University of Groningen

Going green? The relative importance of feelings over calculation in driving environmental intent in the Netherlands and the United States

Taufik, Danny; Bolderdijk, Jan Willem; Steg, Linda

Published in:
Energy Research & Social Science

DOI:
[10.1016/j.erss.2016.08.012](https://doi.org/10.1016/j.erss.2016.08.012)

IMPORTANT NOTE: You are advised to consult the publisher's version (publisher's PDF) if you wish to cite from it. Please check the document version below.

Document Version
Publisher's PDF, also known as Version of record

Publication date:
2016

[Link to publication in University of Groningen/UMCG research database](#)

Citation for published version (APA):

Taufik, D., Bolderdijk, J. W., & Steg, L. (2016). Going green? The relative importance of feelings over calculation in driving environmental intent in the Netherlands and the United States. *Energy Research & Social Science*, 22, 52-62. <https://doi.org/10.1016/j.erss.2016.08.012>

Copyright

Other than for strictly personal use, it is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), unless the work is under an open content license (like Creative Commons).

The publication may also be distributed here under the terms of Article 25fa of the Dutch Copyright Act, indicated by the "Taverne" license. More information can be found on the University of Groningen website: <https://www.rug.nl/library/open-access/self-archiving-pure/taverne-amendment>.

Take-down policy

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

Downloaded from the University of Groningen/UMCG research database (Pure): <http://www.rug.nl/research/portal>. For technical reasons the number of authors shown on this cover page is limited to 10 maximum.

Original research article

Going green? The relative importance of feelings over calculation in driving environmental intent in the Netherlands and the United States

Danny Taufik^{a,*}, Jan Willem Bolderdijk^b, Linda Steg^a^a Department of Psychology, University of Groningen, The Netherlands^b Department of Marketing, University of Groningen, The Netherlands

ARTICLE INFO

Article history:

Received 14 January 2016

Received in revised form 26 July 2016

Accepted 17 August 2016

Available online 6 September 2016

Keywords:

Environmental decision-making

Feelings

Calculations

Electricity consumption

ABSTRACT

Contemporary environmental campaigns often communicate the benefits of acting environmentally-friendly, assuming that larger benefits will translate into stronger intentions to act environmentally-friendly – a mechanism known as “valuation by calculation”. As such, these campaigns have neglected the possibility that decisions to act environmentally-friendly can also be preceded by “valuation by feeling”, where anticipated positive feelings drive people’s intention to act environmentally-friendly.

Acting environmentally-friendly can be driven by anticipated positive feelings because it can be intrinsically rewarding to contribute to the good cause. Indeed, across two studies we found that the stronger people anticipated to feel good about acting environmentally-friendly, the stronger their intention was to act environmentally-friendly. Importantly, anticipated positive feelings were a much stronger predictor of people’s intention to act environmentally-friendly compared to the perceived quantity of the benefits of pro-environmental actions. This indicates that environmental campaigns that resonate with people’s feelings, instead of exclusively appealing to their calculations, may be an important unexploited route to encourage pro-environmental behavior.

© 2016 Elsevier Ltd. All rights reserved.

1. Introduction

Every day, people make many decisions that have implications for the quality of the environment. The products we buy can be either organic or not, we can choose to go to work either by car, public transport or bicycle, and at home we can control the amount of energy we use through various behaviors, such as unplugging appliances that we do not use or lowering the thermostat. Each of these decisions involves different types of benefits, including environmental and financial benefits, such as reductions in CO₂-emissions and monetary savings. These benefits are often stressed in environmental campaigns in order to encourage people to act environmentally-friendly, including campaigns that promote energy conservation. But which mechanisms explain the likelihood that people will act environmentally-friendly when communicating these perceived benefits of pro-environmental actions? This paper attempts to provide an answer to this question, focusing on energy conservation as a way to act in a pro-environmental manner.

Currently, many energy policies are based on the presumption that consumers act as rational economic actors, who aim to maximize their financial gains [33]. Yet, people seem to not always act to in such a rational, utility maximizing manner when it comes to conserving energy (see also [33]), suggesting that integrating social sciences into energy research can ultimately help to optimize energy policies [29]. Studies for instance found that environmental appeals can be more motivating than monetary appeals when promoting pro-environmental actions such as checking one’s car tire pressure [7], conserving energy at home [4], or enrolling into an energy saving program [26]. These studies provide initial evidence that when it comes to conserving energy, motives that go beyond narrow economic self-interest might also, or even be more important.

Currently, many environmental campaigns – including those aimed at stimulating energy conservation – are designed under the assumption that the larger the benefits are of acting environmentally-friendly, the more likely it is that people will act environmentally-friendly. Examples are slogans like “Save more money by using this LED light bulb” or “Save more energy by using this standby-killer”. The underlying mechanism that is addressed here has been labelled “valuation by calculation” [17]: the larger the benefits of an action are perceived to be, the more value people place on the action, which increases the likelihood that people

* Corresponding author at: Faculty of Behavioural and Social Sciences, Department of Psychology, University of Groningen, Grote Kruisstraat 2/1, 9712 TS Groningen, The Netherlands.

E-mail address: d.taufik@rug.nl (D. Taufik).

will adopt the pro-environmental action. This mechanism is rooted in traditional economic theory, where “more is better” because larger (tangible) benefits of the action increase the utility of the action [18]. However, there is another mechanism pertaining to how much value people attach to an action: “valuation by feeling” [17]. Here, how much value people place on an action is driven by how they (expect to) feel about the benefits of that action, which is not necessarily related to the perceived quantity of the benefits. For example, the decision of how much money to donate to save endangered pandas can either be based on calculation (“how many pandas would be saved with my donation?”) or on feelings (“how do I feel about saving pandas with my donation?”; [17]). Importantly, when “valuation by feeling” is the mechanism driving a person’s action – in this example, how much money one donates – the perceived quantity of the benefit of one’s action – how much pandas can be helped with a donation – may not be very relevant. Rather, the action can be primarily based on how one feels about these benefits, which does not have to depend on whether for instance 1 or 10 pandas can be helped [17]. In this paper, we argue that “valuation by feeling” is an important determinant of people’s intention to act environmentally-friendly, and potentially even more important than “valuation by calculation”, as acting environmentally-friendly can be intrinsically rewarding to people.

1.1. The prospect of positive feelings

When a person chooses to act without experiencing external pressure, intrinsic rewards in the form of positive feelings can be achieved when the actions itself are perceived as pleasurable [25]. An example is cycling to work, because you find the exercise you get when cycling inherently pleasurable, which makes you feel good. Alternatively, positive feelings can be achieved as a result of doing the right thing [21]. In this case, people can feel good and experience a “warm-glow” out of doing good [2,3,34], and not because the action in itself is inherently pleasurable to do. An example is separating different kinds of waste at home, which takes effort and is not pleasurable as such, but is the right thing to do which can make one feel good about oneself.

People’s decision-making is often based on feelings, which can occur instantly, without any form of reasoning occurring before these feelings [41]. Particularly moral decision-making often is not based on reasoned arguments and considerations, but appears to be mainly based on people’s feelings [16]. Pro-environmental behavior is typically seen as moral behavior, as such behavior benefits other people, future generations and the environment [11]. As doing the right thing can elicit positive feelings, the prospect of feeling good when acting environmentally-friendly might in itself make it more likely that people will act accordingly. Indeed, an intrinsic motivation to do the right thing appears to be an important predictor of pro-environmental actions [23,30,32,39]. This implies that people might base the value they place on acting environmentally-friendly on anticipated feelings, in which case “valuation by feeling” – rather than “valuation by calculation” – should be an important mechanism determining people’s decision whether or not to act pro-environmentally.

There is some circumstantial evidence in the environmental domain to suggest that anticipated positive feelings can indeed drive pro-environmental behavior. For example, appeals that stressed the environmental benefits of tire pressure checks for one’s car were more effective than appeals that stressed financial benefits, possibly because people expected to feel better when complying to environmental appeals rather than complying to economic appeals [7].

The first aim of the paper is to determine whether the mechanism of “valuation by feeling” can affect the likelihood that people will act environmentally-friendly in addition to the effect of “valu-

ation by calculation”. Hence, we test whether anticipated positive feelings indeed affect people’s intention to act environmentally-friendly, while controlling for the effect of the perceived quantity of the benefits of acting environmentally-friendly.

In doing so, we can also compare the relative impact of “valuation by feeling” as compared to “valuation by calculation”. If “valuation by feeling” indeed drives people’s intention to act environmentally-friendly, does this imply that “valuation by calculation” will have little or no effect on people’s intention to act environmentally-friendly? If “valuation by feeling” is the main mechanism driving people’s intention to act environmentally-friendly, anticipated positive feelings will be a stronger predictor of this intention than the perceived quantity of the benefits of acting environmentally-friendly.

1.2. Is acting environmentally-friendly worth the effort?

A second aim of the paper is to gain more insights into the process through which the two valuation mechanisms affect the likelihood that people will act environmentally-friendly. We do so by looking at the extent to which people perceive the benefits of pro-environmental actions to be worth the effort. Determining whether certain benefits of pro-environmental behavior are worth the effort implies that an elaborated process is instigated in order to make this determination (“Is doing this worth the effort?”). The concept of valuation implies that the subjective value of a certain action is based on a weighing of perceived prospected benefits and costs [35]. The higher the perceived benefits are relative to the perceived costs, the more worth the effort people will find the relevant environmentally-friendly actions, which can make it more likely that they will act accordingly [12]. But what makes these benefits worth the effort?

Our reasoning implies that benefits of pro-environmental actions can be perceived to be worth the effort for different reasons. When “valuation by calculation” is the dominant mechanism affecting environmental decision-making, pro-environmental actions may be particularly seen as worth the effort when people perceive more benefits. The larger the quantity of the benefits is perceived to be, the more worth the effort it is to achieve these benefits by acting environmentally-friendly. Yet, when “valuation by feeling” is the dominant mechanism, achieving certain benefits by acting environmentally-friendly can be perceived as more worth the effort, the more people anticipate they will feel good after acting environmentally-friendly. Hence, determining the extent to which benefits of pro-environmental actions are perceived as worth the effort might be part of the underlying process of both “valuation by feeling” and “valuation by calculation” affecting the likelihood that people will act environmentally-friendly. Both mechanisms can affect the extent to which people consider the benefits of acting environmentally-friendly as worth the effort, which subsequently affects people’s intention to act environmentally-friendly.

An elaborated process of determining how worth the effort certain benefits of pro-environmental actions are fits well with the mechanism of “valuation by calculation”, as some degree of elaboration is needed to determine how large a certain benefit is. But does “valuation by feeling” always operate via elaboration as well? Research revealed that feelings can affect people’s decision-making on both conscious and unconscious levels [5]. When feelings affect decisions on a more conscious level, they affect behavior via a more elaborated process. However, feelings can also drive people’s decision-making without elaboration in situations where feelings affect decision-making more unconsciously. Indeed, anticipated feelings can affect people’s behavior without much elaboration (e.g. [20,28]). In this case, people might not reason extensively how worth the effort they find the benefits of acting environmentally-friendly before determining whether to act

accordingly. Rather, anticipated feelings can affect people's intention with relatively little elaboration. This implies that anticipated positive feelings of acting environmentally-friendly can affect people's intention to act environmentally-friendly both via elaboration (by first determining how worth the effort the benefits of acting environmentally-friendly are), and without much elaboration.

The mechanisms of “valuation by calculation” and “valuation by feeling” are conceptually related to dual process theories which posit that System 1 processes are mostly intuitive and automatic, while System 2 processes are more reflective and controlled [13,19]. The affective basis of the mechanism of “valuation by feeling” can be seen as a source that leads to people engaging in System 1 processing when making decisions, as feelings can act as a heuristic [14], but as was previously mentioned feelings might also affect decision-making in a more elaborate manner [5]. On the other hand, “valuation by calculation” requires some form of reasoning and elaboration and would therefore involve System 2 processing, as it involves a certain degree of reflection.

1.3. Current research

In the current research we conducted two studies to examine to what extent “valuation by calculation” and “valuation by feeling” determine people's intention to act environmentally-friendly. Based on our reasoning above, we test the model as shown in Fig. 1 in two steps. The first hypothesis we test is that people will have a stronger intention to act environmentally-friendly, the more they anticipate to experience positive feelings after acting environmentally-friendly (“valuation by feeling”), above and beyond the effect of the perceived quantity of benefits on people's intention to act environmentally-friendly (“valuation by calculation”). If true, this suggests that the likelihood of acting environmentally-friendly is at least partly based on the mechanism of “valuation by feeling”, next to “valuation by calculation”. We also examine the relative strength of “valuation by feeling” versus “valuation by calculation” in predicting people's intention to act environmentally-friendly and explore which valuation mechanism has a stronger effect on people's intention to act environmentally-friendly. In order to test our first hypothesis we study the unique effects of both valuation mechanisms on people's intention to act environmentally-friendly, as we are particularly interested in which of the two valuation mechanisms is most predictive of intention to act pro-environmentally.

Second, we explore to what extent the effects of anticipated positive feelings on people's intention to act environmentally-friendly is the result of the benefits of pro-environmental behavior being perceived as worth the effort – implying a more elaborated process – as well as to what extent anticipated positive feelings

directly affect people's intention to act environmentally-friendly – which implies that little or no elaboration is used. We hypothesize that worthiness will partially mediate the effect of anticipated positive feelings on people's intention to act environmentally-friendly (Hypothesis 2). This would imply that anticipated feelings indeed can affect people's behavior both via an elaborated process, with worthiness being the mediator, and without much elaboration, as reflected in a direct effect of anticipated feelings on people's intention to act pro-environmentally. Finally, we hypothesize that the effect of the perceived quantity of the benefits of acting environmentally-friendly on people's intention to act environmentally-friendly follows an elaborated process and thus is fully mediated by the perceived worthiness of the benefits of acting environmentally-friendly (Hypothesis 3).

We explore whether the mechanism of “valuation by feeling” affects the likelihood that people will act environmentally-friendly as a result of an intrinsic motivation to do the right thing, by focusing on a type of pro-environmental behavior that, in and of itself, is not inherently pleasurable to do: reducing household electricity consumption. In order to reduce electricity consumption at home, people often have to perform actions that are not inherently pleasurable. Using LED lights can give less cozy lighting and getting of your comfortable couch and walking to the television to turn it off instead of putting it on stand-by can undermine the relaxed state you are in while sitting in your couch. Hence, while reducing electricity consumption might be the right thing to do, it is often seen as a hassle and is not inherently pleasurable.

The choice to use electricity reduction as a domain to test our hypotheses has the additional advantage that it allows us to examine whether the extent to which “valuation by feeling” drives people's intention to act environmentally-friendly depends on the kind of benefit of reducing electricity consumption that is emphasized. After all, electricity savings can be expressed in terms of savings in kilowatt hours (kWh), CO₂-emissions, or money. This distinction is important: savings in kilowatt hours or CO₂-emissions do not deliver tangible, personal benefits so they are less likely to appeal to extrinsic motivation. In other words, if people anticipate to feel good by achieving CO₂ reductions, this is likely based on people's intrinsic motivation to do the right thing rather than on extrinsic motives. In the case of reducing electricity consumption in order to save money, one could argue that this mostly appeals to an extrinsic motivation, as monetary savings are a personal benefit, or to intrinsic motivation based on saving money being perceived as inherently pleasurable, as the money (but not kWh or CO₂-emissions) that is saved can be used on other things. Consequently, larger monetary savings may then motivate people more to act environmentally-friendly. Still, if even in the case of monetary savings anticipated positive feelings affect people's

Fig. 1. The relationship between anticipated positive feelings, perceived quantity of benefits, perceived worthiness of benefits and intention to act environmentally-friendly.

intention to reduce their electricity consumption, and even more so than a higher perceived quantity of monetary savings, this can be an indication that doing the right thing by reducing electricity consumption might weigh more heavily than how many personal benefits people expect to gain from reducing electricity consumption. This would further strengthen the reasoning that “valuation by feeling” occurs because people are intrinsically motivated to do the right thing by acting environmentally-friendly.

2. Study 1

2.1. Method

2.1.1. Participants

A total of 152 psychology students of a Dutch university participated in the study in return for course credits. Of these 152 participants, 86 were females, while 1 person did not indicate his or her gender. The average age was 21.2 ($SD = 2.20$; range 18–29).

2.1.2. Design, procedure and measures

Participants conducted the study online. All participants evaluated three scenarios about a hypothetical electricity bill they just received, including information about potential savings that can be achieved by reducing electricity consumption. In the first scenario, the amount of electricity use and potential savings were communicated in terms of kWh. In the second scenario the same information was communicated in terms of CO₂ emissions. In the final scenario, the information was framed in terms of money. The order in which participants received the three scenarios was randomized, to control for possible order effects.

All three scenarios presented the same amount of electricity use and savings, only communicated in the form of different units. Yet, importantly, we did not make explicit that these savings framed in three different ways all amounted to the same amount of electricity use and reduction. At the start of the study, we only communicated to the participants that they would receive information about three different hypothetical electricity bills.

Participants first received one of the three scenarios. Participants read the following: “Imagine that you receive your electricity bill. It is reported that you consumed 1.680 kWh (kilowatt hours) [924 kg of CO₂ emissions/370 Euro] in the last calendar year.” The numbers used were based on the average electricity use of a Dutch household (3.360 kWh); as we assumed that the average student would use less electricity than an average household, we lowered the numbers accordingly in the scenarios. The numbers for electricity consumption served as a benchmark for the potential savings that were subsequently introduced.

The study continued with questions about potential savings that can be achieved by reducing electricity consumption (again framed in terms of kWh, CO₂ or money). To ensure ecological validity, we aimed to communicate savings as a result of a percentage reduction in electricity use that people could realistically attain within a year. The communicated potential savings amounted to 8.3% on an annual basis, which should be a realistic percentage to achieve regarding electricity conservation, based on other studies (e.g. [1]). Only the absolute savings were communicated (148 kWh/81 kg of CO₂ emissions/33 Euro), while the percentage reduction (8.3%) itself was not communicated to participants.

Participants subsequently were first asked about the *perceived quantity* of this potential saving: An annual saving of 148 kWh [81 kg of CO₂ emissions/33 Euro] by reducing my electricity consumption is . . . (1 = very little, 6 = very much). Next, they indicated the extent to which they *anticipated feeling good* about achieving the saving by reducing electricity: I would feel good about saving 148 kWh [81 kg of CO₂ emissions/33 Euro] on an annual

Table 1

Means of perceived quantity, anticipated positive feelings, perceived worthiness and intention to reduce electricity use for different types of savings (SD's are reported between parentheses; use of different superscripts a or b within a row signify significant differences between the respective means at $p < 0.05$, while equal superscripts within a row imply no significant differences between the means at $p < 0.05$).²

	kWh	CO ₂	Money
Perceived quantity	3.38 (1.08) ^b	3.85 (1.17) ^a	3.45 (1.22) ^b
Anticipated positive feelings	4.11 (1.13) ^a	4.58 (1.16) ^b	4.36 (1.20) ^b
Perceived worthiness	3.90 (1.22) ^b	4.35 (1.22) ^a	4.07 (1.15) ^b
Intention	4.01 (1.02) ^b	4.39 (1.13) ^a	4.19 (1.22) ^b

basis by reducing my electricity consumption (1 = totally disagree, 6 = totally agree). Moreover, they indicated the extent to which they perceived the saving as *worth the effort*: An annual saving of 148 kWh [81 kg of CO₂ emissions/33 Euro] by reducing my electricity consumption is . . . (1 = not at all worth the effort, 6 = totally worth the effort). Finally, we measured participants' *intention* to reduce their electricity consumption in order to achieve the proposed saving: I would reduce my electricity consumption in order to save 148 kWh [81 kg of CO₂ emissions/33 Euro] on an annual basis (1 = totally disagree, 6 = totally agree). The mean scores on these items are reported in Table 1.¹

2.2. Results

We tested the model as shown in Fig. 1 in two steps. First, we regressed intention to reduce electricity consumption on anticipated positive feelings and perceived quantity of the saving to test Hypothesis 1. This reveals the effect of anticipated positive feelings on participants' intention to reduce electricity consumption while controlling for the effect of the perceived quantity of the saving on intention, and vice versa. In order to determine whether the perceived quantity of the saving and the anticipated positive feelings both predict unique variance in the data, we checked for multicollinearity by calculating the variance inflation factor (VIF). The common rule of thumb is that if the size of the VIF is smaller than 10, multicollinearity is not a problem and the predictors each predict unique variance [44].

We report the regression analyses for each of the units used to communicate savings (kWh, CO₂ and money) in separate paragraphs. Second, to test hypothesis 2 and 3, a mediation analysis was conducted. This allowed us to test the extent to which the effects of anticipated positive feelings and the perceived quantity of a saving on participants' intention to reduce electricity exert their effects via a relatively elaborated process – whether participants perceive the saving as worth the effort. We used a mediation macro from Preacher and Hayes [43] to test the model at once. The results for Study 1 are shown in Fig. 2 and are further elaborated on below.

2.2.1. Predicting intention to reduce electricity consumption framed in terms of kilowatt hours

We first examined the responses to electricity savings expressed in terms of kilowatt hours. The perceived quantity of the saving and anticipated positive feelings of kilowatt hour savings together explained 47.0% of the variance (Adjusted R²) in intention to reduce electricity consumption, $F(2, 149) = 67.98$, $p < 0.001$, $VIF = 1.209$. The

¹ Although not a main goal of the study, it is interesting to note that the average means for intention to reduce electricity consumption as well as its predictors are highest when an intangible unit – CO₂ – was used as a unit to communicate energy savings.

² Multiple comparison analyses were done using a Bonferroni correction as part of separate repeated measures ANOVA's for perceived quantity, anticipated positive feelings, perceived worthiness and intention, using the different units (kWh, CO₂ and money) as the within-subject factor.

Fig. 2. Results Study 1; beta coefficients between brackets indicate the coefficients when worthiness is included in the model.

more participants anticipated feeling good about the portrayed 148 kWh saving, the more they intended to reduce their electricity consumption to achieve the saving on an annual basis: $\beta = 0.67$, $t(149) = 10.29$, $p < 0.001$, 95% CI [0.49, 0.72], supporting Hypothesis 1. Perceived quantity of the saving did not significantly predict participants' intention to reduce electricity consumption to save 148 kWh annually ($\beta = 0.05$, $t(149) = 0.72$, $p = 0.475$, 95% CI [-0.08, 0.17]). In sum, the anticipation of feeling good more strongly predicted participants' intention to reduce electricity consumption compared to the perceived quantity of the saving, as reflected by the non-overlapping 95% confidence intervals of the two predictors.

Next, we tested whether the perceived worthiness of the saving mediated the effect of anticipated positive feelings and the perceived quantity on participants' intention. As expected, the effect of anticipated positive feelings on intention was partially mediated by how worth the effort people found this saving. The 95% bias-corrected bootstrap confidence interval of the indirect effect ranged from 0.180 to 0.496. The direct effect was significantly reduced when perceived worthiness was included in the model, but remained significant: $\beta = 0.37$, $t(149) = 5.65$, $p < 0.001$, 95% CI [0.25, 0.51]. For the respective mediation analyses, we also calculated the percentage of the total effect that is mediated, as proposed by Kenny (<http://davidakenny.net/cm/mediate.htm#IE>). Here, the total effect mediated is 55.6%.

The effect of the perceived quantity of the saving on participants' intention to reduce electricity consumption was fully mediated by how worth the effort they found this saving. The 95% bias-corrected bootstrap confidence interval of the indirect effect ranged from 0.016 to 0.152. The effect of perceived quantity on participants' intention to reduce electricity consumption remained non-significant and was further reduced when perceived worthiness was included in the model: $\beta = -0.02$, $t(149) = -0.35$, $p = 0.729$, 95% CI [-0.13, 0.09].

2.2.2. Predicting electricity reduction framed in terms of CO₂ emissions

We then examined participants' responses to electricity savings expressed in terms of CO₂ emissions. The perceived quantity of the saving and anticipated positive feelings of CO₂ emissions savings together explained 52.9% of the variance (Adjusted R²) in intention to reduce electricity consumption, $F(2, 149) = 85.71$, $p < 0.001$. As hypothesized, the more participants anticipated feeling good about saving 81 kg CO₂, the more they intended to reduce their electricity consumption to achieve this saving on an annual basis:

$\beta = 0.67$, $t(149) = 10.80$, $p < 0.001$, 95% CI [0.53, 0.77]. In addition, the higher this saving was perceived to be, the higher the intention was to reduce electricity use in order to achieve this saving: $\beta = 0.13$, $t(149) = 2.18$, $p = 0.031$, 95% CI [0.01, 0.25], VIF = 1.215. Again, anticipated positive feelings were more predictive of the intention to reduce electricity consumption compared to the perceived quantity of the saving, as reflected by the non-overlapping 95% CI's of the two predictors.

In line with Hypothesis 2, the effect of anticipated positive feelings on intention was partially mediated by how worth the effort people found this saving. The 95% bias-corrected bootstrap confidence interval of the indirect effect ranged from 0.093 to 0.383. The direct effect was significantly reduced when perceived worthiness was included in the model: $\beta = 0.47$, $t(149) = 6.87$, $p < 0.001$, 95% CI [0.33, 0.59]. 39.7% of the total effect is mediated.

The effect of the perceived quantity of the saving on participants' intention to reduce electricity consumption was fully mediated by the perceived worthiness of the saving. The 95% bias-corrected bootstrap confidence interval of the indirect effect ranged from 0.025 to 0.190. The effect of perceived quantity on participants' intention to reduce electricity consumption was no longer statistically significant when perceived worthiness was included in the model: $\beta = 0.06$, $t(149) = 0.99$, $p = 0.323$, 95% CI [-0.06, 0.17].

2.2.3. Predicting electricity reduction framed in terms of monetary savings

We finally examined participants' responses to electricity savings expressed in monetary units. The perceived quantity of the saving and anticipated positive feelings of monetary savings together explained 38.5% of the variance (Adjusted R²) in participants' intention to reduce electricity consumption, $F(2, 148) = 47.91$, $p < 0.001$. As expected, the more participants anticipated feeling good about the possible monetary saving, the more they intended to reduce their electricity consumption in order to save 33 Euro annually: $\beta = 0.53$, $t(148) = 7.10$, $p < 0.001$, 95% CI [0.39, 0.69]. The higher the amount of this saving was perceived to be, the stronger the intention was to reduce electricity to save 33 Euro: $\beta = 0.17$, $t(148) = 2.25$, $p = 0.026$, 95% CI [0.02, 0.31], VIF = 1.339. Notably, even when it concerned monetary savings, anticipated positive feelings were more predictive of the intention to reduce electricity consumption compared to the perceived quantity of this saving, as reflected by the non-overlapping 95% CI's of the two predictors.

As expected, the effect of anticipated positive feelings on intention was partially mediated by how worth the effort people found this saving. The 95% bias-corrected bootstrap confidence interval of the indirect effect ranged from 0.080 to 0.389. The direct effect remained significant, but was significantly reduced when perceived worthiness was included in the model: $\beta = 0.35$, $t(148) = 4.16$, $p < 0.001$, 95% CI [0.19, 0.53]. 54.2% of the total effect is mediated.

The effect of the perceived quantity of the saving on participants' intention to reduce electricity consumption was fully mediated by how worth the effort they found this saving. The 95% bias-corrected bootstrap confidence interval of the indirect effect ranged from 0.049 to 0.275. The effect of perceived quantity on participants' intention to reduce electricity consumption became non-significant when perceived worthiness was included in the model: $\beta = 0.06$, $t(148) = 0.79$, $p = 0.433$, 95% CI [-0.09, 0.21].

2.3. Discussion

In Study 1 we tested to what extent the likelihood of people acting environmentally-friendly is based on the mechanism of "valuation by feeling", while controlling for the effect of the mechanism of "valuation by calculation", using the reduction of electricity consumption as an indicator for pro-environmental behavior. As hypothesized, we found that the more people anticipated feeling good about reducing their electricity consumption, the stronger their intention was to reduce their electricity consumption. Importantly, these anticipated positive feelings more strongly predicted people's intention to act environmentally-friendly than the perceived quantity of the benefits of acting environmentally-friendly, indicating that people's intention to act environmentally-friendly is primarily based on "valuation by feeling" and less on "valuation by calculation". Interestingly, this was the case irrespective of which type of savings (in terms of either kWh, CO₂ or Euros) was communicated. As hypothesized, we found that how worth the effort people found the benefits as a result of acting environmentally-friendly partially mediated the effect of anticipated positive feelings on people's intention to act environmentally-friendly. Yet, there remained a direct effect of anticipated positive feelings on people's intention to act environmentally-friendly, indicating that there are other, perhaps less elaborate, processes underlying the effect of anticipated positive feelings on people's intention to act environmentally-friendly. Finally, the effect of the perceived quantity of the benefits of acting environmentally-friendly on people's intention to act environmentally-friendly was fully mediated by how worth the effort people found these benefits to be, indicating that this effect is based on an elaborated process.

In Study 1, we used a student sample. Reducing electricity consumption might be a pro-environmental action that students are less involved in compared to other people, as for example they may still live with their parents or live in large student flats where electricity consumption is not measured on an individual basis. We therefore wanted to see if we could replicate the findings of Study 1, by using a non-student sample in Study 2 for whom electricity savings would be more relevant. Additionally, we wanted to see if our

findings could be replicated by testing the model as shown in Fig. 1 in a different country, to get more insights into the generalizability of our findings.

3. Study 2

3.1. Method

3.1.1. Participants

A total of 132 people participated in the study via Amazon Mechanical Turk (all United States citizens), of which 85 were males. The average age was 30.6 ($SD = 9.65$; range 19–66).

3.1.2. Procedure, measures and design

The study was identical to Study 1, the only difference being the numbers that were used in the scenarios. The actual average electricity consumption is higher in the United States compared to The Netherlands where Study 1 was conducted, and electricity is cheaper in the United States. Therefore, we adapted the numbers that we used in Study 1 so that they better reflect the situation in the US. More specifically, in Study 2 we indicated that yearly electricity consumption either amounted to 5.580 kWh, 3.070 kg CO₂ or 720 Dollars, and savings as a result of a 8.3% electricity reduction were respectively 491 kWh, 270 kg CO₂ or 63 Dollars. The mean scores for the variables included in the study are reported in Table 2.³

3.2. Results

3.2.1. Predictors of reducing electricity consumption

The same analyses as in Study 1 were conducted, separately for each type of unit, to determine the extent to which the anticipation of feeling good and the perceived quantity of a saving would predict participants' intention to reduce electricity consumption. We also again tested whether the effect of perceived quantity of the saving and of anticipated positive feelings on participants' intention to reduce electricity consumption is mediated by the extent to which participants perceive the saving as a result of electricity reduction as worth the effort, in the same way as in Study 1.

The findings of Study 2 are shown in Fig. 3 and are further elaborated on below.

3.2.2. Predicting intention to reduce electricity consumption framed in terms of kilowatt hours

We first examined participants' responses to electricity savings framed in terms of kilowatt hours. The perceived quantity of the saving and anticipated positive feelings of kilowatt hour savings together explained 72.7% of the variance (Adjusted R²) in intention to reduce electricity consumption, $F(2, 129) = 175.07$, $p < 0.001$. The more participants anticipated feeling good about the saving, the more they intended to reduce their electricity consumption in order to save 491 kWh on an annual basis: $\beta = 0.79$, $t(129) = 13.66$, $p < 0.001$, 95% CI [0.72, 0.85], supporting Hypothesis 1. Perceived quantity of the saving did not significantly predict participants' intention to reduce electricity consumption to save 491 kWh annually: $\beta = 0.09$, $t(129) = 1.58$, $p = 0.117$, 95% CI [-0.03, 0.24], $VIF = 1.621$. In sum, the anticipation of feeling good more strongly predicted participants' intention to reduce electricity consumption compared to the perceived quantity of the saving, as reflected by the non-overlapping 95% confidence intervals of the two predictors.

Table 2

Means of perceived quantity, anticipated positive feelings, perceived worthiness and intention for different types of savings (SD's are reported between parentheses; use of different superscripts a, b or c within a row signify significant differences between the respective means at $p < 0.05$, while equal superscripts within a row imply no significant differences between the means at $p < 0.05$).

	kWh	CO ₂	Money
Perceived quantity	3.81 (1.25) ^a	3.45 (1.18) ^b	3.64 (1.45) ^{a/b}
Anticipated positive feelings	4.34 (1.36) ^b	3.99 (1.50) ^c	4.76 (1.39) ^a
Perceived worthiness	4.07 (1.34) ^b	3.81 (1.22) ^c	4.41 (1.53) ^a
Intention	4.07 (1.43) ^b	3.79 (1.49) ^c	4.52 (1.44) ^a

³ Although not a main goal of the study, it is interesting to note that the average means for intention to reduce electricity consumption as well as for the level of anticipated positive feelings and perceived worthiness are highest when monetary savings as a result of electricity reduction were communicated.

Fig. 3. Results Study 2; beta coefficients between brackets indicate the coefficients when worthiness is included in the model.

Next, we tested whether the perceived worthiness of the saving mediated the effect of anticipated positive feelings and the perceived quantity on participants' intention. As expected, the effect of anticipated positive feelings on intention was partially mediated by how worth the effort people found this saving. The 95% bias-corrected bootstrap confidence interval of the indirect effect ranged from 0.078 to 0.370. The direct effect was significantly reduced when perceived worthiness was included in the model, but remained significant: $\beta = 0.65$, $t(129) = 9.82$, $p < 0.001$, 95% CI [0.55, 0.82]. 32.7% of the total effect is mediated.

The effect of the perceived quantity of the saving on participants' intention to reduce electricity consumption was fully mediated by how worth the effort they found the saving. The 95% bias-corrected bootstrap confidence interval of the indirect effect ranged from 0.071 to 0.311. The effect of perceived quantity on participants' intention to reduce electricity consumption remained non-significant, but was significantly reduced when perceived worthiness was included in the model: $\beta = -0.02$, $t(129) = -0.38$, $p = 0.702$, 95% CI [-0.17, 0.11].

3.2.3. Predicting intention to reduce electricity consumption framed in terms of CO₂ emissions

We then examined participants' responses to electricity savings framed in terms of CO₂ emissions. The perceived quantity of the saving and anticipated positive feelings of CO₂ emissions savings together explained 76.2% of the variance (Adjusted R²) in intention, $F(2, 129) = 210.32$, $p < 0.001$. As expected, the more participants anticipated feeling good about the portrayed 270 kg CO₂ saving, the more they intended to reduce their electricity consumption: $\beta = 0.80$, $t(129) = 16.05$, $p < 0.001$, 95% CI [0.69, 0.89]. The higher this saving was perceived to be, the stronger the intention was to reduce electricity in order to save 270 kg CO₂: $\beta = 0.13$, $t(129) = 2.63$, $p = 0.010$, 95% CI [0.04, 0.29], VIF = 1.365. Anticipations of positive feelings more strongly predicted the intention to reduce electricity consumption compared to the perceived quantity of the saving, as reflected by the non-overlapping 95% confidence intervals of the two predictors.

As expected, the effect of anticipated positive feelings on intention was partially mediated by how worth the effort people found this saving. The 95% bias-corrected bootstrap confidence interval of the indirect effect ranged from 0.183 to 0.632. The direct effect was significantly reduced when perceived worthiness was included in the model, but remained significant: $\beta = 0.55$, $t(129) = 8.91$, $p < 0.001$, 95% CI [0.42, 0.66]. 39.8% of the total effect is mediated.

The effect of the perceived quantity of the saving on participants' intention to reduce electricity consumption was fully mediated by how worth the effort they found the saving. The 95% bias-corrected bootstrap confidence interval of the indirect effect ranged from 0.025 to 0.230. The effect of perceived quantity on participants' intention to reduce electricity consumption was significantly reduced and became non-significant when perceived worthiness was included in the model: $\beta = 0.06$, $t(129) = 1.38$, $p = 0.171$, 95% CI [-0.04, 0.19].

3.2.4. Predicting intention to reduce electricity consumption framed in terms of monetary savings

Finally, we examined participants' responses to electricity savings framed in terms of money. The perceived quantity of the saving and anticipated positive feelings of monetary savings explained 66.4% of the variance⁴ (Adjusted R²) in intention to reduce electricity consumption, $F(2, 129) = 130.71$, $p < 0.001$. The more participants anticipated feeling good about saving 63 Dollars by reducing electricity consumption, the more they intended to reduce their electricity consumption in order to realize this saving: $\beta = 0.76$, $t(129) = 12.40$, $p < 0.001$, 95% CI [0.66, 0.91], supporting our first hypothesis. The perceived quantity of saving 63 Dollars by reducing electricity did not significantly affect participants' intention to reduce electricity in order to save 63 Dollars: $\beta = 0.10$, $t(129) = 1.62$, $p = 0.108$, 95% CI [0.20, 0.44], VIF = 1.461. Again, even when monetary savings are emphasized, anticipations of positive feelings more strongly predicted the intention to reduce electricity consumption compared to the perceived quantity of the saving, as reflected by the non-overlapping 95% confidence intervals of the two predictors.

⁴ For Study 1 and 2 we calculated confidence intervals around the R² values of the separate regression analyses for each of the units used to communicate savings (kWh, CO₂ and money) to explore whether the explained variance of the tested model varies depending on the type of unit. A MS-DOS program from Steiger and Fouladi [31] was used to calculate these confidence intervals. The R²'s can be considered as sufficiently different when the confidence intervals around the R² values overlap no more than half of the distance of one side on a confidence interval (see [22]). For Study 1 the confidence intervals are: kWh – (0.34; 0.57), CO₂ – (0.40, 0.62), money – (0.25, 0.49), and for Study 2 they are: kWh – (0.63, 0.79), CO₂ – (0.67, 0.82), money – (0.55, 0.74). Thus for both studies, the explained variance of the tested model is significantly higher when CO₂ is used as a unit to communicate savings as opposed to using a monetary unit; there are no significant differences when comparing the other units to each other.

As expected, the effect of anticipated positive feelings on intention was partially mediated by how worth the effort people found this saving. The 95% bias-corrected bootstrap confidence interval of the indirect effect ranged from 0.226 to 0.747. The direct effect remained significant, but was significantly reduced when perceived worthiness was included in the model: $\beta = 0.44$, $t(129) = 5.72$, $p < 0.001$, 95% CI [0.30, 0.61]. 61.8% of the total effect is mediated.

The effect of the perceived quantity of the saving on participants' intention to reduce electricity consumption was fully mediated by how worth the effort they found the saving. The 95% bias-corrected bootstrap confidence interval of the indirect effect ranged from 0.074 to 0.440. The effect of perceived quantity on participants' intention to reduce electricity consumption was reduced and remained non-significant when perceived worthiness was included in the model: $\beta = -0.05$, $t(129) = -0.86$, $p = 0.391$, 95% CI [-0.17, 0.07].

3.3. Discussion

Study 2 provided further evidence that people's intention to act environmentally-friendly, in this case by reducing their electricity consumption, can be based on the mechanism of "valuation by feeling". As in Study 1, anticipated positive feelings were more predictive of people's intention to act environmentally-friendly than the perceived quantity of the benefits of acting environmentally-friendly. This indicates that people's intention to act environmentally-friendly is mainly based on the mechanism of "valuation by feeling" and to a lesser extent on "valuation by calculation". Again, this was the case irrespective of the type of benefits of pro-environmental actions that were communicated, that is, savings in terms of either kWh, CO₂ or Dollars. As expected, the perceived worthiness of the savings as a result of a reduction in electricity consumption partially mediated the effect of anticipated positive feelings on people's intention to reduce their electricity consumption. Finally, how worth the effort people found the benefits of acting environmentally-friendly fully mediated the effect of the perceived quantity of the benefits on people's intention to act environmentally-friendly.

4. General discussion

It is critical to understand what drives people to act environmentally-friendly, so that more knowledge is gained on how to effectively design environmental campaigns that aim to encourage pro-environmental behavior. The aim of our paper was two-fold. First, we aimed to determine whether the mechanism of "valuation by feeling" affects the likelihood that people will act environmentally-friendly, in addition to the mechanism of "valuation by calculation". This way, we could also explore how strongly people's intention to act environmentally-friendly is driven by "valuation by feeling" compared to "valuation by calculation" to get an indication of which valuation mechanism mainly drives people's intention to act environmentally-friendly. Second, we aimed to gain more insights into the way in which "valuation by feeling" and "valuation by calculation" affect the likelihood that people will act environmentally-friendly by looking at the extent to which the valuation mechanisms affect people's intention to act environmentally-friendly through an elaborated process. To achieve this second aim, we looked at the extent to which the two valuation mechanisms make acting environmentally-friendly perceived to be more worth the effort, subsequently affecting people's intention to act environmentally-friendly, and to what extent the mechanisms directly affect people's intention to act environmentally-friendly.

Different samples across two countries and different types of benefits of pro-environmental actions were used in our studies, to get an indication of the generalizability of our findings. We used electricity reduction as an indicator of pro-environmental behavior, which is often seen as a hassle and is not inherently pleasurable to perform. Using electricity reduction as an indicator of pro-environmental behavior can provide insights whether "valuation by feeling" occurs because people are intrinsically motivated to do the right thing by acting environmentally-friendly and not merely because the behavior is perceived as inherently pleasurable. We communicated benefits of reducing electricity consumption that are either tangible, personal benefits (monetary savings) or that are intangible (savings in kWh or CO₂-emissions).

Across two studies we found that the more people anticipated feeling good when acting environmentally-friendly (i.e., reducing electricity consumption), the stronger their intention to act environmentally-friendly was. This suggests that people's intention to act environmentally-friendly is at least partly based on "valuation by feeling". Importantly, these anticipated positive feelings were more predictive of people's intention to act environmentally-friendly than the perceived quantity of the benefits of acting environmentally-friendly, indicating that "valuation by feeling" more strongly drives people's intention to act environmentally-friendly than "valuation by calculation". To our knowledge, these findings are the first to show that, also when it pertains to environmental decision-making, anticipated feelings may be more important than people's calculations.

Interestingly, we found this pattern of results across all indicators, both when we used intangible (kilowatt hours, CO₂) and tangible units (money) to communicate the savings. This suggests that the moral component of acting environmentally-friendly can make people to expect to feel good about themselves when acting environmentally-friendly and even be more motivating for people than how many personal benefits they expect to gain from this behavior. These findings are in line with research indicating that overall people's decision-making is often based on feelings [41] and with research showing that moral decisions are often made based on feelings rather than on more reasoned considerations [16]. Our studies provided some initial insights that pro-environmental actions can be driven by positive feelings, because of the moral connotation of pro-environmental behavior. Future research could test this reasoning explicitly, in order to more conclusively determine that people indeed expect to feel good about themselves because they are intrinsically motivated to do the right thing by acting in a pro-environmental manner, next to these decisions being either in people's self-interest or being inherently pleasurable to do.

In addition, we found that the perceived worthiness of the benefits of pro-environmental actions fully mediated the effect of the perceived quantity of the benefits of acting environmentally-friendly.⁵ Yet, the perceived worthiness of the benefits of pro-environmental actions only partially mediated the effect of anticipated positive feelings on people's intention to act environmentally-friendly. Specifically, even when taking into account the perceived worthiness of the benefits of pro-environmental actions, there remained a large direct effect of anticipated positive feelings on people's intention. This suggests that there are multiple processes underlying the effect of anticipated positive feelings on people's intention to act in an environmentally-friendly manner, and that feelings not only indirectly affect people's intention via the extent to which people find the benefits of pro-environmental actions to be worth the effort.

⁵ We should note that in some cases we technically found indirect-only mediation effects [42] as the direct effect of perceived quantity on intention to act environmentally-friendly was not always statistically significant.

This further strengthens the importance of the role of anticipated positive feelings as they might affect people's pro-environmental actions in many situations, thereby affecting pro-environmental actions both via an elaborated process, but also without much elaboration.

5. Limitations and future research

There are some limitations of the studies that we conducted that can be addressed in future research. First, we measured all variables in the study with a single item, which can potentially reduce reliability of the measured constructs and introduce some statistical noise. Future research could use multi-item measures to more fully grasp the constructs that we used in our study and/or include different conceptualizations of the constructs. Yet, we should note that in many cases single-item and multi-item measures perform equally well regarding the measuring of constructs (e.g. [6]). More importantly, we replicated the findings across different indicators to communicate savings as well as across two studies comprising different samples, making it less likely that statistical noise seriously affected the findings. Additionally, we measured the variables in the studies by having participants responding to several statements; future research could apply different measurements in order to further explore the validity of the findings.

Second, we focused on the benefits of acting environmentally-friendly, in particular energy conservation actions. We did not control for the (behavioral) costs of pro-environmental actions which might also have an impact on how worth the effort people find it to act environmentally-friendly; for instance, people could have had different specific actions in mind in order to conserve energy. People may make a trade-off between the perceived prospected benefits and costs of acting environmentally-friendly to determine how worth the effort the behavior overall is, but costs were not measured or manipulated in our studies. Future research can for instance examine whether feelings are more impactful when making decisions pertaining to less costly actions, such as recycling paper, and are less predictive of high cost actions, such as reducing one's car use. Costly actions are more likely to be high-involvement decisions, making it more likely that people will base their decision on cognitions and calculations. Therefore, feelings might be more important in explaining people's environmental decision-making regarding low-involvement actions that are associated with lower costs.

Third, we only focused on people's intention to act environmentally-friendly, an operationalization which may not fully acknowledge the costs, for example in terms of effort, of actual pro-environmental behavior. Additionally, there may be a gap between explaining intentions and explaining behavior, as research suggests that medium-to-large sized changes in people's intention translate only into small-to-medium sized changes in actual behavior [27,40], for instance because performing the actual behavior change requires more effort than simply stating one's intention to change behavior. Future research could therefore include actual pro-environmental actions as a dependent variable to further test our reasoning and determine to what extent our findings are generalizable to actual pro-environmental actions. Future research could also experimentally vary (behavioral) costs of such actions in terms of for example effort. Nonetheless, intention-based research is valuable when providing important insights into psychological processes, which our paper aims to do in the context of explaining pro-environmental behavior.

Fourth, future research can focus on the conditions under which anticipated feelings affect people's environmental actions. For example, the effect of anticipated feelings on behavior may differ depending on the level of elaboration. According to the Elaboration

Likelihood Model, the level of people's elaboration in decision-making depends on their motivation and ability to elaborate [9]. People's motivation to engage in elaboration can for instance depend on their level of involvement in environmental issues, where more highly involved people are in general more likely to engage in more elaboration in their decision-making. When people are more motivated to elaborate in their decision-making, then the perceived quantity of the benefits of pro-environmental actions might be more predictive of people's intention to act environmentally-friendly (relative to the effect of anticipated positive feelings), as the effect of "valuation of calculation" on people's decision-making appears to take place via an elaborated process. Additionally, when people are more motivated to engage in elaboration, the effect of anticipated positive feelings on people's intention to act environmentally-friendly might be more likely to occur via an elaborated process, via a determination of how worth the effort the benefits of pro-environmental actions are. People's level of ability to engage in elaboration can for instance depend on the time constraints and/or the cognitive load they encounter in a decision situation. Here, more time constraints and/or a higher cognitive load might make it more likely that decisions are based on feelings, because people do not have the opportunity to engage in much elaboration.

Fifth, we only focused on anticipated positive feelings of acting environmentally-friendly, and did not look at the extent to which anticipated negative feelings of acting in an environmentally-harmful way can affect people's environmental decision-making. People might anticipate feeling bad about themselves in case they act environmentally-unfriendly – for instance when they consider throwing empty batteries in the regular waste bin. They might want to avoid such negative feelings, which can be an also be, or even be a stronger motivator for people to do something good for the environment than anticipated positive feelings when acting environmentally-friendly, given that anticipated losses can potentially affect decision-making more than gains [36]. If anything, our results are a rather conservative test of the relative importance of feelings, given that we only examined the impact of positive (not negative) feelings; future research could explore whether either anticipated positive or negative feelings are more influential in affecting people's environmental decision-making.

A final limitation to point out is that the samples that we used both were non-representative for the respective countries, as we used a Dutch student sample for Study 1 and a sample of United States citizens via Mechanical Turk for Study 2. Yet, we found similar results when we controlled for gender and age. Future research is needed to test whether results can be replicated when representative samples are used.

While our main focus in this paper was on the effect of different valuation mechanisms driving people's intention to act environmentally-friendly, an interesting difference emerged in the strength of these intentions across different units communicating different types of benefits of pro-environmental actions. In Study 1, intention to act environmentally-friendly was strongest when CO₂ savings were communicated, while in Study 2 intention was strongest when monetary savings were communicated. Previous studies have found that environmental appeals can be more motivating than monetary appeals to promote certain pro-environmental actions [4,7,26]. A possible explanation for the different effects of different units in our studies might lie in the samples that we used. In Study 2, we used MTurk, an online participant pool where people get financially compensated for participating in a study. Therefore, monetary savings might be relatively important for this sample. Alternatively, there might have been a difference in the strength of environmental values between the samples that we used for both studies: psychology students in Study 1 may more strongly endorse environmental values

than the MTurk participants in Study 2. Consequently, psychology students might value environmental benefits such as savings in CO₂ emissions more highly, while MTurk participants might value monetary savings more highly. Future research can explore in what situations communicating CO₂ savings leads to stronger intentions to act environmentally-friendly, and in what situations communicating monetary savings leads to stronger intentions to act environmentally-friendly. Even though there were differences between the two studies regarding which type of savings elicited the strongest intentions to act environmentally-friendly, these differences did not appear to affect the strength of the effect of both the perceived quantity of the benefits of pro-environmental actions and of anticipated positive feelings on people's intention to act environmentally-friendly, as the strength of these relations were similar in both studies. Thus, while there might be differences in which saving frames in itself are more motivating for people to act environmentally-friendly, such differences do not appear to affect the extent to which people's intention to act environmentally-friendly is driven by either "valuation by feeling" or "valuation by calculation".

As was already noted in the introduction, it is conceivable that the two mechanisms can to some extent affect each other. For instance, the more CO₂-emissions or money a person could save by reducing one's electricity consumption, the better this person might feel about this reduction. Or vice versa, a person who anticipates to feel very good about reducing electricity consumption, might be more likely to perceive any saving as larger. In this paper, we are particularly interested in which of the two valuation mechanisms is most predictive of intention to act pro-environmentally. Therefore, we focused on the unique effects of the valuation mechanisms on the intention to reduce electricity consumption; we checked for multicollinearity and also attempted to control for such possible interdependent relations between the two valuation mechanisms in the current study design. Future studies could enrich our findings by explicitly taking into account the extent to which the two mechanisms affect each other by using an experimental design. For instance, an experimental design could be used in which the quantity of the benefits of electricity reduction is manipulated (for instance, 27 Euro versus 93 Euro). Additionally, one experimental condition could use visual images of the positive consequences of acting in a pro-environmental manner in the (near) future, which can lead to stronger anticipated positive feelings (e.g. [17]), while another experimental condition only uses text communicating the benefits of the pro-environmental action.

6. Practical implications

Currently, many environmental campaigns are designed under the assumption that people are guided by "valuation by calculation" when deciding whether to act environmentally-friendly, assuming that if certain benefits, such as savings, are large enough, people will be motivated to act more environmentally-friendly. For instance, campaigns indicate that people can save more money if they adopt environmentally-friendly actions. However, our findings suggest that it is important to also consider that anticipated positive feelings can affect people's intention to act environmentally-friendly when designing such campaigns. Specifically, given that the use of vivid images can strengthen people's feelings (e.g. [17]), campaigns could visually highlight the positive (affective) consequences of people's environmentally-friendly actions, for example by highlighting flourishing nature, animal species that can continue to live happily in their natural environment, or clean forests or beaches. We reasoned that "valuation by feeling" affects people's environmental decision-making, because people can be intrinsically

motivated to do the right thing by acting environmentally-friendly. Promoting pro-environmental behavior in such a way that it is based on intrinsic motivations is important, not only because of its potential to make people feel good about acting pro-environmentally [34,37], but also because this can be a more stable, long-term motivator of behavior change compared to extrinsic motivations [10,38]. Additionally, from a policy-perspective strategies targeting intrinsic motivation typically are more cost-effective to promote pro-environmental than strategies appealing to extrinsic motivations such as financial incentives [8,38]. Consequently, it is important that when attempting to make people to expect to feel good about themselves when acting environmentally-friendly in the (near) future, this is a result of these people believing that they do the right thing by acting environmentally-friendly rather than the behavior is pleasurable. Thus the connection between people's contributions to a better, cleaner environment and the use of visual images that show this better, cleaner environment should be made clear in the environmental campaign.

The importance of "valuation by feeling" affecting people's intention to act environmentally-friendly suggests that even when the benefits of acting environmentally-friendly are relatively low, people might still act environmentally-friendly if they anticipate to feel good about themselves when doing so. This is an important finding given that pro-environmental actions generally lead to small or even no savings [8]. Our results suggest that little or no savings do not need to be a barrier to environmentally-friendly actions as long as people anticipate to feel good when acting in such a manner.

In many situations where people have to decide whether to act environmentally-friendly or not, engaging in extensive elaboration might not be possible due to constraints in terms of for example time or a high cognitive load when for instance there are a lot of options to choose from. To illustrate, when people go to the supermarket, they often are in a hurry, while there are also a lot of choice options per product category resulting in a potential high cognitive load (for instance, think about the large assortment of eggs with different options in terms of quality, environmental friendliness, free-range or not). In the current age, and maybe even more so in the future, these kinds of situations are more often the norm than the exception. As a result, feelings can become even more important for pro-environmental choices when people need to more often make decisions with little elaboration. Particularly if the goal is to have people choose the most environmentally-friendly option in a decision situation that is constrained in terms of time and/or cognitive load, it would be beneficial to facilitate decision-making based on feelings. Let's say that pastured eggs (eggs that come from chickens raised outdoors who hunt-and-peck for their food) are the most environmentally-friendly option. Stimulating people to choose pastured eggs can for example be facilitated by hanging a poster at the eggs shelf that not only shows the environmental-friendliness of pastured eggs, but also symbolizes how good people can feel about themselves when choosing this environmentally-friendly option, by for example showing these chickens walking outdoors in their natural environment and hunting for their own food (as opposed to chickens being held in a cage). Such a visual image could also be used on the packaging itself.

To conclude, the mechanism of "valuation by feeling" affects people's intention to act environmentally-friendly, even more so than "valuation by calculation". People do not appear to be as calculating as is often assumed when it comes to explaining how likely it is that they will act in a pro-environmental manner. This implies that getting people to act environmentally-friendly appears to be more a matter of feelings, and less a matter of calculation.

Acknowledgement

This research was conducted as part of the INTEWON project (EOS LT 10033), funded by Netherlands Enterprise Agency (Rijksdienst voor Ondernemend Nederland).

References

- [1] W. Abrahamse, L. Steg, C. Vlek, T. Rothengatter, A review of intervention studies aimed at household energy conservation, *J. Environ. Psychol.* 25 (3) (2005) 273–291.
- [2] J. Andreoni, Impure altruism and donations to public goods: a theory of warm-glow giving, *Econ. J.* (1990) 464–477.
- [3] J. Andreoni, Warm-glow versus cold-prickle: the effects of positive and negative framing on cooperation in experiments, *Q. J. Econ.* (1995) 1–21.
- [4] O.I. Asensio, M.A. Delmas, Nonprice incentives and energy conservation, *Proc. Natl. Acad. Sci.* 112 (6) (2015) 510–515.
- [5] A. Bechara, H. Damasio, A.R. Damasio, Emotion, decision making and the orbitofrontal cortex, *Cereb. Cortex* 10 (3) (2000) 295–307.
- [6] L. Bergkvist, J.R. Rossiter, The predictive validity of multiple-item versus single-item measures of the same constructs, *J. Mark. Res.* 44 (2) (2007) 175–184.
- [7] J.W. Bolderdijk, L. Steg, E.S. Geller, P.K. Lehman, T. Postmes, Comparing the effectiveness of monetary versus moral motives in environmental campaigning, *Nat. Clim. Change* 3 (4) (2013) 413–416.
- [8] J.W. Bolderdijk, L. Steg, Promoting sustainable consumption: the risks of using financial incentives, in: J. Thøgersen, L. Reisch (Eds.), *Handbook of Research on Sustainable Consumption*, Edward Elgar, Cheltenham, UK, 2015 (21).
- [9] J.T. Cacioppo, R.E. Petty, The elaboration likelihood model of persuasion, *Adv. Consum. Res.* 11 (1) (1984) 673–675.
- [10] J.I. De Groot, L. Steg, Mean or green: which values can promote stable pro-environmental behavior? *Conserv. Lett.* 2 (2) (2009) 61–66.
- [11] J.I. De Groot, L. Steg, Morality and prosocial behavior: the role of awareness, responsibility, and norms in the norm activation model, *J. Soc. Psychol.* 149 (4) (2009) 425–449.
- [12] E. Dogan, J.W. Bolderdijk, L. Steg, Making small numbers count: environmental and financial feedback in promoting eco-driving behaviours, *J. Consum. Policy* (2014) 1–10.
- [13] J.S.B. Evans, In two minds: dual-process accounts of reasoning, *Trends Cogn. Sci.* 7 (10) (2003) 454–459.
- [14] M.L. Finucane, A. Alhakami, P. Slovic, S.M. Johnson, The affect heuristic in judgments of risks and benefits, *J. Behav. Decis. Mak.* 13 (1) (2000) 1–17.
- [15] J. Haidt, The emotional dog and its rational tail: a social intuitionist approach to moral judgment, *Psychol. Rev.* 108 (4) (2001) 814.
- [16] C.K. Hsee, Y. Rottenstreich, Music, pandas, and muggers: on the affective psychology of value, *J. Exp. Psychol. Gen.* 133 (1) (2004) 23.
- [17] C.K. Hsee, Y. Rottenstreich, Z. Xiao, When is more better? On the relationship between magnitude and subjective value, *Curr. Dir. Psychol. Sci.* 14 (5) (2005) 234–237.
- [18] D. Kahneman, S. Frederick, Representativeness revisited: attribute substitution in intuitive judgment, *Heuristics Biases: Psychol. Intuit. Judgm.* (2002) 49–81.
- [19] D. Kahneman, A perspective on judgment and choice: mapping bounded rationality, *Am. Psychol.* 58 (9) (2003) 697.
- [20] S. Lindenberg, Intrinsic motivation in a new light, *Kyklos* 54 (2–3) (2001) 317–342.
- [21] M.E. Masson, G.R. Loftus, Using confidence intervals for graphically based data interpretation, *Can. J. Exp. Psychol.* 57 (3) (2003) 203–220.
- [22] A.M. Nordlund, J. Garvill, Effects of values, problem awareness, and personal norm on willingness to reduce personal car use, *J. Environ. Psychol.* 23 (4) (2003) 339–347.
- [23] R.M. Ryan, E.L. Deci, Intrinsic and extrinsic motivations: classic definitions and new directions, *Contemp. Educ. Psychol.* 25 (1) (2000) 54–67.
- [24] D. Schwartz, W. Bruine de Bruin, B. Fischhoff, L. Lave, Advertising energy saving programs: the potential environmental cost of emphasizing monetary savings, *J. Exp. Psychol.: Appl.* 21 (2) (2015) 158–166.
- [25] P. Sheeran, Intention–behavior relations: a conceptual and empirical review, *Eur. Rev. Soc. Psychol.* 12 (1) (2002) 1–36.
- [26] P. Slovic, M.L. Finucane, E. Peters, D.G. MacGregor, The affect heuristic, *Eur. J. Oper. Res.* 177 (3) (2007) 1333–1352.
- [27] B.K. Sovacool, S.E. Ryan, P.C. Stern, K. Janda, G. Rochlin, D. Spreng, M.J. Pasqualetti, H. Wilhite, L. Lutzenhiser, Integrating social science in energy research, *Energy Res. Soc. Sci.* 6 (2015) 95–99.
- [28] L. Steg, L. Dreijerink, W. Abrahamse, Factors influencing the acceptability of energy policies: a test of VBN theory, *J. Environ. Psychol.* 25 (4) (2005) 415–425.
- [29] J.H. Steiger, R.T. Fouladi, R2: A computer program for interval estimation, power calculations, sample size estimation, and hypothesis testing in multiple regression, *Behav. Res. Methods Instrum. Comput.* 24 (1992) 581–582.
- [30] P.C. Stern, T. Dietz, T. Abel, G.A. Guagnano, L. Kalof, A value-belief-norm theory of support for social movements: the case of environmentalism, *Human Ecol. Rev.* 6 (2) (1999) 81–98.
- [31] P.C. Stern, K.B. Janda, M.A. Brown, L. Steg, E.L. Vine, L. Lutzenhiser, Opportunities and insights for reducing fossil fuel consumption by households and organizations, *Nat. Energy* 1 (2016) 16043.
- [32] D. Taufik, J.W. Bolderdijk, L. Steg, Acting green elicits a literal warm glow, *Nat. Clim. Change* 5 (1) (2015) 37–40.
- [33] A. Tversky, D. Kahneman, The framing of decisions and the psychology of choice, *Science* 211 (4481) (1981) 453–458.
- [34] A. Tversky, D. Kahneman, Loss aversion in riskless choice: a reference-dependent model, *Q. J. Econ.* (1991) 1039–1061.
- [35] S. Van der Linden, The helper's high: why it feels so good to give, *Ode Mag.* 8 (6) (2011).
- [36] S. van der Linden, Intrinsic motivation and pro-environmental behaviour, *Nat. Clim. Change* 5 (7) (2015) 612–613.
- [37] E. van der Werff, L. Steg, K. Keizer, It is a moral issue: the relationship between environmental self-identity, obligation-based intrinsic motivation and pro-environmental behaviour, *Glob. Environ. Change* 23 (5) (2013) 1258–1265.
- [38] T.L. Webb, P. Sheeran, Does changing behavioral intentions engender behavior change? A meta-analysis of the experimental evidence, *Psychol. Bull.* 132 (2) (2006) 249.
- [39] R.B. Zajonc, Feeling and thinking: preferences need no inferences, *Am. Psychol.* 35 (2) (1980) 151.
- [40] X. Zhao, J.G. Lynch, Q. Chen, Reconsidering Baron and Kenny: myths and truths about mediation analysis, *J. Consum. Res.* 37 (2) (2010) 197–206.
- [41] A.F. Hayes, K. Preacher, SPSS MEDIANTE macro syntax reference (2012).
- [42] R.M. O'Brien, A caution regarding rules of thumb for variance inflation factors, *Qual. Quant.* 41 (5) (2007) 673–690.