Climate change action as a project of identity: Eight meta-analyses

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ABSTRACT

Identity can improve our understanding of personal climate action, particularly when climate action becomes an expression of a person's self. However, it is unclear which kind of self or identity is most relevant. Building on a comprehensive series of eight meta-analyses (using data from 188 published articles, $N = 414,282$ participants) this research systematically compares how strongly climate-friendly intentions and behaviors are associated with place identity, personal connectedness to nature, environmental self-identity (i.e., personal self-definition as a pro-environmentally acting person), and social identity (i.e., identification with social groups). Results suggest robust, medium-sized to strong links of both pro-environmental intentions and behaviors to people's nature connectedness ($r = 0.44/0.52$), environmental self-identity ($r = 0.62/0.56$), and identification with groups considered to support climate-friendly behavior ($r = 0.48/0.51$), but markedly weaker effects for identification with groups which are unrelated to environmental topics ($r = 0.30/0.15$) and for place identity ($r = 0.18/0.32$). Implications for policy interventions and psychological theory are discussed.

1. Introduction and research background

Climate change calls for fast and far-reaching technological and social changes to reduce greenhouse gas emissions (IPCC, 2014). Their success largely depends on the diffusion of climate-friendly lifestyles (Dietz et al., 2009). The conditions under which people intend, or can be encouraged, to act in a climate-friendly manner are quite diverse. Insights from behavioral research indicate that individuals are motivated for example by economic or resource considerations (Bamberg and Möser, 2007; Bjerkan, Nørbech and Nordtømme, 2016), a sense of moral obligation (Bamberg and Möser, 2007; Klöckner, 2013), social expectations and the behavior of similar others (Bamberg and Möser, 2007; Klöckner, 2013; Nolan et al., 2008), beliefs in personal efficacy (Bamberg and Möser, 2007; Klöckner, 2013), and habits (Verplanken and Wood, 2006). In intervention programs leveraging these motivations, it is often impossible to affect all of these factors at once and without contradictions (e.g., providing external incentives can jeopardize people's intrinsic pro-climate motivation; Deci et al., 1999; Masson and Otto, 2021). Importantly, it is also difficult to target more than one specific area of behavior with interventions designed around the

aforementioned factors, because these factors tend to be linked to a specific area of behavior, rather than to a broader range of climate-friendly behaviors (for example, developing the habit to recycle is fairly independent of developing habits in other areas, like travel mode choice). Furthermore, intervention effects are often rather short-lived due to changing environmental or personal states (Bergquist et al., 2019). Thus, to increase the effectiveness and long-term impact of intervention programs, we need to learn more about broader psychological determinants that have the capacity to affect *all* or at least many of the previously mentioned causal factors, that can guide people's actions in the *full* range of possible climate-friendly behaviors, and that will remain relevant in changing contexts. Identity has been proposed to be such a general factor (Clayton, 2003; Whitmarsh and O'Neill, 2010; van der Werff et al., 2013b).

When climate-friendly behavior is linked to identity, considering climate issues in everyday life becomes part of the individual's self, either as a genuine self-aspect ("Me as an environmentalist") or through internalization of an important reference group's climate-related behavior (Masson and Fritsche, 2014). Hence, people act in a climate-friendly way as this is an expression of *who they are* and not because

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of external incentives or perceived social pressure (Ajzen, 1991). This intrinsic motivating power of identity should make it a central psychological lever to explain and change people's climate-related behavior.

Identity can be seen as a much broader influence on climate-related action than other predictors, such as attitudes (Ajzen, 1991). The power of attitudes to influence climate-related action in general is limited for at least two reasons. Firstly, attitudes usually refer to a person's favorable or unfavorable evaluations of a *specific* behavior (e.g., "I like going by bus"), and secondly their predictive strength can be undermined if a person faces costs which are tied to this behavior. While attitudes can be a significant predictor of a specific climate-related behavior (i.e., going by bus), their predictive power for other climate-related behaviors (e.g., purchase of organic food) should be considerably lower. In contrast, when climate-friendly action is part of the self, e.g., through self-identification as an environmentalist or a green consumer, a person will likely exhibit climate-friendly action across a range of different behaviors (Martin and Czellar, 2017; van der Werff et al., 2013b; 2014; Tam, 2013; Whitmarsh and O'Neill, 2010). If a behavior, such as commuting by bus rather than a private car, is tied to a significant aspect of the self, the person will be more likely to go by bus even if this involves substantial personal costs. This self-expressive function of climate-friendly behavior makes identity a crucial factor when thinking about large-scale climate change mitigation efforts.

While identity processes are increasingly recognized as important drivers of climate-related behavior (Fritsche et al., 2018), there is considerable disagreement about which kind of identities are most important in predicting climate-related intentions and actual behavior (Udall et al., 2020). This is true for different types of identity, such as place identity (Raymond et al., 2011), connectedness to nature (Mayer and Frantz, 2004), environmental self-identity (Sparks and Shepherd, 1992), and social identity (Fielding and Hornsey, 2016; Fritsche et al., 2018). *Place identity* describes people's sense of being personally connected to a specific place or place-based community from which they derive properties of their self (e.g., being a "Berliner", or a person shaped by the sea shore; Droseltis and Vignoles, 2010; Raymond et al., 2011; Scannell and Gifford, 2010). Previous research suggests that people who identify with specific places might be more inclined to protect that place from harm (e.g., due to climate change; Carrus et al., 2005; Devine-Wright et al., 2015; Walker et al., 2015). The concept of *connectedness to nature* describes people's sense of being a part of nature as a whole, the importance of nature to their self, and their emotional connection to nature (Mayer and Frantz, 2004; Tam, 2013). Similar concepts include nature relatedness (Nisbet et al., 2009), inclusion of nature in self (Schultz, 2002), and commitment to nature (Davis et al., 2009). Survey research indicates that connectedness to nature positively affects people's climate-friendly behavior in different domains, such as climate-friendly transportation (Beery and Wolf-Watz, 2014), energy conservation and use of renewable energies (Hedlund-de Witt et al., 2014; Sparks et al., 2014) or purchase of eco-friendly products (Haws et al., 2014; Martin and Czellar, 2016). As a further identity concept relevant to environmental issues, people may define themselves on the basis of action-focused identities, which have been labeled as *environmental self-identities*. An environmental self-identity describes that part of an actor's self which relates to a particular environmental behavior (Conner and Armitage, 1998), e.g., an individual's self-identity as a recycler (Nigbur et al., 2010). Those action-focused identities may relate to very specific behaviors ("Me as a recycler") or more general behavioral domains ("Me as a green consumer") and have been shown to predict climate-related intentions and behaviors (Whitmarsh and O'Neill, 2010; van der van der Werff et al., 2013a; 2013b). More recently, it has been proposed that identification with social groups, or a person's *social identity* (Tajfel and Turner, 1979), should also be a crucial factor in motivating climate-friendly behavior (Bamberg, Rees and Seebauer, 2015; Fielding and Hornsey, 2016; Fritsche et al., 2018). When people define their self in terms of "We" (e.g., citizens of a country, or members of an environmental action group) instead of "I", they are assumed to conceive of their individual behavior as being part of collective action. This should reduce feelings of personal helplessness (Salomon et al., 2017), render individual contribution to a collective good rational and effective, and therefore motivate action to mitigate large-scale environmental crises, such as climate change (Fritsche et al., 2018). However, whether or not social identity fosters climate change action should depend on whether people perceive their salient ingroup as inclined to protect the climate (i. e., norm) and as agentic (i.e., collective efficacy; Fritsche et al., 2018). If ingroup norms prescribe climate-friendly behavior and the group is perceived as capable to bring about change, self-definition on the basis of this social identity will most likely involve behavior to mitigate climate change.

Though many studies have included identity as an explanatory variable, research on the different types of identity is fragmented and previous reviews have provided only narrative descriptions of the links between specific types of identity and climate-related behavior (Fielding and Hornsey, 2016; Fritsche et al., 2018; Restall and Conrad, 2015; Udall et al., 2020). A quantitative synthesis of this research is still lacking. In this work, we conduct a series of eight meta-analyses for the different combinations of two climate-related outcomes (climate-friendly behavioral intention and behavior) and four types of identity (place identity, connectedness to nature, environmental self-identity, social identity), drawing on data from 188 published papers with a combined sample size of 414,282 participants. In order to increase the robustness of our estimations (i.e., to maximize the number of eligible studies), we included studies both on behavior directly related to climate change mitigation (e.g., energy conservation behavior, transportation, climate policy support) as well as studies on general pro-environmental behavior more indirectly related to climate issues (e.g., littering behavior, water conservation). Examples of different identity measures, an overview of all included studies and their characteristics, as well as information on the effect sizes extracted from each study and their sample sizes are provided in Online Supplementary Materials. Assessing the impact of different types of identity is critical for three reasons. Firstly, it advances our understanding of how much identity as a general psychological factor can contribute to the motivation of large-scale climate-friendly action. Secondly, comparing the relative impact of different identity types can provide evidence-based recommendations for the design of policy interventions to stimulate individual mitigation efforts. Finally, our analysis extends previous meta-analyses on other, non-identity-related predictors of pro-environmental behavior (Bamberg and Möser, 2007; Klöckner, 2013), introducing identity research into the broader discussion on quantifying the policy potential of psychological factors in climate change mitigation (Clayton et al., 2015).

We expect a substantial positive correlation between climate-friendly behavior and connectedness to nature (and related constructs) due to its conceptual focus on appreciation of nature and the desire to protect nature from harm (Restall and Conrad, 2015; Whitburn et al., 2020). Likewise, environmental self-identities should be positively associated with climate-friendly behavior as they, by definition, refer to environmental action-focused aspects of the self (Whitmarsh and O'Neill, 2010). For social identity, we assume that the strength of association will depend on the type of social identity. If the norms of the social group or the content of the identity support climate-friendly behavior (e.g., social identity as an environmentalist), self-identification with the group will increase the likelihood of climate-friendly behavior (Masson, Jugert and Fritsche, 2016). In contrast, when the social identity is unrelated to climate issues, the positive correlation should be weaker or even negative in case of anti-environmental identities (e.g., social identity as a climate change denier). Similarly, a strong place identification may aid or impede climate mitigation behavior, depending on the type of behavior, and on specific contextual factors. For example, people who feel a strong connection with their local environment may oppose wind energy installations in their community, as such installations serve global mitigation efforts at the cost of disrupting the local landscape. However,

they may be keen to support initiatives to protect the biodiversity of their local ecosystem (Devine-Wright, 2013). Geographical level of the target behavior could thus be a moderator variable for the effects of place identity (protecting local nature vs. mitigating global climate change). We did not conduct moderator analysis on this issue due to the relatively small number of available studies.

2. Method

2.1. Selection of studies and inclusion criteria

We included studies that assessed a wide range of climate-friendly behaviors, such as energy conservation, purchase of climate-friendly products (e.g., local food products, energy efficient technologies), climate-friendly diet (e.g., eating vegetarian), public transportation use, environmental activism, donations to climate causes, and climate policy support. Studies were included if they met the following criteria. Firstly, they had to be published in a peer-reviewed scientific journal or in an edited book. Secondly, studies had to report at least one quantitative relationship between a climate-related outcome (intention or behavior) and a measure of one of the four identity types: place identity, connectedness to nature, environmental self-identity, social identity. If studies did not report necessary statistical results, they were included when authors provided missing information upon request.

2.2. Literature search

We conducted two searches for articles: an initial search in 2017 and a follow-up search to collect more recent publications in 2018. Regarding search strategy, a literature search was conducted in five electronic databases (PsycINFO, Sage, ScienceDirect, Scopus, and Web of Science) using different combinations of search terms, such as "connectedness to nature", "connectivity with nature", "ecological identity", "energy-saver", "environmental identity", "environmentalist identity", "environmentally conscious consumer", "environmentally friendly consumer", "green consumer", "green self-identity", "group identification", "inclusion of nature in self", "place identity", "pro-environmental identity", and "social identity". We also used combinations of a number of search terms that did not directly refer to our focal variables but could be expected to locate relevant studies, for example "norm" and "theory of planned behavior". When applicable, we used both American and British English spelling. As a second strategy, we conducted ancestry and descendancy searches, i.e., looking up potentially relevant papers that have (been) cited (in) the papers identified via database search.

In total, we identified a set of 38,141 records, including duplicate hits. After reviewing the titles and abstracts based on the inclusion criteria, 1,824 relevant articles remained. Next, we reviewed the full articles according to our inclusion criteria. This resulted in a final selection of 188 articles to be included in the meta-analyses.

2.3. Coding

Each study was coded for the following characteristics: (a) year of publication; (b) sample size; (c) mean age in the sample; (d) gender composition of the sample; (e) study country; (f) country-level individualism-collectivism score (Hofstede, Hofstede and Minkov, 2010; higher scores indicate greater country-level individualism, no score assigned when a study involved multiple countries); (g) dependent variable; (h) dependent variable – reliability; (i) type of dependent variable (1 = behavior, 2 = intention; hypothetical product choice and policy support were coded as intention); (j) independent variable (1 = connectedness to nature, 2 = environmental self-identity, 3 = place identity, 4 = social identity); (k) type of social identity (1 = pro-environmental, 2 = neutral or ambiguous, 3 = anti-environmental); (l) independent variable – reliability; (m) effect size.

2.4. Meta-analytic strategy

Several studies contained multiple outcome variables, such as measures of intention as well as self-reported behavior, or multiple identity variables, such as measures of environmental self-identity as well as social identity. In order to ensure independence of data points included in our meta-analytic research (Hunter and Schmidt, 1990), we conducted eight separate meta-analyses for different combinations of outcome variables (intention, behavior) and predictor variables (social identity, environmental self-identity, connectedness to nature, and place identity). When a study contained multiple outcome variables of the same type (such as two different intention measures) or multiple predictors of the same type (such as two different scales of social identity), we summarized the correlations according to the shifting unit of analysis method (Cooper, 1998). The signs of effect sizes from studies that used reverse-coded items (higher score = less climate-friendly behavior) were reversed. Bivariate zero-order correlations were used as measures of effect size. All results are based on effect sizes corrected for measurement error attenuation (Spearman, 1904). When no information on reliabilities was reported or when single-item scales were used, we assigned a reliability value of 1 when computing the corrected effect size (Manning, 2009). Before estimating the population effect size, we converted the correlations from primary studies to a standard normal metric using Fisher r-to-Z transformation (Hedges and Olkin, 1985). The coefficients were transformed back into r before reporting them.

Meta-analytic calculations were performed in JAMOVI (The jamovi project, 2020) using the MAJOR package (Hamilton, 2018). Weighted average effect sizes were calculated based on the random effects model, assuming the presence of unidentified sources of variance that are randomly distributed across studies (e.g., due to different procedures used to collect data). This assumption was supported by a series of significant Q-tests (reported in Table 1). Pooled correlations were estimated by weighing the observations by the inverse of a variance term including both their within- and between-study variance components (DerSimonian and Laird, 1986; Hedges and Vevea, 1998).

2.5. Publication bias

Estimates from meta-analyses might be biased due to selective publication of results (publication bias). We assessed publication bias using tests for funnel plot asymmetry (see also Appendix A3 in Online Supplementary Materials), fail-safe N tests and the trim-and-fill procedure. Fail-safe N tests (Rosenthal, 1979) revealed that for each of the eight meta-analyses a substantial amount of non-significant effects would be needed to change the overall effect to non-significance (all test values were above the tolerance value of $5\,k + 10$, where k is the number of studies included in the meta-analysis at hand). Tests for funnel plot asymmetry (Kendall's τ-b, see Begg and Mazumdar, 1994; and Egger's regression test, see Egger et al., 1997) were not significant for seven out of eight meta-analyses (exception: Egger's regression test for social identity-intention). The results of the trim-and-fill (Duval and Tweedie, 2000) procedure estimated no missing data on the left side, indicating that no non-significant data points were imputed. In sum, these findings provide little evidence of systematic publication bias.

3. Results

Table 1 provides an overview of our key findings. The results point to robust positive associations between climate-friendly intentions and behaviors and each of the four identity types. In other words, identity emerged as a significant predictor of climate-friendly intentions and behaviors across different types of identity and behavioral domains (overall effects: $r_{\text{int}} = 0.48$; $r_{\text{behav}} = 0.46$). As expected, moderate to large associations were found for environmental self-identity ($r_{\text{int}} = 0.62$; $r_{\text{behav}} = 0.56$) and connectedness to nature ($r_{\text{int}} = 0.44$; $r_{\text{behav}} = 0.52$). Pooled correlations for place identity ($r_{\text{int}} = 0.18$; $r_{\text{behav}} = 0.32$)

Table 1
Summary of the Meta-Analyses for the Four Identity Types.

Outcome	Identity type	r	95% CI	k	Q	I^2	p	Fail-safe N
Intention	Place identity	0.18	0.06-0.30	15	251.58	95.91	0.004	1,179
	Connectedness to nature	0.44	0.34-0.55	29	752.08	96.52	< 0.001	14,389
	Environmental self-identity	0.62	0.54-0.71	70	4,061.03	98.19	< 0.001	225,419
	Social identity	0.33	0.27-0.39	55	1,098.77	98.21	< 0.001	55,046
	Overall	0.48	0.42-0.54	143	8,466.19	98.83	< 0.001	601,709
Behavior	Place identity	0.32	0.17-0.47	16	384.65	97.58	< 0.001	3,139
	Connectedness to nature	0.52	0.46-0.58	54	982.50	96.00	< 0.001	91,790
	Environmental self-identity	0.56	0.48-0.64	64	4,483.74	98.14	< 0.001	213,668
	Social identity	0.21	0.15-0.27	62	2,560.93	99.18	< 0.001	40,752
	Overall	0.46	0.41-0.51	163	17,168.18	99.19	< 0.001	868,294

Note. k is the number of studies included in the meta-analysis, Q is the total heterogeneity, I^2 is the proportion of heterogeneity due to between-study differences, and fail-safe N is the number of null effects needed to change overall effect to non-significance. The total number of studies in the table (k) exceeds the 188 papers mentioned in the introduction because some papers include multiple studies and some studies are included in multiple analyses.

and social identity (r_{int} = 0.33; r_{behav} = 0.21) were small to moderate (Conner, 1998). Results also showed a large amount of between-study heterogeneity in effect sizes for each of the eight meta-analyses. This suggests that there are differences in the effects sizes across the studies that are not attributable to random sampling errors, possibly pointing to the influence of moderator variables.

The overall estimates for social identity were based on a set of different group-related identities (see Appendix A1 in Online Supplementary Materials for examples of social identities included in the analysis). However, social identities vary in the degree to which they can be categorized as supportive or not supportive of climate-friendly behavior, according to either the specific content of the identity or the norms associated with the identity. For example, an individual's social identity as a member or supporter of the environmentalist movement may well be categorized as a pro-environmental identity, whereas a person's social identity as a climate change denier will likely involve resistance to climate-friendly behavior, and could thus be categorized as an anti-environmental identity. For other social identities, such as student or university identities, their relation to climate action is less straightforward, as they should be contingent on the group prototype (i. e., the attributes distinctively tied to the group) and the salient climate-related norms of the specific identity (i.e., whether the group supports or does not support climate action). In order to gain a more precise understanding of the predictive power of social identity for climate-friendly behavior, we coded the social identities included in our analysis as either pro-environmental or neutral (or ambiguous); no anti-environmental identities were present in our dataset. Additional analysis showed that the type of social identity (pro-environmental vs. neutral identity) was a significant moderator for climate-friendly intentions (Z = -2.02; p = .04) and behavior (Z = -5.61; p < .01; see Table 2). Specifically, pro-environmental identities were, as expected, more strongly related to climate-friendly intentions and behavior (r_{int} =

0.48; r_{behav} = 0.51) than identities with no clear connection to climate issues (i.e., neutral identities; r_{int} = 0.30; r_{behav} = 0.15). In other words, social identity can be a strong predictor of climate-friendly intention and behavior when the group is clearly linked to climate issues and action (e. g., through supportive group norms).

3.1. Additional moderator analysis

In order to test possible boundary conditions of the effect of identity on climate-friendly intentions and behavior, we conducted a series of moderator analyses (moderators: mean age, share of female respondents in study sample, country-level individualism-collectivism scores, type of sample, number of citations per year). Previous research has found that women (vs. men) tend to engage more in pro-environmental behavior and express stronger pro-environmental attitudes and values (Hunter et al., 2004; Seebauer et al., 2016). For age, previous results are mixed, but showing a slight increase in pro-environmental attitudes and behavior for older people (Wiernik et al., 2013). Furthermore, we tested whether identity might be a stronger predictor of climate action in more collectivist cultures (vs. more individualistic cultures), especially for social identities (Barbarossa et al., 2015; Kashima et al., 2014). Regarding method-related moderators, we investigated the effects of identity across student and non-student samples, as well as across papers with a relatively high or low number of citations per year (as a proxy for study quality).

Results showed no significant moderator effects for country-level individualism-collectivism and for number of citations per year. For the individualism-collectivism variable this might be a method-related issue (limited variance), as a great majority of the studies included in our analysis were conducted in more individualistic countries. Similarly, mean age, share of female respondents and type of sample (student vs. non-student sample) did not moderate the relationship between identity (on the aggregate level) and climate-friendly *intentions*. However, we found significant moderator effects of age (Z = -4.50; p < .01), gender composition (Z = 3.79; p < .01) and type of sample (Z = -2.27; p = .02) for climate-friendly *behavior*, indicating that the association between identity and behavior was stronger for younger or female respondents as well as in student samples (see Table 3). Additional analyses showed that age and share of female respondents remained significant (or marginally significant) moderators when looking at each of the four identity types separately except for environmental self-identity.

4. Discussion

We conducted a series of eight meta-analyses investigating the associations between four types of identity (place identity, connectedness to nature, environmental self-identity, social identity) and climate-friendly outcomes. Our findings indicate that all studied identity variables have a marked positive influence on the formation of people's

Table 2
Summary of the Meta-Analyses for Social Identity.

Outcome	Type social identity	r	95% CI	k	Q	p
Intention	Pro-environmental	0.48	0.31-0.66	8	94.72	< 0.001
	Neutral	0.30	0.24-0.37	47	826.02	< 0.001
	Overall	0.33	0.27-0.39	55	1,098.77	< 0.001
Behavior	Pro-environmental	0.51	0.33–0.70	11	382.54	< 0.001
	Neutral	0.15	0.10-0.19	51	756.80	< 0.001
	Overall	0.21	0.15-0.27	62	2,560.93	< 0.001

Note. k is the number of studies included in the meta-analysis, Q is the total heterogeneity.

Table 3
Moderation Analyses for Climate-Friendly Behavior.

	Place identity		Connectedness to nature		Environmental self-identity		Social identity		Overall	
	Z	p	Z	p	Z	p	Z	p	Z	p
Moderator:										
Mean age	−1.94	0.053	−2.07	0.038	−1.36	0.173	−1.86	0.063	−4.50	< 0.001
Share of female respondents	2.44	0.015	2.93	0.003	0.59	0.556	3.78	< 0.001	3.79	< 0.001
Type of sample (0 = student, 1 = non-student)	−1.41	0.157	−0.72	0.471	−0.68	0.499	−1.81	0.071	−2.27	0.023

climate-friendly intentions and the enactment of climate-friendly behaviors. Specifically, we found substantial correlations between climate-friendly outcomes and environmental self-identity, connectedness to nature, and pro-environmental social identities. In contrast, the links between climate-friendly outcomes and place identity or social identities with no clear focus on environmental protection (i.e., neutral identities) were less pronounced.

As the present work demonstrates, the effects of several of the studied identity variables are not only substantial in size but also relate to both intentions *and* behavior to a similar degree. This is noteworthy, as other psychological factors are typically more strongly related to intentions than to behaviors (Bamberg and Möser, 2007; Gardner and Abraham, 2008; Klöckner, 2013; Manning, 2009; Sandberg and Conner, 2008). Perhaps, strong pro-environmental identities specifically motivate people to overcome possible obstacles to translating intentions to behavior (Lapinski et al., 2017): Highly identified people may proactively seek and create opportunities for implementing climate action in their everyday behavior. When identity is focal, it is the intrinsic motivation to express who you are that fosters climate-friendly behavior, leaving less power to extrinsic factors such as money or time constraints.

We should point out a possible limitation of the present study in how the different identity variables were categorized. We attempted to group conceptually and empirically related constructs together, but arguments can be made for categorizing the variables in alternative ways as well. For instance, environmental identity can be seen as being sufficiently close to connectedness nature to warrant categorizing them under the same rubric (correlations between environmental identity and connectedness to nature tend to be sizeable, Mayer and Frantz, 2004; Tam, 2013). There is some initial evidence to suggest that connectedness to nature may be a causal factor implicated in the formation of environmental identity via biospheric values (van der Werff, Steg and Keizer, 2013b; Martin and Czellar, 2017). It thus seems useful to treat environmental identity and connectedness to nature as very closely related but distinct phenomena.

4.1. Policy potential

Identity possesses considerable policy potential with respect to fostering climate-friendly action. Identity-based policy interventions may also have other desirable properties:

Firstly, identity variables are malleable. Although most of the meta-analyzed studies are correlational in nature, previous work has shown that pro-environmental identities can be fostered through education (Liefländer et al., 2013; Otto and Pensini, 2017), virtual and real contact with nature (Mayer et al., 2009; Nisbet and Zelenski, 2011), display of climate-friendly behaviors (Lacasse, 2016), or just comparing one's own group with other groups (e.g., other nations) who are considered to act in environmentally harmful ways (Rabinovich et al., 2012). Thus, there is a number of suitable ways to promote climate-friendly behaviors through affecting or triggering identity variables. These approaches appear to be scalable, and testing their effectiveness at scale (ideally using controlled field trials) will be the logical next step. For instance, ICT-mediated, tailored and gamified approaches could be used for both reminding people of their existing pro-environmental identities or for creating new ones. Mobile apps that are designed to provide specific information and feedback, track users' progress, give users positive reinforcement, issue motivating behavioral challenges, and connect users to each other might not only help identified environmentalists to reduce their footprint but also remind them of their pro-environmental identity in everyday life through enacting this identity. At the same time, less identified users might develop a pro-environmental identity while engaging with the app (broadly similar approaches have been piloted for example in Wemyss et al., 2019; Mulcahy et al., 2020; for a theoretical discussion and an overview of the literature on serious games with relevance to environmental behavior see Fjællingsdal and Klöckner, 2017; Morganti et al., 2017; Creutzig and Kapmeier, 2020).

Secondly, there is reason to believe that interventions aimed at identity variables are unlikely to have negative side effects on the intervention targets' emotional well-being. For example, connectedness to nature has been consistently linked to positive emotional experiences and well-being (Capaldi et al., 2014; Howell et al., 2011; Mayer et al., 2009; Zelenski and Nisbet, 2014). Moreover, identifying with social groups determines people's self-definitions in everyday life (Turner et al., 1987) and fulfills basic psychological needs (Correll and Park, 2005). Available evidence therefore suggests that properly designed interventions cultivating and leveraging pro-environmental identities may be able to boost both climate-friendly behavior and emotional well-being. Identity-based interventions could thus potentially serve as a "gentle" complement to other behavioral interventions, particularly in cases when established interventions might be thought to be emotionally taxing for the target audience in some way (e.g., when the norm referent in a norm-based intervention can be perceived by the target audience as an outgroup; for evidence suggesting occasional adverse or antagonistic reactions to established behavioral interventions see Aronson and O'Leary, 1982–83; Sussman and Gifford, 2014, Bergquist and Nilsson, 2016, but see also Allcott and Kessler, 2019; Leoniak and Cwalina, 2019).

Finally, because identities are typically not behavior-specific, interventions based on environmentally friendly identities should have the capacity to motivate a wide range of behaviors, rather than single isolated actions (Fritsche et al., 2018; Martin and Czellar, 2017; Sloot et al., 2018; van der Werff et al., 2013a; Whitmarsh and O'Neill, 2010). This is a great advantage in the context of climate change mitigation where many different behaviors are at play (Dietz et al., 2009). In addition to this, strong pro-environmental identities should help prevent undesirable negative spillover and rebound effects (Lacasse, 2016; Lauren et al., 2019) and reduce resistance to pro-environmental appeals (Kavvouris, Chrysochou and Thogersen, 2020; Murtagh et al., 2012).

4.2. From personal to social identities

This paper represents the first attempt to systematically quantify the impact of personal *and* collective identities on climate-friendly behaviors and intentions. Descriptively, associations with behaviors and intentions seem to be of roughly similar magnitude when comparing certain personal identities (environmental self-identity or connectedness to nature) to those social identities that are stereotyped as pro-environmental. Interestingly, climate-friendly behavior was increased even in people who identified with groups that are not distinctively characterized as pro-environmental, although to a lower degree. This might be explained by a general consensus across most communities that

climate protection is an important collective goal (European Commission, 2017; Lee et al., 2015; Lewis et al., 2019). In other words, strengthening psychological person-group bonds may be a strategy to increase climate-friendly intentions and behavior (as a form of prosocial behavior), even for groups with no explicit focus on climate protection.

The human capacity to think and act as collectives (Rabinovich et al., 2008; Tomasello, 2009; Turner et al., 1987) may play a crucial role in solving global environmental crises. Individual climate action can only be perceived as effective and rational when people consider it to be *collective* action, as the climate crisis can only be tackled by collective efforts (Fritsche et al., 2018; Masson and Fritsche, in press). Thus, people who define their self in terms of group memberships (e.g., because they feel involved in personally relevant communities) might be more strongly inclined to engage in environmental action than those who prefer personal self-definitions. Translated into effective intervention strategies, this means that besides popularizing the personal identification with nature and with climate-friendly behaviors, we need to seize opportunities for people to experience social connection and identification with agentic communities (Fritsche and Masson, in press). The global *Fridays for Future* movement is a striking example for employing a generational social identity to promote personal action and perhaps even societal change.

Declaration of Competing 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.

Acknowledgments

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.gloenvcha.2021.102322.

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