

# Should we talk (more) about climate change when promoting energy conservation? An intervention in Swiss households

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## ABSTRACT

To encourage energy conservation, some interventions refer to abstract, large-scale, and complex phenomena (e.g., climate change), while others rely on concrete actions (e.g., changing light bulbs) and consequences (e.g., saving money). Some also combine both. Mostly conducted in non-applied settings, existing studies that compare the impact of abstract vs. concrete pro-environmental interventions have yielded mixed results. Moreover, they have not documented the potential advantage, in the long term, of adding abstract information to an existing concrete intervention. With this goal in mind, we joined an intervention in which households of two neighbourhoods ( $N = 177$ ) participated in an energy conservation programme encouraging and facilitating concrete energy-conserving behaviours. We randomly assigned about half of the households to a concrete-only condition (the basic intervention) and half to a condition in which we also provided abstract environmental information. Results showed that an abstract message added to a concrete intervention successfully increased the amount of attention households reported paying to energy consumption six months after the intervention, compared to the concrete-only intervention. An abstract message also had an indirect impact on energy saving behaviours six months later, through increased biospheric (environmental) values. Taken together, these results suggest that low-level construal goals, such as everyday energy saving behaviours, should be accompanied by high-level construal goals, such as limiting climate change, to increase individuals' willingness to act for the environment.

## 1. Introduction

What is the best strategy to convince individuals to reduce their energy use? To encourage energy conservation, some interventions refer to abstract, large-scale, and complex phenomena (e.g., climate change), while others rely on concrete actions (e.g., changing light bulbs) and consequences (e.g., saving money). Some interventions even combine both types of messages. However, it remains unclear which type is most efficient. Indeed, research on pro-environmental behaviours (including energy conservation behaviours) comparing abstract, concrete and combined messages has yielded mixed results (e.g., Rabinovich et al., 2009; Moussaoui & Desrichard, 2016; Ejelöv et al., 2018; Griffioen et al., 2019; Wang et al., 2019). Moreover, some have argued that energy-related interventions that focus on short term and concrete (financial, for example) savings “fail to promote sustainable behaviour because they are designed to motivate egoistic considerations only” (De Groot & Steg, 2009; p.64; see also Corner et al., 2014). The potential advantage, in the long term, to add abstract information to a real concrete intervention thus remains yet to be documented. For this reason, in

the present research, we tested the impact of adding abstract information to an existing intervention based on concrete information and instructions. We also measured a set of two abstract social psychological variables (i.e., biospheric values and global identity), through which such an impact may operate.

## 2. Theoretical background

### 2.1. Abstract, concrete and combined messages

Objects, phenomena and activities can be mentally construed on a continuum from abstract (e.g., leisure) to concrete (e.g., playing football with two friends on a Sunday afternoon; Trope and Liberman, 2010). Due to its complex nature, climate change is generally seen as an abstract concept, which makes it psychologically distant from most individuals' everyday lives (for reviews, see McDonald et al., 2015; Maeilla et al., 2020; Keller et al., 2022). Using an experimental approach, Duan et al. (2019) for example found that when facing abstract portrayals of climate change (e.g., ice melting, rising

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temperatures), US participants saw climate change as more spatially and temporally distant than when facing more concrete images (e.g., containing people, portraying climatic consequences such as hurricanes).

Because concrete messages reduce the psychological distance between individuals and environmental issues, some authors have argued that concrete representations of either climate change consequences or the benefits of pro-environmental behaviours should be used to promote the latter (see for instance [Perga et al., 2023](#)). Empirical evidence on the impact of abstract vs. concrete pro-environmental messages is however mixed. For instance, [Moussaoui and Desrichard \(2016; Study 1 and Study 2\)](#) found that concrete messages (e.g., “I press the button to turn off my computer screen to save energy at the university”, p. 541) led students to adopt more pro-environmental behaviours than more abstract messages (“... to help phase out nuclear power in Switzerland”, p. 541). By way of contrast, in an online experiment carried out with a convenience sample, [Ejelöv et al. \(2018\)](#) showed that an abstract description of climate change consequence (e.g., sea rise, temperature increase) triggered an increase in participants’ willingness to change and repair the situation than a more concrete description (e.g., heat waves, flooding). Finally, [Wang et al. \(2019\)](#) found no significant differences in participants’ willingness to engage in pro-environmental behaviours and in actual donation behaviours when they were exposed to an abstract message (i.e., to make participants think about why they may want to use fewer plastic bags) or to a concrete message (i.e., how they may do it concretely).

Other authors have nevertheless argued that a combination of both abstract and concrete arguments would work best to promote pro-environmental behaviours. Whatever the goal in question, implementation intention theory ([Gollwitzer and Sheeran, 2006](#)) indeed suggests that behaviours related to abstract objectives should be combined with situated information (e.g., guidelines) describing how to implement them concretely. In line with this argument, [Rabinovich and colleagues \(2009\)](#) found that presenting an abstract goal (i.e., slowing down climate change) with a specific mindset (i.e., to think about three concrete ways to do so) was related to the highest level of environmental donation. However, other studies have suggested that combining different levels of construal may be difficult to process on the cognitive level. For instance, [Goldsmith et al. \(2016\)](#) found that participants in an abstract mindset (i.e., asked to think about their life in one year) expressed more difficulty to evaluate an eco-friendly product presented in a concrete way (i.e., with economic benefits highlighted), than to evaluate the same product when presented in an abstract way (i.e., with environmental benefits highlighted). Moreover, when there was a mismatch between the construal levels involved in the primed mindsets, they also expressed a lower willingness to use the eco-friendly product. Similar results were obtained in a field experiment conducted in Dutch student housing facilities, in which the impact of abstract vs. concrete messages on behaviours (water and electricity use) was measured ([Griffioen et al., 2019](#)). Again, participants’ mindset was manipulated (e.g., to think about why reducing water use is important in the abstract condition vs. how to do it in the concrete condition). Then, participants were asked to choose among charities to donate to (abstract) or among gifts to receive (concrete). Water use was more reduced in the “twice abstract” condition (i.e., concrete mindset and concrete behaviour). In a field experiment, [Ryoo et al. \(2017, Study 2\)](#) presented abstract (i.e., why use a reusable mug instead of a disposable cup) and concrete (i.e., how to do it) messages to customers of a coffeehouse chain in Korea, coupled with national (abstract) or local (concrete) norms. When an abstract message was used, reusable mugs were more often used in the presence of an abstract and more global (national) norm.

Whether combining abstract and concrete information increases pro-environmental behaviours compared to when only abstract or concrete information is provided thus remains an open question. Three shortcomings of the reviewed literature can be highlighted at this point. First, these studies were not conducted in applied settings, where concrete messages directly relate to important aspects of people’s lives. Second,

the impact of abstract and concrete messages was measured in the short term only. Third, and most importantly, although all the studies described above either compared the impact of abstract vs. concrete messages, or combined both, they also mixed constructs, namely goals, norms, mindsets, behaviours and values.

The present research sought to respond to these shortcomings. First, this research consisted of joining a neighbourhood-based applied intervention, in which concrete goals and instructions concerning how to perform pro-environmental behaviours were provided to households. Second, we measured the potential longer-term benefits of the intervention. Third, while the intervention with concrete goals was set as the baseline condition, we created an experimental abstract X concrete condition in which we added abstract goals (e.g., to mitigate climate change) to this baseline. We thus manipulated the abstract X concrete vs. concrete-only nature of the same construct: goals. Finally, to shed light on the reasons underpinning a potential longer-term impact of abstract goals, we explored two potential abstract social psychological mechanisms: biospheric values and global identity.

## 2.2. Theoretical hypotheses

Our literature review has concluded that the positive effect of combining abstract and concrete information on pro-environmental behaviours remains an open question. In the present study, however, we expect a positive effect of such a combination because we only manipulated goals. Indeed, implementation intention theory ([Gollwitzer and Sheeran, 2006](#)) explains that concrete goals are necessary to make abstract goals attainable, and abstract goals are necessary to provide direction to concrete goals. Thus, our first hypothesis is that a set of abstract and concrete goals should result in greater energy conservation than a condition with concrete goals only.

Climate change is a complex and abstract phenomenon (see [McDonald et al., 2015](#)). For this reason, abstract psychological processes play a major role in shaping how individuals perceive climate change and to what extent they engage in acts to mitigate it. In the present research, we focused on two abstract social psychological concepts known to predict pro-environmental behaviours (e.g., [de Groot and Steg, 2007; Klöckner, 2013; Reese, 2016](#)), that is, the extent to which individuals value the environment (biospheric values) and feel attached to and identify with the world or all of humanity (global identity).

First, a human value is defined as a “desirable transsituational goal varying in importance, which serves as a guiding principle in the life of a person or other social entity” ([Schwartz, 1992; p. 21](#)). As such, values do not entail representations of specific objects, people or places but more general representations that can apply to highly different situations. Due to their abstract nature, human values were shown to relate to outcomes that are depicted in an abstract manner. For instance, [Eyal et al. \(2009\)](#) found that values have a greater impact on how people plan their distant (and abstract) rather than their near (and concrete) future. Indeed, behaviours in situations that are seen or represented as concrete are to a greater extent influenced by contextual features, while behaviours in situations that are seen or represented as abstract are mostly driven by individuals’ values ([Ledgerwood et al., 2010](#)). When it comes to pro-environmental behaviours, biospheric values—that emphasize the environment and the biosphere ([de Groot and Steg, 2007](#))—were found to relate to individuals’ willingness to act in favour of the environment (e.g., [Fornara et al., 2016; Lind et al., 2015](#); for a review, see [Corner et al., 2014](#)) and their actual pro-environmental behaviours (beyond willingness; [Sarrasin et al., 2022](#)). Based on that, we make here the hypothesis that an abstract message should activate biospheric values and, in turn, relate to increased pro-environmental behaviours.

Second, global identity is defined as identification on the highest inclusive level, that is the whole world or humanity ([Reese, 2016](#)). Akin to biospheric values, a global identity has been repeatedly related to a stronger concern for the environment, and to more frequent pro-environmental behaviours (e.g., [Reysen and Katzarska-Miller, 2013](#);

Leung et al., 2015; Renger and Reese, 2017). One may argue that feeling generally attached to places, either local or global or both, may relate to a strong sense that (all) places must be protected. A sense of global attachment seems, however, to have a unique predictive power on pro-environmental behaviours. Individuals who express a "global over local attachment" have indeed been found to more likely engage in ecological behaviours (Devine-Wright et al., 2015; Walker et al., 2015). Presenting general and abstract information on climate change implies that the whole world is affected, which may then impact individuals' sense that they belong to all of humanity. Indeed, climate change implies interdependencies between places, generations and species. As argued by McDonald et al. (2015) in their review on the psychological distance of climate change, presenting environmental issues in a way that is too concrete may backfire, because a certain level of abstractness may in fact "encourage action if it led to more global, holistic perspectives (i.e., by seeing the 'big picture', realizing for action now)" (p. 110). In line with this argument, priming a global identity was found to attenuate the negative impact of presenting climate change as irrelevant for the participants (i.e., as happening in distant countries; Loy and Spence, 2020). We thus make here the hypothesis that abstract information on climate change may activate a global identity, which, in a turn, will encourage pro-environmental behaviours.

### 3. Current study

#### 3.1. Applied research design

Data for the present study were collected in collaboration with the electricity and gas provider of a medium-size Swiss town, which coordinated an eco-social programme encouraging households to reduce their energy consumption over a few years. Following programmes targeting households is of particular interest to researchers studying pro-environmental behaviours, because at this meso-level of analysis "macro level change can be observed and micro level activity can be contextualized" (Reid et al., 2010; p.309). Indeed, there have been calls to move from an individualist approach to pro-environmental behaviours to research perspectives that study the interactions between participants and the people they live with, "since day-to-day influences between family members are a common phenomenon, even when it comes to inconspicuous, every-day consumer behaviour" (Grønhoj, 2006; p.491; see also Bell et al., 2015; Toole et al., 2016). For this reason, in the present study, we examined the impact of an intervention on behavioural changes within the targeted households.

The theoretical hypotheses developed in the introduction were first presented in a grant proposal, and then to the energy provider as background of the intervention we wanted to carry out. Our goal was to measure our variables of interest before and after presenting more abstract goals to about a half of the households participating in their 'concrete' programme. We elaborated preliminary versions of both the experimental material and the pre- and post-test questionnaires, and discussed them with our field partners. As requested by them, we tried to keep the questionnaires as short as possible and avoided overly sensitive questions (e.g., income, which is generally sensitive in the Swiss context), while including items to measure our variables of interest and information that was important to our partners (e.g., satisfaction with the intervention).

#### 3.2. Operational hypotheses

Some of the additional variables allowed us to obtain different measures of pro-environmental behaviours (i.e., discussions about energy within the household, attention to energy consumption, and number of reported pro-environmental behaviours), more largely defined as the concrete behaviours in which participations would have been engaging themselves. As a function of both the meso-level structure of the study and the measures ultimately negotiated with our field

partner, the following operational hypotheses were subsequently formulated (see Fig. 1):

**H1:** Adding abstract information to an existing neighbourhood-based concrete intervention targeting households should increase biospheric values directly after the intervention (H1a). These biospheric values directly after the intervention should impact, in turn, biospheric values six months after the intervention (H1b).

**H2:** Increased biospheric values, as measured six months after an intervention, should relate to increased pro-environmental behaviours, broadly speaking, at the household level. These pro-environmental behaviours include more frequent discussions about energy within the household (H2a), greater attention to energy consumption (H2b), and a higher number of reported pro-environmental behaviours (H2c).

**H3:** Adding abstract information to an existing neighbourhood-based concrete intervention targeting households should increase participants' global identity in the short term (H3).

**H4:** A stronger global identity should relate to more frequent discussions about energy within the household (H4a), to greater attention to energy consumption (H4b), and to a higher number of reported pro-environmental behaviours (H4c).

**H5:** More frequent discussions within the household should relate to greater attention to energy consumption (H5a), and to a higher number of reported pro-environmental behaviours (H5b). Admittedly, discussing energy consumption within the household was added because our partner (the electricity and gas company) requested it. However, we formulated a hypothesis regarding this variable because discussing energy consumption within the household is a sort of public commitment, which research has shown to be related to pro-environmental behaviour (Lokhorst et al., 2013).

## 4. Material and methods

### 4.1. Procedure and experimental manipulation

Around six to eight block leaders ("volunteers who help inform other people about a certain issue"; Abrahamse and Steg, 2013, p. 1174) were hired by the electricity and gas provider to visit all voluntary households in the selected (low to middle-income) neighbourhoods. During a 45-min visit, participating households were presented with the goal of performing energy efficient behaviours in their home, and were given concrete advice about how to perform these behaviours and how much they would save by doing so. Participants also had the opportunity to receive a variety of energy-efficient materials (such as lightbulbs and power bars). In two neighbourhoods,<sup>1</sup> block leaders then left a questionnaire, stating that a research team would contact them within the next days. Then, master students went to the participating households or phoned them in case of absence, to invite them to participate in the present study. Approximately half of the households were randomly assigned to the experimental (i.e., abstract x concrete) condition: Prior to filling out the questionnaire, they were shown a short brochure describing both abstract information about the important goal of reducing energy consumption, along with concrete information about how to do so (e.g., some of the same pro-environmental behaviours that block-leaders mentioned as goals during the initial intervention). One person per household filled out the questionnaire. A follow-up questionnaire was sent by post and was self-administered around six months later.

<sup>1</sup> A third neighbourhood was included towards the end of the project, although the questionnaire differed substantially (including different measures and a different experimental manipulation) and the questionnaire was self-administered. For these two reasons, the results are not presented in the present article but are available from the first author upon request.

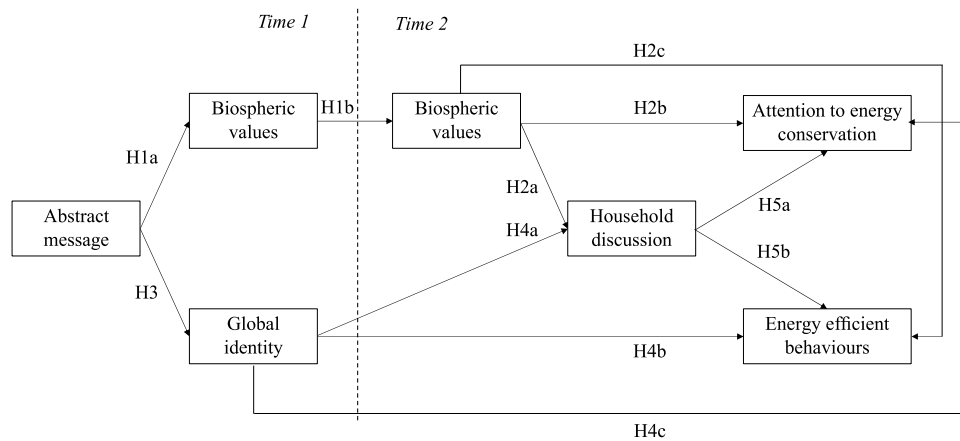


Fig. 1. Summary of operational hypotheses.

4.2. Participants

In the two neighbourhoods, 492 households (180 in one neighbourhood and 312 in the other) participated in the present study. This represented 44 % and 62 % of all participating households, respectively. Then, 255 households (108 and 147 households, respectively) filled out the follow-up questionnaire. However, since the follow-up questionnaire was sent (by post) to all households that participated in the energy conservation programme, some households filled in the follow-up questionnaire only. Therefore, given our goal to study effects over time, only households that participated both at Time 1 and at Time 2 were retained (*Neighbourhood*<sub>1</sub> = 61, *Neighbourhood*<sub>2</sub> = 116). Moreover, since the follow up questionnaire was sent to the family name provided by the electricity and gas provider, 73.4 % of the final sample was composed of the same individual at Time 1 and Time 2, while the remaining 26.6 % involved different individuals within the same household filling out the questionnaire. This discrepancy was coded as a dichotomous variable and controlled for in hypothesis testing.

In the final sample, 68 households (28 in the first neighbourhood and 40 in the second) were introduced to the experimental brochure prior to filling out the first questionnaire (experimental condition), and 109 were not (control condition). The final sample at Time 1 comprised 65.9 % women, with an average age of 51.78 (*SD* = 16.23) and an average household size of 2.57 people. The final sample at Time 2 comprised 57.1 % women, with an average age of 53.74 (*SD* = 14.84) and an average household size of 2.61 people.

4.3. Measures

The complete questionnaires translated in English are available in Supplementary Material 1, S1. Unless otherwise indicated, all items were responded to on a 5-point Likert scale ranging from 1 (not at all) to 5 (completely). Means and standard deviations (or frequencies) of items used in the analyses are presented in Table 1 (means and standard deviation per neighbourhood are presented in Supplementary Material 2, S2). First, three items measured biospheric values at Time 1 and Time 2 (see Table 1). These items were incorporated in a longer battery of 18 items adapted from Schwartz et al. (2012), see S1. Internal consistency was satisfactory ( $\alpha = .75$  at Time 1;  $\alpha = .68$  at Time 2). At Time 1 in one

Table 1

Means and standard deviations of the items used in the analyses.

	Time 1 M SD	Time 2 M SD
<b>Biospheric values.</b> It is important to me to...	4.24 (0.71)	4.08 (0.74)
VAL <sub>bio1</sub> to care for nature	4.47 (0.73)	4.38 (0.70)
VAL <sub>bio2</sub> to participate in actions to defend nature	3.88 (0.98)	3.61 (1.18)
VAL <sub>bio3</sub> to protect the environment from destruction or pollution	4.38 (0.87)	4.26 (0.90)
<b>Global identity.</b> To which extent do you feel attached to ...	3.91 (0.91)	
GLOB_ID <sub>1</sub> to the European continent	3.80 (1.04)	
GLOB_ID <sub>2</sub> to the world	4.03 (1.02)	
<b>Household discussion</b>		3.16 (1.28)
DISCsince the intervention, do you talk more within your household about energy consumption?		
<b>Attention to energy consumption</b>		3.50 (1.12)
ATTsince the intervention, do you think you pay more attention to your energy consumption?		
<b>Energy conservation behaviours (BEH_SUM)</b>		
Recoded as 'performed'		
unplugging charger after use		64.97 %
plugging office equipment and TV on a multiple socket, and switch it off in the evening		51.98 %
using a kettle		66.67 %
setting the temperature according to recommendations: 21° in the kitchen and 18° in bedrooms		59.32 %
if heaters are on, airing only five minutes		70.62 %

Note. Mean and standard deviations by neighbourhood are presented in Supplementary Material 2, S2.

neighbourhood, and at Times 1 and 2 in the other neighbourhood, six questions were included regarding attachment to different places, from very local to the world (and also their country of origin, if participants had an immigrant background; this item was discarded because 40.1 % of the sample did not provide an answer). Only Time 1 data were used.<sup>2</sup> An exploratory factor analysis with oblimin rotation revealed two

<sup>2</sup> The only difference in the questionnaires between the two neighbourhoods was the discrepancy at Time 2 which occurred because we did not know how many people would respond to a questionnaire sent by post. As such, we sought to keep it as short as possible and removed the attachment measure for the first neighbourhood at Time 2. When we noted that the response rate in this first neighbourhood was reasonable, we included the attachment measure in the follow-up questionnaire for the second neighbourhood.



factors with an eigenvalue greater than 1; a more local identity (i.e., related to one's neighbourhood, to one's canton and to Switzerland;  $\alpha = .64$ ). vs. a more global identity (related to Europe and to the world,  $r = .55$ ,  $p < .001$ ). Given our hypothesis on global identity, only the second score was used in the analyses.

At Time 2, three variables were used to measure behaviours within the household (see Table 1). First, upon request of our partner, participants were asked to what degree they discussed energy consumption in their household since the intervention. Second, the degree to which participants reported more attention to their energy consumption since the intervention was measured with one item. Third, energy efficient behaviour was measured with five items referring to the frequency of a variety of energy efficient behaviours on a scale from 1 (never) to 5 (every day). A sixth item measuring a rather infrequent behaviour—freezer defrosting—used a different scale and was not used in the present study. Since we were interested in how many behaviours households were engaged in since the intervention, the five items were dichotomized (with the 'often' and 'every day' responses coded as 1) and then summed to create a single score ranging from 0 (no energy efficient behaviours) to 5 (five energy efficient behaviours; for a similar procedure see Bruderer Enzler and Diekmann, 2019).

Note that while we wanted to include (actual) household electricity consumption, it was not possible: While the electricity provider reads households' meter once a year and made these data available to the research team, data could not be used in the first neighbourhood since data were collected for some households before, for some between, and for some after our experimental intervention (making comparisons obsolete). Finally, which energy-efficient materials (and how many) households received were recorded, but since preliminary analyses revealed no significant correlations with any of the constructs of interests (both independent and dependent variables), this information was not considered in the analyses.

## 5. Results

### 5.1. Analytic strategy

We tested our operational hypotheses with a saturated path model in Mplus 8 (the output, including the syntax, is available as Supplementary Material 3, S3). In addition to the variables of interest, three control variables were included in the model: household size (at Time 2; note that household sizes at both times are nearly identical;  $r = .95$ ,  $p < .001$ ), neighbourhood, and same vs. different respondent at Times 1 and 2.<sup>3</sup> Significant paths are presented in Fig. 2. Indirect paths from the independent variable (concrete vs. abstract X concrete condition) to the three dependent variables (i.e., discussion within household, attention to energy consumption and number of energy efficient behaviours) were estimated. Correlations between all variables are presented in Table 2.

### 5.2. Biospheric values

Confirming H1a, exposure to the brochure that contained abstract information was directly related to biospheric values at Time 1 ( $\beta = .23$ ,  $p = .001$ , 95 % CI [.09; .37]). Indeed, biospheric values were higher in the abstract X concrete condition ( $M = 4.44$ ,  $SD = 0.56$ ), compared to the concrete-only condition ( $M = 4.12$ ,  $SD = 0.76$ ). Biospheric values at Time 1 were, in turn, significantly related to biospheric values at Time 2 ( $\beta = .57$ ,  $p < .001$ , 95 % CI [.46; .68]). As expected (H1b), the abstract

<sup>3</sup> Additional models were explored, including education recoded in four categories (i.e., primary education only,  $N = 56$ ; apprenticeship,  $N = 64$ ; high school & higher education,  $N = 43$ , or other & not provided,  $N = 14$ ). Results were nearly identical and only one of the coefficients involving the 18 resulting educational dummy variables yielded a significant effect. For this reason, education was not included in the model.

message also had an indirect impact on biospheric values at Time 2, through increased biospheric values at Time 1 ( $\beta = .13$ ,  $p = .003$ , 95 % CI [.05; .22]).<sup>4</sup> Unexpectedly, the experimental condition also had a direct impact on attention to energy consumption ( $\beta = .17$ ,  $p = .01$ , 95 % CI [.03; .30]; abstract X concrete:  $M = 3.72$ ,  $SD = 1.08$ , concrete:  $M = 3.36$ ,  $SD = 1.13$ ), while no significant differences across the two conditions were found when it came to discussing energy consumption within the household ( $\beta = -.00$ ,  $p = .97$ , 95 % CI [-.15; .15]) and energy efficient behaviours ( $\beta = .12$ ,  $p = .10$ , 95 % CI [-.02; .26]).

Then, and as expected, biospheric values as measured at Time 2 were found to be significantly positively related to all three dependent variables: discussion within the household (H2a:  $\beta = .21$ ,  $p = .02$ , 95 % CI [.04; .39]), increased attention to energy consumption (H2b:  $\beta = .18$ ,  $p = .03$ , 95 % CI [.02; .34]), and energy conservation behaviours (H2c:  $\beta = .24$ ,  $p = .008$ , 95 % CI [.06; .41]). Biospheric values measured at Time 1 were not significantly related to any of the three dependent variables (for detailed information, see S3).

### 5.3. Global identity

There was a positive relationship between global identity and biospheric values at Time 1 ( $r = .26$ ,  $p < .001$ , 95 % CI [.12; .40]). However, and not supporting H3, exposure to the brochure was not significantly related to participants' global identity ( $\beta = .04$ ,  $p = .65$ , 95 % CI [-.12; .19]). In addition, contrary to our expectations, participants' global identity did not relate significantly to discussing energy consumption within the household (H4a:  $\beta = .03$ ,  $p = .65$ , 95 % CI [-.12; .18]), to paying attention to energy consumption (H2b:  $\beta = -.13$ ,  $p = .057$ , 95 % CI [-.26; .00]),<sup>5</sup> nor to energy saving behaviours (H4c:  $\beta = -.11$ ,  $p = .13$ , 95 % CI [-.25; .03]).

### 5.4. Indirect paths

Confirming H5, discussing energy consumption within the household since the intervention was positively related to both increased attention to energy consumption ( $\beta = .45$ ,  $p < .001$ , 95 % CI [.33; .57]) and energy conservation behaviours ( $\beta = .23$ ,  $p = .002$ , 95 % CI [.09; .37]). We thus examined whether the experimental condition was related to the two latter, which did not significantly relate to each other ( $r = .08$ ,  $p = .27$ , 95 % CI [-.07; .23]), through participants' biospheric values and energy-related discussion within the household.

Only one significant indirect path from the independent variable to any of the dependent variable was found (arrows in bold in Fig. 2). Adding an abstract message to an existing concrete intervention was related to a higher number of energy-saving behaviours, through increased biospheric values at Time 1 and then at Time 2 ( $\beta = .03$ ,  $p = .05$ , 95 % CI [.000; .06]). All other indirect paths were non-significant. Nevertheless, three additional paths yielded a marginally significant positive effect. First, like the significant one reported above (but with a different outcome), adding an abstract message to an existing concrete intervention was marginally related to an increase in attention to energy consumption, again through increased biospheric values at Time 1 and then at Time 2 ( $\beta = .02$ ,  $p = .07$ , 95 % CI [-.002; .05]). Second, the same indirect path but including a supplementary step also yielded a marginal result: Adding an abstract message to an existing concrete intervention

<sup>4</sup> The experimental condition was also significantly and negatively related to biospheric values as measured at Time 2 ( $\beta = -.14$ ,  $p = .03$ , 95 % CI [-.26; -.02]). This effect could however be spurious, since there is no significant bivariate correlation between these two variables (see Table 2).

<sup>5</sup> This marginally significant negative relationship could be spurious, given that there was barely any correlation between global identity and attention to energy consumption (see Table 2); .00 or -.00 indicate that the lower or higher band of the confidence is either just below or just above zero, but not exactly zero,

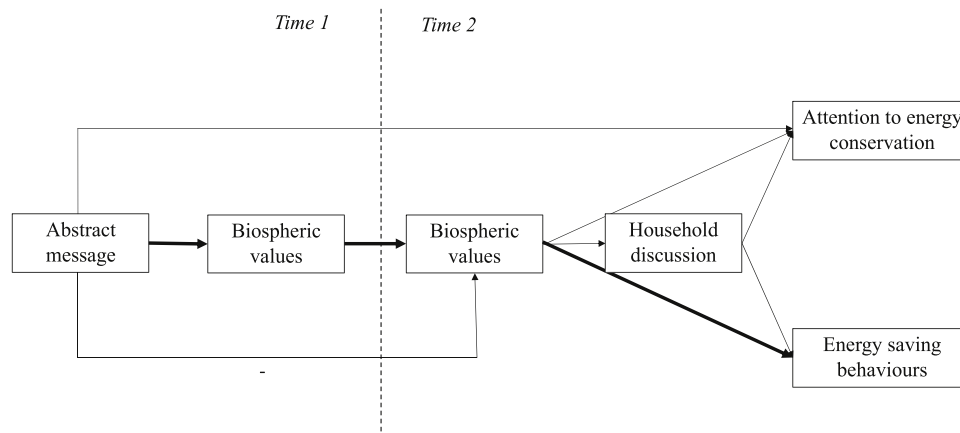


Fig. 2. Summary of path model results (only significant direct paths are pictured; relationships with control variables are not represented; the only significant indirect path is represented with arrows in bold).

Table 2

Correlations between all variables included in the path model, that is the experimental condition (1 = abstract), biospheric values at Time 1 (VAL\_bio\_t1) and at Time 2 (VAL\_bio\_t2), global identity (GLOB\_ID), discussion within the household (DISC), attention to energy consumption (ATT), energy saving behaviours (BEH\_SUM), household size at Time 2 (HHsize2), same vs. different participants at Time 1 and Time 2 (same\_particip), and neighbourhood.

	abstract	VAL_bio_t1	VAL_bio_t2	GLOB_ID	DISC	ATT	BEH_SUM	HHsize2	same_particip
VAL_bio_t1	.22**								
VAL_bio_t2	.00	.56***							
GLOB_ID	.03	.27**	.25***						
DISC	.03	.17*	.24**	.11					
ATT	.16*	.20**	.27***	-.01	.47***				
BEH_SUM	.11	.14	.24**	-.03	.26***	.26***			
HHsize2	-.02	.11	.00	.00	.10	-.06	-.15**		
same_particip	.08	.02	-.05	-.04	.06	-.02	.11	-.40***	
neighbourhood	-.11	.06	.14	.06	.00	.06	-.12	-.23**	.16*

Note.

- \*  $p < .05$ .
- \*\*  $p < .01$ .
- \*\*\*  $p < .001$ .

was still related to an increase in biospheric values at Time 1, which was related to an increase in these same values at Time 2, but this, in turn, was related to an increase in energy-related discussion within the household, which was then associated with an increase in attention to energy consumption ( $\beta = .01, p = .07, 95\% \text{ CI } [-.00; .03]$ ). Third, adding an abstract message to an existing concrete intervention was marginally related to a lower number of energy saving behaviours, through biospheric values only at Time 2 ( $\beta = -.03, p = .09, 95\% \text{ CI } [-.07; .01]$ ). However, as mentioned in Footnote 3, this last effect is likely spurious.

### 5.5. Control variables

Household size was marginally and negatively related to attention to energy consumption ( $\beta = -.14, p = .05, 95\% \text{ CI } [-.28; .00]$ ), but significantly and positively to discussing energy consumption within the household ( $\beta = .16, p = .05, 95\% \text{ CI } [.00; .32]$ ). The neighbourhood and the fact that the same vs. a different person responded to the follow-up questionnaire did not significantly relate to any of the variables of interest (for detailed information, see S3).

## 6. Discussion

Previous research has shown that energy conservation interventions that focus on concrete goals and short-term savings (e.g., saving money by reducing energy use) may fail to lead to changes in the long run because such messages do not provoke changes in abstract-level predictors of pro-environmental behaviours (at least if they are not repeated several times). Results of the present study suggest that adding more

global and large-scale information about climate change to a concrete intervention mattered: The abstract message was directly related to the amount of attention households paid to energy consumption six months after the intervention. It also had an indirect impact on energy saving behaviours six months later, through increased biospheric values. Contrary to our expectations, participants' global identity was not affected by our experimental manipulation, and did not relate to any of the measured dependent variables either. In the following sections, we discuss the contributions of the present results in terms of the advantage of combining abstract and concrete information, and thereby change in individuals' values.

### 6.1. Combining high-construal and low-construal goals: a way to go

Research on the advantage of relying on either abstract or concrete arguments, or both, to convince individuals to act for the environment has so far produced mixed findings. We noted that in this literature, the way abstract and concrete information was measured or manipulated are quite different from the content of a real intervention, and very often abstract and concrete information do not refer to the same construct (i.e., goals, norms, mindsets, behaviours and values). For instance, in Goldsmith et al. (2016), participants were asked to think about their life the day after (considered a concrete condition) versus one year later (considered a more abstract condition); in Griffioen et al. (2019), choosing a gift to receive was described as 'more concrete' than choosing a donation to a charity (considered more abstract); in Ryo et al. (2017, Study 2), a local norm represented a more concrete situation than a national norm.

In the present research, we chose to limit our materials to abstract and concrete goals, in order to provide a test of the hypothesis contrasting the concrete-only and the abstract X concrete conditions by keeping the construct constant. The results of the experiment we conducted revealed that households were more likely to report pro-environmental behaviours when concrete, low-construal goals (e.g., switching off lights when leaving a room) were repeated and linked to abstract, high-construal goals (e.g., limiting climate change impacts) than when alone, through the effect of increased levels of biospheric values. We had predicted this difference based on goal implementation theory, which shows that there are higher levels of actual goal attainment when abstract goal intentions ("I intend to achieve X") are associated with concrete implementation intentions ("I intend to perform goal-directed behavior Y when I encounter situation Z" (e.g., Gollwitzer and Brandtätter, 1997). Our results thus suggest that it is indeed possible that the combined effect of abstract and concrete information leads to increased commitment to pro-environmental behaviours to the extent that both sets of information are related to goals, thereby reproducing the association between abstract goal intentions and concrete implementation intentions.

### 6.2. Changing people's biospheric values, but not their global identity

Human values are generally described as stable across life, and biospheric values in particular are considered as factors significantly shaping individuals' intention to or tendency to engage in pro-environmental behaviours (for reviews and meta-analyses, see Corner et al., 2014; Gifford and Nilsson, 2014; Klöckner, 2013; Newell et al., 2014). Given this important role of biospheric values, research in environmental psychology has surprisingly paid little attention to the factors underlying their adoption. Biospheric, as other values, appear to be only very partially explained by socio-demographic factors, according to a large-scale survey conducted in seven European countries (Sargisson et al., 2020). Loving and being close to nature also seems to trigger biospheric values (Jaung et al., 2022; Wu and Zhu, 2021). Whether and how exposure to environmental communication varying in content influences individuals' values is however understudied, despite that values are known to be influenceable (Maio et al., 2009). The present results suggest that environmental communication pertaining to climate change that combines abstract and concrete goals may increase adherence to biospheric values as compared to concrete goals only. Importantly, such an effect appeared not only immediately but also, indirectly, on a delayed measure several months after the communication.

In line with past research on related concepts, participants' global identity was positively correlated with their biospheric values. For instance, self-transcendent emotions have been found to relate more strongly to global identities than self-oriented emotions (Włodarczyk et al., 2022), and universalism-tolerance as a value has been found to positively relate to identification with all humanity (Hamer et al., 2019). Despite that, none of our hypotheses related to global identity were confirmed. On the one hand, participants' global identity did not differ between the experimental 'brochure' condition and the control condition. On the other hand, and contrary to past research on the topic (e.g., Reysen and Katzarska-Miller, 2013; Leung et al., 2015; Renger and Reese, 2017), global identity did not relate to any of the measure of pro-environmental behaviours considered in the present study (with one exception though, due to what appears to be a spurious effect). Several explanations may be brought forward for these results concerning global identity and biospheric values. First, biospheric values relate directly to the environment and its conservation; it is thus unsurprising that they were found to be more strongly activated than participants' global identity by the content of a brochure that describes environmental damages. Second, there seem to be different forms of all-inclusive identities, as a function of the wording used in the items (e.g., whether the word "people" is used or not, etc.; Carmona et al., 2020). In

the present case, the words "Earth" or "people from all over the world" as alternatives to merely "world" (as used in the present study) could have elicited representations of interdependencies between species or continents, which are more closely related to the concept of climate change.

### 6.3. Limitations

The present study has several limitations, mostly because our experiment was part of a larger intervention. Households had to find time to participate in the intervention set up by the electricity and gas provider, and to avoid that some households may refrain from participating, we confronted some obstacles. In particular, we were not able to distribute a questionnaire prior to the intervention, we were mindful of the length of the questionnaires, and we could not ask all household members to respond to our questionnaires. For this reason, we for instance did not include a global identity measure in the follow up questionnaire in the first neighbourhood. It would also have been relevant to add a manipulation check (e.g., a measure of psychological distance of climate change), or measures of other and alternative abstract mechanisms (e.g., emotions). Moreover, having only one person respond to our questionnaire per household offered only a partial vision of meso-level dynamics (e.g., Grønhoj, 2006; Reid et al., 2010). In addition, in about a quarter of cases, different members of the same household replied to the first and the follow-up questionnaires. Nevertheless, despite this limitation, we found no differences between households when the same vs. a different respondent filled out the follow-up questionnaire, consistent with existing research suggesting that values are often similar within households (see e.g., Gaunt, 2006).

### 6.4. Conclusion

It is urgent to find ways to convince households to decrease their energy use, for environmental reasons but also because energy may be lacking in the future. By testing the power of theoretical constructs in real settings, applied and/or action research is bound to play a key role in this respect. As illustrated in the present study, integrating an existing programme into research has challenges of its own, which may dissuade some researchers from conducting studies "beyond the lab". Nevertheless, providing evidence of the ecological validity of mechanisms found in more artificial settings is essential if one wants to contribute to real social and environmental change.

In Switzerland, where the present study was carried out, it has become official that the country may even face electricity blackouts in Winter during the next years, illustrating the increasingly pressing need to take action at both macro- (societal/organisational) and individual-levels, but also, and importantly, at the meso-level. The present study suggests that communication that combines abstract goals with concrete means to achieve those goals may be an effective approach in meso-level interventions, leading to more sustainable value transformation within households and thus, longer-term behavioural change.

### Ethical statement

For social sciences, current regulations in Switzerland require ethical approval only for studies conducted with vulnerable individuals. For this reason, the present research project was not examined by an ethical research committee. However, ethical standards usually applied in social psychological research were strictly followed.

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## CRediT authorship contribution statement

**Oriane Sarrasin:** Conceptualization, Methodology, Formal analysis, Data curation, Writing – original draft, Supervision, Funding acquisition. **Jessica Gale:** Methodology, Formal analysis, Data curation, Writing – review & editing. **Fabrizio Butera:** Conceptualization, Methodology, Writing – review & editing, Funding acquisition.

## 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.

## Data availability

Data will be made available on request.

## Supplementary materials

Supplementary material associated with this article can be found, in the online version, at [doi:10.1016/j.cresp.2023.100179](https://doi.org/10.1016/j.cresp.2023.100179).

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