubs who meet regularly for training sessions. Where possible, the addresses of team coaches were collected either through online research or contacts provided by the city sports department. Personal contacts to sports clubs were also used to approach teams and motivate them to participate. Coaches received information about the programme by mail, such as competition conditions, instructions for registration and participation and accompanying research. All communication materials, as well as the campaign website, were developed by a communication agency.

To recruit gym members, large displays promoting the programme were installed in the foyers of four gyms in Winterthur. Flyers were also distributed. These communication materials were

[1] 'Luftaus' is a made-up German word referring to running out of breath. The umbrella programme Luftaus in Winterthur focuses on preventing air pollution. The Team Cup and Fitness Cup are part of this programme. More information (in German) can be found at www.luftaus.ch (retrieved 20 July 2018).

identical to those distributed to sports clubs save for small differences in the contents, since materials for the Team Cup addressed teams while those for the Fitness Cup addressed individuals.

As a whole, the programme resulted from a close collaboration of research and practice. Researchers, city representatives and a communication agency collaborated closely in different stages of the programme: designing and implementing the programme, selecting strategies to reach target groups and compiling the accompanying research.

2.2. Data collection procedure

Data collection took place over a period of approximately 20 weeks (see Figure 1 for an overview). Before the start of the competition, the email addresses of all participants were collected (either upon their individual registration or via team coaches). A first questionnaire was sent to all participants by email shortly before the competition started (T1). During the competition, participants' reported their choices of transport to training sessions. Team coaches reported these figures on behalf of those participating in the Team Cup. After each training session, coaches asked team members openly what mode of transport they used to attend training and then input the information into an online form (online reporting). Weekly updates on the relative positions of all teams in the Team Cup were published on the programme website. Individuals participating in the Fitness Cup filled out an online form on their own (online reporting). All participants received a second questionnaire via email at the end of the programme, which was six weeks after it began (T2). A third questionnaire was sent by email 12 weeks after the programme ended (T3). Participants received up to three reminders to complete each questionnaire. All questionnaires were in German and included the measures described in section 2.3.2. Participants who filled out all questionnaires received a voucher worth 20 CHF (around 17 euro) for a product of their choice.

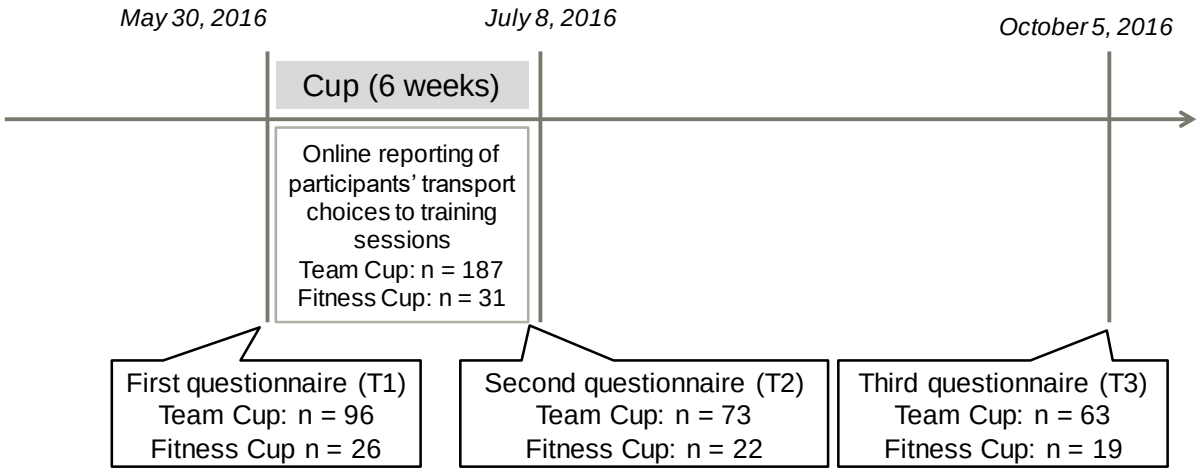

Figure 1. Overview of data collection.

In addition, we checked the regional weather data for each period. Table 1 shows that precipitation, a major barrier to cycling, had similar rates before and during the competition (April/May 2016 and May/June 2016, respectively) but was lower in September/October 2016, which was a few months after the competition. The mean daily temperature was lower in April/May and it was equally warm in May/June and September/October.

Table 1. Regional weather data.

Weather data	Six weeks before the Cups (Apr/May 2016)	Six weeks during the Cups (May/Jun 2016)	Three months after the cup ended, during six weeks (Sep/Oct 2016)
Mean temperature during the day	13.6 °C	19.3 °C	19.9 °C
Mean precipitation per day	5.26 ml	5.35 ml	1.44 ml

Notes: Measuring station: Zürich-Kloten. Data provided by the Federal Office of Meteorology and Climatology MeteoSwiss (https://www.meteoswiss.admin.ch).

2.3. Quasi-experimental design

The field experiment was set up as a quasi-experiment and included the following independent and dependent variables:

2.3.1. Independent variable (quasi-experimental)

Formal social group or individual: This variable was operationalised by the two different cups: participants in the Team Cup participated as part of a formal social group and participants of the Fitness Cup participated individually.

2.3.2. Dependent variables and measures

Motivation: The first questionnaire (T1) asked participants about their motivation to participate in the programme. Reasons included health and fitness, climate and environment and competitiveness. Team Cup participants responded to additional items relating to group dynamics. Participants responded on seven-point Likert scales (see Table 3 for items).

Mode of transport to training: This was measured in three online assessments at different points in time. The first questionnaire assessed respondents' modes of transportation in the six weeks before the cup began (T1). More specifically, participants reported i) how many times in total they attended training in the six weeks prior and ii) how many times they took the following means of transport: bike, public transport, car, motorbike or foot (self-report). Transportation used to attend training during the cup was reported online for each training session, again differentiating between going by bike, public transport, car, motorbike and foot (T2, see section 2.2 for details about online reporting). Twelve weeks after the cup ended, participants' modes of transport to attend training over a six-week period was assessed in the third questionnaire (T3), which contained the same questions as in T1 (self-report).

Social norms: Participants of the Team Cup replied to the following three items in all three questionnaires (T1, T2 and T3): 'My team tries to go to training by bike or by foot as often as possible' (descriptive norm, based on Cialdini, Kallgren, & Reno, 1991), 'My team expects me to go to training by bike or by foot' (injunctive norm, based on Cialdini et al., 1991; Karlin et al., 2012) and 'My team supports me to go to training by bike or by foot' (social support, based on Molloy, Dixon, Hamer, & Sniehotta, 2010). Participants responded to these items on seven-point Likert scales (1 = I do not agree at all, 7 = I agree completely). A respective scale was computed based on mean responses to the three items with acceptable to good reliability: Cronbach's α T1 = .76, Cronbach's α T2 = .79, Cronbach's α T3 = .86. We also included questions about social norms in Fitness Cup participants' questionnaires. These related to mobility behaviours of family and friends. Data yielded no significant impact of the competition on these norms, therefore these items are not analysed further.

2.3.3. Socio-demographic and further variables

Socio-demographic variables such as gender, age, and education were collected, as well as participants' travel distance to the training locations. These variables were only asked once to keep questionnaires as short as possible.

2.4. Sample

In total, twelve teams with *n* = 187 team members signed up and completed the online reporting of their transportation choices during the Team Cup. Participating teams covered a wide range of team sports, including volleyball, rugby, gymnastics, artistic cycling and aerobics. Six participants in the Team Cup were members of two different teams. In the Fitness Cup, *n* = 31 individuals participated. In both the Team Cup and in the Fitness Cup, women were slightly overrepresented when compared to Swiss population statistics (see Table 2). Car ownership among Fitness Cup participants was lower than in the overall Swiss population. Meanwhile, Team Cup participants mirrored Swiss population statistics regarding car ownership. Participants in the Fitness Cup were of a higher mean age and, accordingly, a higher educational level compared to participants in the Team Cup, 10% of which were still in education.

Some participated in the competition without filling out the online questionnaires. Response rates were lower for the Team Cup than for the Fitness Cup. They are displayed in Table 2.[2]

[2] We found that those who completed all questionnaires were more likely to cycle (mean share = .75) during the competition compared to those who did not fill out questionnaires (mean share = .57). These differences were similar for both cups.

Table 2. Overview of socio-demographics of the sample compared with Swiss population statistics.

Variables	Team Cup	Fitness Cup	Swiss population statistics
Sample size, response rates	Online reporting: *n*=187 (100%) T1: *n*=96 (51%) T2: *n*=73 (39%) T3: *n*=63 (34%)	Online reporting: *n*=31 (100%) T1: *n*=26 (84%) T2: *n*=22 (71%) T3: *n*=19 (61%)	-
Mean age	35.4 years (SD=17.1)	43.0 years (SD=13.6)	41.9 years (BFS, 2016)
Gender	57% female	68% female	51% female (BFS, 2016)
Highest level of education	25% vocational training 22% grammar school 21% university 14% compulsory school 10% no diploma (yet) 5% higher voc. training rest: other	36% vocational training 32% university 20% grammar school 12% higher voc. training All other options: 0%	38% vocational training 27% university 14% higher voc. training 13% compulsory school 8% grammar school (all: BFS, 2017a)
Availability of car	20%: no car 51%: one car 30%: two or more cars	36%: no car 44%: one car 20%: two or more cars	22%: no car 49%: one car 29%: two or more cars (all: BFS, 2017b)

Notes: Age was only included in questionnaires T2 and T3 and education was only included in questionnaire T1 to keep questionnaire length to a minimum.

3. Results

3.1. Encouraging participation through formal social groups

Twelve teams participated in the Team Cup. The coaches of these teams were able to encourage 187 members to participate in the competition. This implies a multiplier effect, as every participating team on average engaged 16 members to participate in the programme. In contrast, only 31 participants were recruited in the Fitness Cup (see Table 2).

For participants of both the Team Cup and the Fitness Cup, environmental reasons were an important motivation for participating in the competition (T1). Health-related reasons were significantly more important for Fitness Cup participants than for Team Cup participants. For the latter, social reasons were also important: Many of them participated because they were motivated by their team or their coach (see Table 3 for details).

Table 3. Variables measuring motivation to participate in the competition and respective differences in means for Team Cup and Fitness Cup participants (T1).

Variables	Team Cup (*n* = 92) *M* (*SD*)	Fitness Cup (*n* = 26) *M* (*SD*)	*T*	*df*	*p*
I would like to help prevent climate change	5.85 (1.40)	5.92 (1.35)	-0.24	116	.81
I would like to reduce air pollution	5.76 (1.46)	5.92 (1.41)	-0.51	116	.62
My team has decided to participate°	5.32 (1.90)	-	-	-	-
My coach has persuaded me to participate°	4.75 (2.14)	-	-	-	-
I would like to improve my fitness	3.72 (1.94)	4.62 (1.96)	-2.08	116	.04*
I like to do warm-ups before training	3.78 (1.98)	3.92 (2.38)	-0.27	35.3	.79
I would like to win a prize	3.59 (2.23)	4.04 (2.20)	-1.06	118	.29

Note: Items marked with a ° were only included in Team Cup questionnaires. * $p < .05$ (independent t-tests, two-tailed). Items were measured on 7-point-Likert scales, 1 = not at all important, 7 = very important. Items translated from German.

3.2. Changing mobility behaviour

The goal of the programme was to reduce participants' car use and increase their bike use when travelling to training sessions. The mean distance to training locations was *M* = 6.2 km (*SD* = 8.7 km) for Team Cup participants and *M* = 7.6 km (*SD* = 10.5 km) for Fitness Cup participants. This difference was not statistically significant; $t(89) = .63$. $p = .53$. About 90% of participants indicated that it was possible for them to travel to training sessions by bike. Only a very small share of participants mentioned that they were unable to bike to trainings because it was too far away (9%) or because they had to carry materials (2%). Participants indicated via questionnaires (T1, T3, both self-report) and online reporting how many times they attended training by bike, public transport, car, motorbike or foot. The programme's influence on participants' modes of transport to training sessions before, during and after the programme is described in the following paragraphs. As the programme promoted reduced car use and increased bike use, we focused on these two means of transport in our analysis.

Only participants who completed questionnaires T1, the online reporting and questionnaire T3 were considered for analyses. For each participant, we calculated the share of car and bike use to training sessions for three different time periods: the six weeks before the cup (T1, self-report), six weeks during the cup (online reporting), and six weeks following a couple of months after the cup ended (T3, self-report). Mean shares of car use and bike use are displayed before, during and after the cups for Team Cup and Fitness Cup participants (see Table 4 and Table 5).

Table 4: Mean shares (and standard deviations) of car use before (T1), during (online reporting) and after (T3) the Team Cup and Fitness Cup. Only participants who completed questionnaire T1, the online reporting and questionnaire T3 were considered.

Type of Cup	Share of car use: T1 (self-report), M (SD)	Share of car use: Online reporting, M (SD)	Share of car use: T3 (self-report) M (SD)
Team Cup (*n* = 52)	21% (34%)	3% (14%)	18% (33%)
Fitness Cup (*n* = 16)	8% (12%)	4% (8%)	2% (5%)

Table 5: Mean shares (and standard deviations) of bike use before (T1), during (online reporting) and after (T3) the Team Cup and Fitness Cup. Only participants who completed questionnaire T1, the online reporting and questionnaire T3 were considered.

Type of Cup	Share of bike use: T1 (self-report), M (SD)	Share of bike use: Online reporting, M (SD)	Share of bike use: T3 (self-report), M (SD)
Team Cup (*n* = 53)	57% (40%)	73% (35%)	62% (41%)
Fitness Cup (*n* = 17)	61% (43%)	65% (40%)	65% (43%)

Car use to training sessions over time was investigated with a Repeated Measures Analysis of Variance (Repeated Measures ANOVA). Figure 2 (left graph) shows that participants in general rarely drove to their training sessions. Team Cup participants' shares of car use exceeded those of the Fitness Cup participants before the competition began. Table 6 highlights a significant main effect of car use over time; $F(1.9) = 4.47$, $p < .05$. Car use was highest before the competition started (T1) and lowest during the competition phase (online reporting). After the competition (T3), car use increased again. This main effect was qualified by an interaction effect between type of cup and car use over time; $F(1.9) = 3.10$, $p < .05$. This interaction effect indicates that the competition had a different effect on the Team Cup and Fitness Cup participants' modes of transport to their training. Team Cup participants used their cars less often during the cup (online reporting) than before (T1) or after the cup (T3). This indicates that the programme had a significant impact on their car usage, but only while the cup lasted. Fitness Cup participants' car use to attend training was already low before the programme, representing a floor effect. Fitness Cup participants' car use decreased both during the programme and after it, but this decrease is not statistically significant (see Figure 2, left graph).

Table 6. Results of the Repeated Measures ANOVA. Within-subjects factor: car use to training in T1 (self-report), online reporting and T3 (self-report). Between-subjects factor: cup. Team Cup: n = 52, Fitness Cup: n = 16. Only participants who completed questionnaire T1, the online reporting and questionnaire T3 were considered.

Variables	*df*	*F*	*Partial* η^2	*p*
Within subjects				
Car use	1.90	4.47*	.06	<.05
Car use x type of cup	1.90	3.10*	.05	<.05
Error	125.47	(.03)		
Between subjects				
Type of cup	1	2.43	.04	.12
Error	66	(.13)		

Note. Values in parentheses represent the mean square errors. Degrees of freedom were corrected using Greenhouse-Geisser estimates of sphericity. * p < .05.

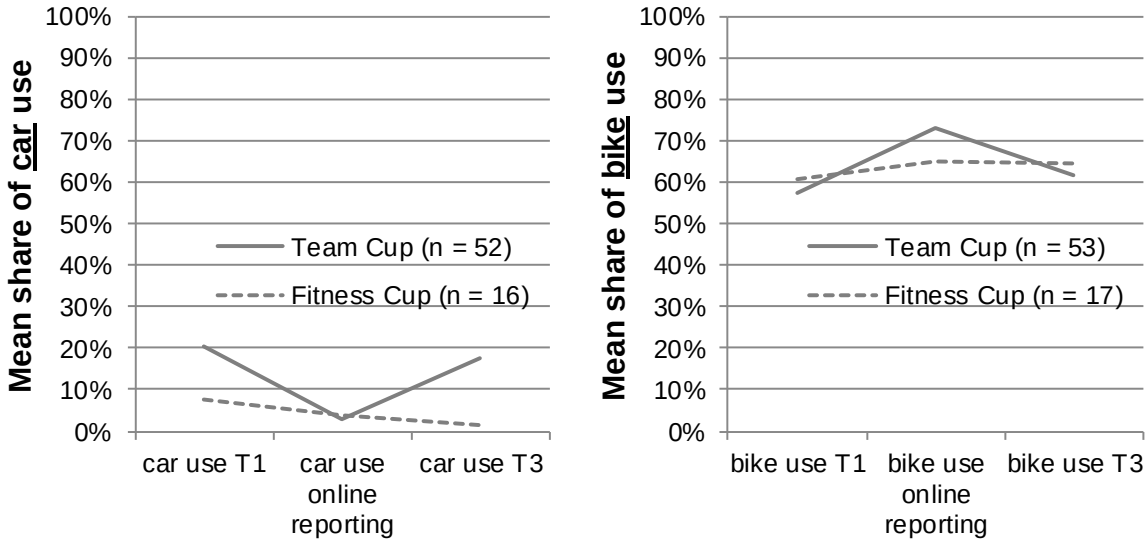

Figure 2. Mean share of car use (left) and bike use (right) to training for three time points by type of cup. Only participants who completed questionnaires T1, the online reporting and questionnaire T3 were considered.

Participants' bike use to training sessions over time was investigated using a Repeated Measures ANOVA. Figure 2 (right graph) shows that participants reported a substantial share of bike use to training sessions even before the competition. Table 7 shows a significant main effect for bike use over time; $F(2) = 3.62$, p < .05. This indicates that the programme had a significant effect on bike use for both groups. While bike use increased during the programme, it returned to its previous level after the programme. This effect was more pronounced for participants of the Team Cup. However, the interaction effect between bike use over time and type of cup was not statistically significant; $F(2) = 1.50$, p = .23 (see Figure 2, right graph).

Table 7. Results of the Repeated Measures ANOVA. Within-subjects factor: bike use to training sessions for T1(self-report), online reporting and T3 (self-report). Between-subjects factor: cup. Team Cup: n = 53, Fitness Cup: n = 17. Only participants who completed questionnaires T1, the online reporting and questionnaire T3 were considered.

Variables	*df*	*F*	*Partial* η^2	*p*
Within subjects				
Bike use	2	3.62*	.05	<.05
Bike use x type of cup	2	1.50	.02	.23
Error	136	(.04)		
Between subjects				
Type of cup	1	.00	.00	.96
Error	68	(.04)		

Note. Values in parentheses represent the mean square errors. * p < .05.

3.3. Effects of social norms on mode choices

In the following, we analysed the role of social norms in teams. This analysis is therefore limited to participants of the Team Cup. First, we assessed the impact of the programme on social norms over time by a Repeated Measures ANOVA. Table 8 displays a main effect of social norms over time; $F(2)$, = 16.82, p < .001, indicating that social norms before, during and after the cup were different. They were weakest at T1 (M = 3.96, SD = 1.53, scale from 1 [weak norms] to 7 [strong norms]) and strongest directly after the competition at T2 (M = 5.37, SD = 1.55). At T3, social norms weakened again (M = 4.62, SD = 1.66) but not to the initial level of T1. Pairwise comparisons (using Bonferroni's correction) indicate that all differences are statistically significant.

Table 8. Repeated Measures ANOVA. Within-subjects factor: social norms T1, T2 and T3; n = 47.

Variables	*df*	*F*	*Partial* η^2	*p*
Within subjects				
Social norms	2	16.82***	.27	<.001
Error	92	(1.93)		

Note. Values in parentheses represent the mean square errors. *** p < .001.

Next, we investigated whether social norms are related to modes of transport to training for T1, online reporting and T3 using linear regression analyses. Before the cup started (T1), social norms were related to participants' reported means of transportation to their training. The stronger the social norms, the smaller the share of car use to training. For bike use, no such relationship could be identified (see Table 9). During the competition, a similar yet more pronounced picture emerged; social norms measured directly after the competition (T2) were negatively correlated with car use to attend training during the competition (online reporting, see Table 10). Once again, no significant relationship between social norms and rates of

cycling to training was found for the time of the competition. A couple of months after the programme, a negative correlation between social norms and car use emerged, as well as a positive correlation between social norms and self-reported bike use to trainings (T3, see Table 11). Together, these results suggest that social norms were related to reduced car use rather than increased bike use. Only after the programme ended did stronger social norms correlate with higher rates of cycling to training. Despite these effects, social norms only explain a minor share of variance in car or bike usage.

Table 9. Linear regression models of car use and bike use before the competition started (T1). Car use: *n* = 88, Bike use *n* = 88.

	Car use T1			**Bike use T1**		
	B	*SE B*	*β*	*B*	*SE B*	*β*
Constant	0.37	.08		.42	.12	
Social norms T1	-0.05	.02	-.26*	0.04	.03	.14

Note: For car use T1: Corrected R^2 = .06, for bike use T1: Corrected R^2 = .01. * p < .05.

Table 10. Linear regression models of car use and bike use during the competition (online reporting). Car use: *n* = 66, Bike use *n* = 66.

	Car use online reporting			**Bike use online reporting**		
	B	*SE B*	*β*	*B*	*SE B*	*β*
Constant	0.21	.06		0.52	.16	
Social norms T2	-0.03	.01	-.36**	0.04	.03	.15

Note: For car use online reporting: Corrected R^2 = .12, for bike use online reporting: Corrected R^2 = .01. ** p < .01.

Table 11. Linear regression models of car use and bike use a few months after the competition (T3). Car use: *n* = 62, Bike use *n* = 62.

	Car use T3			**Bike use T3**		
	B	*SE B*	*β*	*B*	*SE B*	*β*
Constant	0.38	.11		0.21	.14	
Social norms T3	-.05	.02	-.28*	0.09	.03	.35**

Note: For car use T3: Corrected R^2 = .06, for bike use T3: Corrected R^2 = .11. * p < .05, ** p < .01.

4. Discussion

The goal of this study was to explore if collaborating with formal social groups is a more effective strategy for behaviour change programmes in mobility compared to targeting individuals, both in terms of reaching target groups as well as fostering behavioural change. The setting of our study was a programme promoting substituting cars with bikes to attend sports/fitness training. The programme approached sports teams and individuals exercising at gyms, which allowed a systematic comparison between both approaches. Thus, our study

draws from data concerning a specific segment of the population that has not yet been studied empirically.

4.1. Discussion of main findings

4.1.1. Sports clubs are effective multipliers

Our findings suggest that sports clubs have the potential to be effective multipliers for energy-saving programmes; 12 team coaches yielded 187 participating team members, indicating a multiplying effect. Targeting individual participants in gyms only yielded 31 participants.

Teams and coaches seem to have been important motivating factors when engaging participation. We also observed that team members were more likely to have a car at home and more likely to have driven to training sessions before the programme compared to individual participants. In contrast, the low shares of car use among Fitness Cup participants indicate that those who were already environmentally aware and highly motivated participated in the Fitness Cup. As such, the Fitness Cup highlights that when targeting individuals for voluntary participation in sustainability-related programs, an already engaged sample participates through self-selection. Our results suggest that the Fitness Cup attracted people who either did not own a car or did not use it to attend training sessions. Hence, the results indicate that targeting teams is an effective strategy for reaching new target groups in future behaviour change programmes.

According to our study results, cities planning energy-saving initiatives may approach formal social groups to more effectively reach out to participants instead of approaching individuals. At the same time, one must consider that recruiting coaches and teams required substantial effort: Motivating the coaches required a tailored communication strategy, and personal contacts to the city administration and research team were also crucial for recruitment. In many cities, these personal contacts are available, as the municipalities often provide infrastructure for formal social groups, such as training facilities, and many municipal employees are also active members in such groups. Collaboration between different departments within a city is furthermore quite promising, as it combines technical know-how (e.g. energy and environmental departments) and access to different social groups (e.g. sports departments).

4.1.2. The programme had a significant impact on teams' car use and formation of social norms — but only in the short term

The programme led to reduced car use during the competition, but only for participants of the Team Cup, who used their cars significantly less often during the programme compared to before. However, this effect did not persist. Car use among Team Cup participants increased again a couple of months after the programme ended. This effect cannot be explained by the weather, since the mean daily temperature after the competition was comparable to that during

the competition; in fact, precipitation rates were even lower after the competition. Fitness Cup participants' shares of car use were already low before the competition, and they remained similar before, during and after the programme. A significant increase in bike use was found in both groups during the programme compared to before and after the programme. In addition to behavioural changes, we investigated the role of social norms in the observed behavioural changes in Team Cup participants. We observed that social norms differed before, during and after the programme, with social norms for sustainable mobility being strongest during the programme. Coaches openly asking about transport mode during the training session could have fostered both descriptive and injunctive social norms within teams. These norms impacted participants' modes of transport to training, especially during the programme; the stronger the social norms were, the less often cars were used to attend training. These results confirm that social norms are especially powerful when including face to face interaction (Abrahamse & Steg, 2013).

Although we found that formal social groups are effective conduits for participation, the programme itself did not seem to have promoted lasting behavioural change. One explanation for this effect is that the programme was not disruptive enough to break participants' mobility habits. Scholars argue that disruptions are effective interventions in breaking mobility habits and yielding long-lasting changes. Examples of such disruptions are closed tube lines due to a strike (Larcom, Rauch, & Willems, 2015), extreme weather events (Marsden & Docherty, 2013) or socio-economic changes such as moving, change of job or the birth of a child (Schäfer, Jaeger-Erben, & Bamberg, 2012; Sovacool, Kester, Noel, Zarazua, & Rubens, 2018; Verplanken & Roy, 2016). These disruptions are windows of opportunity through which people can reconsider and adjust their travel behaviours. Even providing people with free e-bikes in exchange for their car keys for two weeks can represent such a disruption (Moser, Blumer, & Hille, 2016); this intervention not only encouraged people to organize their day-to-day activities without a car, but allowed them to experience a new method of transport that led to a reduction in participants' habitual car use associations (Moser et al., 2018). However, the Luftaus Cups were likely not perceived as such a disruption since most participants were used to riding bicycles from time to time. Participants were also not required to reorganize their regular mobility patterns as in the disruptive examples mentioned above. In line with this, research outlining the provision of temporary free travel passes for public transport reports that an intervention's effect usually starts wearing off as soon as it stops (Fujii & Kitamura, 2003; Matthies, Klöckner, & Preißner, 2006; Thøgersen & Møller, 2008).

The question of how behavioural changes can be maintained even after a programme ends is crucial; and assessing how spillover to other mobility domains can be facilitated is also critical. The shift in social norms observed in this study is a promising starting point. Although social norms were strongest during the competition, they did not relapse to their initial level (as was

observed with car and bike usage). Environmental psychological research has for a long time acknowledged the importance of social norms in fostering pro-environmental behaviour (e.g., Bamberg & Möser, 2007; Abrahamse & Steg, 2013), such as decreased car use (Bamberg, Fujii, Friman, & Gärling, 2011). Collaborating with formal social groups may thus be a good strategy to foster social norms for sustainable mobility. However, in our study, social norms did not translate to long-term behavioural change. One reason for this could be that the competition was something of a double-edged sword; on the one hand, it was an attractive trigger in motivating participation (especially among sportspeople, who are accustomed to competition). On the other hand, the monetary benefits offered to the winning team could have crowded out intrinsic motivation (Gneezy, Meier, & Rey-Biel, 2011; Ryan & Deci, 2000). It could be that the competition facilitated the creation of social norms, but these new norms were perhaps anchored on winning the competition (which incidentally required sustainable mobility behaviours) instead of sustainable mobility for its own sake. Future research is required to better understand how changes in social norms can translate into long-term environmental-friendly mobility behaviours, such as being combined with infrastructural changes which is another field that cities can influence.

4.2. Limitations of the study and implications for further research

As this study shows, it is difficult to influence long-term behavioural change with a competition-based programme with clear temporal boundaries. While it is possible to trigger behavioural changes through cooperative efforts, it is difficult to maintain these changes over time once the cooperative initiative ends. This is in line with literature pointing out that giving people a good reason for a certain behaviour such as a law, financial incentives or the prospect of winning a competition can inhibit intrinsic motivation. Hence, behavioural changes revert as soon as this good reason has gone (Gneezy et al., 2011; Ryan & Deci, 2000; Frey & Oberholzer-Gee, 1997; Abrahamse et al., 2005). It could be beneficial for cities and worth further researching to couple such programmes with infrastructural or policy changes. Thereby, cities could use the attractive momentum of a competition to encourage participation and at the same time support long-term behavioural changes through attractive infrastructures or policy measures. For example, pairing the Luftaus.ch programme with new bike lanes or increased parking prices may be effective strategies. For future field research, it might also be interesting to implement programmes at disruption points in formal social groups, like the reallocation of training facilities.

When interpreting our results, one must consider the relatively small sample size (especially regarding the Fitness Cup). In this case, initial participation was already low and not all participants filled out all questionnaires. Willingness to fill out questionnaires was particularly low among teams. This implies that coaches were successful in motivating participation in the

competition, but not necessarily in the evaluation of the programme. However, given that this was not a lab experiment but a real-world programme, the participation rate also underscores that participating in such programmes is not a primary interest of sportspeople. This points to several important issues for designing such programmes, including timing (e.g. duration of competition, coordination with other activities and events) and communication.

In this case, the city invested substantial effort in motivating teams. Personal contacts among sportspeople and those working in city administration were key to increasing participation. One might argue that it is problematic to use employees' personal contacts to reach strategic policy goals, but one can also argue that reaching out to such contacts is an indispensable tool when implementing such programmes. A city like Winterthur (113,500 inhabitants in 2018), with roughly 5,000 city employees of different backgrounds working in diverse fields, has access to vast social networks through its employees. However, further research is necessary in order to better understand how this resource can be used in an ethically responsible way.

Participants' transport choices before and after the competition were assessed via self-report for a period of six weeks. While this can of course induce certain biases (such as memory issues, social desirability), the approach was chosen to keep the technical barriers for participation as low as possible by avoiding, for example, that participants had to download an app. Considering the fact that our interest was restricted to mobility to sports trainings (which takes place once or twice a week for most participants), the chosen procedure seems appropriate. In addition, it is important to note that we were mostly interested to study differences between people participating as part of a team and individual participants. To our knowledge, there is no reason to assume that both groups systematically differ in how their self-reports are biased. Hence, this method seems appropriate for the purpose of our study.

Methodologically, we chose a quasi-experimental approach with pre-existing groups (sports teams and members of gyms). As in many other real-world studies, participants were not randomly assigned to groups. There may be some bias present, since those who exercise at gyms may be systematically different in relevant aspects from those who exercise at sports clubs. At the same time, these groups represent real demographics, so the study has high ecological validity and offers valuable insights for actors planning behaviour change programmes. The study also displays some characteristics of high internal validity (e.g. matching materials for teams and individuals, comparable questionnaires), which facilitates systematic comparison.

5. Conclusions

We conclude that formal social groups such as sports clubs are potentially effective multipliers and motivators for programmes promoting environment-friendly mobility. One coach can motivate many people, and among those people are those with low energy-saving engagement

who would probably not have participated in a programme if approached individually. Thus, our results suggest that formal social groups have the potential to motivate critical new target groups for environment-friendly mobility behaviour. This is highly relevant for the large number of behavioural interventions in many places of the world that aim to promote behavioural changes in the mobility domain and which are struggling to reach energy consumers.

At the same time, the study results do not suggest that involving formal social groups (more specifically, sports clubs) in mobility behaviour change programmes is a panacea or works better than scattershot approaches in every case. Recruiting such groups is neither free nor quick, especially if contact must first be established. However, if contacts already exist, this is an asset that can and should be used to effectively promote campaigns to trigger behavioural change and social norms towards environment-friendly mobility.

The competition in our study triggered behavioural changes in particular for group members but these changes did not translate into habits after the competition has ended. More research is needed about how the momentum of a competition could be combined with infrastructural or policy changes that support the formation of long-term environment-friendly mobility habits.

Finally, this study illustrates that social scientists in energy research can contribute to tackling climate and energy issues by engaging with cities (Haarstad et al., 2018). Collaboration with researchers can be beneficial for cities as it offers them an opportunity to profit from scientific know-how when designing and evaluating such behaviour change programmes. Such evaluation is an important basis for learning from programmes and transferring programmes to other cities. This form of collaboration is also fruitful for researchers, as it enables them to test theories in the field and collect respective contextualized data (Caniglia et al., 2017; Luederitz et al., 2016).

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