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Self-affirmation theory and pro-environmental behaviour: Promoting a reduction in household food waste.

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Abstract

Household food waste has a significant detrimental impact on the environment. However, despite national campaigns, people in high income countries throw away a sizeable proportion of the food they purchase. The present study investigated whether self-affirmation could promote openness to information detailing the negative consequences of household food waste, with a particular focus on fruit and vegetable waste. Participants ($N = 362$) completed either a standard self-affirmation manipulation, an integrated self-affirmation manipulation or a control task before reading the information and completing a series of measures assessing cognitive antecedents of behaviour. Household fruit and vegetable waste was self-reported one-week later. Compared to their non-affirmed counterparts, participants in the standard self-affirmation condition wasted less fruit and vegetables at follow-up. The findings suggest that self-affirmation has the potential to promote engagement with pro-environmental behaviour. Research should continue to explore how to integrate self-affirmation successfully within pro-environmental campaigns.

Keywords: self-affirmation theory, behaviour change, food waste, pro-environmental behaviour, sustainability.

Self-affirmation theory and pro-environmental behaviour: Promoting a reduction in household food waste.

Food waste presents a major contemporary environmental challenge. People waste approximately one third of the food produced for human consumption each year, which equates to 1.32 billion tonnes globally (Gustavsson, Cederburg, Sonesson, van Otterdijk, & Meybeck, 2011). Furthermore, the global carbon footprint of food waste has been estimated to be the equivalent of 3.3 gigatons of carbon dioxide emissions (Food and Agriculture Organization [FAO], 2013). Food waste occurs at all stages of the food supply chain; however, in high-income countries such as the UK, consumers have been identified as the largest single contributor (Griffin, Sobal, & Lyson, 2009).

In spite of campaigns targeting household food waste, UK households still throw away around 19% of the food and drink purchased for consumption (Waste and Resource Action Programme [WRAP], 2013). One possible reason why campaigns may not have been effective at eliminating high levels of waste is that people may respond defensively to information detailing the negative consequences of their actions (Sherman, 2013; Stoll-Kleemann, O'Riordan & Jaeger, 2001; van't Riet & Ruiter, 2013). Self-affirmation theory (Steele, 1988) contends that such defensive responses can be ameliorated by self-affirmation: the process of affirming the self by thinking about one's personally important values, characteristics or strengths. However, to date, only one published study has explored whether self-affirmation might encourage behaviour change after exposure to information about an environment-related issue (Walter, Demetriades, & Murphy, 2017a). Given the demonstrated applied benefits of self-affirmation in other domains (Cohen & Sherman, 2014), this would seem to be a notable omission to the research literature. Accordingly, the primary aim of the current study was to explore whether self-affirmation could increase openness to a message detailing the negative consequences of household food waste, resulting in a subsequent reduction in food waste behaviour.

Food Waste and the Role of the Consumer

In addition to detrimental social and economic consequences (Stuart, 2009; WRAP, 2011), the production, supply and disposal of food which is wasted confers significant environmental costs. Food waste contributes to the demand for agricultural land, placing increased pressure on the world's already depleted forests (FAO, 2013). Food waste also has significant implications for water consumption; for example approximately 6.2 billion cubic meters of water are wasted annually in the UK producing food that is subsequently thrown away (Chapagain & James, 2011). Furthermore, the disposal of biodegradable waste into landfill contributes to the release of methane, a more potent greenhouse gas than carbon dioxide with 34 times the global warming potential over 100 years (IPCC, 2013). Indeed, it is estimated that avoidable food and drink waste is responsible for 17 million CO_2 equivalent tonnes of greenhouse gas emissions in the UK alone (WRAP, 2011; 2013).

In high income countries such as the UK, the consumer has been identified as the main contributor to food waste, with households generating more food waste than any other single sector, including manufacturing, distribution, grocery retail, and hospitality (Griffin, Sobal, & Lyson, 2009; Quested, Parry, Easteal, & Swannell, 2011). Accordingly, it is proposed that minimizing household food waste represents an effective means of reducing the impact of food waste on the environment (Quested, Marsh, Stunell, & Parry, 2013). Numerous factors have been identified that may influence household food waste, including: knowledge and skills around food management and preparation, the perceived need to have an abundance of food readily available in the home, the desire to minimise inconvenience, and the belief that reducing food waste is not a priority (e.g., Graham-Rowe, Jessop, & Sparks, 2014). The focus of the present paper, however, is on the potential for defensive responses to undermine the efficacy of campaigns aimed at minimising household food waste.

Despite the best efforts of national campaigns, household food waste levels remain high. Indeed, in the UK, it is estimated that households generate 7.3 million tonnes of food waste a

year, the majority of which (4.2 million tonnes) is thought to be avoidable (WRAP, 2015). Public communication campaigns have frequently focused on the negative consequences of food waste, either for the environment (e.g., "The waste of good food and drink is associated with 4% of the UK's total water footprint" [Love Food Hate Waste, 2007]) or for the individual (e.g., "Wasting food costs the average household £470 a year, rising to £700 for a family with children, the equivalent of around £60 a month" [Love Food Hate Waste, 2007]). One possible factor that may limit the success of these campaigns is the tendency for individuals to react defensively to such messages. Information that implies shortcomings in an individual's actions can elicit defensive responses, including denial, rationalization or rejection of the message content (Sherman, 2013; Stoll-Kleemann, O'Riordan & Jaeger, 2001; van 't Riet & Ruiter, 2013). Such defensive responses may, in turn, reduce the likelihood that individuals will accept the message and change their behaviour in accordance with the aims of the campaign. In other words, by highlighting how people have behaved ill-advisedly in the past, food waste campaigns might inadvertently elicit defensive responses, which lessen the chances of recipients taking the message on board and reducing their food waste accordingly.

Self-Affirmation Theory

Self-affirmation theory (Steele, 1988) offers a theoretical account of why people may respond defensively when faced with messages that highlight the negative consequences of their behaviour. The theory posits that people are motivated to protect their self-integrity, the belief that they are "adaptively and morally adequate, that is, competent, good, coherent, unitary, stable, capable of free choice, capable of controlling important outcomes..." (p. 262). To accept a message detailing the shortcomings of one's actions is tantamount to admitting that one has failed to live up to these standards. Consequently, defensive responses to such messages may represent attempts to protect or restore one's self-integrity.

Critically, however, self-affirmation theory offers a potential means of reducing such defensive reactions by use of a relatively simple technique. Specifically, self-affirmation theory contends that if individuals are given the opportunity to self-affirm by reflecting on their cherished values, actions or attributes, this should act as a boost to their self-integrity and leave them more amenable to consider information detailing the shortcomings of their actions without engaging in defensive responses (Cohen & Sherman, 2014; Sherman, 2013).

A growing body of research supports the position that self-affirmation can facilitate open-minded processing of information in health-related domains. Thus, two recent meta-analyses found small, but reliable, effects of self-affirmation manipulations on cognition and behaviour (Epton, Harris, van Koningsbruggen, Kane, & Sheeran, 2015; Sweeney & Moyer, 2015). Indeed, Epton et al. (2015) note how their effect sizes are comparable to those obtained in meta-analyses of other health behaviour change interventions. Moreover, the benefits of self-affirmation have frequently been found to be greatest for those most at risk (e.g., higher alcohol consumers [Harris & Napper, 2005] or heavier smokers [Harris, Mayle, Mabbot, & Napper, 2007]). This presumably reflects the fact that these individuals are most threatened by - and hence most likely to respond defensively to - the health-risk information, with the consequence that they are particularly influenced by self-affirmation's apparent capacity to reduce such defensive responses. The finding that higher risk groups appear to derive the greatest benefit from self-affirmation has important applied significance, as these individuals are typically the most important to persuade, yet simultaneously the most resistant to persuasion.

Applications of Self-Affirmation in the Environmental Domain

Little research has investigated whether self-affirmation can promote openness to information highlighting the negative environmental consequences of behaviour. A couple of studies have shown that self-affirmation results in people being more open to generic information detailing (a) the threat posed by climate change and (b) the contribution of

human activity to climate change, as reflected in less denial of climate change and greater personal involvement with regard to the consequences of climate change (Sparks, Jessop, Chapman, & Holmes, 2010, Study 1; van Prooijen & Sparks, 2014). Furthermore, van Prooijen and Sparks (2014) demonstrated that these effects were most apparent for those who were initially sceptical about climate change. These findings suggest that self-affirmation can sometimes promote acceptance of information detailing the consequences and anthropogenic nature of climate change. However, a further study revealed that self-affirmation can strengthen people's commitment to their established beliefs about climate change when they are not presented with any new information (van Prooijen, Sparks, & Jessop, 2013).

To date, few published studies have directly investigated whether a standard self-affirmation manipulation increases openness to information detailing the consequences of a specific behaviour for the environment (Sparks et al., 2010, Study 2; Walter et al., 2017a; see also Jessop, Sparks, Jessop, Dodds, & Lynch, 2016) and only one of these has explored the impact of self-affirmation on subsequent behaviour (Walter et al., 2017a). Sparks et al. (2010, Study 2) exposed participants to information detailing (a) the environmental costs of failing to recycle and (b) the benefits and relative ease of recycling. They demonstrated that low-recyclers who were self-affirmed prior to reading this information expressed stronger intentions to increase the amount they recycled compared to their non-affirmed counterparts; indeed, the self-affirmation manipulation appeared to attenuate the relationship between past recycling behaviour and cognitions regarding future recycling behaviour. There was no evidence that the self-affirmation manipulation influenced attitudes towards recycling. These findings suggest that self-affirmation techniques have the potential to promote acceptance of information detailing the negative consequences of one's behaviour for the environment, with the result that individuals may be more motivated to change their behaviour accordingly. However, this study is subject to several limitations. First, the authors explored the effects of self-affirmation on only two cognitive antecedents of behaviour: attitudes and intentions.

Second, they did not examine whether the reported effects of self-affirmation on intentions translated into actual behaviour change.

More recently, Walter at al. (2017a) explored whether a self-affirmation manipulation would promote openness to a message detailing the negative consequences of the drought in California. The researchers found no evidence that the self-affirmation manipulation impacted intentions to conserve water reported immediately after exposure to the information or self-efficacy (although there were effects on collective-efficacy). However, compared to those in the control condition, self-affirmed participants engaged in more water conservation behaviours at both 7-day and 30-day follow-up. Walter et al.'s finding regarding the behavioural impact of self-affirmation in an environmental domain is promising. Although, as the researchers did not include a measure of baseline behaviour, one cannot rule out the possibility that there were pre-existing differences between conditions in terms of water conservation.

The Present Research

Collectively the findings of Sparks et al. (2010, study 2) and Walter et al. (2017a) suggest that self-affirmation has potential as a technique to promote openness to information detailing the consequences of one's behaviour for the environment. However, additional studies applying self-affirmation to environmental issues are needed to substantiate these initial findings. Moreover, research is required to address a number of issues arising and hence further advance our understanding of applications of self-affirmation to environmental domains.

First, the studies described above have reported the effects of self-affirmation on a limited number of cognitive antecedents of behaviour. Empirically-supported models of behaviour suggest that additional variables may be important precursors to behaviour, including perceived norms, perceived behavioural control, anticipated regret, self-identity and moral norm (Conner & Sparks, 2015; Fishbein & Ajzen, 2010). If self-affirmation renders people

more open to information detailing the consequences of a particular behaviour for the environment, then we might expect self-affirmation to be associated with positive changes in these cognitions in a manner consistent with greater openness to the message. Moreover, each of these precursors to behaviour has been shown to predict motivation and/or behaviour in environment-related contexts (e.g., Graham-Rowe, Jessop, & Sparks, 2015; Largo-Wight, Bian, & Lange, 2012). It would seem to be worthwhile, therefore, to ascertain whether self-affirmation can lead to positive changes in these variables, not least because any impact of self-affirmation on behaviour at follow-up could potentially be mediated by its impact on such antecedents.

Accordingly, the first aim of the present research was to explore whether a self-affirmation manipulation could promote openness to a message detailing the negative consequences of food waste assessed across a number of cognitive antecedents to behaviour, including intentions, attitudes, perceived norms, perceived behavioural control, anticipated regret, self-identity and moral norm. The decision was made to also include measures of pro-environmental self-identity, as this latter construct has been shown to be a significant predictor of motivation and behaviour in environment-related contexts (Whitmarsh & O'Neill, 2010), and message derogation, as a general indication of openness to the message.

Second, it is important to confirm whether self-affirmation can lead to increases in pro-environmental behaviour. Only one published study has explored the effects of combining self-affirmation with information about the environmental consequences of a specific behaviour on the subsequent performance of that behaviour (Walter et al., 2017a). The findings of this study are definitely encouraging, insofar as they revealed that self-affirmed participants reported more water conservation at follow-up compared to controls, a finding consistent with the position that self-affirmation resulted in increased water conservation. However, the absence of a baseline measure of behaviour means that it is not possible to rule out alternative explanations this finding; for example it is conceivable that there were pre-

existing differences between conditions in terms of water conservation which were simply maintained at follow-up. The absence of a baseline measure of behaviour also precluded the researchers from exploring whether the impact of self-affirmation on behaviour was particularly evident for those who initially wasted more water. Accordingly, the second aim of the current study was to explore whether a self-affirmation manipulation (vs. control) would be associated with reduced levels of food waste at follow-up, controlling for baseline behaviour, and whether any such effects would be more apparent for those initially wasting more food.

Third, studies to date applying self-affirmation to environment-related issues have employed traditional, stand-alone self-affirmation manipulations. Both Walter et al. (2017a) and Sparks et al. (2010, study 2) required participants in the self-affirmation condition to select and write about their most important value before reading the respective environment-related text. Such self-affirmation tasks require relatively engaged and motivated participants who are logistically able to take part in a writing task immediately before exposure to a message. In the context of 'real world' environment-related campaigns, such an approach may well not be practicable. Thus, there is a need to develop integrated self-affirmation tasks which can be presented as a part of the environment-related information and require relatively little input on the part of the recipient (see Jessop, Simmonds, & Sparks, 2009). Consequently, the third aim of the research reported here was to explore whether a relatively brief self-affirmation task, which did not involve a writing activity, could be integrated alongside the food waste message to promote open processing of the message and precipitate lower levels of food waste at follow-up.

In sum, the present study tested whether a standard self-affirmation manipulation would promote openness to a message detailing the negative consequences of food waste. Specifically, we hypothesized that participants in the standard self-affirmation condition would (a) report more positive cognitions towards household food waste reduction, a more

pro-environmental self-identity and less derogation of the message, and (b) evidence lower levels of food waste at follow-up controlling for baseline behaviour, compared to their non-affirmed counterparts. Consistent with previous research findings indicating that the effects of self-affirmation are strongest for those at greatest risk, we also hypothesized that any such effects would be particularly apparent for (or restricted to) those individuals who wasted more food at baseline.

We also explored whether a relatively brief integrated self-affirmation task would have similar effects. It should be emphasised that this aspect of the research was more exploratory, as previous attempts to integrate self-affirmation tasks in the context of health promotion campaigns have met with mixed success (Dillard, McCaul, & Magnan, 2005; Jessop et al., 2009; Walter, Demetriades, & Murphy, 2017b).

In the present study, we decided to focus on household fruit and vegetable waste, rather than generic household food waste, for the following reasons. In the UK, fresh fruit, vegetables and salad make up the greatest share of household food waste out of all the food groups (WRAP, 2013). Furthermore, with a heavy reliance on energy-intensive heated greenhouses, refrigeration and transportation (Garnett, 2008), fruit and vegetable waste reduction represents an important and worthwhile behavioural target.

Method

Participants

Participants were recruited opportunistically by (a) contacting UK fruit and vegetable box companies and asking them to advertise the study to their customers and (b) contacting local council waste management departments and asking them to advertise the study to their staff members. Three hundred and sixty-two participants completed the baseline questionnaire and met the inclusion criterion that they had wasted at least some of their household fruit and vegetables in the previous week. Ages ranged from 18 to 86 years (M = 43.30 years, SD = 12.73). The majority of the sample was female (82.32%), resident in the UK (97.24%),

employed/self-employed (77.07%), married/cohabiting with their partner (75.14%), had no one under the age of eighteen living in their household (62.98%) and had one or more additional adults living in their household (88.67%).

Two hundred and eighty-three participants completed the follow-up questionnaire representing an attrition rate of 21.82%. One-way ANOVAs revealed no significant differences between responders and non-responders at follow-up in terms of number of adults living in their household, number of children living in their household, level of responsibility for household food shopping, level of responsibility for household food cooking and preparation, or baseline fruit and vegetable waste behaviour, all *ps* > .223. However, there was a significant difference in terms of age, F (1, 352) = 15.03 $p < .001$, $\eta p^2 = .04$: participants who completed both time points were significantly older (M = 44.65) than participants who completed only the baseline questionnaire (M = 38.38). Chi-square analyses revealed no significant associations between responding at follow-up and gender, marital status (married/cohabiting vs. other) or condition, all *p*s ≥ .791. However, there was a significant association between responding at follow-up and occupational status (employed/self-employed vs. other), χ^2 (1, N = 360) = 5.35, p = .021, Cramer's V = .12; such that employed/self-employed participants were under-represented at follow-up.

Design and Procedure

The study employed a one-way experimental design (condition: standard self-affirmation, integrated self-affirmation, control). Data were collected using online questionnaires. At baseline, participants completed a measure of household fruit and vegetable waste. They were then exposed to either a self-affirmation manipulation (standard or integrated) or a control task, prior to reading a message detailing the negative consequences of household food waste. Participants next completed measures of the following indicators of openness to the message: cognitions in relation to household food waste reduction (intentions, attitudes, perceived norms, perceived behavioural control, anticipated regret, self-identity and moral norm), pro-

environmental self-identity, and message derogation. Household fruit and vegetable waste was again assessed one-week later.

Prospective participants were invited to take part in a study exploring their thoughts and feelings about household fruit and vegetable waste. The recruitment message contained a link to the baseline questionnaire. Upon clicking the link, participants were randomly allocated by the hosting website to the standard self-affirmation condition (n = 106), the integrated self-affirmation condition (n = 142) or the control condition (n = 114). Participants who provided their e-mail address at baseline were sent the web-link to the follow-up questionnaire seven days later. To aid recruitment and deter attrition, participants who completed both questionnaires were entered into a cash prize draw. The numbers of participants in the standard self-affirmation condition, integrated self-affirmation condition and control condition at follow-up were 84, 109 and 90 respectively.

Materials

Baseline questionnaire.

At baseline participants completed a questionnaire including the following sections:

Demographic and background information. Participants were asked to indicate their age, gender, occupation status, marital status, UK residency and the number of adults and children living in their household. They were also asked to indicate their level of responsibility for (a) household food shopping and (b) household food cooking and preparation on five-point scales ranging from *not responsible at all* (1) to *responsible for all or almost all* (5).

Fruit and vegetable waste behaviour definition. The following description of household food waste was provided to all participants before they were asked to estimate their baseline fruit and vegetable waste behaviour: *"Now we would like to ask you some questions about the amount of fruit and vegetables that get thrown away from your household. Please note that for the purposes of this study we are interested in fruit and vegetables that were brought into the home with the intention of being eaten. We are not concerned with waste that is generally*

perceived to be inedible, such as banana skins, apple cores and tough outer leaves. By 'thrown away' we mean any fruit and vegetables disposed of into the household rubbish bin, fed to animals or composted".

Fruit and vegetable waste behaviour at baseline. Following existing classifications of fruits (citrus, berries, tropical, other) and vegetables (root, stem/leaf, other vegetables), fruit and vegetable waste behaviour was measured using seven items, each of which assessed the amount wasted from a particular category of fruits or vegetables over the past seven days, e.g., "Please estimate what percentage of your household's root vegetables (e.g. carrots, potatoes, onions, turnips) was thrown away in the last seven days", $\alpha = .71$. A mean score was calculated for each participant, with higher scores indicating higher levels of fruit and vegetable waste at baseline.

Self-affirmation manipulation. Following Harris and Napper (2005) and Harris et al. (2014), participants in the standard self-affirmation condition were asked to read a list of values (conscientiousness, spirituality/religiousness, compassion, intelligence, generosity, trustworthiness, creativity, hedonism, friendliness, kindness, spontaneity) and select their *most important* value; this value did not have to appear on the list. They were then asked to provide three reasons why the value was important to them and to give an example of something they had done demonstrating the importance of the value to them. In line with previous studies employing a similar values self-affirmation task (e.g. Harris & Napper, 2005; Harris et al., 2014), participants in the control condition were presented with the same list of values and asked to select their *least important* value (again, this value did not have to appear on the list), provide three reasons why this value might be important to someone else and give an example of something someone else might do to demonstrate the importance of the value to them.

Participants in the integrated self-affirmation condition were presented with a list of values (conscientiousness, morality, compassion, commitment, determination, resourcefulness,

intelligence, open-mindedness, creativity, enthusiasm, competence) and asked to select their most important value from the list. Participants were asked to think about why the value was important to them and how it had influenced things they had done. On the next page of the questionnaire they were presented with a message that read: "The good news is that if any of these values are important to you, you are likely to be successful in reducing your household food waste". This task was adapted from that used by Jessop et al. (2009) in their integrated positive traits affirmation condition. The list of values in the integrated self-affirmation condition differed from the standard self-affirmation condition, as it was seen to be important that each value in the integrated self-affirmation condition could plausibly influence success at reducing household food waste in order to maintain the credibility of the resultant message for participants.

Value importance. Participants in the standard self-affirmation and control conditions responded to the following question. "How important to you is the value that you selected to write about?" (*extremely unimportant* [1] to *extremely important* [7]).

Food waste message. Participants next read a message which detailed the negative consequences of food waste and provided suggestions of how to reduce household fruit and vegetable waste. This message was presented over three pages of the on-line questionnaire. The first page outlined the link between food waste and climate change. An excerpt from this page read: *"Food waste is a major contributor to emissions of carbon dioxide and other greenhouse gases. The production, distribution and storage of food which is subsequently thrown away wastes energy, fuel and water, and contributes towards deforestation."* The second page addressed the consequences of food waste to the individual. An excerpt from this page read: *"Did you know that purchasing food that never gets eaten costs the average household £480 a year, rising to £680 for a family with children?"* The third page explained that fruit and vegetables were the most commonly wasted food group in the home and highlighted the benefits of reducing fruit and vegetable waste. This final page also presented

suggestions for how to use up the fruit and vegetable in the home that might otherwise be thrown away (e.g., "*Add fruit to cereal or yogurt in the morning*"). All the information provided was deemed to be factually correct and was adapted from official on-line resources (FAO, 2013; IPCC, 2007; Love Food Hate Waste, 2013).

To ensure participants had read the food waste message, they were asked to briefly summararise the information they had just read. All participants completed this check acceptably.

Cognitive outcomes. Participants were then asked to complete the following measures of cognitive antecedents to behaviour, pro-environmental self-identity and message derogation. Unless otherwise indicated, measures were based on those used by Graham-Rowe et al. (2015) and responses were given on 7-point scales ranging from *strongly disagree* (1) to *strongly agree* (7). All measures showed acceptable internal reliability and mean scores were calculated for each construct, with higher scores indicating higher levels of the construct in question.

Intentions. Participants' intentions were assessed by three items, e.g., "I intend to reduce the amount of fruit and vegetables that gets thrown away from my household over the next seven days", $\alpha = .89$.

Attitudes. Participants' attitudes were assessed by asking them to respond to the statement: "For me to reduce the amount of fruit and vegetables that gets thrown away from my household over the next seven days would be..." on six pairs of semantic differentials (*extremely pointless* [1] to *extremely worthwhile* [7], *extremely unenjoyable* [1] to *extremely enjoyable* [7], *extremely foolish* [1] to *extremely wise* [7], *extremely bad* [1] to *extremely good* [7], *extremely unpleasant* [1] to *extremely pleasant* [7], *extremely harmful* [1] to *extremely beneficial* [7]), $\alpha = .88$.

Perceived norm. Perceived norm was assessed by four items, e.g., "Most people who are important to me probably think that I should reduce the amount of fruit and vegetables that gets thrown away from my household over the next seven days", α = .72.

Perceived behavioural control. Perceived behavioural control was assessed using four items, e.g., "It would be possible for me to reduce the amount of fruit and vegetables that gets thrown away from my household over the next seven days", α = .79.

Anticipated regret. Anticipated regret was assessed by two items, e.g., "I would feel regret if I did not reduce the amount of fruit and vegetables that gets thrown away from my household over the next seven days", $r(360) = .80$, $p < .001$.

Self-identity. Self-Identity was assessed with three items, e.g., "I am the type of person who would reduce the amount of fruit and vegetables that gets thrown away from my household over the next seven days", α = .86.

Moral norm. Moral norm was assessed with four items, e.g., "I feel a strong obligation to reduce the amount of fruit and vegetables that gets thrown away from my household over the next seven days", α = .85.

Pro-environmental self-identity. Pro-environmental self-identity was assessed with four items based on Whitmarsh & O'Neill (2010), e.g., "I think of myself as someone who is very concerned with environmental issues", α = .68.

Message derogation. Message derogation was assessed with four items adapted from Ruiter, Verplanken, Kok, & Werrij (2003), e.g., "I thought the information that I was asked to read about the negative consequences of food waste was exaggerated", α = .85.

Follow-up questionnaire.

At follow-up, participants were reminded of the description of household fruit and vegetable waste and asked to complete the same measure used to assess fruit and vegetable waste behaviour at baseline, α = .63. A mean score was calculated for each participant, with

higher scores indicating higher levels of fruit and vegetable waste over the past seven days at follow-up.

Results

Preliminary Analyses

At baseline, the percentage of fruit and vegetables that participants had thrown away over the previous seven-day period ranged from 0.71% to 33.57% (M = 4.36, SD = 5.37).

One-way ANOVAs revealed no significant differences between participants in the standard self-affirmation, integrated self-affirmation and control conditions in terms of age, number of adults living in their household, number of children living in their household, level of responsibility for household food shopping, level of responsibility for household food cooking and preparation, or baseline fruit and vegetable waste behaviour, all ps > .200. A series of Chi-square analyses revealed no associations between condition and gender, marital status (married/cohabiting vs. other), or occupational status (employed/self-employed vs. other), all ps >.156.

As expected, participants in the standard self-affirmation condition rated the value that they had selected as significantly more important to them than did participants in the control condition, $F(1, 218) = 76.14$, $p < .001$, $\eta p^2 = .26$, Ms = 5.06 and 2.58 respectively.

The Impact of the Self-Affirmation Manipulation on Cognitions Reported Immediately after Exposure to the Message

In order to test the hypothesis that self-affirmed participants would report more positive cognitions regarding household food waste reduction, a more pro-environmental self-identity and/or less derogation of the message, we conducted a series of one-way ANOVAs with each outcome entered in turn as the dependent variable. As this involved conducting nine separate ANOVAs, we used Bonferroni correction to protect against making a Type 1 error. This correction resulted in a p-value of less than .006 being required to achieve statistical

significance (.05 ÷ 9 = .00$\overline{55}$). None of the ANOVAs achieved statistical significance according to this criterion[1]. The resultant analyses are summarised in Table 1.

[1] It may be of interest to note that a MANOVA similarly revealed no multivariate main effect of condition on these outcomes, Wilk's $\lambda = 0.95$; $F(18, 702) = 0.99$, $p = .467$, $\eta_p^2 = .02$.

Table 1

Summary of One-Way ANOVAs Comparing Participants in the Control, Standard Self-Affirmation and Integrated Self-Affirmation Conditions on Indicators of Openness to the Message

	Condition						
	Control *M (SD)*	Standard self-affirmation *M (SD)*	Integrated self-affirmation *M (SD)*	*F*	η_p^2	*p*	*df*
Intentions	5.80 (1.17)	5.81 (1.25)	6.03 (1.01)	1.67	.01	.190	2, 359
Attitudes	5.89 (1.02)	5.81 (0.97)	6.01 (0.87)	1.38	.01	.253	2,359
Perceived norms	4.67 (1.12)	4.58 (1.12)	4.64 (1.15)	0.19	.00	.823	2, 359
Perceived behavioural control	5.53 (1.23)	5.60 (1.31)	5.67 (1.17)	0.41	.00	.665	2,359
Anticipated regret	4.93 (1.66)	4.76 (1.69)	5.35 (1.26)	5.02	.03	.007	2, 359
Self-identity	5.74 (1.31)	5.84 (1.15)	5.86 (1.33)	0.29	.00	.746	2,359
Moral norm	5.30 (1.48)	5.27 (1.37)	5.57 (1.23)	2.00	.01	.137	2, 359
Pro-environmental self-identity	6.04 (1.05)	5.92 (1.02)	6.03 (0.93)	0.43	.00	.649	2,359
Message derogation	2.75 (1.32)	2.79 (1.36)	2.68 (1.27)	0.22	.00	.800	2,359

To test the hypothesis that any effects of self-affirmation on these outcomes might be most apparent for those who wasted more fruit and vegetables at baseline, we next conducted a series of hierarchical multiple regression analyses to determine whether any effects of condition were moderated by baseline behaviour. Condition was dummy coded so that the first contrast (D_1) compared the standard self-affirmation condition (1) with the control condition (0) and the second contrast (D_2) compared the integrated self-affirmation condition (1) with the control condition (0). Baseline fruit and vegetable waste scores were mean centred prior to analysis. Condition and baseline fruit and vegetable waste scores were entered at step 1; the two-way interaction terms between condition and baseline fruit and vegetable waste were entered at step 2. As the resultant analyses involved conducting nine separate hierarchical multiple regressions, we again utilised Bonferroni adjustment to protect against making a Type 1 error. There was no evidence that the inclusion of the interaction terms at step 2 approached the adjusted criterion for statistical significance ($p = .006$) for any of the indicators of openness to the message, all ΔFs < 2.78, ps > .063, $\Delta R^2 < .02$. Therefore, there was no evidence that baseline behaviour moderated any impact of condition on these outcomes.

Given the absence of any main or moderated effects of condition on the measures of cognitive antecedents to behaviour, pro-environmental self-identity and message derogation, no further analyses were conducted to explore whether these variables might mediate any impact of condition on behaviour at follow-up.

The Impact of the Self-Affirmation Manipulation on Household Fruit and Vegetable Waste Behaviour at Follow-Up

In order to test the hypothesis that self-affirmed participants (vs. controls) would waste less fruit and vegetables at follow-up, we conducted a one-way ANCOVA to ascertain whether there was any effect of condition on household fruit and vegetable waste behaviour at follow-up, controlling for baseline behaviour. This analysis revealed a marginally

significant main effect of the self-affirmation manipulation on fruit and vegetable waste at follow-up, $F(2, 279) = 2.73$, $p = .067$, $\eta p^2 = .02$ (Figure 1).

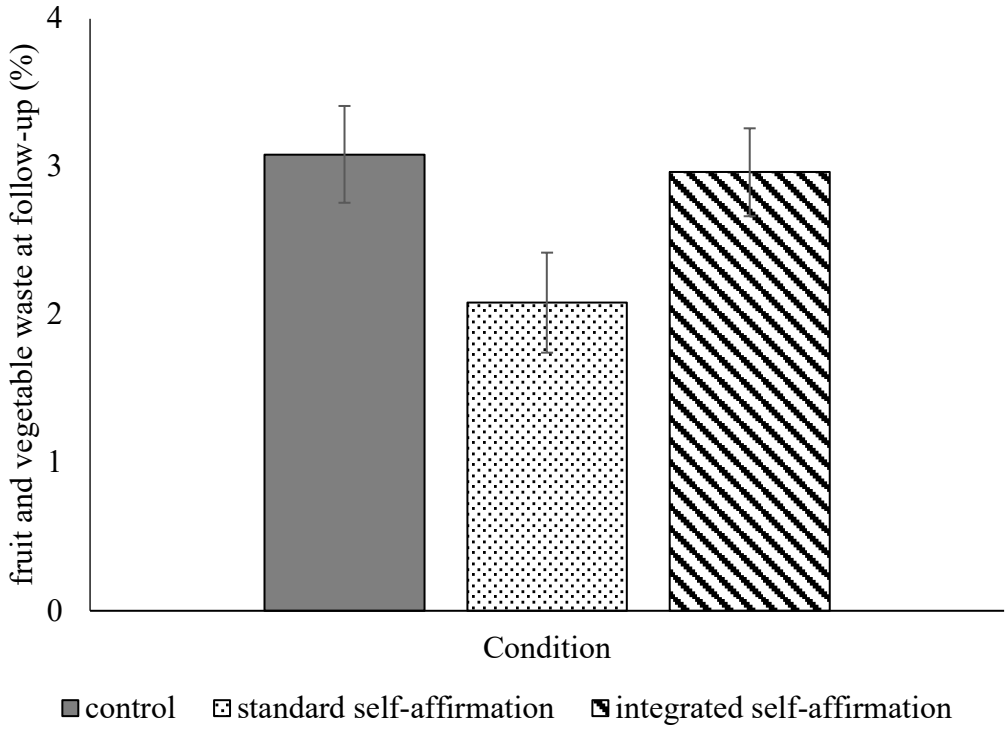

Figure 1. Marginal means (with standard error bars) for fruit and vegetable waste behaviour at follow-up by condition, controlling for baseline behaviour.

Note: marginal means calculated at baseline behaviour = 4.19

In line with our hypothesis, we followed up the ANCOVA with planned contrasts to test whether participants in (1) the standard self-affirmation condition or (2) the integrated self-affirmation condition differed from those in the control condition. The first contrast revealed that participants in the standard self-affirmation condition wasted less fruit and vegetables at follow-up than participants in the control condition, $p = .034$, 95% CI [-1.93, -.08], estimated marginal means = 2.08 and 3.08 respectively[2]. The second contrast revealed no significant

[2] Marginal means calculated at baseline fruit and vegetable waste = 4.19

difference in fruit and vegetables waste at follow-up between participants in the integrated self-affirmation and control conditions, $p = .78$, 95% CI [-.99, .75], estimated marginal means = 2.96 and 3.08 respectively.

To test the hypothesis that any effects of self-affirmation on waste behaviour at follow-up might be most apparent for those who wasted more fruit and vegetables at baseline, we next conducted a hierarchical multiple regression analysis to determine if baseline fruit and vegetable waste moderated any associations between condition and fruit and vegetable waste at follow-up (Table 2). Condition (D_1 and D_2) and mean-centred baseline fruit and vegetable waste scores were entered at step 1; the two-way interaction terms between these variables were entered at step 2. Critically, when the interaction terms were included at Step 2, this significantly increased the variance in fruit and vegetable waste at follow-up accounted for by the model, ΔF (2, 277) = 16.72, $p < .001$, $\Delta R^2 = .07$, showing that the effect of condition on fruit and vegetable waste at follow-up was moderated by baseline fruit and vegetable waste behaviour. Inspection of the beta weights revealed that the interaction between D_1 and baseline fruit and vegetable waste was significant ($\beta = -.38$, $p < .001$), demonstrating that baseline behaviour moderated the impact of the standard self-affirmation condition (as compared to the control condition) on behaviour at follow-up. There was no significant interaction between D_2 and baseline fruit and vegetable waste ($\beta = -.10$, $p = .145$), and therefore no indication that baseline behaviour moderated any impact of the integrated self-affirmation condition (as compared to the control condition) on behaviour.

Table 2

Hierarchical Multiple Regression Analysis Exploring Whether Baseline Behaviour Moderated the Impact of Condition on Fruit and Vegetable Waste at Follow-Up.

Predictors	Step 1	Step 2
D_1 (β) (control vs. standard self-affirmation)	-.12*	-.12*
D_2 (β) (control vs. integrated self-affirmation)	-.02	-.01
Baseline behaviour (β)	.55***	.83***
D_1 X baseline behaviour (β)		-.38***
D_2 X baseline behaviour (β)		-.10
R^2	.31***	.38***
F	41.74***	34.56***
ΔR^2		.07***
ΔF		16.72***

*$p < .05$, ***$p < .001$

In order to further explore the moderating role of baseline behaviour on the impact of the standard self-affirmation manipulation, we conducted simple slopes analysis using the PROCESS macro in SPSS, taking 5,000 bootstrap samples to compute bias corrected confidence intervals (Hayes, 2013). Specifically, with the data set restricted to participants in the standard self-affirmation and control conditions, the percentage of fruit and vegetables wasted at follow-up was regressed onto condition, for those with high (1 *SD* above the mean; equivalent to 9.74%), mean (equivalent to 4.28%) and low (set at the actual minimum value; equivalent to 0.71%[3]) baseline fruit and vegetable waste scores (Figure 2). The resultant analyses revealed a significant effect of condition on fruit and vegetable waste at follow-up

[3] One standard deviation below the mean was replaced with the minimum actual value for the corresponding simple slopes analysis, as one standard deviation below the mean was outside of the range of the data.

for participants with high and mean baseline fruit and vegetable waste scores (b = -3.47, t = -5.52, p < .001, 95% BCa CI [-4.71, -2.23] and b = -1.00, t = -2.25, p = .026, 95% BCa CI [-1.87, -0.12] respectively); participants in the standard self-affirmation condition wasted less fruit and vegetables at follow up compared to those in the control condition. There was no effect of condition on fruit and vegetable waste at follow-up for individuals with low baseline fruit and vegetable scores (b = 0.62, t = 1.16, p = .246, 95% BCa CI [-0.43, 1.66]).

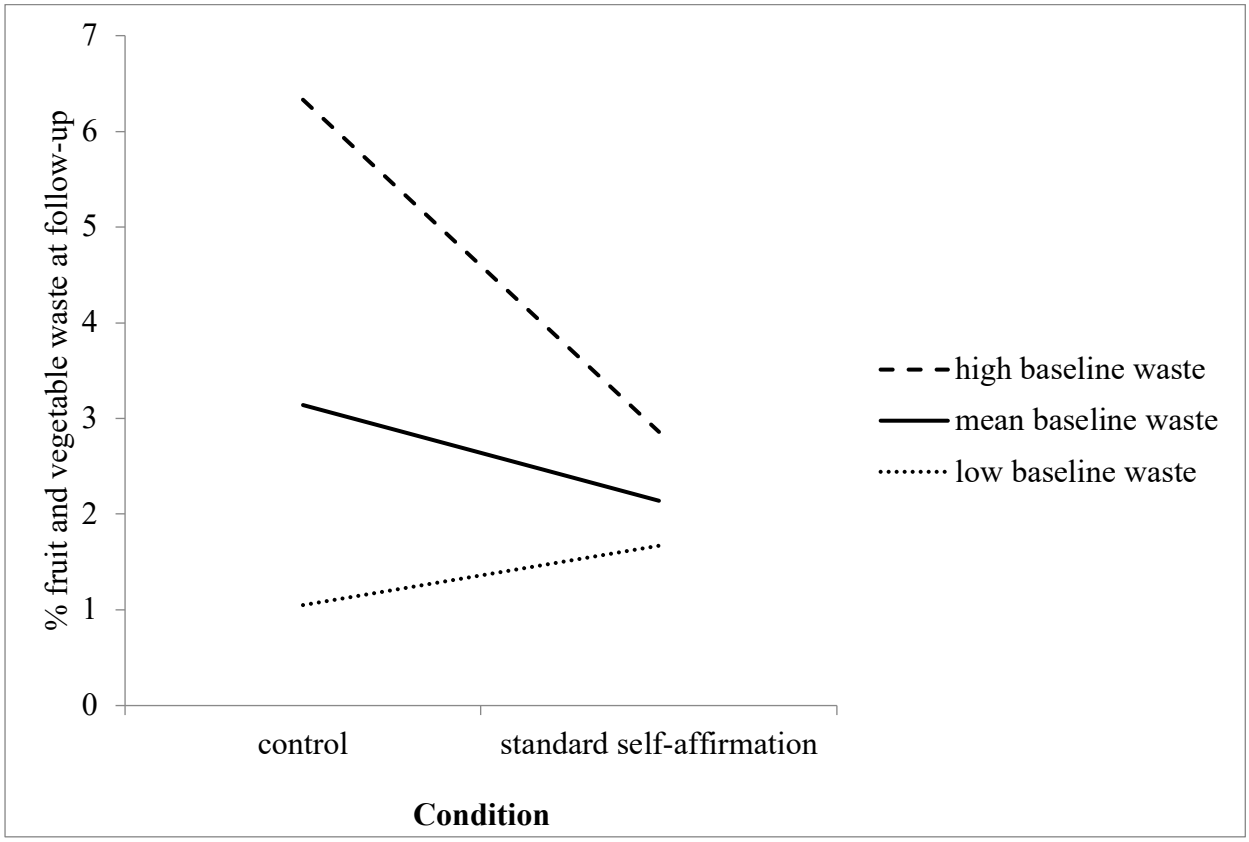

Figure 2. Fruit and vegetable waste behaviour at follow-up regressed onto condition for individuals with low, mean and high fruit and vegetable waste behaviour at baseline.

Note. High baseline waste was set at 1 *SD* above the mean, while low baseline waste was set at the actual minimum value, as 1 *SD* below the mean fell outside of the range of scores.

Discussion

The findings of the present study provide support for our prediction that participants who received a standard self-affirmation manipulation would waste less food at follow-up, controlling for baseline behaviour, suggesting that they were more receptive to a message detailing the negative consequences of household food waste. Importantly, the planned contrast demonstrated that participants receiving this intervention reported lower levels of food waste at follow-up compared to those in the control condition. However, this significant main effect was qualified by a significant interaction with baseline waste behaviour, reflecting the fact that participants who wasted more benefitted most from the standard self-affirmation intervention and evidenced the greatest reduction in food waste compared to their control counterparts.

These findings are encouraging, insofar as they indicate that a standard self-affirmation manipulation might profitably be used to promote pro-environmental behaviour. They also complement Walter et al.'s (2017a) finding that a self-affirmation manipulation (vs. control) was associated with higher levels of water conservation behaviour at follow-up. Furthermore, the design of the current study confers the added advantage that we were able to control for baseline behaviour in the analyses and hence can be relatively confident that the differences between conditions at follow-up do not simply reflect pre-existing differences in behaviour.

By contrast, we found no evidence that the standard self-affirmation manipulation influenced cognitions assessed immediately after exposure to the message, irrespective of baseline levels of waste. These findings contrast with those reported by Sparks et al. (2010, study 2), who demonstrated effects of a self-affirmation manipulation on intentions to recycle (although there were no effects on attitudes). However, our results are broadly consistent with those reported by Walter et al. (2017a), who documented an impact of self-affirmation on behaviour at follow-up but not on intentions reported immediately after exposure to the message or self-efficacy. Our findings thus support the position that self-affirmation can have

an impact on behavioural outcomes in environmental domains, even if immediate indicators of openness and motivation do not demonstrate the same pattern. This raises the interesting possibility that self-affirmation might sometimes exert its effects on behaviour not by reducing defensiveness and promoting openness to a potential threat, but via another pathway. For example, it is possible that self-affirmation might improve working memory (Logel & Cohen, 2012) or self-control (Churchill, Jessop, Green, & Harris, 2018), which - in turn - might facilitate behaviour change. Walter et al. found that collective-efficacy mediated the impact of self-affirmation on behaviour in their study, implying that the manipulation boosted perceptions that one's group could successfully achieve a common goal, with attendant implications for behaviour change. Identifying and validating mediators of the effects of self-affirmation on environment-related behaviour represents an important goal for future research.

The present study found no evidence that a brief, integrated self-affirmation manipulation promoted openness to the message, in terms of either reported cognitions or behaviour at follow-up. This contrasts with Jessop et al. (2009), who found that their integrated self-affirmation task (on which the present task was loosely based) was effective at promoting more positive cognitions and behaviour after exposure to a leaflet highlighting the need to use sunscreen (cf. Dillard et al., 2005). However, there were various disparities between the interventions, which may have contributed to their differential success. For example, in the Jessop et al. task, participants ticked boxes to indicate whether various positive traits applied to them; it is plausible that the absence of any tangible engagement with the integrated self-affirmation task in the present study limited its efficacy.

The null effects for the integrated self-affirmation manipulation make it hard for us to advise how self-affirmation might effectively be incorporated alongside environment-related information. Future research should continue to search for ways to integrate relatively unobtrusive self-affirmation tasks with environmental (and other) campaigns to positive

effect. Findings by Toma and Hancock (2013) indicate that Facebook profiles can be self-affirming. It is thus feasible that providing links to environmental campaigns from people's own Facebook profiles might result in individuals being self-affirmed prior to exposure to the campaign, with consequent benefits for message acceptance and behaviour change. Alternatively, Walter et al. (2017b) recently documented evidence of vicarious self-affirmation, where participants were affirmed by an early part of a narrative which later presented a personally relevant health threat. By extension, it is conceivable that environmental campaigns could employ a similar technique, using a narrative to affirm participants vicariously before highlighting the damaging effects of a particular behaviour for the environment. However, the efficacy of such novel approaches would need to be assessed empirically.

The current study inevitably exhibits some limitations. First, the self-selection aspect of the recruitment process may have resulted in an over-representation of those with an interest in food waste. Indeed, using fruit and vegetable box companies and local council waste management departments to identify participants may have accentuated this potential bias. The resultant sample is thus unlikely to be representative of the general population. Indeed, it seems highly plausible that fruit and vegetable waste would be relatively low in this sample compared to the general population, a speculation which is borne out by the self-reported average levels of baseline waste. It should be noted, however, that this bias may have resulted in the present study underestimating the effectiveness of self-affirmation at reducing food waste, given our finding that a reduction in food waste was most apparent for those initially wasting more food. Nevertheless, future research would benefit from exploring whether the pattern of findings reported here holds for a representative sample drawn from the general population. A second limitation is the reliance on a self-report measure of behaviour. It would be prudent for future research to extend our findings using a more objective measure of food waste; however, at present, there is no accepted or standard method for monitoring and

evaluating household food waste reduction, with each existing method being subject to its own limitations (Sharp, Giorgi, & Wilson, 2010).

In summary, this study represents one of the first applications of self-affirmation theory to an environment-related behaviour. More specifically, it provides the first demonstration that a standard self-affirmation manipulation can lead to an apparent reduction in household food waste. The study also presents the first attempt to integrate a self-affirmation manipulation with a pro-environmental message. Despite the fact that the present findings did not support the efficacy of the integrated self-affirmation intervention, future research should continue to search for effective and practical ways to present self-affirmation alongside environmental campaigns, not least because our findings suggest that a standard self-affirmation manipulation might provide a useful technique for increasing engagement with pro-environmental behaviour.

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