Vanquishing energy vampires: the failure of feedback

Kathryn Buchanan & Riccardo Russo
Department of Psychology
University of Essex
Wivenhoe Park
Colchester CO4 3SQ
United Kingdom
kbucha@essex.ac.uk
rrusso@essex.ac.uk

Ben Anderson
Engineering and the Environment
University of Southampton
Southampton
SO17 1BJ
United Kingdom
b.anderson@soton.ac.uk

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Abstract

Feedback strategies are frequently employed as a behavioural change strategy. The idea is that presenting people with information about their past behaviour can change their future intentions. Hence feedback strategies appear to rest on the assumption that "if only we knew better we would act differently". In this paper we assess the validity of this assumption by examining whether feedback can influence pro-environmental intentions and the processes that it involves. Specifically, across 6 different studies we provided over 1,000 participants with feedback about the yearly costs of their homes "energy vampires" (appliances such as televisions and laptops that consume energy even when they are not being actively used). We presented feedback in several different ways (e.g., financial losses vs. financial savings, collective costs vs. personal household costs). Yet, regardless of the form in which we presented feedback it did not have a significant effect on behavioural intentions. However, feedback did significantly increase knowledge and awareness. Such findings suggest that while feedback may lead to increases in awareness and knowledge, these factors alone are not enough to influence behavioural intentions.

Introduction

As a generic term feedback refers to the provision of information to a recipient about their performance and is often a strategy employed to encourage behaviour change. The so called "consequence" strategy (Abrahamse et al., 2005) is based on the notion that feeding back information about past performance can be used to modify future behaviour (Foulds, Royston, Buchanan, & Hargreaves, 2014). In the context of energy, it is hoped that distributing information about consumption (i.e., eco-feedback) will lead consumers to adopt energy efficient behaviours. In the 1980's so called 'eco-feedback' strategies became increasingly popular, leading to burgeoning research that critics noted was marked by "a simultaneous lack of concern with theory and overemphasis on application" (Katzev & Johnson, 1987). Several decades later and the empirical studies assessing whether feedback can reduce energy consumption (Delmas et al., 2013) still outnumber those assessing the assertions about how feedback does (or does not) work. Yet, if feedback interventions are to be implemented that can effectively influence energy consumption behaviour, then it is important to know not only if they can work (the practical applications) but also how they work (the theory behind them). In the present study, we aimed to go beyond the contributions of existing research, by examining *both* (i) the applications of feedback (i.e., the impact it has on consumers' behavioural intentions) and (ii) the theory behind feedback (i.e., whether it increases knowledge and/or awareness and/or motivations). To achieve this, we examine feedback in the context of a home-energy-calculator that provides people with feedback about the costs of their energy vampires, (appliances, such as televisions, that, when in stand-by mode, consume energy despite not being actively used). Given the online nature of our study, we assessed behavioural intentions rather than behaviours, as it was beyond the scope of our resources to monitor and measure the energy consumption from the energy vampires, both before and after

feedback, to assess whether or not feedback led to behavioural changes (i.e., unplugging energy vampires).

In the following introduction we describe existing research that examines the applications of feedback and identify the theoretical assertions typically made about how feedback works, before outlining the approach of the present research.

APPLICATIONS: CAN FEEDBACK REDUCE ENERGY CONSUMPTION? IDENTIFYING AN EFFECTIVE STRATEGY

Countless researchers have examined the effect of feedback on energy consumption. Meta analyses typically quote that energy savings range from 5 to 20 % (e.g., Abrahamse et al., 2005; Darby, 2006; Fischer, 2008), although when more robust studies are conducted, the average energy savings are lower at just 2 % (Delmas et al., 2013). Delmas et al. (2013) suggest that the differing findings are likely due to varying quality in methodological designs (e.g., the use of an appropriate control condition), differences in sample (e.g., demographics, sample sizes) and variation in the feedback technique(s) employed. Indeed, feedback can be presented in many different forms. For instance information about consumption can be framed as economic gains (savings) or economic losses, compared to others' performance, or presented with varying levels of personal relevance and specificity. To date, research has not conclusively identified which feedback strategies are the most effective. Indeed, Delmas et al (2013) note that this is because existing research has tended to combine multiple feedback strategies within a single experimental condition. To help address this research gap, in the present research we administered feedback in various forms across 6 different studies. To ensure that we were able to make meaningful comparisons between the different feedback strategies we generally avoided combining multiple feedback studies in a singular experimental condition. However in studies where an experimental condition included two feedback strategies (e.g., disaggregated costs and energy efficiency advice) we also included an experimental condition containing one of these feedback strategies (e.g., just disaggregated costs). Given, that our experimental context utilized an online calculator, we provided participants with feedback on just one occasion.

In Study 1 we varied both the personalisation of the feedback (e.g., participants were shown either their own personal costs or the national average cost) and its granularity (e.g., participants were shown either disaggregated costs vs. the total costs vs. no costs). We varied these factors as past research has found that people respond better to feedback when it is tailored to them (Goodhew et al., 2014) and speculated that feedback may be more effective when it provides disaggregated costs (Buchanan et al., 2014). In Study 2 we manipulated whether the information was presented using positive or negative frames (i.e., potential savings vs. losses). On the basis of prospect theory (Tversky & Kahneman, 1991), we expected that feedback would have a more powerful effect on behavioural intentions when the costs involved are framed as losses rather than as gains or potential savings. In Study 3 we supplemented the yearly costs with socially comparative information (i.e., we told participants if their vampire costs were lower/higher/comparable to the national average). Past findings suggest that people may be more inclined to engage with feedback when social norms are also provided (Harries et al., 2013). In Study 4 we provided participants with collective costs (e.g., details of the country's annual energy vampire costs). We reasoned that the collective monetary (and environmental) savings may be larger than individual savings and thus may be more likely to motivate intentions to change behaviour. In Studies 5 and 6 we attempted to increase the appeal of the monetary savings using visualization tasks. We reasoned that if people could relate the outcome of the targeted behaviour (unplugging energy vampires) to the purchase of a desired product then this might influence their behavioural intentions.

THEORY: HOW DOES FEEDBACK WORK? THREE TYPICAL ASSERTIONS

Typically, the explanations provided for why feedback might reduce consumption are based around the following themes; filling an information/knowledge deficit (e.g., Wilhite & Ling, 1995/Darby, 2006), promoting economical motivations (e.g., McKerracher & Torriti, 2012) and, transforming energy to increase visibility (e.g., Hargreaves et al., 2010). Whilst each of these themes have a different emphasis they all based on the inherent characteristics of energy as something that is abstract, intangible, and invisible – both visually and consciously (Fischer, 2008; Hargreaves et al; 2010).

In Table 1 we provide a summary of each of the three main perspectives in respect of and how each perspective views (i) the consumers, (ii) the feedback device, and (iii) how the feedback device will be used and (iv) how it works. While these explanations have not been tested quantitatively, qualitative data suggests that feedback may highlight the visibility of energy consumption, increase awareness of the costs associated with energy use and subsequently elicit curtailment behaviours, as well as enhancing knowledge about a home's energy profile (Buchanan et al., 2014; Hargreaves et al., 2010). To tests these explanations quantitatively, in the present study we measured knowledge, awareness, and motivations both before participants received feedback, and again after they received feedback. This allowed us to see whether these constructs changed as a function of the feedback received.

The Present Research: Testing Applications and Theory

In the present study, we investigated feedback using an adapted version of an energy vampire calculator, which provided end users with a personalised estimate of the costs of their energy vampires (a term used to refer to appliances in the home that consume energy even when they are not in active use). Before completing the calculator and receiving feedback, participants completed a questionnaire which measured their motives, knowledge about energy vampire costs and existing habits regarding unplugging energy vampires. After receiving feedback, participants completed a post-feedback questionnaire which measured their; behavioural intentions to vanquish energy vampires, motives, knowledge and awareness about energy vampire costs. The type of feedback that participants received, depended on the condition to which they had been randomly assigned.

This design allowed us to examine both the applications of feedback and the theoretical assertions made about how it works. As such we aimed to address the following research questions: (i) Can feedback influence behavioural intentions? (ii) Which feedback strategies are most effective? (iii) Will feedback significantly alter knowledge, and/or awareness and/

Table 1. An overview of the typical assertions made about feedback according to the commonly adopted perspectives.

	The Information/Knowledge Deficit Perspective	The Economical Perspective	The Heightened Visibility Perspective
View of Consumer	Unknowing.	Rational & logical.	Unaware (oblivious).
View of Feedback Device	An information resource/learning aid.	A means of linking consumption to cost.	A means of highlighting consumption.
How feedback device will be used	To gain information/a better understanding of energy consumption.	To micro-manage energy resources.	To direct attention towards consumption.
How feedback devices works	Empowers consumers with information/knowledge so that they can make 'better choices'.	Consumers motivated to maximize efficiency in order to minimize costs.	Increases both physical and conscious visibility.

or motivations? Specifically, to examine (i), whether feedback influenced behavioural intentions, we examined the differences in behavioural intentions to vanquish vampires between the control condition and each of the experimental conditions. This allowed us to see whether receiving feedback about the costs of energy vampires (experimental conditions) increased behavioural intentions to vanquish energy vampires significantly more than reading a sentence that explained what energy vampires were (control condition). In comparing each experimental condition to the control condition, we were also able to examine (ii) which feedback strategy was most effective. To further examine (ii), we also conducted 6 Analysis of Variance (ANOVA), one for each study, to examine if there was any difference in mean scores obtained on behavioural intentions to vanquish energy vampires' scores. It should be noted that an ANOVA is an inferential statistical test used to assess whether there are significant differences between the mean scores in different conditions. Thus conducting the ANOVAs enabled us to see if in any of the studies, any one type of feedback was more effective than another type of feedback strategy. To examine (iii), the theoretical assertions made about feedback, we examined if knowledge, motives and awareness would change as a result of feedback. We thus, measured these constructs both before and after participants received feedback to see if there would be a changed as a result of receiving feedback.

Notably, we chose to focus on energy vampires for four reasons. First, energy vampires plague most homes and constitute 10 % of the average American's energy bill. Second, we reasoned that, compared to other energy saving measures (e.g., purchasing energy star products), unplugging energy vampires is a relatively easy action to take. Third, as we derived our feedback using calculations extracted from a US utility company's (NStar) energy vampire calculator (http://c03.apogee.net/contentplayer/?coursetype=misc&utilityid=nstar&id=18942) we were able to provide each participant with a personalised estimate of their energy vampire costs. This added a dimension of ecological validity to our research as the costs shown to people vary depending on the households' characteristics. Fourth, given that we were able to provide feedback online we were able to modify the feedback provided and thus assess the individual value of several different feedback strategies.

Method

We recruited 1,106 American respondents (556 female, aged 18–80, Mean = 33.24, Standard Deviation; SD = 11.48) via Amazon's Mechanical Turk (M-Turk), a website where workers are paid to complete tasks. Past research suggests that the data obtained from M-Turk is at least as reliable as the data obtained via traditional methods, and reflect a more diverse sample than either internet or college student samples (Buhrmester, Kwang, & Gosling, 2011; Mason & Suri, 2011; Paolacci, Chandler & Ipeirotis, 2010; Rand, 2011). Moreover researchers have replicated experimental studies previously conducted using both convenience and nationally representative samples and have found that the estimated average treatment effects are similar in the M-Turk and in the original samples (Berinsky et al., 2011). In the present research, appropriate measures were taken to ensure that the data were of acceptable standard. Specifically, we prevented respondents from taking the questionnaire more than once and attention checks were included where participants were instructed to select a particular option (e.g., please select the middle option to show you are paying attention). Moreover, to avoid accruing a biased sample comprised only of participants with a specialist interest in energy our task description, "your feedback about some info", was intentionally vague. Our experiment involved four steps for the participants. (1) Completing the pre-feedback questionnaire, (2) completing the home energy vampire calculator, (3) receiving feedback about the costs of their energy vampires (evidently the type of feedback they received depended on which condition participants had ben randomly assigned to), (4) completing the post-feedback questionnaire. Participants completed all steps in one single session, such that they responded to the pre-feedback questionnaire immediately before receiving feedback and completed the post-feedback questionnaire immediately after receiving feedback.

DETAILS OF FEEDBACK PRESENTATION

We presented participants with a genuine estimation of their vampire costs using the estimates provided by NSTAR's 2013 'Vampire Power Calculator'. In Study 1, participants were shown one of the following: (a) the personalised total cost of their energy vampires (hereafter referred to as personalised

total – PT); (b) a PT plus the disaggregated costs per each appliance; (c) PT and advice regarding how to eliminate energy vampires; (d) an explanation about what an energy vampire is (but no PT); (e) generic costs of vampires in the US (but no PT).

In Study 2, participants were either shown a smiling emoticon (☺) stating, "'Good news!' You could save __$ per year by unplugging your appliances when they are not in use!" or a sad emoticon (☹) stating, "'Bad news!' You are wasting __$ per year by keeping your appliances plugged in when they are not in use!". In Study 3, participants were shown their PT along with a statement about whether their energy vampire costs were lower than/comparable to/higher than the average American home. In Study 4, participants were shown either their PT or their PT and a short paragraph emphasizing the collective costs of energy vampires. In Study 5, participants were shown their PT and asked either to complete a positive visualization task in which they imagined something they would like to buy with the money saved from vanquishing energy vampires or a negative visualization task where they imagine something that they would not like to buy with their savings. In Study 6, participants were assigned to complete one of four different variations of the positive visualization task. They either had to imagine what they could purchase with their potential savings that they (a) needed for themselves, (b) needed for others, or (c) wanted for themselves or (d) wanted for others.

MEASURES

We administered the measures listed below. These were developed by the first and second author due to the specificity of the constructs we were measuring (e.g., behavioural intentions to vanquish energy vampires, knowledge of costs associated with energy vampires). Where measures used more than 1 item, we conducted factor analyses to ensure the structural validity of the scale and tested the internal consistency of each measure. With respect to the latter, we report the Alpha Cronbach scores below. The rule of thumb for interpreting Cronbach's alpha is that; $\alpha \geq 0.9$ is excellent, $0.7 \leq \alpha < 0.9$ is good, $0.6 \leq \alpha < 0.7$ is acceptable, $0.5 \leq \alpha < 0.6$ is poor, and $\alpha < 0.5$ is unacceptable. However, it is worth noting that a greater number of items in the measure can artificially increase the value of alpha and a smaller number of items in the measure can decrease it.

Where measures used multiple items, we computed a mean score. Unless otherwise stated, the measures involved participants rating the extent to which they endorsed each item using a 7 point scale ranging from 1 (Strongly Disagree) to 7 (Strongly Agree). Within each measure we randomized the order in which the questions were presented.

The Pre-Feedback Questionnaire (i.e., constructs assessed before feedback)

Knowledge: We assessed knowledge of energy vampires using three items, "I know how much it costs me when I leave appliances in standby mode.", "If I wanted to reduce my energy costs I would know which appliances I should avoid leaving in standby mode.", and "I can see a clear link between my energy use and my energy bills".). The reliability of the scale was poor, but this may be expected given that it was comprised of just 3 items (In Studies 1 to 6, α's ranged from .47 to .60).

Awareness: In Studies 4–6 we examined if feedback increased awareness by asked participants to indicate their agreement/disagreement with the following two statements, "I am aware that appliances that have a standby mode cost me money even when they are not in use" and "I am conscious of the fact that appliances that are plugged in but not in use still consume energy". The scale had acceptable reliability (α's ranged from .62 to .72).

Motives: Participants used a 7 point scale to indicate to what extent they were (a) environmentally motivated ("I would like to reduce my carbon footprint") and (b) financially motivated ("I would like to reduce my energy bills").

The Post Feedback Questionnaire (i.e., constructs assessed after feedback)

Behavioural intentions to vanquish vampires: We assessed behavioural intentions using 7 items (e.g., "unplug some 'energy vampire' appliances?" and "regularly check that appliances are unplugged if they are not in use?"). Participants were asked to indicate the likelihood that they would enact each of the 7 items, using a scale ranging from 1 ("Very Unlikely") to 7 ("Very Likely"). Across each of the studies the scale had excellent reliability (α ranged from .82 to .92).

Knowledge: As per the pre-feedback questionnaire. The reliability ranged from .45 to .68.

Awareness: As per the pre-feedback questionnaire. The scale had acceptable reliability as α's in Studies 4 to 6 ranged from .65 to .83).

Motives: As per the pre-feedback questionnaire.

Results

CAN FEEDBACK INFLUENCE BEHAVIOURAL INTENTIONS TO VANQUISH ENERGY VAMPIRES?

Table 2 shows the means, standard deviations for each of the variables we measured.

The findings clearly show that the mean behavioural intention scores (ranging from 4.20 to 4.67) were relatively stable, varying little across the 18 conditions. Planned comparisons between the control condition (in Study 1) and each of the experimental conditions (in Studies 1 to 6) yielded only one significant result. Specifically, participants who had visualized spending the monetary savings obtained from vanquishing energy vampires on a desired item had higher behavioural intentions to vanquish energy vampires than participants in the control condition (4.65 vs. 4.20, $p = .038$). However, this difference became non-significant after applying Bonferroni's corrections to account for the multiple tests we had run. Given, these non-significant differences, our findings do not provide support for the assertion that providing people with feedback about the monetary costs of their home's energy vampires will lead to intentions to unplug energy vampires.

IDENTIFYING AN EFFECTIVE FEEDBACK STRATEGY

Our results did not lead us to identify one feedback strategy that was more effective than another. This was not only because there were no significant differences between the control condition and any of the experimental conditions (as per above) but also because there were no significant effects of con-

Table 2. Studies 1 to 6: Means Scores for (i) Behavioural Intention to Vanquish Energy Vampires and (ii) Changes in Knowledge, Motives, and Awareness Per Condition.

				Knowledge		Financial Motives		Environmental Motives		Awareness	
Study	Condition	*N*	Beh Intent	Time 1	Time 2	Time 1	Time 2	Time 1	Time 2	Time 1	Time 2
1	No PT (Control)	63	4.20	4.51	4.48	–	–	–	–	–	–
	Generic total	83	4.35	4.38	4.90**	–	–	–	–	–	–
	PT	62	4.23	4.24	5.31**	–	–	–	–	–	–
	PT + disaggregated	63	4.46	4.41	5.51**	–	–	–	–	–	–
	PT + advice	52	4.27	4.43	5.48**	–	–	–	–	–	–
2	PT + gain frame ☺	47	4.32	4.23	5.21**	6.28	6.26	5.28	5.40*	–	–
	PT + loss frame ☹	49	4.67	4.48	5.64**	6.12	6.14	5.51	5.63	–	–
3	PT + < average	51	4.29	4.39	5.43**	6.00	5.86	5.27	5.33	–	–
	PT + average	42	4.42	4.38	5.35**	6.12	6.14	5.43	5.45	–	–
	PT + > average	68	4.25	4.32	5.59**	6.16	6.04	5.35	5.47	–	–
4	PT	72	4.60	4.28	5.48**	5.67	6.18	5.38	5.67*	5.70	6.00**
	PT + collective	56	4.66	4.61	5.64**	5.88	6.07	5.50	5.80*	5.61	6.16**
5	PT + VD	88	4.65	4.49	5.67**	6.22	6.31	5.37	5.43	5.61	6.15**
	PT + VU	87	4.30	4.29	5.46**	6.12	6.04	5.36	5.46	5.81	6.13**
6	PT + VYN	56	4.53	4.51	4.48* *	6.32	6.25	5.57	5.63	5.86	6.15**
	PT + VON	53	4.45	4.38	4.90**	6.30	6.25	5.43	5.58	5.85	6.22**
	PT + VYW	58	4.49	4.24	5.31**	6.29	6.22	5.28	5.48*	5.85	6.15**
	PT + VOW	56	4.43	4.41	5.51**	6.14	6.07	5.57	5.71	5.84	6.07**

*Note: PT = Personalised total. VD = visualize desired item(s), VU = visualize undesired item(s), VYN = visualize item(s) you need, VON = visualize item(s) others need, VYW = visualize item(s) you want, VOW= visualize item(s) others want. Time 1 = pre feedback, Time 2 = post-feedback. * denotes where changes between time 1 and time 2 = p < .05, ** = p < .01. Standard deviations, standard errors, and confidence intervals are not included in this table due to space prohibitions. However, a full table with information for each variable measured is available on request.*

dition on behavioural intentions in any of the ANOVA's that we conducted (Study 1: $F(4,318) = .42$, *Non Significant; NS*), Study 2: $F(1,94) = 1.57$, *NS*, Study 3: $F(2,158) = .24$, *NS*, Study 4: $F(1,126) = .06$, *NS*, Study 5: $F(1,173) = 3.10$ $p = .08$, Study 6: $F(4,318) = .42$, *NS*).

TESTING THE THEORY: CAN FEEDBACK AFFECT KNOWLEDGE, AWARENESS, AND MOTIVATIONS?

Knowledge: In each of the studies we found that feedback significantly increased knowledge (Study 1: $F(1,318) = 144.74$; Study 2: $F(1,94) = 82.07$; Study 3: $F(1,158) = 158.89$; Study 4: $F(1,126) = 111.84$; Study 5: $F(1, 130) = 154.13$; Study 6: $F(1, 219) = 273.59$, all p's $< .01$). However, there was only a significant interaction between knowledge and condition in Study 1($F(4,318) = 12.93$, $p < .01$), such that every condition apart from the control, experienced significant gains in knowledge. In Studies 2–6, the interaction between knowledge and condition was not significant (Study 2: $F(1,94) = .62$; Study 3: $F(2,158) = 1.19$; Study 4: $F(1,126) = .73$; Study 5: $F(1,146) = .01$; Study 6: $F(3,219) = 2.21$, all *NS*).

Awareness: In each of the studies that we measured awareness we found that it significantly increased post-feedback (Study 4: $F(1,126) = 37.15$; Study 5: $F(1,130) = 25.35$; Study 6: $F(1,219) = 40.16$. All p's $< .01$). There were no significant interactions between changes in awareness and condition (Study 4: $F(1,126) = 3.16$; Study 5: $F(1,130) = 0.45$, Study 6: $F(3,219) = .24$ all *NS).*

Motivations: We did not find overwhelming support for the notion that receiving feedback significantly changes either financial or environmental motives. Specifically, feedback only significantly increased environmental motivations in 4 out of 13 conditions and only financial motivations in 1 out of 13 conditions. As such, our data does not provide strong support for the assertions that feedback elicits motivation.

Discussion

Across 6 different studies we provided over 1,000 participants with feedback about the costs of their energy vampires. Despite, presenting this information in a variety of ways we failed to find support for the notion that feedback can significantly influence behavioural intentions. In fact, given that behavioural intention scores did not significantly vary between conditions, we were unable to state that any one of the feedback strategies was more successful than any other in inciting pro-environmental behaviour. As for the theoretical assumptions often made about feedback, we found little support for the idea that feedback can significantly alter motivations. Consequently, there was no strong support for the economic perspective that feedback motivated consumers to rationally micromanage their consumption to accrue financial benefits. Yet, this is not to say that feedback did not have any impact at all. On the contrary, we consistently found that feedback significantly increased both awareness and knowledge, thus support was provided for the theoretical assertions made by both the knowledge deficit and heightened visibility perspectives. However, despite the fact that feedback significantly increased knowledge and awareness, these benefits alone were not enough to substantially influence behavioural intentions.

OUR FINDINGS IN THE CONTEXT OF EXISTING RESEARCH

Given that, past research has often found feedback to have a beneficial effect on pro-environmental behaviour (e.g., Abrahamse et al., 2005); our results may appear in opposition to existing findings. However, more recently researchers have questioned whether pecuniary feedback strategies really are effective. For instance, a meta-analysis found that far from inducing conservation, providing study participants with monetary savings actually increased consumption (Delmas et al., 2013). The researchers speculated that this may be because the monetary savings are not large enough to motivate behavioural changes and instead prompt a "licensing effect" (p. 31) where people feel entitled to the benefits from energy use because they are paying for it. Indeed, receiving feedback about potential monetary savings after interacting with a home energy calculator led some participants to comment that reducing energy use was "not worth it" (Spence et al., 2014, Study 1). However, we do not think this explanation fully accounts for our own findings as controlling for either the costs we told participants or the appraisal of monetary savings did not change our results. Such findings led credence to researchers' comments (e.g., Hargreaves et al., 2010) that there is no simple cause and effect relationship such that providing feedback leads to rational decisions to reduce energy consumption.

METHODOLOGICAL CONSIDERATIONS

We speculate that there are a number of characteristic of the present research that may have led to our findings that feedback did not influence behavioural intentions. First, we employed a "one shot" feedback technique (i.e., we effectively utilised an energy savings calculator) rather than a continuous feedback strategy (e.g., such as an in-home-display). While, this is a method that is employed in the real-world in the form of online calculators, feedback may be most effective when it is given frequently and over a long time (Fischer, 2008). It may be that, people need time to reflect on the feedback they have been given before they form the required behavioural intentions. Notably, our study design did not allow participants the time for this reflection as behavioural intentions were measured immediately after they received feedback. It may also be that we did not present our feedback in a visually appealing way, as per other studies that have had more success in using feedback to instigate behavioural changes. For instance, Goodhew et al. (2014) found that householders were more likely to reduce their energy use if they viewed a thermal image of the heat escaping from their own home than householders who received a carbon footprint . Second, we measured behavioural intentions as opposed to actual behaviours. Although meta-analyses show that behavioural intentions and behaviours are strongly correlated (r = .46, Godin & Kok, 1996) they are not perfectly correlated. Thus, while it seems unlikely, we cannot rule out the possibility that the feedback we provided might have prompted decreases in energy consumption. Finally, in order to identify which feedback strategy worked the best; unlike past feedback experiments we did not simultaneously use several feedback strategies. However, it may be that individual feedback strategies are not enough to promote behavioural intentions, but rather only work when various combination are simultaneously implemented (e.g., loss framings and visualisation).

BROADER APPLIED IMPLICATIONS

While the present research only examined feedback in the context of energy vampires, nonetheless we believe that our findings have wider societal implications. In particular, information strategies are frequently employed by the government to encourage behavioural changes (e.g., more detailed nutritional information is now provided on food packaging). Yet, while such information based initiatives may raise awareness and increase knowledge levels, it is naive to believe that information alone will result in the desired behavioural changes. As such, there is need for government policy to recognize the wider complexities surrounding human nature and to implement informational campaigns as just one aspect of a more holistic strategy to facilitating positive behavioural changes.

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