



Perceived impacts of the Fridays for Future climate movement on environmental concern and behaviour in Switzerland

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Abstract

Calling for increased action on climate change, Fridays for Future (FFF) quickly gained momentum around the world and became highly visible through strikes and protests in more than 150 countries. Considering its scale and magnitude, questions about the impact of this newly emerging climate movement arise. This article is based on a survey investigating the perception of Swiss residents ($N = 1206$) of how the FFF movement and Greta Thunberg's climate activism changed their environmental awareness and behaviour. We found that the Swiss public by and large perceives Greta Thunberg and the FFF movement positively, and a considerable share of participants report that Greta Thunberg (30%) and the FFF activism (23%), respectively, positively influenced their environmental concern and behaviour. Structural equation modelling revealed that the strength of the behaviour change motivation depended mainly on how a participant evaluated the FFF movement and Greta Thunberg. The latter was influenced positively by general environmental attitudes, and education level and negatively by the acceptance of justifications for environmentally harmful behaviours. Participants reported environmentally positive changes most frequently in private sphere behaviours, particularly in the domains of mobility, consumption and waste, whereas few changes in public sphere behaviour were reported. Next to increased awareness and motivation gains, also the reinforcement of existing pro-environmental behaviour was reported. Although the influence on sympathisers was stronger, some of those sceptical of the climate strike movement also reported behaviour changes, indicating that the unconvinced have to some extent been reached.

Keywords Sustainability transitions · Collective action · Social movements · Climate action · Pro-environmental behaviour · Environmental attitudes

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Introduction

The United Nations (UN) Earth summits of five decades and agreements of the UN Framework Convention on Climate Change concur that the science is settled on the reality and anthropogenic nature of climate change (Glavovic et al. 2021; Knutti 2019). Governments around the world have thus committed under the Paris Agreement to limiting global warming to well below 2 °C, preferably to 1.5 °C, compared to pre-industrial levels (UNFCCC 2015, article 2). Despite these high-level political pledges, CO₂ emissions have been steadily on the rise ever since the first assessment report of the Intergovernmental Panel on Climate Change (IPCC) in 1990. In short, we failed to “bend the global emissions curve” (Stoddard et al. 2021). To reduce global warming and tackle climate change, profound societal transformations which endorse and promote pro-environmental lifestyles, social norms, and values as well as environmentally

friendly production, energy and mobility systems are needed (Barr and Prillwitz 2014; Cohen and Kantanbacher 2020).

Social movements can be crucial drivers of such behavioural and systemic changes (Martiskainen et al. 2020). While there are numerous historical examples of the decisive role of social movements in harnessing deep societal transformations (Sovacool 2022) and cultural change (Andrews et al. 2022; Van Dyke and Taylor 2018), success and lasting impact cannot be taken for granted, with social movement scholarship also documenting cases of limited effects on policy change and only negligible impact on public opinions (Giugni 1998). In view of insufficient climate action in the sphere of institutionalised politics, research on “social tipping points” (Fesenfeld et al. 2022; Milkoreit 2022) and calls for inquiries into how bottom-up initiatives can unfold their transformative potential and act as drivers of change have multiplied (Sovacool 2022). The recent youth-led climate movement constitutes an important example of such bottom-up initiatives with transformative ambitions.

The youth-led climate movement began in 2018 after 15-year-old Greta Thunberg sat in front of the Swedish parliament every school-day for 3 weeks, to protest the lack of political action to tackle the climate crisis and to demand politicians deliver on their commitments made in the Paris Agreement (Fisher and Nasrin 2021). Thunberg institutionalised her strikes on Fridays, and young people across Sweden and in other countries began to join the climate protests, sparking a global movement (De Moor et al. 2020), today widely known as the “Fridays For Future” (FFF) movement and in Switzerland mostly referred to as “Klimastreik” (climate strike).¹ Visibility and public discussions of this youth-run climate activism reached a preliminary peak in September 2019 when an estimated four million people in 150 countries, including in all major Swiss cities, took their protest to the streets and called for climate action as part of the global “Fridays4Future” climate strike (Alter et al. 2019; Fridays for Future 2022). In December 2019, Time Magazine named Greta Thunberg the “Person of the Year” (Alter et al. 2019) and scientists around the world have expressed their support of the climate strikes and emphasised the legitimacy of the calls for climate action (Fisher 2019; Hagedorn et al. 2019; Warren 2022). Considering the scale and magnitude of this movement, questions about its transformative potential for climate action arise. It was in

this pre-COVID-19 context when FFF was a particularly visible manifestation of the climate movement in Switzerland and beyond (Kreil 2021) that the present study was conducted with the aim of grasping the impact of this newly emerging climate movement on environmental behaviour as one element of transformation (e.g. Kaufman et al. 2021).

Previous studies have identified the profiles of the young protestors and their motivations to engage (Boucher et al. 2021; De Moor et al. 2020; Hagestad et al. 2021; Lorenzini and Rosset 2023; Noth and Tonzer 2022; Pickard 2022; Wahlström et al. 2019; Wallis and Loy 2021). These studies suggest that those engaging in the climate strikes tend to be well-educated, with females often outnumbering males (Brügger et al. 2020; De Moor et al. 2020; Wahlström et al. 2019), and to have high environmental concerns and adopt pro-environmental lifestyles and consumption practices (Martiskainen et al. 2020; Noth and Tonzer 2022). In the Swiss context, an investigation of students’ motives to engage in climate strikes revealed that their decision to engage was affected amongst others by the level of trust in climate scientists, protest enjoyment and the perceived success of the strikes (Cologna et al. 2021). Similar to studies conducted in other national contexts (Noth and Tonzer 2022), those participating in the Swiss climate strikes reported more pro-environmental behaviours than non-participants, including for example reduced meat consumption and less carbon intense mobility practices (Cologna et al. 2021).

A second relevant body of literature emerges on the broader impact of the youth climate movement. Effects have been studied at a macro-societal scale, with analyses scrutinising shifting discourses or newly formed discursive spaces on climate change (Blühdorn and Deflorian 2021), the socio-political implications of the youth climate strikes (Marquardt 2020), behaviour changes in the context of increased climate change awareness (Venghaus et al. 2022) as well as effects of Greta Thunberg’s media presence on intentions to engage in climate activism (Sabherwal et al. 2021). Regarding the latter, Sabherwal et al. (2021) speak of a “Greta Thunberg effect”, suggesting that familiarity with her predicts intentions to engage in climate activism among US residents. Following Stern’s (2000) typology of behaviours, these findings suggest that Greta Thunberg and the FFF movement have the potential to trigger changes in public sphere behaviour, including increased political activism.

While political and collective action for meeting the commitments of the Paris Agreement and effectively tackling climate change are the core demands of the climate strike movement (De Moor et al. 2021), also behavioural changes at the individual and organisational levels play a role in change narratives (Kaufman et al. 2021; Linnér and Wibeck 2021; Martiskainen et al. 2020; Svensson and Wahlström 2021). Apart from the aspired political and systemic

¹ While the Swiss movement emerged in parallel and sees itself as part of the global Fridays for Future movement (<https://climatestrike.ch/movement>), mainly the terms “climate strike” (“Klimastreik” or “Grève du climat”) or “climate movement” are used. In this article, we use these notions synonymously, but acknowledge national, regional and local diversity and variances within the international climate strike movement.

changes, increased environmental concerns and pro-environmental behaviour changes in the wider population might be conceived as a secondary effect of the climate strike movement (Axon 2016; Whitmarsh et al. 2013). According to Gössling (2019, p. 1) the FFF movement “underlines the importance of personal accountability for greenhouse gas emissions”. Greta Thunberg’s widely covered transatlantic sailing trip and rejection of air travel to the UN Climate Action Summit 2019 in New York exemplify corresponding personal action in the mobility domain (see Alter et al. 2019).

The wider societal and cultural effects of the movement and of the environmental behaviour of its protagonists are likely to be linked to the movement’s public reception, the public’s perception of its legitimacy and the resulting level of support (Grabs et al. 2016). Surveys and opinion polls in the German-speaking part of Switzerland and its neighbouring country Germany suggest that in 2019 the majority of the population supported or sympathised with the climate strikers (Statista Research Department 2020; Koos and Naumann 2019). At the same time, Greta Thunberg and other protesters have also encountered negative reactions and critical comments on social media. The partially negative public reactions to the afore-mentioned sailing trip in rejection of air travel by Greta Thunberg is a prominent example thereof (Mkono et al. 2020). Reflections on the latter form part of a third emerging body of literature concerned primarily with discourses and media portrayal of the FFF movement and its main actors, for instance, as “heroes” or “villains” (Mkono et al. 2020), as “pupils”, “dreamers” or “absentees” (Bergmann and Ossewaarde 2020).

With (youth) climate strikes being a relatively recent phenomenon, empirical insights into the sustainability impacts of the movement are only nascent. Fisher and Nasrin (2021, p. 6) observe that “[s]o far, research that specifically connects this climate-focussed civic engagement to environmental outcomes is woefully limited”. In this article, we take a first step in this direction by examining the relation between the climate movement and environmental behaviour changes which ultimately are expected to manifest in tangible environmental outcomes. We propose to complement the focus on those actively engaging in the climate strike movement—previously studied as part of the biographical effects of engagement (Roth and Saunders 2022)—with a wider perspective that links these climate-focussed civic engagements to sustainability transformations and behavioural changes also among those not active in the strike movement. This seems crucial considering that social movements and their participants also aim to impact those who are not themselves engaged (Andrews et al. 2022) and that the success of social movements is assessed by looking at whether they have transformed political attitudes and behaviour in the wider population amongst other things (Rucht 1999; Uba et al.

2022). To that end we investigate the changes in behaviours and antecedents of behaviour to which the youth climate movement contributed among Swiss residents. The following research questions guide the study:

- How is the FFF movement perceived in Switzerland and to what extent has it contributed to or facilitated behavioural changes among Swiss residents in the first years of the movement’s existence?
- Which factors determine whether a person has been reached and influenced by the FFF movement and Greta Thunberg?

Addressing these questions, we aim to enhance our understanding of the behavioural impact of this collective movement that has emerged as a reaction to global environmental change. Relying on an environmental–psychological survey conducted among Swiss residents ($n = 1206$) in October and November 2019 shortly after major global climate mobilisations occurred, we combine qualitative and quantitative empirical analyses to tackle these questions. The types of behavioural changes will be identified through qualitative analyses of respondents’ statements. The strength of subjectively perceived motivation for such behaviour changes will be investigated primarily through bivariate statistical analyses and complementarily by structural equation modelling (SEM). The primary analyses consider the gender, age, education level, socio-economic status, and general environmental concern of the survey participants, i.e. variables that could be related to participation in the climate movement according to previous research (for example, Arya and Henn 2023; Uba et al. 2022; Wahlström et al. 2019), and which may also moderate personal attitudes towards the climate strike movement and Greta Thunberg. Contributing to the nascent literature on the climate strike movement, this article offers novel empirical insights into the behavioural impacts of the youth climate protests in Switzerland and their potential for fostering sustainability transitions. We hope that future research will complement this focus on bottom-up changes at the individual level with analyses of further dimensions of the movement’s transformative potential, most notably its impact on structural and top-down changes at a system level.

The remainder of this article is structured as follows: we briefly review the literature on pro-environmental behaviour changes that forms the basis of the hypotheses that we introduce in “Materials and methods” section along with further information on our methodological approach. In the “Results” section we present survey results focussing on (i) Swiss residents’ perception of Greta Thunberg’s activism and the FFF climate strikes, (ii) motivations for changes towards environmentally friendly behaviour, (iii) the determinants of such behaviour changes and (iv) the kinds of

behaviour changes reported. We end with a critical discussion of our empirical contributions to understanding the youth-led climate strike movement and to the literature on pro-environmental behaviour changes more generally and point to strategic and practical considerations for fostering the transformative impact of the movement.

Pro-environmental behaviour changes: perspectives from environmental and social psychology and social movement scholarship

There is wide agreement that profound, pro-environmental changes in individual behaviour are needed to meet the climate goals of the Paris agreement (e.g. Nielsen et al. 2021a, b) and that such changes form part of complex and multi-layered transformation processes towards sustainable, low-carbon societies (Huttunen et al. 2021; Kaufman et al. 2021). In addition to scholarship on social movements and political participation, environmental and social psychology offer important insights into pro-environmental behaviour changes that can inform an analysis of the impact of the climate strike movement.

Following this scholarship, understanding the influence of social movements on the environmentally relevant behaviour of individuals requires us to pay attention to several aspects. First, it suggests scrutinising the link between attitudes and behaviour. According to studies applying the theory of planned behaviour (TPB) (Ajzen 1991, 2012), environmental attitudes are a strong predictor of intentions for environmentally significant behaviours (Armitage and Conner 2001; Klöckner 2013; Lanzini and Khan 2017; Morten et al. 2018; Sun 2019; Trail and McCullough 2021). Intentions to behave in environmentally friendly ways, however, do not always translate into actual behaviour. A recent study in the German context illustrates this gap and observes that despite increasingly positive attitudes towards climate protection and growing problem awareness of climate change partially brought about by the FFF movement, notable behavioural changes are limited (Venghaus et al. 2022). Justifications for harmful behaviours can widen the intention-behaviour gap through moral licensing processes (Burger et al. 2022) that protect persons from self-blame and from being blamed by others (De Witt Huberts et al. 2012, 2014a, b; Taylor et al. 2014; Zhang et al. 2018). Justifications can thus neutralise basically accepted personal and social behavioural norms as firstly described in the neutralisation theory (NT) of juvenile delinquency by Sykes and Matza (1957). Environmental attitudes and corresponding behavioural norms, on the one hand, and behavioural justifications, on the other hand, are therefore complementary factors determining environmental behaviour according to the Model of Justified Behaviour (MJB) (Hansmann and Binder 2021; Hansmann and Steimer 2017; Goldman et al. 2020), which integrated the

justification processes described by NT with various environmental behaviour models including the TPB, and the general requirements for environmental behaviour models described by Stern (2000). Having positive environmental attitudes, and the rejection of justifications for negative environmental behaviours can thus also be assumed to increase support for the FFF movement. These factors may also be directly positively related to the behaviour changes triggered by the environmental FFF movement as they involve an affinity to such behaviour change (Hansmann and Binder 2020; Johe and Bhullar 2016; Thompson and Barton 1994). Accordingly, in this study environmental attitudes, and justifications will be considered as predictors of the behaviour change motivation which the recent climate movement facilitated in Swiss residents. The respondents' perception of the climate movement will be regarded as a crucial moderating variable which may itself be related to environmental attitudes and justifications as well as to socio-demographic variables such as gender, age, and level of education.

We formulate the following hypothesis for our study:

Hypothesis 1a People with strong environmental attitudes are expected to evaluate the FFF movement and its proponents more positively than others.

Hypothesis 1b People who accept justifications for environmentally harmful behaviour are expected to evaluate the FFF movement and its proponents less positively than others.

Second, communication and cultural effects play an important role. By giving visibility to emerging issues—in our case to environmental and climate issues—and enhancing their salience in the public sphere, social movements and other forms of political participation can have an impact on the practices of people who do not themselves take part in civic engagements (Andrews et al. 2022). Prominent leaders of social movements can function as role models and communicators of persuasive messages exerting social influence on pro-environmental behaviour change (Grabs et al. 2016; Hansmann et al. 2005). Their influence depends amongst other things on their credibility and the trust which recipients of the communicated content have in the senders and their messages (Bolsen et al. 2019), and is shaped by media coverage which informs the formation of public opinion on emerging issues (Luhmann 2000). According to the dynamic social impact theory by Latene (1981, 1996), the strength and number of influence sources and their proximity to the recipients of the influence, determine how effectively the former can produce changes in attitudes, behaviours, and norms among the latter. Immediacy can in this context be understood physically, temporally or socially. A strong impact of media can be explained on this basis through a large number of influence sources (news agencies, media

outlets) with considerable status and power that are covering environmental topics temporally close to arising issues. Physical proximity is, however, closer in face-to-face discussions with family and friends as well as in direct encounters with activists or prominent leaders of the climate movement, for example, at the occasion of protests or debates, which accordingly can be considered important social events that shape individual and hence ultimately also public opinion formation. The importance of social closeness has been shown in a study by Schunk and DiBenedetto (2020) where behavioural role models proved more influential if they were perceived as similar to oneself, competent and successful. Social closeness could likewise play a crucial role in determining the impacts that are achieved through social media communication, interaction and activism regarding climate change (Perez Vega et al. 2016). The dynamic social impact theory assumes that social influence decreases with the distance between people and that polarisation processes can lead to the formation of clusters of persons with similar attitudes, norms and opinions (Latene 1996). Since environmental attitudes form an important part of the social- and self-identity of some persons (Johe and Bhullar 2016), this effect can be further reinforced as differences in ecological opinions may themselves create social distance and reduce the communication between persons having opposing viewpoints. The latter has been confirmed by research identifying echo chambers and filter bubbles with internal homogenous, but mutually opposing environmental opinions in social media networks (Miller et al. 2021). Accordingly, it may be assumed that persons with positive attitudes towards the FFF movement and their representatives tend to be influenced more strongly by this social movement than those who evaluate them negatively.

On this basis we formulate Hypothesis 2 of our study:

Hypothesis 2 The strength of the behavioural impact of FFF on a person increases with the positivity of the person's evaluation of FFF and its proponents.

Third, previous research shows that socio-demographic variables also require attention. As many participants of the FFF climate strikes are high school students between 14 and 19 years, university students and younger school children accompanied by adults (Wahlström et al. 2019), younger persons may experience a stronger identification with the movement (Brügger et al. 2020; Wallis and Loy 2021). In addition, shared lived experiences among young people and a sense of belonging have been found to stimulate political engagement for climate action and to have given rise to the emergence of a “generational agency” (Pickard 2022). Furthermore, highly educated people tend to have stronger environmental attitudes (Franzen and Vogl 2013) and may accordingly also value the FFF movement more highly than

less educated persons. Previous studies have also identified stronger environmental attitudes among women compared to men (Briscoe et al. 2019; Chekima et al. 2016; Hansmann and Binder 2020). In addition to age, education level and gender, emerging evidence also suggests that income and other economic variables might affect the environmental attitudes and behaviour of individuals. This includes observations of how economic hardship and the according need to prioritise economic considerations hinder climate concerns, also among younger populations (Lorenzini et al. 2021; Arya and Henn 2023), thus pointing to the need for paying closer attention to the interactions between various socio-demographic variables.

On this basis we formulate Hypothesis 3 of our study:

Hypothesis 3 Considering socio-demographics, it is expected that (a) females, (b) young persons, and (c) highly educated persons, evaluate FFF and its proponents more positively than others.

Regarding the kinds of behaviour changes that the FFF movement and Greta Thunberg might have induced, Stern's (2000) classification model for environmentally significant behaviours offers a useful analytical distinction between private and public sphere behaviour. Accordingly, private sphere behaviours influence environmental parameters directly (e.g. going by bicycle instead of using the car, saving energy, recycling batteries), whereas public sphere behaviours exert social or political influence and therefore affect environmental parameters only indirectly (e.g. discussing with peers about climate change, signing a petition, participating in a demonstration). The latter encompasses a wide spectrum of traditional and non-traditional (or non-institutionalised) forms of political participation (Serra and Smets 2022).

Focussing on pro-environmental changes on the level of individuals, this study shall pave the way for future studies on the broader socio-cultural and political processes and on how individual contributions, communications and behavioural changes shape and are shaped by cultural changes on organisational, national and global levels, as well as by changes in political and economic structures (cf. Adey et al. 2021; Latene 1996; Nowak et al. 1990). Such encompassing transformation processes ultimately rely on an interplay of individual and collective action, technological change, and more sustainable approaches towards governance (cf. Ostrom 2010).

Table 1 Sample characteristics (gender, age, highest level of education, income) and comparison to Swiss population data

Characteristics	Frequency		Percentage sample (%)		Percentage Switzerland (%)	Chi-square test (df, <i>p</i>)
	<i>N</i>	%	Valid %			
Gender						
Male	605		51.1		49.6	df = 1 <i>p</i> = 0.694
Female	601		48.9		50.4	
Age						
18–34	355		29.4		29.1	df = 2 <i>p</i> = 0.926
35–54	477		39.6		39.4	
55–74	374		31.0		31.5	
Highest completed education						
No academic degree	763		63.3	> 24 ^j ^a	> 24 ^j ^a	df = 1 <i>p</i> < 0.001 ^a
Academic degree	441		36.6	61.7	70.4	
Not answered	2		0.2	38.3	29.6	
Income^b						
	Individual income (singles, shared residence)			Household income (with partners or parent(s))		
	<i>N</i>	%	Valid %	<i>N</i>	%	Valid %
> 5000 CHF	131	35.4	40.1	58	6.9	8.1
5000–6999 CHF ^c	114	30.9	34.9	115	13.7	16.1
7000–8999 CHF	42	11.3	12.8	152	18.2	21.3
9000–11,999 CHF	27	7.2	8.3	171	20.4	24.0
12,000–14,999 CHF	6	1.7	1.8	122	14.6	17.1
> 15,000 CHF	7	1.9	2.1	95	11.4	13.3
Not answered	42	11.6		124	14.8	
Total	329	100	100	837	100	100

The presented *p*-value of *p* < 0.001 for highest completed education specifically refers to the values presented in italic

^aThe Federal Statistical Office of Switzerland (FSO) determines the percentage of persons holding an academic degree for the Swiss population aged older than 24 years. To allow for a corresponding comparison a corrected percentage was calculated for our corresponding subsample above 24 years (and excluding non-responders) to allow for statistical comparison

^b1 CHF ≈ 1 USD at the time of the survey

^cThis range encloses the median of the individual monthly incomes in Switzerland of 6538 CHF in 2018 and 6665 CHF in 2020 as reported by the FSO (2020b, 2022b)

Materials and methods

This article is based on a mixed-method survey study combining quantitative modelling and hypotheses testing with explorative qualitative research methods employing an open-question format.

Survey and participants

The online survey began on October 25 and ended on November 19, 2019. The participants were recruited based on a random sample from the resident population of the German and French language regions of Switzerland restricted to adult persons below 75 years of age with internet access. Corresponding invitations for survey participation were sent via email, and participants could choose to respond to a German or French version.

A total of 1219 people completed the survey. The responses of thirteen participants were excluded from the data analysis because they completed it in less than 6 min and did not meet the quality requirements set for valid responses. Thus, the responses of a total of 1206 persons were included in the data analysis. Some items contained answer options such as “I do not know” or “not applicable,” which were considered missing values (or replaced by missing value estimates) in the statistical analyses.

The distribution of our sample regarding important socio-demographic characteristics is presented in Table 1 together with comparisons to the Swiss population and results of the corresponding chi-square test of representativeness. The gender distribution of the participants was 51.1% male and 48.9% female, and thus similar to that of the permanent resident population of Switzerland at that time according to the Federal Statistical Office (FSO) (2020a), so that representativeness in relation to gender can be assumed.

The age of the participants ranged from 18 to 74 years ($M = 47.6$ years, $SD = 15.04$), and the distribution of the participants over three distinguished age categories was similar to the age distribution in Switzerland (FSO 2022a). However, only adults were included in our sample and people older than 74 were excluded. Therefore, the effects of the FFF movement on children and adolescents as well as on persons older than the latter threshold could not be investigated.

The percentage of respondents with university or polytechnic degrees (MSc, BSc, Diploma, Magister) was 36.6%, whereas 63.3% stated that they had no academic degree and 0.2% ($N = 2$) did not answer the question on highest completed education. According to the FSO, in 2019, 29.6% of the Swiss population older than 24 years had an academic degree. To allow for a corresponding comparison the percentage was calculated for our corresponding subsample above 24 years. This resulted in a share of 38.3% with an academic degree, which deviates significantly from the value in the Swiss population according to a Chi-square test ($df = 1$, $p < 0.001$). This means that highly educated people were overrepresented in our sample. An affinity of highly educated persons to the internet as well as towards environmental topics may be reasons for this deviation. The relationship between academic education and the evaluation of the FFF movement and its effects on pro-environmental motivations and behaviour will be analysed in this study, allowing for a discussion of possible consequences of the identified sample bias towards highly educated persons.

The income of the participants was addressed differentially depending on the social context of their residential situation. 836 participants living with partners or parent(s) (69.3%) were asked about the household income. The median household income of these participants was in the range category of 9000–12,000 CHF per month. The other 370 participants (30.7%) were asked about their individual income. Here the median income was in the range from 5000 to 7000 CHF per month (1 CHF \approx 1 USD at the time of the survey) which is consistent with the median income in Switzerland (Table 1). Still, based on the known relationship between education level and income, and taking into account that economically severely disadvantaged persons may have been prevented from participation, an overrepresentation of persons with high income in our sample cannot be excluded. Furthermore, 166 participants chose not to disclose their income (selecting the “no” or “I do not know” response options). The share of missing data was, therefore, at 13.8%, very high for this variable, which may reflect the hesitancy of persons to disclose their income, even in a situation where anonymity was ensured.

Questionnaire and scales

The questionnaire was divided into four sections:

- (1) Socio-demographic items (gender, age, education level, social context of the residential situation and individual and household incomes, respectively).
- (2) Questions addressing the FFF movement and Greta Thunberg’s climate activism and their effects on respondents’ behaviour.
 - Two items asked the participants to subjectively evaluate “Greta Thunberg’s commitment to climate protection” and “the demonstrations and school strikes by students of the ‘Fridays for Future’ movement” (response scale: 1 = very negative, 2 = negative, 3 = rather negative, 4 = rather positive, 5 = positive, 6 = very positive; additional response options were: “I do not know Greta Thunberg [respectively, the ‘Fridays for Future’ movement]”, “I do not know” and “I do not want to respond”).
 - Two further questions were asked: “Has Greta Thunberg’s commitment motivated you to behave more environmentally friendly?” and “Have the Fridays for Future school strikes and demonstrations motivated you to behave more environmentally friendly?” (1 = no, 2 = rather no, 3 = rather yes, 4 = yes; additional response options: “I do not know” and “I do not want to respond”).
 - The participants perceiving the effects of Greta Thunberg and/or the climate strikes on themselves were additionally asked to describe in an open-ended item the ways in which their motivations and environmental behaviours changed (restricted to a maximum of 500 characters).
- (3) A scale for measuring general environmental attitudes (GEA scale by Hansmann and Binder 2020)
 - The GEA scale consisted of six items using a four-point rating scale polled in a way that high values represent positive environmental attitudes (see Appendix A1).
- (4) A scale measuring the acceptance of justifications for negative environmental behaviours (JNEB scale by Hansmann and Binder 2020).
 - The JNEB scale consisted of six items using a four-point rating scale for measuring the acceptance of justifications (see Appendix A2).

In addition, the survey contained further items addressing diverse environmental behaviours that are not specifically investigated in this study.

Statistical and content analyses

IBM SPSS Statistics was used to analyse the data. Descriptive statistics such as frequency distributions, means and standard deviation were computed as well as inferential statistics. Paired samples *t*-tests were used to compare average evaluations for Greta Thunberg and FFF as well as to compare the ratings of perceived behaviour change attributed to them. Pearson correlations were calculated to investigate relationships between these ratings and the non-parametric chi-square-based McNemar test was used for comparing the number of persons who know Greta Thunberg and FFF.

The Hypotheses (3a) and (3c) were tested through one-way ANOVAs with the independent variables gender and education level and evaluations of Greta Thunberg and FFF. The Hypotheses (1a), (1b), (2), (3b) were tested by calculating Pearson correlations between age, environmental attitudes, and justifications on the one hand, and evaluations of Greta Thunberg and FFF as well as the pro-environmental behaviour change motivation incited by them on the other. The relationship between income levels and the evaluations of Greta Thunberg and FFF and the incited behaviour change motivations was likewise analysed by calculating Pearson correlations.

In addition, an SEM analysis of influence pathways was conducted to investigate the interplay between environmental attitudes, justifications, and evaluations of Greta Thunberg and FFF in determining whether and how strongly the climate movement incited pro-environmental behaviour change motivation according to the self-reports of the study participants.

The Cronbach alpha value of GEA was 0.80 which was satisfying and that of the JNEB scale was 0.67 which was at the minimally acceptable level, when considering the small number of items it contains (Griethuijsen et al. 2014; Taber 2018). To avoid an accumulation of missing values in the two scales and in the multifactorial SEM analysis, the responses “I do not want to respond” or “I do not know” (which were excluded from the numeric response values of the items in the GEA- and JNEB-scales) were replaced by the overall mean of numerical responses for the respective item. The same procedure was applied to numerically coded dichotomous variables (e.g. no academic degree = 0 vs academic degree coded = 1). Replacing occasional missing values with the overall mean of the missing variable is a conservative method because it sets the squared deviation of the missing case for this variable to zero and therefore generates no variance that could lead to an unjustified rejection of the zero Hypotheses (Gelman and Hill 2006). Missing values were, however, not estimated for the variable income, since the number of missing cases was with 13% rather high for this variable. The relationship between

income and evaluations of Greta Thunberg and FFF was thus only analysed on the bivariate level. Furthermore, the bivariate correlations between environmental attitudes and justifications on the one hand, and evaluations and behaviour change motivations related to Greta Thunberg and FFF, on the other, were calculated solely for the complete cases with no missing items, to test the robustness of the corresponding findings.

To illustrate and clarify the findings of the SEM, chi-square-tests were conducted which mutually compare eight subgroups composed of participants with (i) consistent positive *versus* negative evaluations of Greta Thunberg and FFF, (ii) high *versus* low GEA and (iii) high *versus* low JNEB scores regarding the level of self-reported motivation for behaviour changes. The latter was transformed into a dichotomous variable using a threshold value of equal to or above 2.5 of the averaged ratings for behaviour changes attributed to Greta Thunberg and the FFF movement. This threshold value ensures that there is at least one rating of 3 = “rather yes” or 4 = “yes” in these two items. Missing values for one of the two behaviour change motivation items were estimated by regression on the other item. A split at the overall mean of the respective scale values in the sample was applied to distinguish persons with high versus low levels of attitudes and justifications. Only cases with either consistent positive or consistent negative evaluations of both Greta Thunberg and the FFF movement were included in this analysis ($N = 821$). This way two groups providing consistent positive versus negative evaluations of both the FFF movement and its prominent protagonist could be compared.

Responses to the open question addressing the ways in which the FFF movement have led to changes in respondents’ environmental behaviour were analysed with a qualitative and quantitative content analysis based on the formation of various mutually non-exclusive categories (see Appendix A3). The qualitative coding was guided by Stern’s (2000) typology of private and public sphere behaviour and additional sub-categories distinguishing diverse topical domains were developed inductively.

Results

General perception of Greta Thunberg’s activism and the FFF climate strikes

Survey respondents perceived both Greta Thunberg’s climate activism and the FFF movement rather positively with an average rating of $M = 4.1$ ($SD = 1.5$) and $M = 3.8$ ($SD = 1.6$), respectively on the six-point Likert-scale.

A comparison of these ratings revealed that Greta Thunberg’s climate activism was assessed significantly more favourably than the FFF movement (paired sample *t*-test,

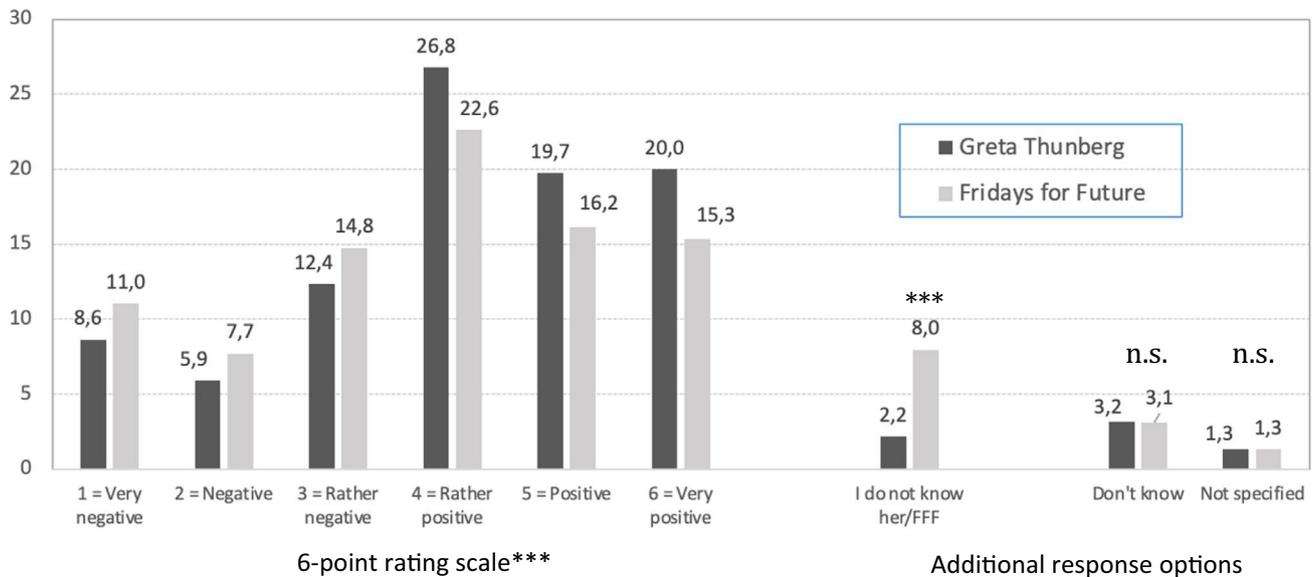


Fig. 1 Distribution of the ratings of Greta Thunberg's and FFF's engagement for climate action on the six-point rating scale, respectively, and for not providing an evaluation ($N=1206$). *** $p < 0.001$, significant difference according to a paired samples t -test comparing

the rating scale means $M_{\text{Greta Thunberg}}=4.1$ vs $M_{\text{Fridays for Future}}=3.8$, respectively, according to McNemar's test for comparing frequencies of the additional response options. *n.s.* Not significant according to McNemar's test

$p < 0.001$). Furthermore, both, Greta Thunberg and FFF were known by the vast majority of participants. However, whereas the former was not known by only 2.2%, the latter was not known by 8% of the respondents. This difference was significant (McNemar test, $p < 0.001$). The response distributions are shown in Fig. 1.

The ratings of the commitment of Greta Thunberg and FFF for climate action were positively correlated with $r = 0.76$ ($p < 0.001$). This high correlation suggests that the two corresponding items could be considered a unified measure of the evaluation of the FFF movement and its prominent protagonist in the subsequent SEM.

Bivariate analyses were used to gain the first insights into determinants of respondents' evaluation of Greta Thunberg and the FFF movement. As shown in Table 2, environmental attitudes correlated highly significantly ($p < 0.001$) positively and justifications highly significantly ($p < 0.001$) negatively with both evaluations. For education, the one-way ANOVAs showed highly significant differences ($p < 0.001$) in both evaluations in the direction of more positive evaluations by highly educated persons compared to persons without a degree. For gender, the one-way ANOVAs only showed a significant difference in relation to the evaluation of Greta Thunberg ($p < 0.05$) with more positive evaluations of females ($M=4.2$) compared to males ($M=4.0$) whereas the analogous tendency regarding evaluations of FFF did not surpass the significance threshold ($p=0.130$). Age was not significantly correlated with the two evaluations.

To investigate the possibility of curvilinear relationships between age and the evaluations of Greta Thunberg and FFF, two additional one-way ANOVAs comparing three *age groups* (18–34 y; 35–54 y; 55–74 y) were conducted. However, no significant effects of the independent variable *age group* regarding the evaluations of Greta Thunberg ($M_{18-34\text{ y}}=4.1$; $M_{35-54\text{ y}}=4.2$; $M_{55-74\text{ y}}=4.0$; $p=0.450$) and FFF ($M_{18-34\text{ y}}=3.9$; $M_{35-54\text{ y}}=3.8$; $M_{55-74\text{ y}}=3.8$; $p=0.708$) were found in these ANOVAs.

The household income variable proved to be significantly positively correlated with the evaluation of Greta Thunberg ($p < 0.05$), but the correlation was in absolute terms very small ($r=0.08$). The correlation between the individual income variable and the evaluation of Greta Thunberg was similar, but did not surpass the significance threshold ($p=0.148$).

Perceived motivation for changes towards environmentally friendly behaviour

Asked whether Greta Thunberg's activism motivated them to act more environmentally friendly, 30.6% responded with yes (6.3%) or rather yes (24.3%), whereas 69.4% responded with rather no (23%) or no (46.4%) (see Fig. 2). The average response on the four-point scale was $M = 1.9$ ($SD = 0.98$; $N = 1093$). The correlation between the evaluation of her engagement and the perceived impact on her own behaviour was positive with $r = 0.57$ ($p < 0.001$).

Asked whether the climate movement more generally motivated them to behave in a more environmentally

Table 2 Analyses of bivariate relationships between the evaluation of Greta Thunberg and FFF and possible influential variables (one-way ANOVAs and correlations)

		<i>N</i>	<i>M</i>	<i>SD</i>		<i>F</i>	<i>Sig. p</i>
One-way ANOVAs							
<i>Gender</i>							
Evaluation Greta Thunberg	Male	589	4.01	1.54		5.322	0.021*
	Female	537	4.21	1.46			
Evaluation FFF	Male	561	3.74	1.62		2.299	0.130
	Female	496	3.89	1.54			
<i>Education</i>							
Evaluation Greta Thunberg	No academic degree	707	3.85	1.51		56.341	<0.001***
	Academic degree	418	4.53	1.40			
Evaluation FFF	No academic degree	656	3.59	1.60		35.151	<0.001***
	Academic degree	400	4.18	1.49			
<i>Correlations</i>							
	<i>Age</i>	<i>N</i>	<i>Sig. p</i>			<i>N</i>	<i>Sig. p</i>
Evaluation Greta Thunberg	$r = -0.033$	1126	0.268				
Evaluation FFF	$r = -0.027$	1057	0.385				
	<i>Individual income</i>			<i>Household income</i>			
Evaluation Greta Thunberg	$r = 0.084$	296	0.148	$r = 0.076^*$		682	0.046*
Evaluation FFF	$r = 0.025$	276	0.675	$r = 0.014$		646	0.730
	<i>Environmental attitudes, GEA-scale</i>			<i>GEA (only complete cases)^a</i>			
Evaluation Greta Thunberg	$r = 0.623^{**}$	1126	<0.001	$r = 0.642$		918	<0.001
Evaluation FFF	$r = 0.616^{**}$	1057	<0.001	$r = 0.636$		875	<0.001
	<i>Justifications, NJEB-scale</i>			<i>NJEB (only complete cases)^a</i>			
Evaluation Greta Thunberg	$r = -0.398^{**}$	1126	<0.001	$r = -0.412$		988	<0.001
Evaluation FFF	$r = -0.382^{**}$	1057	<0.001	$r = -0.404$		933	<0.001

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

^aRobustness check: only cases with no missing responses in any of the items of the corresponding scale have been included in the calculation of these correlations

friendly way, a minority of 23.6% responded with yes (4.5%) or rather yes (19.1%), whereas more than three-quarters (76.4%) answered with rather no (22.7%) or no (53.7%). The average response was $M = 1.7$ ($SD = 0.92$; $N = 1024$). The motivating effect of the engagement of Greta Thunberg was thus only slightly, but significantly larger than the corresponding impact of the FFF movement (paired sample t -test, $p < 0.001$). The correlation between the evaluation of FFF and the reported impact of the FFF movement on respondents' behaviour was positive with $r = 0.53$ ($p < 0.001$).

The correlation between the two ratings of behaviour change attributed to Greta Thunberg, on the one hand, and FFF on the other hand was, with $r = 0.77$, quite high ($p < 0.001$). The two ratings were thus considered as an integrative measure of perceived behaviour and/or awareness changes attributed to the FFF movement and its prominent protagonist in the SEM.

We also conducted bivariate analyses in relation to perceived behaviour change motivations reported by respondents in relation to Greta Thunberg and the FFF movement

(Table 3). As expected by Hypothesis 2, the evaluations of Greta Thunberg ($r = 0.57$) and FFF ($r = 0.53$) correlated highly significantly (both $p < 0.001$) with the corresponding motivation for environmentally positive behaviour change.

Furthermore, environmental attitudes correlated highly significantly ($p < 0.001$) positively and justifications highly significantly ($p < 0.001$) negatively with the behaviour change motivations incited by Greta Thunberg and FFF. For education, the one-way ANOVAs showed highly significant differences ($p < 0.001$) in the direction of stronger pro-environmental behaviour change motivations among respondents with higher education compared to those without an academic degree. For gender the one-way ANOVAs showed significantly stronger behaviour change motivations among females compared to males ($p < 0.05$). Age and income were not significantly correlated with behaviour change motivations, but for age a tendency ($p < 0.10$) in the direction of lower motivations triggered among older people was observed.

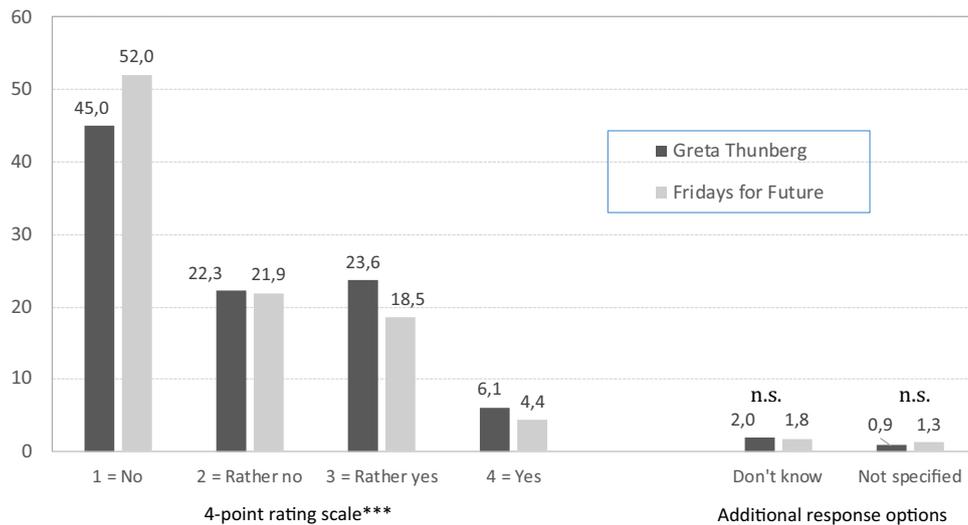


Fig. 2 Distribution of the ratings of the motivation for environmentally friendly behaviour triggered by Greta Thunberg's and FFF's climate activism (only persons who provided the corresponding evaluation of Greta Thunberg's and FFF's engagement received this question, Greta Thunberg: $N=1126$, FFF: $N=1057$). *** $p < 0.001$,

A summary of the outcomes of the hypotheses investigated is provided in Table 4. The outcome for five of the total six hypotheses and sub-hypotheses was clear. However, regarding gender influences H3a) the findings are somewhat ambiguous: whereas the analyses showed a significantly higher evaluation of Greta Thunberg among females compared to males, only a corresponding tendency, but no significant influence of gender on the evaluation of FFF was found.

Main influence paths regarding motivation for pro-environmental behaviour change

The SEM confirmed the strong positive effect of the evaluation of the FFF movement and Greta Thunberg on the self-reported pro-environmental changes. Likewise in line with the bivariate analyses, these evaluations were in turn influenced significantly positively by a high level of education and environmental attitudes, and negatively by the acceptance of justifications for environmentally negative behaviour (Fig. 3). However, contrary to the bivariate analyses, a significant negative direct effect of environmental attitudes and a positive direct effect of justifications on the motivation for behaviour change were found in the SEM. This means that when statistically controlling for the evaluations, positive environmental attitudes decreased and acceptance of justifications increased the behaviour change motivation reported in relation to the FFF movement and its proponent. This could partially be due to a ceiling-effect capturing that those with high environmental attitudes and low justification levels

significant difference according to a paired samples t -test comparing the rating scale means $M_{\text{Greta Thunberg}} = 1.9$ vs $M_{\text{Fridays for Future}} = 1.7$. *n.s.* not significant according to McNemar's test for comparing frequencies of the additional response options

tended to behave in environmentally friendly ways already before experiencing the FFF movement and therefore, perceived less room for further improvement. The SEM indicates some behavioural effects on those with no a priori strong environmental orientation.

However, the negative direct influence of positive environmental attitudes is much smaller than the positive indirect influence on reported behaviour change which they exert via improving the evaluation of FFF and Greta Thunberg (see Table 5). The net influence of general environmental attitudes on behaviour change motivation which results from the sum of the positive indirect effects ($\beta_{\text{indirect}} = 0.629 \cdot 0.793 = 0.499$) and the negative direct influence ($\beta_{\text{direct}} = -0.106$) is therefore with ($\beta_{\text{indirect}} + \beta_{\text{direct}} = \beta_{\Sigma} = 0.393$) still clearly positive.

When adding the negative indirect effect of the acceptance of justifications via their negative impact on the liking of FFF and Greta Thunberg ($\beta_{\text{indirect}} = -0.118 \cdot 0.793 = -0.094$) to the positive direct effect ($\beta_{\text{direct}} = 0.092$), a net effect of practically zero can be observed ($\beta_{\text{indirect}} + \beta_{\text{direct}} = \beta_{\Sigma} = -0.002$). The overall motivation effect of the FFF movement and Greta Thunberg on behaviour is accordingly equally strong on persons who tend to accept justifications as on those rejecting them. This suggests that the FFF movement and Greta Thunberg were at least to a small extent able to overcome the barrier of the acceptance of justifications in promoting positive environmental behaviours.

An additional analysis considering only persons with consistent positive (rather positive, positive) or consistent negative (rather negative, negative) evaluations of both Greta

Table 3 Analyses of bivariate relationships between the motivation triggered by Greta Thunberg and FFF and possible determinants (one-way ANOVAs and correlations)

		<i>N</i>	<i>M</i>	<i>SD</i>	<i>F</i>	<i>Sig. p</i>
One-way ANOVAs						
<i>Gender</i>						
Motivation Greta Thunberg	Male	574	1.85	0.96	4.446	0.035*
	Female	519	1.97	0.99		
Motivation FFF	Male	548	1.68	0.88	5.990	0.015*
	Female	476	1.82	0.96		
<i>Education</i>						
Motivation Greta Thunberg	No academic degree	687	1.82	0.94	14.124	<0.001***
	Academic degree	405	2.05	1.02		
Motivation FFF	No academic degree	638	1.70	0.90	4.047	0.045*
	Academic degree	385	1.82	0.95		
<i>Correlations</i>						
		<i>Age</i>	<i>N</i>	<i>Sig. p</i>		
Motivation Greta Thunberg	$r = -0.057$	1093	0.060			
Motivation FFF	$r = -0.057$	1024	0.070	<i>N</i>	<i>Sig. p</i>	
		<i>Individual income</i>		<i>Household income</i>		
Motivation Greta Thunberg	$r = 0.062$	289	0.297	$r = 0.014$	659	0.720
Motivation FFF	$r = 0.008$	266	0.898	$r = 0.043$	629	0.284
		<i>Environmental attitudes, GEA-scale</i>		<i>GEA (only complete cases)^a</i>		
Motivation Greta Thunberg	$r = 0.361$	1093	<0.001	$r = 0.371$	898	<0.001
Motivation FFF	$r = 0.364$	1024	<0.001	$r = 0.362$	852	<0.001
		<i>Justifications, NJEB-scale</i>		<i>NJEB (only complete cases)^a</i>		
Motivation Greta Thunberg	$r = -0.179$	1093	<0.001	$r = -0.174$	963	<0.001
Motivation FFF	$r = -0.196$	1024	<0.001	$r = -0.190$	909	<0.001
		Evaluation of Greta Thunberg				
Motivation Greta Thunberg	$r = 0.570$	1093	<0.001			
		Evaluation of FFF				
Motivation FFF	$r = 0.528$	1024	<0.001			

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

^aRobustness check: only cases with no missing responses in any of the items of the corresponding scale have been included in the calculation of these correlations

Table 4 Overview of results for the tested hypotheses

Hypothesis	Description	Result
Hypothesis 1a	People with strong environmental attitudes are expected to evaluate the FFF movement and its proponents more positively than others	Confirmed
Hypothesis 1b	People who accept justifications for environmentally harmful behaviour are expected to evaluate the FFF movement and its proponents less positively than others	Confirmed
Hypothesis 2	The strength of the behavioural impact of FFF on a person increases with the positivity of the person's evaluation of FFF and its proponents	Confirmed
Hypothesis 3a	Women are particularly positive about the FFF movement and its proponents	Partially confirmed
Hypothesis 3b	Young persons are particularly positive about the FFF movement and its proponents	Rejected
Hypothesis 3c	Highly educated persons are particularly positive about the FFF movement and its proponents	Confirmed

Fig. 3 Main results of the SEM analysing the influence of background variables, general environmental attitudes, acceptance of justification for negative environmental behaviours, and the evaluation of the FFF movement and its protagonist on the elicited motivation for pro-environmental behaviour change (beta-weights, correlation r, and significance levels). *N*=1206. *FFF* Fridays for Future; *GT* Greta Thunberg. **p*<0.05, ***p*<0.01, ****p*<0.001

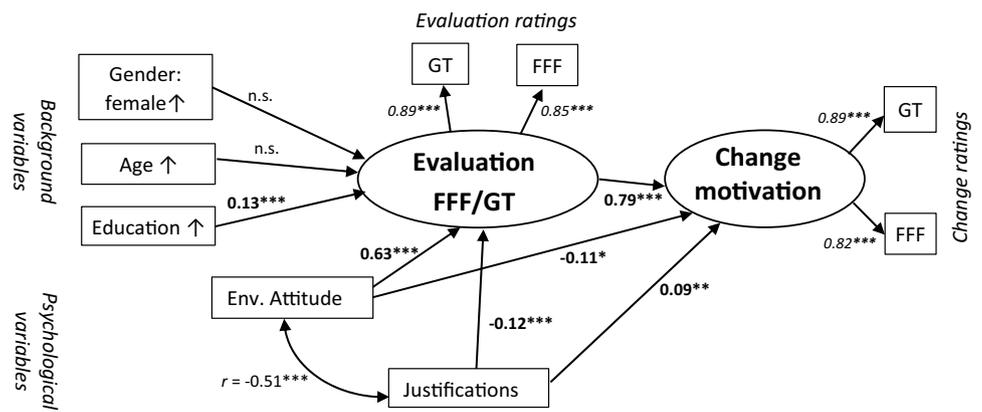


Table 5 Strength of influence of variables on the evaluation of the FFF movement and its protagonist and on the motivation for behaviour change

Dependent variable/predictor	β	<i>B</i>	SE (<i>B</i>)	Sign. <i>p</i>
<i>Evaluation of FFF/GT</i>				
Gender (female)	-0.003	-0.008	0.062	0.897
Age	-0.014	-0.001	0.002	0.562
Education	0.130	0.355	0.065	<0.001***
Env_Attitude	0.629	1.447	0.067	<0.001***
Justification	-0.118	-0.269	0.064	<0.001***
<i>Change motivation</i>				
<i>Evaluation of FFF/GT</i>				
Env_Attitude	0.793	0.517	0.032	<0.001***
Justification	-0.106	-0.159	0.064	<0.05*
Justification	0.092	0.137	0.047	<0.01**
Indirect influences → via evaluation → change motivation				
Env_Attitude → evaluation → change motivation	0.499			
Justifications → evaluation → change motivation	-0.094			

p*<0.05, *p*<0.01, ****p*<0.001

FFF Fridays for Future; *GT* Greta Thunberg

Thunberg and the FFF movement showed that those with low evaluations were only marginally motivated to change their behaviour. Figure 4 illustrates this, by showing the percentage of persons who reported substantial behaviour change motivation in eight subgroups of survey respondents with high versus low (a) evaluations of FFF and its proponent, (b) environmental attitudes and (c) justification tendencies.

Altogether 28 Chi-square test comparisons were conducted to compare all cells of Fig. 4 with each other. The change percentages in the positive evaluation groups ranged from 39% to 54%, whereas the negative evaluation groups obtained only low values ranging from 0% to 4.5%. All 16 mutual Chi-square test comparisons between the percentages of behaviour change in the four groups with positive versus negative evaluations were thus clearly significant (*p*<0.01 or *p*<0.001). This reflects the strong influence of the evaluations on the behaviour change incited by FFF and Greta Thunberg that was identified in the SEM.

Only one further significant difference was observed in the 12 remaining comparisons, namely between the two groups with positive evaluations, a high level of justification, and high (54%) versus low (39%) environmental attitudes (*p*<0.05). This difference illustrates a positive effect of environmental attitudes on perceived behaviour change motivations.

Perceived awareness and behaviour changes triggered by FFF and Greta Thunberg

Those who stated that the climate strikes of Greta Thunberg and/or the FFF movement more generally motivated them to change their behaviour were asked to describe the corresponding changes (see Table 6 for selected statements).

While respondents described awareness and behaviour changes in various areas of their private sphere (95% of overall changes reported), they reported only a few changes in public sphere behaviour (5% of overall changes reported).

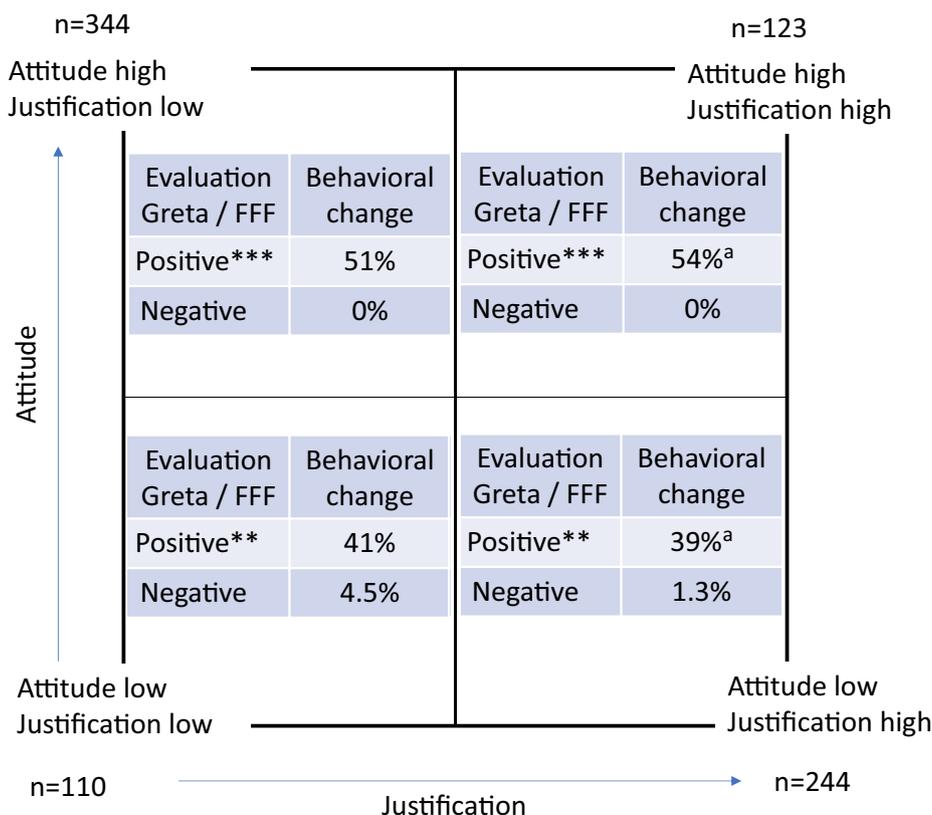


Fig. 4 Percentage of participants reporting substantial behavioural changes in eight subgroups with positive vs. negative evaluation of FFF and Greta Thunberg, high vs. low levels of justification for negative environmental behaviour (x-axis), and high vs. low environmental attitudes (y-axis). Only cases with either consistent positive (rather positive, positive) or consistent negative (rather negative, negative) evaluations of Greta Thunberg and the FFF movement were included in this analysis ($N=821$). In total 17 significant differences

emerging in the 28 mutual comparisons of the change percentage between the subgroups using Chi-square tests are marked as follows: *** $p < 0.001$, ** $p < 0.01$, significant differences between the change percentage in the subgroup with positive evaluations and each of the four subgroups with negative evaluations. ^aSignificant difference ($p < 0.05$) between the change percentage of the two subgroups sharing this superscript

The answers regarding awareness and behavioural changes in respondents' private sphere reveal pro-environmental changes in various areas (Fig. 5). Most frequently changes in mobility behaviour were reported (33% of all reported changes in the private sphere). These included shifts towards public transport and active mobility, most notably cycling, or changes in leisure mobility, in particular reduced flying to reach holiday destinations. The second most frequently mentioned changes concerned respondents' goods (including food) consumption behaviour (23%), referring mostly to a reduction in consumption as well as to shifts towards consumption of local and organic products. These were followed by changes in waste behaviour (16%), concerning most notably recycling practices but also avoidance of plastic packaging and an increased general awareness (13%) of environmental impacts. Respondents, furthermore, reported changes in their energy behaviour (6%) consisting mostly of a reduction in electricity consumption and other sufficiency measures. In addition, respondents expressed

feeling strengthened and reinforced in their existing pro-behaviour pattern (6%) and having made investments in sustainable technologies or projects (3%).

Awareness and behaviour changes in the public sphere were found for political engagement and activism (46% of reported changes in the public sphere) and social communication (54%). Only two respondents specifically mentioned participation in the climate strikes as a newly adopted behaviour.

Discussion and conclusion

Since 2018, the worldwide youth-led climate strike movement, widely known as FFF, has called for societal transformation and action to tackle the climate crisis. Also in Switzerland FFF (under the umbrella of "Klimastreik/Grève du climat") has become a visible manifestation of the climate movement. In this article, we traced the immediate

Table 6 Selected statements illustrating awareness and behaviour changes triggered by FFF and the climate activism of Greta Thunberg

Reported changes in selected areas	Example statements
Mobility behaviour	<p>“We decided to avoid air travel for our usual family vacations.”</p> <p>“I now use the bicycle instead of the car to go to the train station.”</p> <p>“I take public transport more often instead of the car (...)”</p>
Consumption behaviour, including food consumption	<p>“For a few months now, I have (almost) stopped eating meat, the production of which represents a huge part of greenhouse gas emissions.”</p> <p>“I try to buy more local and seasonal. I pay even more attention to these issues and before buying I ask myself if an object is really necessary for me.”</p>
Waste behaviour	<p>“I started to question my behaviour and avoid plastic bags and plastic packaging wherever possible.”</p> <p>“More conscious waste separation, avoid food waste.”</p> <p>“I have become more conscious of reusable materials and make an effort to leave as little waste as possible.”</p>
General awareness	<p>“Thinking even more about where I can do more to help the environment.”</p> <p>“A general awareness, not on concrete actions that we already do on a daily basis.”</p> <p>“I realized the real limits of the planet's resources. (...)”</p>
Energy behaviour	<p>“Electricity consumption reduced, heating switched to heat pump.”</p> <p>“Saving energy”</p> <p>“Think of Greta’, we say to each other when someone leaves the light on unnecessarily or is too generous with the hot water:-)”</p>
Reinforcement of existing behaviour	<p>“Even before the whole “Fridays for Future” movement and Greta Thunberg, I was committed to more environmental protection and tried to reduce my personal CO₂ emissions. However, the movement has encouraged me in my actions, and I have adapted my lifestyle even more.”</p> <p>“I’ve always paid attention to it, but with Greta and the youth making the topic even more present, I remind myself more often to be more environmentally conscious and act accordingly (plastic, public transportation, eating vegan).”</p>
Investment	<p>“Environmentally friendly heating installed, new windows purchased. “</p> <p>“I bought an electric bike to get to work and invested in buying green electricity.”</p>
Political engagement and activism	<p>“I’ve already had a fairly ecologically oriented lifestyle/consumption for several years. What has changed in my behaviour is that I joined a new association in my town that is committed to proposing all sorts of actions, events, etc. in favour of the environment”</p> <p>“(…) I voted a little greener / greener liberal than usual last weekend.”</p>
Social communication	<p>“The topic of the environment and climate was simply perceived more consciously again, it was discussed within the family and with friends. We gave each other ideas about what could be improved in our own households.”</p> <p>“I am already very environmentally friendly. I often try to persuade other people to do the same.”</p>

The selection of statements was guided by the aim of (i) illustrating anchor statements reflecting particularly well the theme of the respective category while also (ii) covering the variety of aspects within each category. Further examples are provided in Appendix A3

impact of this newly emerging climate movement on environmental behaviour and awareness. In the following, we discuss the main contributions of this analysis to the nascent literature on the youth-led climate strike movement and to the literature on pro-environmental behaviour changes more generally. Building on these contributions we share practical suggestions on how to increase the potential of FFF for stimulating societal transformation.

Positive public reception and traceable impacts mostly in the private sphere

Our findings show that already in the first year of existence the climate strike movement and Greta Thunberg gained high visibility among the Swiss population, with a majority of respondents declaring to be familiar with the youth climate strike movement. Similar to trends in other countries

such as neighbouring Germany (Koos and Naumann 2019), our findings confirm for the Swiss case that the climate strike movement is received positively by a clear majority of survey respondents, whereas only a minority are critical of their engagement to tackle climate change.

The climate strike movement and the activism of Greta Thunberg have indeed contributed to behavioural and awareness changes in Switzerland. Out of the 1206 participants, 375 (31%) reported behaviour and awareness changes due to the FFF movement and/or Greta Thunberg and 310 (26%) provided concrete descriptions of these changes. Accordingly—and similarly to findings for neighbouring Germany (Venghaus et al. 2022)—only a minority of the participants perceived to be influenced in their behaviour. Nevertheless, these percentages are substantial and clearly display the transformative potential of this movement regarding bottom-up changes at the individual level, along-side its quest for

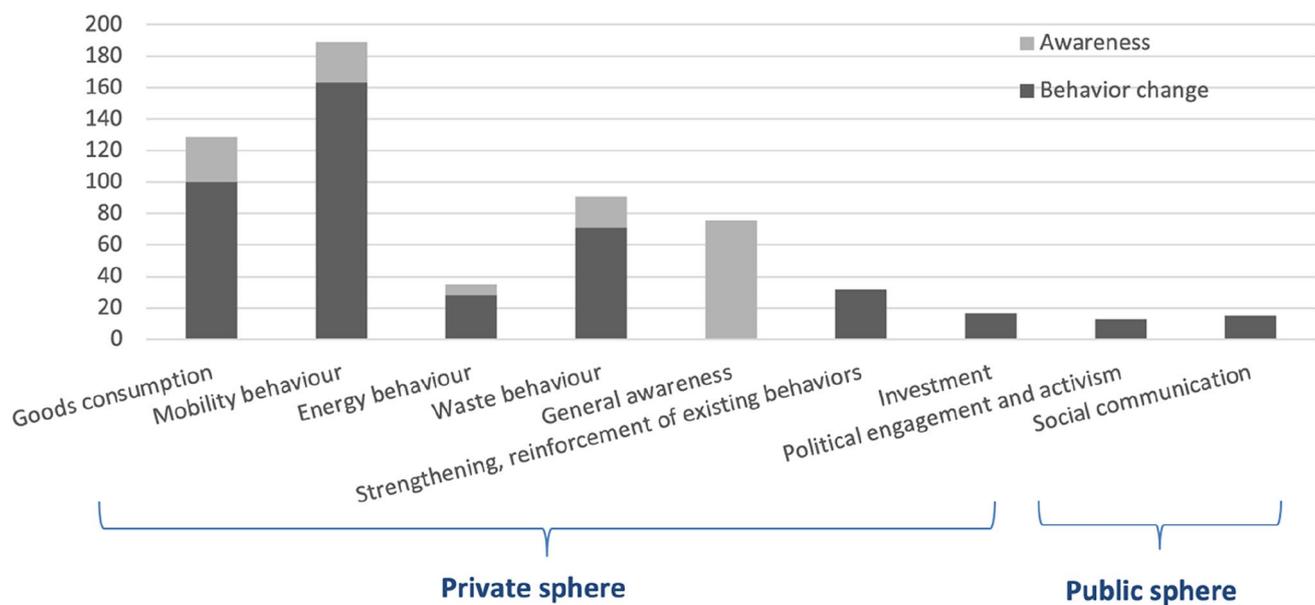


Fig. 5 Content analysis of responses ($N=310$) to the open-ended question concerning changes motivated by the Fridays for Future movement and the activism of Greta Thunberg. Note: the response

categories are not mutually exclusive, as some responses referred to more than one category

pressuring political action and structural changes at a system level (Marquardt 2020).

Our findings point to what might be considered “low hanging fruits” as well as blind spots in actions triggered by the FFF movement. The vast majority of reported changes concerned private sphere behaviours, most importantly related to mobility behaviour, the consumption of food and goods and waste behaviour. While changes were reported for both low-impact behaviour such as recycling and high-impact behaviours in terms of CO₂ emissions such as reduced meat consumption or reduced flying (Cologna et al. 2022), changes that require substantial upfront investment, for example, in new energy and heating technologies, were mentioned only by a small fraction of respondents. Pointing to the necessary interplay of behavioural and structural dynamics for achieving transformation (Brownstein et al. 2022; Huttunen et al. 2021), these findings suggest that political action is needed to stabilise the reported pro-environmental behaviour changes as well as to create favourable conditions for more far-reaching changes in everyday practices and lifestyles. These measures should particularly account for unequal opportunities to change due to financial constraints and limited or inadequate physical infrastructures in energy, transport, housing or food production systems (Meinherz and Fritz 2021; Newell et al. 2021) and be complemented with strategies targeted at reducing the disproportionate impact of people with high socio-economic status (Nielsen et al. 2021a, b), thus embracing social justice

as an indispensable pillar of sustainability transitions and climate action (cf. Swilling 2020).

Despite the movement’s explicit call for political action on climate change (Marquardt 2020), survey respondents reported only very few changes in public sphere behaviour, including increased political engagement or activism. The results of the content analysis of open survey responses, therefore, seem to some extent inconsistent with findings for the US context suggesting that knowing Greta Thunberg predicts intentions to engage in climate activism (Sabherwal et al. 2021). One explanation for this may be that in spite of the FFF movement, in Switzerland still, a small share of the population engages in environmental activism and non-traditional forms of political participation. Another possibility is that private sphere behaviours such as recycling, energy and mobility choices are cognitively more salient for the participants than public sphere actions such as influencing peers in political discussions. As a consequence, examples of behaviour changes of the former type eventually came more easily to participants’ mind than examples of the latter type. Both explanations substantiate the importance of a shift from a de-politicised perspective and environmental education with a strong focus on personal private sphere behaviours to a broader perspective on (education for) environmental citizenship with a more integrative focus on the social and political dimensions of sustainable socio-environmental development (Hadjichambis et al. 2020).

Still, private sphere behaviour changes and intangible awareness increases of citizens are important as societal

changes, as public opinion formation and political decisions are ultimately contingent on processes at the individual level (Latene 1996). Furthermore, in their role as consumers, citizens can influence at least to some extent the socio-technological sphere comprising the development and scope of applications of green technologies with their behavioural, purchasing and investment decisions. For example, FFF activists or sympathisers may become early adopters of technologies that can become commonly used by the majority later on in an innovation cycle (e.g. Nygrén et al. 2015).

The findings, thus, shed light on the diversity of strategies for tackling climate change called for by the climate movement. Capturing perspectives amongst the wider population, they contribute empirical evidence to research showing that a considerable share of protesters in seven European cities focus on individual lifestyle changes and bottom-up strategies as the way forward (Svensson and Wahlström 2021). While Switzerland was not included in Svensson and Wahlström's study, a closer look at their results for protesters' perspectives in neighbouring states of Switzerland points to important future questionings about nationally varying notions of responsibility, consumerism and citizenship. The focus on private sphere behaviour identified in our study shows similarities to Svensson and Wahlström's (2021) results on the prevalence of bottom-up change narratives focussed on individual behaviour among protesters in Italy as well as among younger activists, as opposed to more top-down oriented narratives among protesters in Austria and Germany. While this variance warrants further research, strong appeals to the principle of individual responsibility in the Swiss social system (often referred to as "Eigenverantwortung" or "responsabilité individuelle") (Studer 2020), might provide important contextualization for interpreting the propensity towards individual behaviour changes in the private sphere in our sample.

At the same time, these results also indicate that there is untapped potential for inciting changes in the public sphere behaviour of citizens that could be addressed more effectively by the climate strike movement in addition to its direct appeal to important political actors.

A positive evaluation of the climate movement as the main determinant of behavioural change

A closer look at the profile of those who reported behavioural and awareness changes partially corroborates previous research and partially suggests the need for further detailed studies.

Identifying the main variables explaining behaviour changes related to the FFF movement and Greta Thunberg's activism, our results confirm the importance of positive public perceptions of those communicating and of potential role models (Bolsen et al. 2019; Schunk and DiBenedetto

2020). A good public image of the climate strike movement is accordingly crucial for inciting behaviour changes on the personal level.

In this regard consistent low-carbon behaviours of climate activists appear as a critical leverage and source of credibility for the movement, thus strengthening its transformative potential. Gössling (2019) distinguishes two types of public persons advocating for climate change mitigation: *low-carbon performers* who are taking substantial personal action on mitigation, and those displaying only very limited evidence of a personal behaviour change. The study of Gössling identified Greta Thunberg as the most prominent example of the *low-carbon performers* aiming at a low-carbon personal lifestyle, whereas, it considered Al Gore as a prominent example of the other type, because of his frequent reliance on private aircrafts to travel to political and awareness raising events. The benefit of reaching large audiences and taking part in high-level political meetings may justify air-travel to some extent. However, justifications for negative environmental behaviours have repeatedly been identified as a facilitating factor of these negative behaviours, and therefore, need to be considered with caution (e.g. Hansmann and Binder 2021; Uba et al. 2022; Zhang et al. 2018). Disputable justifications of activists can also backfire if they trigger criticism that is connected to negative public perceptions and evaluations, which may impair the possible positive impact of their actions on public environmental awareness according to the current findings.

The motivating effect of Greta Thunberg (reported by roughly 30%) was slightly, but significantly larger than the impact of the FFF movement (reported by roughly 24%) and her consistent personal lifestyle presumably contributed to this. This does not, however, mean that the personal lifestyle and activist behaviours of Greta Thunberg remained unchallenged. For example, Greta Thunberg's transatlantic sailing trip to the UN Climate Action Summit 2019 in New York was only partially embraced by the media as an ecologically formidable substitution for air travel; it also encountered negative reactions and critical comments, as the carbon emissions of her sailing trip were disputed (see Alter et al. 2019; Mkono et al. 2020). In theoretical terms, this somewhat odd example points to an important difference between NT and the MJB in their conceptualization of justifications and the formation of corresponding behavioural habits. Due to its historical origin in criminology, the NT solely addresses justifications for deviant behaviours, i.e. behaviours that are considered negative. In contrast, the MJB represents a general environmental behaviour model, implying that both positive and negative environmental behaviours need to be justified before corresponding intentions are realised (e.g. in terms of effort, costs, time-losses, and emission levels). The example of the sailing trip shows that under

Table 7 Accounts of the environmental behaviour and consciousness changes incited by Greta Thunberg and FFF reported by persons who evaluated them both consistently in the range from rather negative to very negative

“In my personal mobility, I consider whether there are alternatives to the private car”
“Buy more consciously, live more consciously, live more frugally”
“I am more attentive to the topic”
“This reinforces ecological awareness for everyday actions such as lowering the temperature of the heating or limiting the production of plastic waste”
“I’m more careful about what I buy, especially when it comes to food. But also in terms of shopping. I avoid buying unnecessary things”

This is the full list of behaviour changes reported in open-text responses by those who evaluated both Greta Thunberg and the FFF movement negatively. However, providing such textual accounts was optional, when indicating that such changes occurred on the corresponding rating scale

complex circumstances even behaviour realised with clear environmentally positive intentions may require justification. It also reminds us of the role and responsibility of media when it comes to reporting about climate change in ways that stimulate action and behavioural changes (Perga et al. 2023).

The strong motivational effects elicited by Greta Thunberg also suggest that giving faces to the climate movement can be an impactful strategy for motivating further actors to engage in climate action and relevant behavioural changes, thus confirming previously identified principles for effective climate communication (Corner et al. 2015). To some extent these results mirror visualisation patterns in newspaper coverage of the movement, which at least in the case of the United Kingdom have heavily relied on depicting human faces, particularly of girls and women protesters, and of individualising and personifying protest (Hayes and O’Neill 2021).

In line with research on participant profiles in the FFF movement (Brügger et al. 2020; De Moor et al. 2020; Wahlström et al. 2019) and on environmental attitudes (Franzen and Vogl 2013) more generally, highly educated persons were particularly positive about the FFF movement and hence more likely to report behavioural changes. Since highly educated persons were slightly overrepresented in our sample this could entail a positivity bias in the overall evaluations and behaviour change motivations reported for the whole sample.

Contrary to what previous research on pro-environmental attitudes and behaviour in other contexts might suggest (Briscoe et al. 2019; Chekima et al. 2016; Hansmann and Binder 2020), our findings revealed that age did not significantly influence respondents’ evaluation of the climate strike movement. This indicates a large potential for shaping and facilitating behavioural changes among diverse socio-demographic population groups.

Convincing the already convinced? Mostly, but not only!

A different question is, however, whether Greta Thunberg and the movement were able to convince the unconvinced

such as persons with negative environmental attitudes and high acceptance of justifications for environmentally harmful behaviours. The response is ambiguous.

Among the admitting non-environmentalists (with low pro-environmental attitudes and a high level of justification of environmentally harmful behaviours) who evaluated the climate strike movement and Greta Thunberg positively, a considerable share of 39% were motivated to positive environmental behaviour changes. In contrast, only 1.3% of the non-environmentalists, who evaluated the climate strike movement and Greta Thunberg negatively, reported changes in their behaviour or awareness. A similar picture emerged for the consistent “justifications rejecting environmentalists” and the persons with inconsistencies between attitudes and justifications.

Overall, among those evaluating the climate strike movement positively, 48.4% reported changes in their environmental behaviour. This was the case for only 1.7% of those who evaluated the movement consistently negatively. The sympathy of the population for the FFF movement is, thus, a major agent for the changes it can provoke. Accordingly, the findings suggest that the movement influenced the behaviour of those who criticise it only to a very limited extent. Still the FFF movement can to some extent also reach less environmentally orientated persons who are critical of the climate movement. The statements of the few persons who evaluated both the engagement of Greta Thunberg and the FFF movement negatively, but nevertheless explained how they were impacted by them in open-text responses, illustrate this (Table 7).

This potential of the climate movement to reach a wide range of people, including to some extent those who are not “convinced environmentalists”, is indicated by the significant negative direct influence of environmental attitudes and significant positive direct influence of the acceptance of justifications on the behaviour change motivation in the SEM. These two direct relationship paths seem surprising and need to be considered complementary to the indirect effects with the opposite sign. So that in sum, at least strong environmental attitudes positively influence the behaviour change motivation. Partly the surprising signs of the direct

influences of attitudes and justifications on behaviour change motivation may reflect ceiling effects in the sense that those who already behave environmentally friendly—as they have positive attitudes and reject justifications for not doing so—have fewer possibilities or see less need to further change their behaviour (Thomas and Sharp 2013). Overall SEM showed how environmental attitudes and justifications can complementarily influence behaviour change. From a methodological perspective, applying the SEM proved particularly helpful in this regard as it allowed us to simultaneously analyse direct and indirect influences.

Limitations and future research

While offering novel insights into the immediate effects of the climate strike movement on the environmental awareness and behaviour of Swiss residents, our empirical data allow only for a partial view. One limitation of this study is that it only assessed the participants' stated behavioural changes, which have been demonstrated to deviate from actual behavioural decisions (Wardman 1988). Social desirability might have led to an over-reporting of pro-environmental behaviour changes such as flying less or reducing meat consumption (Lange et al. 2018). Future research using longitudinal measures of actual behaviour (changes) based on observations or self-monitored behaviours is needed to further substantiate the findings presented in this article. Complementing our results for 2019 when the movement was at its pre-Covid-19 peak, such future research should also consider whether the behavioural changes that we identified last and unfold long-term impact (Martiskainen et al. 2020), thus contributing to tangible environmental outcomes in terms of emissions reductions (Fisher and Nasrin 2021). Along these lines also the question could be tackled whether such movements contribute to surpassing a social tipping point towards more sustainable behaviours.

Building on our observation that changes in private sphere behaviour clearly dominated public sphere behaviour, including activist engagement, future research is needed to clarify the link between the FFF movement and political engagement. Although activism is generally considered a form of behavioural engagement too (Martiskainen et al. 2020), the focus on individual attitudes and behaviour in our survey might not have explicitly encouraged participants to reflect on possible changes in their political engagement or collective action—in part explaining why few changes in public sphere behaviour were reported. To tackle this issue, future research could complement our explorative approach to ask about concrete behaviour changes in an open-question format with a closed-ended survey item in the form of a list of possible changes including public sphere behaviours. The fact that

our survey included only individuals above 18 years accentuates this limitation. Since youth make up a large share of the FFF participants and given a higher prevalence of bottom-up vs. top-down narratives of change and an emphasis on individual agency among younger protesters (Svensson and Wahlström 2021), the movement-related attitudes, activities and inspired behaviour changes in this age class merit an in-depth investigation. Such a youth-focussed study seems particularly important in light of an emerging “generational agency” observed by some (Pickard 2022). Complementing the focus of the present study on self-declared behaviour change, further research is needed to draw a more holistic picture of the transformative impact of this youth-led climate strike movement. Exploring the extent to which the FFF movement contributed to a reconfiguration of discursive spaces (Blühdorn and Deflorian 2021) would be an important complement to understanding the movement's impact. The impact of the FFF movement on sympathising individuals may thus extend further to sceptics and could reach the latter indirectly through altering the frame of societal discussions. Still in addition to enhancing the environmental attitudes and behaviour of citizens, addressing politicians, policy-makers, economic actors and technological innovation seems crucial (Adey et al. 2021). While this study focussed on the former, futures studies focussing on the interrelations between the individual, political, technological and societal levels are required.

Appendix

A1. Items of the GEA scale

General environmental attitudes scale

1. If we continue as we have been doing, we are heading for an environmental disaster
2. In my opinion, the environmental problem is greatly exaggerated in its importance by many environmentalists. ^a
3. For the sake of the environment, we should all be prepared to reduce our current standard of living
4. Environmental protection measures should be enforced even if they result in job losses
5. It is still the case that politicians do far too little for the environment
6. The protection of the environment is very important to me

Cronbach alpha (additive raw scale, missing listwise)

Final scale values (items averaged, missing values estimated)

All items used a four-point Likert scale ranging from *not agree at all* to *fully agree* (1 = do not agree at all, 2 = rather disagree, 3 = rather agree, 4 = I fully agree).

^aFor this statement the response scale coding was reversed.

A2. Items of the JNEB scale

Justification scale items

1. There are more important things in life than protecting the environment, so to a certain extent it is justified to pollute the environment
2. The impact of a single person's environmental behaviour is small, so it is not worth limiting oneself for the environment
3. I behave very environmentally friendly in most areas of life, so it is also okay if I pollute the environment by some behaviours (and e.g. go on holiday now and then)
4. Environmentally friendly behaviour is often more expensive than environmentally unfriendly behaviour, so it is also okay if I pollute the environment through some behaviour (such as e.g. flying to a holiday destination now and then instead of travelling more expensive by train)

Note. All items used a four-point Likert scale ranging from *not agree at all* to *fully agree* (1 = do not agree at all, 2 = rather disagree, 3 = rather agree, 4 = I fully agree).

A3. Description and examples of categories of the qualitative content analyses of subjectively perceived awareness and behaviour changes triggered by FFF and the engagement of Greta Thunberg

Following Stern (2000) we classified the open-text responses in two main categories: private sphere behaviour and public sphere behaviour. Within these two main categories we inductively developed several sub-categories. In the following we provide an overview of the definitions used in the coding process.

For *private sphere behaviour* the following sub-categories were developed:

Goods consumption behaviour

- Change of diet: change in nutritional intake, for example becoming vegetarian or vegan, reduced meat consumption.
- Reduced consumption: buying fewer products and goods, such as clothes.
- Local and organic consumption: considering provenance i.e. regionality and ways of cultivation in consumption choices.
- Local food consumption: answers that mention locality and regionality specifically with regard to food consumption behaviour.
- Awareness related to goods consumption.

Mobility behaviour

- Holiday mobility: descriptions of reduced mobility for holidays or change in location (closer to the place of residence, accessible e.g. via public transport).
- Everyday mobility: change in behaviour in everyday mobility such as commuting, adoption of low-carbon modes of transportation such as cycling, public transport, walking.
- Awareness related to mobility behaviour.

Energy behaviour

- Adoption of low-carbon technologies for energy production: change in energy behaviour to rely on less-carbon intense ways of producing electricity or heating.
- Saving energy: change in energy consumption behaviour; gestures that allow for sparing energy.
- Awareness related to energy behaviour.

Waste behaviour

- Packaging: refraining from using plastic, avoiding to the extent possible packaging, buying in bulk.
- Sorting: separating waste according to different materials.
- Food waste: avoiding food waste.
- Awareness related to waste behaviour.

General awareness: the environmental impact of the respondent's behaviour is more on their minds now in their daily life.

Strengthening, reinforcement of existing behaviours: people who had already been acting in environmentally friendly ways feel confirmed in their actions by the strike movement to continue doing so.

Investment: Make a significant financial investment in a sustainable product or project such as the installation of photovoltaic cells.

For *public sphere behaviour* the following sub-categories were developed:

Political engagement and activism: having a newly developed or intensified desire to get involved in politics or having changed voting practice; engaging in activism and supporting environmental initiatives, joining and contributing to environmental organizations.

Social communication: talking to and discussing with colleagues, friends and family about climate and

environment-related topics and the impacts of our ways of producing and consuming; communication online such as on social media about the environmental impacts of their behaviour and/or discussing, writing about the FFF movement and climate action.

In the following we provide examples of statements illustrating the respective categories and sub-categories. The selection of statements was guided by the aim of (i) illustrating anchor statements reflecting particularly well the theme of the respective category while also (ii) covering the variety of aspects within each category. The response categories are not mutually exclusive, as some responses referred to more than one category.

Examples of responses addressing a change in consumption behaviour, a change of diet

I eat less meat, leave my car at home more often and travel by public transport

I've always paid attention to it, but with Greta and the youth making the topic even more present, I remind myself more often to be more environmentally conscious and act accordingly (plastic, public transportation, eating vegan.)

Vegetarian

I realized the real limits of the planet's resources. I was already doing in my daily life actions like waste sorting, less useless consumption, avoiding plastic, bike versus car, little or no red meat, attempt to digitalize my administration (not at the top). I accentuate these actions

To be more attentive on a daily basis to what I eat and how I throw away

Adopted a vegan diet

For a few months now, I have (almost) stopped eating meat, the production of which represents a huge part of greenhouse gas emissions

Examples of responses addressing a change in consumption behaviour, reduced consumption

I am more careful about what I buy, especially when it comes to food. But also, in terms of shopping. I avoid buying unnecessary things

I try to be even more attentive and reduce my consumption

Reconsider if I really need something

Consume less, shop more consciously, use energy sparingly

Less food and drinks to go. Less packaged food. Less consumption e.g. of magazines

Examples of responses addressing a change in consumption behaviour, local and organic consumption

Pay more attention to what I buy (origin, packaging, etc.)

Plan vacations without flights, reduce car trips to a minimum. Consider food from the region that has also been produced organically. Make sure to use as little plastic packaging as possible

I fly less, buy more organic

I try to buy more local and seasonal. I pay even more attention to these issues and before buying I ask myself if an object is really necessary for me

Examples of the responses addressing a change in consumption behaviour and raised awareness about it

I try to consume local and seasonal products. I am even more attentive to these questions and ask myself if an object is really indispensable to me

More conscious use of recyclable materials, switch to reusable articles

Buy more consciously, live more consciously, live more frugally

I try to be even more careful and reduce my consumption

I question my consumption patterns

Examples of responses addressing a change in mobility behaviour, focussed on holiday mobility behaviour

For example, went to England by train instead of by plane

We decided to avoid air travel for our usual family vacations

Less meat, vacation destinations in Switzerland or neighbouring countries, less electricity consumption, consumption of only local food as far as possible, shopping at Brockenhaus [secondhand stores]

Stop flying several times a year. Prefer the train

Train trips abroad already booked several times this year; holidays in Europe or Switzerland

More local holiday plans (Jura ridges on foot)

Examples of responses addressing a change in mobility behaviour, focussed on everyday mobility behaviour

I talk about it more with my children and I take the car less. We rarely fly

example I now use the bicycle instead of the car to go to the train station

e.g. drive less!

bike versus car

take the bike or public transport more

do without car for short distances, travel more by bike

bike to work

Examples of responses addressing a change in mobility behaviour and raised awareness about it

Desire much more to travel by public transport

I bought an electric bike to get to work and invested in buying green electricity

I take public transport more often instead of the car and eat more ecologically

no more plastic bags, organic vegetables, public transportation if I can

More conscious use of packaging

Once again more taking the train instead of the plane

I bought an electric bike to get to work

bike to work

Examples of responses addressing a change in energy behaviour, adoption of low-carbon technologies for energy production

Thinking about buying an electric car, thinking about installing solar panels on our house, rethinking my mobility

Electricity consumption reduced, heating switched to heat pump, bike to work

I bought an electric bike to get to work and invested in buying green electricity

purchased more solar power; plug-in hybrid purchased environmentally friendly heating installed, new windows bought thinking about buying an electric car, thinking about installing solar panels on our house, rethinking my mobility

Examples of responses addressing a change in energy behaviour, saving energy

Conscious shopping: organic, without packaging

Bicycle instead of car

Less meat

Lower room temperature

Consume less, shop more consciously, use energy sparingly

Careful sorting of waste, saving fuel oil etc....

save energy

Take a closer look at our own water and energy consumption

Examples of responses addressing a change in energy behaviour and raised awareness about it

More frequent use of public transport. Reduction of unnecessary car travel. Questioning my use of energy resources

I question electricity policy more and air travel is also more likely to be bypassed

Examples of responses addressing a change in waste behaviour through reducing packaging

Minimize use of plastic (bags), save energy

Use public transport whenever possible. When shopping, make sure that environmentally friendly packaging is used wherever possible. Turn down the heating and wear warmer clothes

This reinforces ecological awareness for everyday actions such as reducing the temperature of the heating or limiting the production of plastic waste

I started to question my behaviour and avoid plastic bags and plastic packaging wherever possible

More conscious use of packaging

Examples of responses addressing a change in waste behaviour through improved sorting

Even more thorough waste separation. Save electricity- More train, more walking

Careful sorting of waste, saving fuel oil etc....

I sort my waste more. and I think about my means of transport more conscious waste separation, avoid food waste. use the bicycle instead of the car to go to the train station

To use public transport more. Buy fewer consumer goods. Recycling more. To fly less

separate waste more consciously

I now pay attention to what I eat but also to the way I travel and sort my waste

Examples of responses addressing a change in waste behaviour and raised awareness about it

More thoughtful about plastic, theme of waste again in mind. I now collect plastic

I think more about plastic consumption and mass consumption, as well as my waste

just with the waste especially with PLASTIK I pay attention more

I have become more conscious of reusable materials and make an effort to leave as little waste as possible

Examples of responses addressing a change in waste behaviour, a reduction in food waste

Separate waste more consciously, avoid food waste

minimise food waste

less food waste

Live more consciously. Avoid food waste

Examples of responses addressing a change of general awareness on climate and environmental impacts

A general awareness, not on concrete actions that we already do on a daily basis

The topic of environment and climate was simply perceived more consciously again, it was discussed within the family and with friends. We gave each other ideas about what could be improved in our own households. After all, little things make a mess

I pay even more attention to my environmental behaviour and encourage my acquaintances to be aware of theirs

Think of Greta, we say to each other when someone leaves the light on unnecessarily or is too generous with the hot water:-)

Thinking even more about where I can do more to help the environment

Examples of responses addressing a strengthening, reinforcement of existing behaviours

Even before the whole “Fridays for Future” movement and Greta Thunberg, I was committed to more environmental protection and tried to reduce my personal CO₂ emissions. However, the movement has encouraged me in my actions, and I have adapted my lifestyle even more

I've always paid attention to this, but now that Greta and the youth have made the issue even more present, I remind myself more often to be more environmentally conscious (plastic, public transport, vegan)

I was already environmentally friendly before, but now I produce a little less waste

All the things that should be done, most of us have been doing for a very long time

I have been trying to live in a more environmentally friendly way for a long time, but on a small scale... and so Greta has motivated me to enlarge this small scale

I try to be environmentally friendly, but I have been for a long time, before this movement

Examples of responses addressing an investment

I bought an electric bike to get to work and invested in buying green electricity

Environmentally friendly heating installed, new windows purchased. Regularly bad conscience when flying (unfortunately)

Climate compensation for flights. No palm oil if possible

I'm considering buying a hybrid car next and not just gasoline

I make financial donations

Examples of responses addressing a change in political engagement and activism

I've already had a fairly ecologically oriented lifestyle/consumption for several years. What has changed in my behaviour is that I joined a new association in my town that is committed to proposing all sorts of actions, events, etc. in favour of the environment

Greater activism regarding the environment

More conscious shopping, travelling and supporting environmental projects. I also take the issue of waste much more seriously

I try to create even less packaging waste and consider whether a flight is really necessary. Where that is the case, I pay for CO₂ compensation. I voted a little greener / greener liberal than usual last weekend

Examples of responses addressing a change in social communication

I am already very environmentally friendly. I often try to persuade other people to do the same

I pay more attention to my behaviour towards the environment and I push my acquaintances to be aware of theirs

The topic of the environment and climate was simply perceived more consciously again, it was discussed within the family and with friends. We gave each other ideas about what could be improved in our own households. After all, little things make a mess

We no longer take the plane, we eat even less meat, we often ride our bikes, and we often talk about the issue with our children. In addition, we have given environmental protection a lot of weight in the elections

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Data availability The data supporting the conclusions of this article are made available upon request.

Declarations

Conflict of interest The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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