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van der Werff, Ellen; Steg, Linda; Keizer, Kees

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Follow the signal: When past pro-environmental actions signal who you are

Ellen van der Werff*, Linda Steg, Kees Keizer

University of Groningen, The Netherlands

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ABSTRACT

Research has shown that past pro-environmental actions can promote as well as inhibit subsequent environmentally-friendly behaviour. When are past pro-environmental actions likely to lead to more environmentally-friendly behaviour? We propose this depends on the extent to which initial actions are linked to people's environmental self-identity. We hypothesise that past pro-environmental actions are more likely to influence one's environmental self-identity when the behaviour implies something about you. As expected, environmental self-identity was stronger when the initial behaviour more strongly signals that you are a pro-environmental person. The signalling strength of previous pro-environmental actions was high when people considered a wide range of past pro-environmental actions, or when the initial behaviour was difficult and unique. Our results suggest that pro-environmental behaviour can be promoted by reminding people of their past pro-environmental actions, particularly when these actions strongly signal that one is a pro-environmental person, thereby strengthening environmental self-identity.

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1. Introduction

Many people regularly engage in different pro-environmental actions such as bringing their glass bottles to the recycling bin or lowering their thermostat when they leave their house. But can such actions increase the likelihood that someone makes subsequent pro-environmental choices as well? For example, if someone just recycled waste will that person also be more likely to choose sustainable products if he or she goes shopping afterwards? Or would it rather increase the likelihood that someone will choose the cheap and unsustainable option in a subsequent choice, as they already did their bit?

Research has shown that our past pro-environmental actions can promote future pro-environmental actions. For example, a Danish longitudinal correlational study on consumer behaviour showed that engagement in pro-environmental actions is related to engagement in other pro-environmental behaviours the following years (Thøgersen & Ölander, 2003). Also, in experimental studies people were more likely to choose sustainable products after they were reminded of a range of pro-

environmental actions they often perform (Cornelissen, Pandelaere, Warlop, & Dewitte, 2008; Van der Werff, Steg, & Keizer, 2014). Past pro-environmental behaviour may thus promote subsequent environmentally-friendly actions. However, in some cases past pro-environmental behaviour did not lead to more pro-environmental behaviour or even resulted in less environmentally-friendly behaviours. For example, in the study on consumer behaviour by Thøgersen and Ölander (2003) mentioned earlier, there was no or even a negative relationship between some environmentally-friendly behaviours in one year and pro-environmental actions in the following years, suggesting that engaging in some pro-environmental behaviours in one year did not promote or even inhibited some subsequent pro-environmental actions (Thøgersen & Ölander, 2003). Also, research on moral licensing suggests that past pro-environmental behaviours may inhibit rather than promote future pro-environmental actions, as people may feel licensed to act immorally after their good deed (Mazar & Zhong, 2010). This suggests that past pro-environmental actions may promote subsequent environmentally-friendly behaviour (i.e., positive spill-over), but also inhibit future pro-environmental behaviour (i.e., negative spill-over; Thøgersen & Crompton, 2009). Therefore, an important question is: When do pro-environmental actions lead to more environmentally-friendly behaviours and when is this less or even not likely to be the case?

* Corresponding author. Grote Kruisstraat 2/1, 9712 TS Groningen, The Netherlands. Tel.: +31 50 363 9098.

E-mail address: ellen.van.der.werff@rug.nl (E. van der Werff).

1.1. Environmental self-identity

We propose that the extent to which past pro-environmental actions will promote future pro-environmental behaviour depends on the level to which the initial actions are linked to one's self-concept, and more particularly, to one's environmental self-identity. Environmental self-identity can be defined as the extent to which people see themselves as an environmentally-friendly person. Research has shown that a stronger environmental self-identity increases the likelihood that one engages in pro-environmental behaviour, and that environmental self-identity is an important predictor of pro-environmental behaviour. For example, people with a strong environmental self-identity are more likely to conserve energy, reduce waste, and eco-shop (Whitmarsh & O'Neill, 2010), are more likely to engage in pro-environmental behaviours, recycle, buy fair trade products and refrain from flying to a holiday destination (Gatersleben, Murtagh, & Abrahamse, 2012), and use less energy, are more likely to use green energy, choose more sustainable products and use paper more economically (Van der Werff, Steg, & Keizer, 2013; Van der Werff et al., 2014).

In addition, research has found that reminding people of their past pro-environmental actions can strengthen their environmental self-identity, which in turn promotes subsequent pro-environmental behaviour (Van der Werff et al., 2014). When people were reminded of eight pro-environmental behaviours they often perform, their environmental self-identity was strengthened and they were more likely to engage in pro-environmental behaviours afterwards, while the opposite was true for people who realised that they often do not engage in environmentally-friendly behaviours. Yet, environmental self-identity only seemed to be malleable to some extent, as it also depends on values, which are considered to be relatively stable (Gatersleben et al., 2012; Van der Werff et al., 2013, 2014). Indeed, values appeared to be a significant predictor of environmental self-identity even after reminding people of their previous pro-environmental actions (Van der Werff et al., 2014).

Past pro-environmental actions may thus strengthen one's environmental self-identity and thereby promote subsequent environmentally-friendly behaviour, if people often engage in these behaviours. But which other factors influence whether past pro-environmental behaviour strengthen one's environmental self-identity? Do people need to be reminded of various pro-environmental actions as was the case in the study described above? Or is it sufficient to remind people of one past pro-environmental action? And can it be any type of pro-environmental behaviour or should it be a particular type of pro-environmental behaviour in order to influence one's environmental self-identity? The aim of this research is to study which factors influence the extent to which past pro-environmental actions strengthen environmental self-identity, thereby promoting subsequent pro-environmental actions. When environmental self-identity is rooted in values and thus has a stable component, it is probably not changed by just reminding people of any pro-environmental action. We propose that the more past environmental behaviour implies something about you, that is, the more strongly the behaviour signals your identity, the more it will influence environmental self-identity. This suggests that the extent to which environmental self-identity is influenced by previous environmental actions depends on the signalling strength of that behaviour.

1.2. When does past behaviour have a signalling function?

According to attribution theory, past behaviour can signal someone's traits or motivations (Kelley, 1973; Kelley & Michela,

1980). We use information about other's actions and the circumstances under which it occurs to explain the cause of their behaviour. The behaviour is either attributed to internal characteristics of the person (such as personality traits or motivations) or to external factors (Kelley, 1967). Attribution theory mainly focuses on inferences about other people's behaviour. However, following self-perception theory (Bem, 1972), we propose that people also make inferences about their own behaviour. Therefore, your own past behaviour may signal to yourself what type of person you are in a similar way, thereby affecting the strength of your self-identity.

We propose that three types of information about pro-environmental behaviour influence whether you think a particular behaviour signals who you are and hence, whether you attribute your behaviour to internal factors. More specifically, we suggest that people are more likely to attribute their own behaviour to internal factors when (1) they perform a range of pro-environmental behaviours instead of only one, and particularly when these behaviours reflect different types of pro-environmental behaviours instead of very similar behaviours, (2) not many other people perform the behaviour(s), and (3) when it is rather difficult to perform the pro-environmental action(s). If you perform many different environmentally-friendly behaviours, that are difficult and performed by few others, you are more likely to attribute this behaviour to internal factors and to see yourself as a type of person who acts in an environmentally-friendly way. This implies that your previous pro-environmental actions will particularly strengthen your environmental self-identity when the signalling strength of the initial behaviour is higher. On the basis of this, we first hypothesised that environmental self-identity will particularly be strengthened, compared to not performing any pro-environmental actions, when one engages in many pro-environmental behaviours rather than engaging in a single behaviour only, as the former is more likely to signal who you are. However, we expect that a range of past pro-environmental behaviours is particularly likely to signal who you are when it concerns a variety of past pro-environmental actions (compared to rather similar actions). For example, when you perform environmentally-friendly actions with regard to transport, recycling, as well as energy use, the behaviours will signal more about your environmental self-identity than when you only engage in actions that all concern switching off appliances.

Second, we hypothesised that the signalling strength of behaviour is higher when only few others perform the behaviour. Hence, we propose that the effect of past pro-environmental actions on one's environmental self-identity is likely to depend on the uniqueness of the behaviour. When few people perform a certain pro-environmental behaviour, this behaviour is more likely to be an indication of that person's environmental self-identity than when many others perform that behaviour. After all, if everyone does it, you may not perform the behaviour because you find it important, but for other reasons. For example, you may simply follow the norm, or acting in a pro-environmental manner may simply be the most attractive option. Research indeed showed that when a product is highly unique, it is more likely to influence the impression people have of the owner (Belk, 1981). We expect that this will also be the case for pro-environmental behaviours and how this affects one's self-concept: The more unique your behaviour is (that is, the fewer others perform it), the more strongly it will influence how you see yourself.

Third, we hypothesised that the difficulty of the pro-environmental behaviour influences the extent to which behaviour signals your identity. The more effort it takes you to perform a certain pro-environmental action, the more the behaviour will signal your environmental self-identity. Some initial support for

this proposition can be found in research on moral behaviour. When participants performed a moral behaviour that took effort, their moral identity was strengthened more than when they performed a moral behaviour that did not take much effort (Gneezy, Imas, Brown, Nelson, & Norton, 2012). Hence, we propose that environmental self-identity is particularly likely to be strengthened when people engaged in difficult pro-environmental actions.

1.3. Current research

To our knowledge it has not been studied yet under which conditions past pro-environmental actions are most likely to strengthen one's environmental self-identity, thereby promoting subsequent environmentally-friendly actions (i.e., positive spillover), and the role of the signalling strength of previous actions in this respect. The aim of the current research is to study which factors influence the extent to which past pro-environmental actions strengthen one's environmental self-identity and promote subsequent pro-environmental actions. We propose that past pro-environmental behaviour is more likely to lead to subsequent environmentally-friendly behaviour the more this past behaviour signals your identity, that is, when this behaviour strengthens environmental self-identity. We argued that this is more likely to be the case when the signalling strength of the initial actions is high, that is, when it concerns a range of different behaviours, when the behaviour is rather unique and when the behaviour is difficult. In the first study we will test if environmental self-identity is more likely to be strengthened when people consider a range of pro-environmental behaviours they engaged in before instead of only one, and when these behaviours reflect a variety of past pro-environmental actions rather than very similar actions. We expect that environmental self-identity will be strengthened (compared to not reminding them of pro-environmental actions) when people are reminded of eight different pro-environmental behaviours, while it is less likely to be strengthened (compared to not reminding them of pro-environmental actions) when they are reminded of eight similar pro-environmental actions or only one pro-environmental action. In the second study we will test whether considering a single past pro-environmental action may also strengthen environmental self-identity. More specifically, we will test if environmental self-identity will be stronger when the signalling strength of the relevant behaviour increases, which is more likely to be the case when the behaviour is rather unique or difficult, and even more so when it is unique *and* difficult. In both studies, we will also test if environmental self-identity in turn promotes subsequent pro-environmental actions and if environmental self-identity mediates the relationship between past pro-environmental actions and subsequent pro-environmental behaviour. If so, we gain a better understanding of the process through which past pro-environmental actions promote future pro-environmental behaviour, and thus promote positive spillover.

2. Study 1 – effects of the number and variety of pro-environmental actions on environmental self-identity

In Study 1 we tested if reminding people of a range of different past pro-environmental behaviours will indeed strengthen environmental self-identity, while reminding them of a range of similar past pro-environmental actions or a single past pro-environmental action will not be sufficient to strengthen environmental self-identity substantially compared to not reminding them of previous pro-environmental actions. We hypothesised that reminding people of eight rather different past pro-environmental actions will

strengthen environmental self-identity (as compared to a control group). In contrast, we expected that reminding people of eight pro-environmental actions that basically reflect a similar type of environmental behaviour or of a single pro-environmental action will not significantly strengthen environmental self-identity (compared to a control group), as the signalling strength of these behaviours may be too weak to substantially affect environmental self-identity. Finally, we hypothesised that environmental self-identity is in turn positively related to subsequent pro-environmental preferences and that environmental self-identity mediates the relationship between past behaviour and subsequent pro-environmental preferences.

2.1. Method

2.1.1. Participants and procedure

Respondents were students at a Dutch university who were approached in three cafeterias and one lecture hall of the university. In total 267 respondents participated in the study, of which 148 were female; 11 participants did not indicate their gender. Age ranged from 16 to 33 ($M = 21.5$, $SD = 2.74$).

2.1.2. Materials

2.1.2.1. Pilot test. To ensure that the effects of our manipulation do not result from differences in environmentally-friendliness, difficulty or frequency of the behaviours selected, and to ensure that we only select behaviours that people often engage in, we first conducted a pilot study to select pro-environmental behaviours to be included in our manipulation. The pilot study was conducted before the main study and with different participants. In the pilot test 50 participants rated how often they perform 32 pro-environmental behaviours reflecting different types of behaviours as well as one basic type of behaviour (on a scale from 1 *totally disagree* to 7 *totally agree*), how environmentally-friendly they think the behaviours are (on a scale from 1 *very environmentally-unfriendly* to 7 *very environmentally-friendly*) and how difficult they think the behaviours are (on a scale from 1 *very easy* to 7 *very difficult*). Based on the results, we selected eight behaviours reflecting different types of behaviour (i.e., transport, recycling and home energy use) and eight behaviours reflecting one basic type of behaviour (i.e., switching off appliances) that were all performed relatively often and seen as relatively environmentally-friendly (see Table 1). These behaviours were included in the manipulation of the main study. We selected the most common behaviours that were perceived to be pro-environmental to be sure that respondents will indicate that they often engage in the relevant behaviours, and thus be likely to realise that they are a pro-environmental person. The eight behaviours reflecting one basic type of pro-environmental behaviour ($M = 1.94$, $SD = 1.34$) as well as the eight different behaviours ($M = 2.10$, $SD = 1.44$) were seen as relatively easy. In addition, we selected the behaviour 'I sometimes buy an organic product' for the experimental group that was reminded of one environmentally-friendly behaviour, because this behaviour was also performed relatively frequently ($M = 5.74$, $SD = 1.72$), seen as environmentally-friendly ($M = 5.38$, $SD = 1.60$) and found the least easy compared to the other behaviours ($M = 2.57$, $SD = 1.66$). By selecting a single action that was not too easy, we were able to have a fair test of whether a single action can affect environmental self-identity as well.

2.1.2.2. Manipulation. We manipulated past behaviour by reminding people of their previous pro-environmental actions in a similar way as Cornelissen et al. (2008); research showed that this manipulation indeed influences environmental self-identity (Van der Werff et al., 2014). The manipulation of previous pro-

Table 1
Means and standard deviations of the frequency and environmentally-friendliness of behaviours reflecting different types of environmental behaviours and of behaviours reflecting one basic type of environmental behaviour included in the manipulation of Study 1.

8 Behaviours reflecting different types of behaviour	Frequency		Environmentally-friendliness		8 Behaviours reflecting one basic type of behaviour	Frequency		Environmentally-friendliness	
	M	SD	M	SD		M	SD	M	SD
I often go to work or studies by bike instead of by car	5.10	2.53	6.64	.94	I turn electrical devices off instead of putting them on standby (to save energy)	4.44	1.86	5.74	1.26
I bring glass bottles to the recycling bin	6.16	1.71	5.96	1.16	I turn the heater off when I go to bed	6.30	1.22	6.36	1.01
I do not throw litter on the street	6.34	1.08	5.89	1.39	I turn the lights off in a room where nobody is present	6.08	1.18	6.09	1.10
I turn off electrical appliances (to save energy)	4.44	1.86	5.74	1.26	I turn my laptop or computer off at night, instead of leaving it on standby	6.02	1.55	5.96	1.20
I separate paper from my waste	5.40	1.85	5.91	1.28	I turn the television off when I'm not watching it	6.14	1.29	6.04	1.22
I turn off the heater when I leave my room	6.10	1.23	6.30	1.04	I disconnect the plug of my charger from the power point when I'm not charging my phone	5.38	2.07	5.66	1.19
I use energy-efficient light bulbs	5.50	1.61	6.21	1.10	I turn the DVD player off instead of putting it on standby when I'm not using it	5.50	2.17	5.72	1.23
I turn off the lights when no one is in the room	6.08	1.18	6.09	1.10	I turn down the thermostat when I leave home	6.10	1.23	6.30	1.04
Overall	5.64	1.08	6.09	.97	Overall	5.74	1.02	5.98	.99

environmental actions involved participants indicating on a scale from 1 (totally disagree) to 7 (totally agree) how often they performed the pro-environmental behaviours. One quarter indicated how often they perform the eight behaviours reflecting different types of pro-environmental behaviour ($M = 5.17$, $SD = .91$), one quarter indicated how often they perform the eight behaviours reflecting one basic type of behaviour ($M = 4.96$, $SD = 1.12$), one quarter indicated how often they perform one pro-environmental behaviour (i.e., buying organic products; $M = 4.06$, $SD = 1.82$), and finally one quarter indicated how often they performed eight behaviours which are not related to the environment (e.g., 'read the newspaper'; $M = 3.45$, $SD = .79$); this is our control condition.

2.1.3. Measures

2.1.3.1. Environmental self-identity. We measured environmental self-identity with three items: Acting pro-environmentally is an important part of who I am; I am the type of person who acts in an environmentally-friendly way; I see myself as an environmentally-friendly person. These items were adapted from previous research and proved to be a valid measure (e.g., Fielding, McDonald, & Louis, 2008; Terry, Hogg, & White, 1999; Van der Werff et al., 2013, 2014). Respondents rated each item on a seven point scale, ranging from *totally disagree* to *totally agree*. We computed the mean score on these items; Cronbach's alpha for this scale was .88 ($M = 4.11$, $SD = 1.33$).

2.1.3.2. Preference for sustainable products. Respondents were asked to indicate their preference for one out of two options of a product (see Van der Werff et al., 2013). One option of the product was a sustainable choice, which was 10% more expensive than the other, unsustainable, option. The sustainable choice was more expensive to mirror real life choices. In total eight choices were offered. Respondents indicated for a pair of jeans, milk, a laptop, a pen, a writing pad, a bicycle, a pair of socks and a mobile phone if they would choose the sustainable or the unsustainable option. For example, participants chose between a pair of socks of 3 Euros which was produced in an unsustainable way and a pair of socks of 3.30 Euros which was produced sustainably. We counted the number of times respondents preferred the sustainable option ($M = 3.71$, $SD = 2.28$).

2.2. Results

25 Participants had missing data,¹ we removed them from the dataset as these participants are likely to have completed the questionnaire less seriously (because the questionnaire was very short including only questions on the main topics of interest). As expected, Analysis of Variance revealed that the manipulation influenced environmental self-identity ($F(3,238) = 3.61$, $p = .01$, $\eta_p^2 = .04$). Subsequent specific contrasts revealed that participants who were reminded of eight behaviours reflecting different types of behaviour ($M = 4.53$, $SD = 1.17$) indeed had a significantly stronger environmental self-identity than participants in the control group ($M = 4.08$, $SD = 1.38$; $t(238) = -2.01$, $p < .05$, $d = .35^2$). As expected, environmental self-identity of participants who were reminded of eight behaviours reflecting one basic type of behaviour ($M = 4.24$, $SD = 1.36$; $t(238) = -.64$, $p = .52$) and of one behaviour ($M = 3.80$, $SD = 1.32$; $t(238) = 1.23$, $p = .22$) did not differ significantly from the control group. Furthermore, we found that participants who were reminded of eight behaviours reflecting different types of behaviour also had a stronger environmental self-identity than participants who were reminded of one behaviour ($t(238) = -3.22$, $p < .01$, $d = .59$). There were no other significant differences between the groups (all $ps > .10$).³

The manipulation did not have an effect on product preference ($F(3, 238) = 1.22$, $p = .30$). However, as expected, environmental self-identity was related to product preference after controlling for the manipulation ($F(4, 237) = 11.27$, $p < .001$). The stronger environmental self-identity, the more sustainable products participants preferred ($\beta = .39$, $p < .001$).

As the independent variable does not need to predict the dependent variable in order to test mediation (Shrout & Bolger,

¹ The results of Little's Missing Completely at Random Test (MCAR) suggest that the data was missing at random ($\chi^2(41) = 51.42$, $p = .13$).

² When we conducted a conservative test of our hypotheses, including all participants in our analyses, including those with missing data, this contrast was marginally significant ($t(260) = 1.79$, $p = .07$, $d = .30$).

³ In all conditions the relationship between the endorsement of the behaviours of the manipulation and environmental self-identity was positive and significant (Eight different behaviours: $r = .43$, $p < .001$; eight similar behaviours: $r = .69$, $p < .001$; one behaviour: $r = .49$, $p < .001$), suggesting that past pro-environmental actions are more likely to strengthen environmental self-identity when people often engage in these actions.

2002; Zhao, Lynch, & Chen, 2010), we then tested if environmental self-identity mediates the relationship between the manipulation and product preference. We conducted mediation analysis for multicategorical independent variables (Hayes & Preacher, *in press*). We used stratified bootstrap sampling because the four groups did not comprise an equal number of participants. Dummy coding was used in which all experimental groups were compared one by one with the control group. As there needs to be a significant relationship between the independent variable and the mediator to be able to test mediation effects, we only tested the dummy variable in which the group that was reminded of eight behaviours reflecting different types of behaviour was compared to the control group, because this was the only group that significantly differed from the control group in the strength of environmental self-identity. The mean indirect effect from the bootstrap analysis of this dummy variable was positive and significant ($a \times b = .30$). The 95% confidence interval ranged from .029 to .635, and thus does not include 0.⁴ In the indirect path a unit increase in the dummy variable (comparing the group that was reminded of eight different behaviours with the control group) increases environmental self-identity by $a = .45$. Holding the dummy variable constant, a unit increase in environmental self-identity increases product preference by $b = .66$. The direct effect c ($-.33$) is not significant ($p = .36$), therefore it is an indirect-only mediation (Zhao et al., 2010). Hence, we found that reminding people of a range of different previous pro-environmental behaviours influenced environmental self-identity, which was in turn related to product preferences.

2.3. Discussion

Study 1 showed that reminding people of their past pro-environmental actions can strengthen one's environmental self-identity, but that this is particularly likely when the initial behaviour has a stronger signalling function, thus being more indicative of who you are. In line with our expectations, we found that when people are reminded of a range of different past pro-environmental actions, environmental self-identity was strengthened compared to the control group. In contrast, when participants were reminded of a range of very similar pro-environmental behaviours, or of a single action, environmental self-identity was not significantly stronger compared to the control group. Apparently, the signalling strength of the range of very similar actions and of the single action was too weak to significantly strengthen environmental self-identity.

Next, in line with our hypothesis, we found that environmental self-identity was in turn related to preferences for sustainable products. The stronger one's environmental self-identity, the more strongly one preferred sustainable products. Also, as expected, environmental self-identity mediated the relationship between the manipulation and product preference. Our results thus suggest that reminding people of a variety of eight past pro-environmental behaviours strengthens one's environmental self-identity, which is in turn related to preferences of environmentally-friendly products. We found indirect only mediation, as there was no direct effect of our manipulation on product preference. The relatively weak effect of the manipulation on environmental self-identity and the non-significant effect on product preferences may be due to the influence of values. As argued earlier, environmental self-identity not only depends on previous actions, but also

on one's (rather stable) values, which implies that environmental self-identity will only change to some extent when people are reminded of their previous pro-environmental actions (Van der Werff et al., 2013, 2014). Previous actions thus need to have a high signalling strength to influence environmental self-identity and subsequent behaviour. In addition, our manipulation was still relatively weak, we only reminded people of their past pro-environmental actions. A stronger manipulation in which people are actually persuaded to perform pro-environmental behaviour or in which they perform environmentally-friendly actions over a longer period of time may have stronger effects on environmental self-identity and subsequent behaviour. Future research is needed to test this. Also, it may be that our measure of environmental self-identity influenced the results. For example, participants answered the environmental self-identity items in line with the manipulation, but perhaps participants in the control group (after indicating that they have a relatively low environmental self-identity) may have become motivated to express their environmentally-friendly preferences. Research indeed suggests that measuring environmental self-identity as the first dependent variable may influence the effects of the manipulation of previous behaviour on subsequent preferences (Van der Werff et al., 2014). This is thus an important issue to take into account in future research.

Study 1 thus showed that reminding people of a range of eight very similar pro-environmental actions, or of one pro-environmental action may not have a strong signalling function, and consequently, not significantly strengthen one's environmental self-identity and thereby lead to more environmentally-friendly behaviour. Although we selected a single action that was not too easy, this action did not significantly strengthen environmental self-identity. Perhaps this behaviour was not difficult enough to strengthen environmental self-identity, or maybe one signalling feature (i.e., difficulty) is not sufficient to strengthen environmental self-identity. Probably, other signalling features need to be present as well, such as the behaviour being difficult as well as unique, in order to strengthen one's environmental self-identity. Therefore, we designed Study 2 to test under which circumstances a single action may have a clear signalling function as well.

3. Study 2 – effects of uniqueness and difficulty of a single action on environmental self-identity

The aim of Study 2 was to test if engagement in a single pro-environmental behaviour may strengthen one's environmental self-identity, and thereby promote subsequent environmentally-friendly preferences. We hypothesised that this may be the case when the signalling strength of the relevant behaviour is high enough, making the behaviour indeed signal who you are. We tested whether the signalling strength of previous pro-environmental actions may be sufficient to change environmental self-identity when the behaviour is difficult and/or unique. We expected an interaction effect in which environmental self-identity is strengthened most when the behaviour is difficult and unique compared to when only one of these or none of these conditions is fulfilled. When the behaviour is only difficult or only unique we expected environmental self-identity to be stronger than when it is not unique and easy. Furthermore, we again expected that a strong environmental self-identity will in turn be related to pro-environmental preferences and mediate the relationship between the manipulation and subsequent pro-environmental preferences. Hence, we tested if the relationship between the manipulation and product preference would be mediated by environmental self-identity; we only tested this mediation effect if the manipulation indeed affected environmental self-identity of the groups that were reminded of previous difficult and/or unique behaviour.

⁴ Again, if we ran the same analyses including the participants with missing data, the indirect effect becomes marginally significant. The 95% confidence interval including the participants with missing data ranged from $-.009$ to $.580$, and thus includes 0. The 90% bootstrap confidence interval ranged from $.032$ to $.527$ and does not include 0.

3.1. Method

3.1.1. Participants and procedure

Respondents were undergraduates at a Dutch university who participated in exchange for course credits. In total 157 respondents participated in the study, of which 103 were female, 19 participants did not indicate their gender. Age ranged from 18 to 33 ($M = 20.7$, $SD = 1.84$).

3.1.2. Materials

3.1.2.1. Manipulation of previous behaviour. We presented the participants with one out of four scenarios, and asked them to imagine that they work at a company and just bought an electric car. We selected the purchase of an electric vehicle as this behaviour may already be more likely to strengthen environmental self-identity, because it is relatively difficult and can have a substantial environmental impact. A pro-environmental action that has an important environmental impact may be more likely to strengthen environmental self-identity than an action with a weak environmental impact. The experiment followed a 2×2 design in which we manipulated the difficulty and uniqueness of this pro-environmental action. First, for half of the participants we indicated that buying an electric car was relatively easy, because the company where they work had a special arrangement and took care of everything. For the other half we indicated that buying an electric car was relatively difficult, because they had to figure out and arrange everything themselves. Second, for half of the participants, it was indicated that only few people drive an electric car, and for the other half it was indicated that most of their colleagues drive an electric car. Below is an example of the scenario in which the behaviour was difficult and unique and of the scenario in which the behaviour was not difficult and not unique:

'Imagine that you work at a company and need a car to get to work every day. You bought an electric car. You spent a lot of time figuring out which electric car was most environmentally-friendly. The car was much more expensive than a regular car, and it is not likely that you will recover the costs. Only few people buy an electric car.'

'Imagine that you work at a company and need a car to get to work every day. You bought an electric car. At work there was a special arrangement. They figured out which electric car was best for you, and arranged everything with the car dealer, you did not have to do anything. The car was not more expensive than a regular car. Most of the people at work drive an electric car.'

3.1.3. Measures

3.1.3.1. Environmental self-identity. Environmental self-identity was measured with the same items as in Study 1. The items formed a reliable scale ($\alpha = .91$, $M = 4.79$, $SD = 1.34$).

3.1.3.2. Preference for sustainable products. Preference for sustainable products was measured in the same way as in Study 1. On average participants chose 5.15 sustainable products ($SD = 2.20$).

3.2. Results

There was no main effect of difficulty of the initial behaviour on environmental self-identity ($F(1, 153) = .29$, $p = .59$). We also did not find a main effect of uniqueness of the initial behaviour on environmental self-identity ($F(1, 153) = .09$, $p = .77$). However, we did find a significant interaction effect ($F(1, 153) = 9.65$, $p < .01$). More specifically, in line with our expectations, specific contrasts showed that environmental self-identity was stronger when the

initial behaviour was unique and difficult ($M = 5.09$, $SD = 1.37$) compared to when it was only difficult, but not unique ($M = 4.38$, $SD = 1.38$, $t(153) = 2.40$, $p = .02$, $d = .52$) and marginally stronger compared to when it was only unique but not difficult ($M = 4.56$, $SD = 1.40$; $t(153) = 1.82$, $p = .07$, $d = .38$; see Fig. 1). Unexpectedly, however, we did not find a difference in environmental self-identity between the groups that were presented with the scenario with strong signalling features (when the initial behaviour was unique and difficult) or weak signalling features (when it was not unique and easy; $M = 5.15$, $SD = 1.04$; $t(153) = -.17$, $p = .86$).

There was no main effect of difficulty of the initial behaviour on product preference ($F(1, 153) = .89$, $p = .35$) and of uniqueness of the initial behaviour on product preference ($F(1, 153) = .20$, $p = .65$). Again, we found a significant interaction effect ($F(1, 153) = 3.90$, $p = .05$). When the behaviour in the scenario had strong signalling features people expressed stronger preference for sustainable products compared to when the scenario contained weak signalling features. Specific contrasts revealed that when the behaviour was unique and difficult, participants had a stronger preference for sustainable products ($M = 5.74$, $SD = 2.14$) than when it was unique but easy to do so ($M = 4.73$, $SD = 2.39$, $t(153) = 2.07$, $p = .04$, $d = .45$). Also, participants had a slightly stronger preference for sustainable products if the behaviour in the scenario was unique and difficult compared to when it was not unique and difficult ($M = 4.90$, $SD = 2.46$; $t(153) = 1.71$, $p = .09$). Again, unexpectedly, there was no difference in preference for sustainable products when the initial behaviour was unique and difficult compared to when it was not unique and easy ($M = 5.26$, $SD = 1.67$; $t(153) = .99$, $p = .33$).

As expected, environmental self-identity was related to product preference after controlling for the manipulation ($F(4, 152) = 8.49$, $p < .001$). The stronger the environmental self-identity, the more sustainable products participants preferred ($\beta = .40$, $p < .001$). Next, we tested if the effect of the manipulation on product preference was mediated by environmental self-identity. We used dummy coding in which we compared the scenario in which it was difficult and unique to buy an electric car to all other scenarios. We only tested mediation effects for the scenarios that yielded significant differences in environmental self-identity compared to the scenario in which the initial behaviour was described as difficult and unique. Hence, we compared the scenario depicting the initial behaviour as difficult and unique to the scenarios in which the behaviour was difficult but not unique and to the scenario in which the behaviour was unique but not difficult, respectively. When the scenario in which buying an electric car was difficult and unique was compared to the scenario in which it was difficult but not unique, we found that the mean indirect effect from the bootstrap analysis

Fig. 1. Average score on environmental self-identity.

was negative and significant ($a \times b = -.47$), with the 95% bootstrap confidence interval ranging from $-.974$ to $-.096$. In the indirect path a unit increase in the dummy variable (indicating that the behaviour in the scenario changes from difficult and unique behaviour to difficult but not unique) decreased environmental self-identity by $.71$ ($a = -.71$). Holding the dummy variable constant, a unit increase in environmental self-identity increased product preference by $.66$ ($b = .66$). The direct effect is marginally significant ($c = -.85$, $p = .09$), suggesting that holding environmental self-identity constant, a unit increase in the dummy variable (indicating that the behaviour in the scenario changes from difficult and unique to difficult but not unique) decreased the preference for sustainable products by $.85$. Since $a \times b \times c$ is positive ($.40$) it is a complementary mediation (Zhao et al., 2010). This indicates that in this case, environmental self-identity indeed mediated the relationship between the manipulation and sustainable product preference, but that there may be other mediators as well. When the scenario in which buying an electric car was difficult and unique was compared to the scenario in which it was unique but not difficult, the mean indirect effect from the bootstrap analysis was positive and marginally significant ($a \times b = .40$). The 95% bootstrap confidence interval ranged from $-.008$ to $.970$, and thus included 0, while the 90% bootstrap confidence interval ranged from $.081$ to $.894$, which suggests a marginal significant effect. In the indirect path, a unit increase in the dummy variable (indicating that the behaviour in the scenario changes from difficult and unique behaviour to unique but easy) decreased environmental self-identity by $.54$ ($a = -.54$). Holding the dummy variable constant, a unit increase in environmental self-identity increased sustainable product preference by $.75$ ($b = .75$). The direct effect was significant ($c = -1.02$, $p = .04$), meaning that holding environmental self-identity constant, a unit increase in the dummy variable (indicating that the behaviour in the scenario changes from difficult and unique to unique but not difficult) decreased the preference for sustainable products by 1.02 . Since $a \times b \times c$ is positive ($.41$) it is a complementary mediation, indicating that, again, environmental self-identity indeed mediated the relationship between the manipulation and product preference, but there may be other mediators as well.

3.3. Discussion

In Study 2 we found that environmental self-identity and preference for sustainable products is indeed stronger when the behaviour in a scenario has strong signalling features. More specifically, we found that environmental self-identity was stronger and people had stronger preferences for sustainable products when the past action was difficult and unique than when this action was difficult but not unique and compared to the situation where the action was unique but easy, supporting our hypothesis. This suggests that behaviour with weak signalling features does not significantly strengthen environmental self-identity, and that strong signalling features are needed to substantially strengthen environmental self-identity. However, interestingly, participants who read the scenario in which the past behaviour was difficult and unique did not have a stronger environmental self-identity and were not more likely to prefer sustainable products than participants who read the scenario that the past behaviour was easy and not unique. Perhaps this result is due to a contrast effect: if everyone does it and it is easy you need to show in another way that you are an environmentally-friendly person, for example by indicating that you are an environmentally-friendly person, which would be expressed in a stronger environmental self-identity. Hence, when the signalling strength of behaviour is weak, a contrast effect may occur, as people may be motivated to express

that they are a pro-environmental person. Alternatively, the fact that your company arranged an electric car for you, and most of your colleagues drive an electric car may signal that the group to which you belong is very environmentally-friendly, and therefore you may also see yourself more strongly as an environmentally-friendly person. If this reasoning is true, this would imply that next to past behaviour and values, other variables (such as social identity or strong social norms) may also influence one's environmental self-identity. Future research is needed to explicitly test these explanations. In order to get more insight into the results of Study 2, we conducted Study 2b in which we examined the signalling strength of the different behaviours included in the scenarios in Study 2, as to test whether the behaviour that is easy and not unique indeed has a weak signalling function, as we expected.

Furthermore, as expected, we found that a stronger environmental self-identity was in turn related to stronger environmentally-friendly preferences. Importantly, as hypothesised, we found that environmental self-identity mediated the relationship between the manipulation and product preference, when we compared the behaviour that was difficult as well as unique to the behaviour that was only difficult or only unique. We found complementary mediation, suggesting that there may be other variables mediating the relationship between past behaviour and product preference as well. For example, when people realised that they have performed a pro-environmental action in the past, this may also strengthen their sense of efficacy to perform other pro-environmental actions in the future, thereby increasing the likelihood to engage in these actions. Future research is needed to test whether self-efficacy or other variables also mediate the relationship between past environmental behaviour and future environmental actions.

4. Study 2b – signalling strength of the behaviour

The aim of Study 2b was to provide more insight into the results of Study 2. That is, why the scenario in which the initial behaviour was difficult and unique was not related to a stronger environmental self-identity and sustainable product preference compared to the scenario in which the initial behaviour was easy and not unique. More specifically, we aimed to test whether the signalling strength of the initial behaviour varied in the expected way. For this purpose, we tested the signalling strength of behaviour varying in difficulty and uniqueness by presenting the same scenarios as in Study 2, but this time we described the behaviour of another person (rather than behaviour of the participant). We hypothesised that participants would be more likely to see another person as an environmentally-friendly person when he or she performed a difficult and unique pro-environmental behaviour. We expected that the person would be seen as less environmentally-friendly when the behaviour was only difficult and not unique or only unique and not difficult. Finally, we expected that another person would be perceived as least environmentally-friendly when that person performed a pro-environmental action which was not difficult and not unique.

4.1. Method

4.1.1. Participants and procedure

Respondents were undergraduates at a Dutch university who voluntarily participated in the study as part of a course. In total 103 respondents participated in the study, of which 94 filled in the complete study. We only included these participants in the analyses. In total 78 participants were female, 16 were male. Age ranged from 18 to 31 ($M = 21.6$, $SD = 2.39$).

4.1.2. Materials

4.1.2.1. Manipulation. We presented participants with the same scenarios as in Study 2, only now the scenarios focused on another person: Peter. The scenarios described that Peter had just bought an electric vehicle. As in Study 2, the experiment again followed a 2*2 design: in half of the scenarios it was relatively easy for Peter to buy an electric vehicle as his company arranged everything, for the other half it was indicated that it was difficult for Peter to buy an electric car because he had to arrange everything himself. Also, in half of the scenarios it was indicated that few people drive an electric car, and for the other half it was indicated that most of Peter his colleagues drive an electric car. Each participant was presented with one of the four scenarios.

4.1.3. Measures

4.1.3.1. Signalling strength. We measured the signalling strength of the behaviour by asking participants how environmentally-friendly they perceive Peter. These items were similar to the measure of environmental self-identity only now the items focused on Peter. We used three items (Peter is the type of person who acts in an environmentally-friendly way; Acting environmentally-friendly is an important part of who Peter is; I see Peter as an environmentally-friendly person). The items formed a reliable scale ($\alpha = .95$, $M = 4.79$, $SD = 1.48$).

4.2. Results

There was a main effect of difficulty of the initial behaviour on signalling strength ($F(1, 90) = 52.79$, $p < .001$). Participants rated Peter as more environmentally-friendly when the behaviour was difficult ($M = 5.65$, $SD = 1.10$) than when it was easy ($M = 3.94$, $SD = 1.31$, $t(92) = -6.82$, $p < .001$, $d = 1.41$). We also found a main effect of uniqueness of the behaviour on signalling strength ($F(1, 90) = 7.03$, $p < .01$). Participants rated Peter as more environmentally-friendly when the behaviour was unique ($M = 5.12$, $SD = 1.65$) than when it was not unique ($M = 4.47$, $SD = 1.22$, $t(92) = 2.18$, $p = .03$, $d = .45$). In addition, we found a significant interaction effect ($F(1, 90) = 9.17$, $p < .01$). When the initial behaviour had strong signalling features, Peter was more strongly seen as an environmentally-friendly person compared to when the behaviour had weak signalling features (see Fig. 2). Specific contrasts revealed that when the initial behaviour was unique and difficult, Peter was seen as more environmentally-friendly ($M = 6.29$, $SD = .45$) than when it was difficult but not unique ($M = 4.97$, $SD = 1.18$, $t(90) = 4.02$, $p < .001$, $d = 1.48$), unique but easy ($M = 3.90$, $SD = 1.55$, $t(90) = 7.28$, $p < .001$, $d = 2.09$) and easy and not unique ($M = 3.99$, $SD = 1.06$, $t(90) = 7.09$, $p < .01$, $d = 2.82$). Also, Peter was seen as more environmentally-friendly if his behaviour was difficult but not unique compared to when it was unique but easy ($t(90) = 3.23$, $p < .01$, $d = .78$) and when it was easy and not unique ($t(90) = 3.00$, $p < .01$, $d = .87$). Finally, there was no difference in the perceived environmentally-friendliness of Peter when the initial behaviour was easy and unique compared to when it was easy and not unique ($t(90) = -.27$, $p = .79$).

4.3. Discussion

In Study 2b we found that the signalling strength of past behaviour was stronger when the behaviour had strong signalling features compared to weak signalling features. This suggests that, in line with our expectations, the signalling strength of the behaviour in the scenario in which someone bought an electric vehicle and it was easy (because the company arranged everything) and not unique (because many colleagues drive an electric vehicle) was weak indeed.

Fig. 2. Average score on environmental self-identity of Peter.

5. General discussion

We tested under which circumstances past behaviour is most likely to strengthen one's environmental self-identity, and how identity is in turn related to pro-environmental preferences. Research suggests that past pro-environmental actions may promote subsequent environmentally-friendly behaviour (Cornelissen et al., 2008; Thøgersen & Ölander, 2003), but may also inhibit subsequent pro-environmental actions (Mazar & Zhong, 2010; Thøgersen & Ölander, 2003). We proposed that past pro-environmental behaviour will particularly promote subsequent environmentally-friendly behaviour if it strengthens environmental self-identity. Reminding people of their past pro-environmental behaviour can strengthen environmental self-identity (Van der Werff et al., 2014). However, this may not always be the case. As environmental self-identity also depends on values, and is thus stable to a certain extent, we argued that past behaviour needs to imply something about the person performing the behaviour in order to strengthen environmental self-identity. On the basis of attribution theory (Kelley & Michela, 1980) and self-perception theory (Bem, 1972), we proposed that past pro-environmental actions will strengthen environmental self-identity to a larger extent when this behaviour is more indicative of who you are. We proposed that this is more likely to be the case when the initial behaviour concerns a range of rather different pro-environmental behaviours, or when a single initial pro-environmental behaviour is rather difficult and/or unique.

We indeed found that environmental self-identity was stronger when the signalling strength of the initial pro-environmental behaviour(s) was strong, that is, when it concerned a range of different behaviours or when the behaviour was unique and difficult. Interestingly, we did not find main effects of the single signalling features in Study 2, suggesting that these features alone were too weak to strengthen one's identity. However, in contrast to our expectation, we found that the scenario including strong signalling features had the same effect on environmental self-identity as the scenario with weak signalling features. Study 2b suggests that this effect was probably not due to the fact that behaviour that is easy and not unique has a strong signalling function as well, as we found that when the easy and not unique behaviour was performed by another person, people inferred that this person was not very pro-environmental, supporting our reasoning that this scenario does not signal that one is a pro-environmental person.

As the signalling strength of the easy and not unique behaviour was indeed weak, the unexpected results of Study 2 may be due to a different process. After reading that you have engaged in a pro-environmental action that was easy and most people did it too, you may become motivated to indicate that you are

environmentally-friendly in another way, which was reflected in a stronger environmental self-identity and a stronger preference for sustainable products. Future research is needed to test this. Also, reading that most of your colleagues act pro-environmentally and that your company stimulates pro-environmental actions may have conveyed a strong social norm to act pro-environmentally, which in turn may motivate you to more strongly prefer sustainable products. This implies that the information in the scenario affected product preferences via a different (social norm) route, in which case environmental self-identity does not play a role as a process variable. One explanation is that when a behaviour is unique it signals that one is a pro-environmental person, thereby strengthening environmental self-identity, and promoting subsequent pro-environmental preferences and behaviour. Another explanation is that when a behaviour is not unique it signals that there is a strong social norm to engage in pro-environmental behaviour, thereby promoting pro-environmental behaviour. Therefore, an important question for future research is to study under which circumstances uniqueness of the behaviour is more likely to influence environmental self-identity and under which circumstances it is more likely to influence behaviour via social norms.

Our findings are a first indication of the conditions under which past pro-environmental actions may influence environmental self-identity. Future research could further test whether the effects on environmental self-identity are indeed due to the signalling strength of the initial behaviours, for example by directly measuring the signalling strength of different pro-environmental behaviours as to test whether this depends on the number of behaviours. Also, future research could test which pro-environmental behaviours are most likely to strengthen environmental self-identity. For example, the fact that it was indicated in the manipulation of Study 1 that the single behaviour is performed 'sometimes' may have weakened the signalling strength of this action; future research should test if the signalling strength is stronger when 'sometimes' is left out. Also, future research could test if any of the behaviours from the eight different behaviours condition in Study 1, which strengthened environmental self-identity, could strengthen environmental self-identity by itself. Furthermore, future research could study whether other factors may also strengthen the signalling function of past pro-environmental actions, thereby strengthening environmental self-identity. For example, the signalling strength may also depend on whether the behaviour was performed autonomously or not. If someone freely chose to perform a pro-environmental behaviour, the behaviour may be more likely attributed to internal factors, hence environmental self-identity may be strengthened more than when people were more or less forced to act pro-environmentally. The level of conceptual abstraction of past behaviour (the extent to which past behaviours are conceptualised on an abstract or concrete level) may also influence the signalling function. For example, research on moral behaviour suggests that participants who recalled a temporally distant abstract moral behaviour acted morally on a subsequent task, while participants who recalled a recent concrete moral behaviour acted immorally on a subsequent task (Conway & Peetz, 2012). Also, the environmental impact of pro-environmental behaviour may influence the signalling strength of past behaviour. Behaviour with a significant environmental impact (such as buying an electric vehicle) may more strongly signal that someone is the type of person who acts in an environmentally-friendly way than behaviour that hardly influences environmental quality. Future research is needed to test whether these and other factors influence the signalling strength of pro-environmental actions, and thereby influence environmental self-identity.

Interestingly, we found much stronger effects of the manipulation of past behaviour on the extent to which participants see another person as environmentally-friendly than on how

environmentally-friendly they see themselves, as reflected by the larger effect sizes reported in Study 2b compared to Study 2. This is probably due to the fact that environmental self-identity not only depends on previous actions, but also on one's values, which implies that environmental self-identity will only change to some extent when people are reminded of their previous pro-environmental actions (Van der Werff et al., 2013, 2014). In contrast, people had no clue of the values of Peter, so they had to rely on his initial behaviour when inferring Peter's environmental self-identity.

In both studies we found that a strong environmental self-identity in turn predicted subsequent pro-environmental actions. Indeed, both studies revealed that the stronger one's environmental self-identity, the stronger one's preference for sustainable products. This is in line with research showing that environmental self-identity predicts pro-environmental behaviour (Gatersleben et al., 2012; Van der Werff et al., 2013, 2014; Whitmarsh & O'Neill, 2010). More importantly, we also found support for our prediction that environmental self-identity mediates the relationship between past pro-environmental actions and subsequent pro-environmental preferences. Environmental self-identity thus seems to be a process through which initial pro-environmental actions may spill over to subsequent pro-environmental preferences and behaviour. The results of the mediation analysis in Study 2 suggest that there may be other variables that mediate this relationship as well. Future research should test which other variables, for example self-efficacy, may also explain why environmentally-friendly behaviour spills over to other pro-environmental actions.

Studies found that past pro-environmental actions may inhibit as well as promote subsequent environmentally-friendly behaviour. Our results may provide more insight into these inconclusive results of earlier studies. Our findings suggest that studies that demonstrated that moral or pro-environmental actions may inhibit subsequent environmentally-friendly behaviour may be due to the fact that the initial behaviours did not strongly signal that one is a pro-environmental person, and thus did not result in a strengthened environmental self-identity. For example, in the study by Mazar and Zhong (2010) pro-environmental behaviour was not performed autonomously, but participants had no other choice than to engage in pro-environmental behaviour (select green products). When one does not freely choose to perform the pro-environmental action the behaviour may not have a strong signalling function and thereby not lead to subsequent pro-environmental or moral behaviour. Future research is needed to test if licensing in the environmental domain is indeed less likely to occur when the initial behaviour signals who you are and has clear implications for your environmental self-identity. Although many studies argued that licensing effects are due to effects of previous 'good' conduct on self-image, there is often no empirical evidence to substantiate this reasoning. Additionally, the way identity or self-image has been measured in different studies may play a role in finding licensing or positive spill-over. Some studies that found moral licensing effects in other domains included a measure of one's traits reflecting a broad domain (e.g., I am warm, compassionate; Khan & Dahr, 2006; Cornelissen, Bashshur, Rode, & Le Menestrel, 2013); such broad traits are likely to be less strongly related to specific actions than a domain specific self-identity (such as environmental self-identity). Also, in one study one's current identity was compared to one's ideal self (Cornelissen et al., 2013), which may yield different results. Furthermore, some studies included dependent variables that did not reflect a moral choice (Khan & Dahr, 2006). Hence, a moral view of oneself is not likely to be related to this choice. Future research is needed to test if these factors indeed influence licensing or positive spill-over effects.

Our findings suggest that in order to promote environmentally-friendly actions, campaigns should focus on the pro-environmental

actions that people already perform. For example, campaigns could stress engagement in a range of different common pro-environmental behaviours, such as bringing glass bottles to the recycling bin or separating paper from the regular waste. This could for example be done by raising the questions: 'Do you sometimes bring your glass bottles to the bin?', 'Do you sometimes go by bike instead of by car?' on a billboard or in a commercial. Also, signs thanking people for their pro-environmental behaviour could be placed close to where people actually perform a pro-environmental behaviour, for example on recycling bins or on the cycling lane. The stronger the signalling function of these behaviours, the more likely it is that it will strengthen people's environmental self-identity and thereby lead to subsequent pro-environmental actions. Therefore, it may not be enough if campaigns stress, for example, one easy pro-environmental action, as a single action may only strengthen one's environmental self-identity and lead to more pro-environmental behaviour when the behaviour has a strong signalling function. Hence, campaigns should focus on, for example, a range of rather different pro-environmental actions or on single actions that have strong signalling features. For example, via tailored messages a range of different past behaviours that that person has performed can be stressed or a single past behaviour that was, for example, difficult as well as unique, as this is likely to increase the signalling strength of the behaviour, thereby strengthening environmental self-identity and promoting subsequent pro-environmental choices. Future research is needed to test if campaigns that stress pro-environmental behaviours that signal who you are indeed promote subsequent environmentally-friendly behaviour via one's environmental self-identity.

In sum, we studied the relationship between the signalling strength of past pro-environmental actions, environmental self-identity and subsequent environmental preferences. Our results showed that past pro-environmental actions can strengthen environmental self-identity and thereby promote subsequent environmentally-friendly preferences, and that this is particularly likely when the past actions have a strong signalling function, that is, when it concerns a range of different pro-environmental behaviours, or a single action that is difficult and unique.

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