



Tell me what is on the line and make it personal: Energizing Dutch homeowners through message framing

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ABSTRACT

Behavioural scientists in the field of climate change communication call for a better understanding of how information provided to the public should be presented in order to be effective. The aim of this research is to connect insights from framing theory with message processing theory and regulatory focus theory to see whether public communication can effectively affect pro-environmental behavioural change. The framing types that are of interest in the current study are outcome framing and point-of-reference framing. An online, scenario-based experiment was conducted with 170 Dutch homeowners using a 2×2 between-group design. The stimulus material consisted of a communal newsletter advocating pro-environmental behaviours (both short-term and long-term investments in insulation and investment in an alternative heating system) in which both the outcome (gain vs. loss) and the point of reference (self vs. environment) were manipulated. The results indicate that the effect of outcome framing on pro-environmental behavioural intentions depends on the point of reference employed in a message as well as on a recipient's regulatory focus. Homeowners' pro-environmental intentions are stronger when the message is presented in a loss frame with a reference to the self than when the message is presented in a loss frame with a reference to the environment. Furthermore, pro-environmental intentions are stronger when the message is presented to homeowners in a gain frame with a promotion focus compared to a prevention focus. No direct effects were found for either outcome framing or point-of-reference framing.

1. Introduction

Climate change is seen as one of the most substantial challenges ever faced by humanity. After 195 countries adopted the Paris Agreement in 2015, the issue has been at the top of many national and international agendas [1,2]. In the Netherlands, the Paris Agreement led to a national climate agreement, including a provision that two million houses would be disconnected from the gas grid by 2030, with all of the approximately eight million houses disconnected by 2050. However, disconnecting every household from natural gas is a major technical and social challenge, as it requires citizens to adopt alternative heating systems and invest in insulation for their houses [3]. The national government has stated that the transition will be gradually executed by local governments for an average of 50,000 households per year. A distinction must be made between homeowners and tenants in this regard; homeowners need to take action and invest in the transition themselves, while tenants depend on housing corporations or their landlords. In the Netherlands, 60% of households are homeowners, 30% rent from housing corporations, and 10% rent from private landlords [4]. Homeowners are mainly people with middle and high

incomes because they are eligible for mortgages. In the Netherlands, more than half of homeowners have a mortgage on their home, which is a higher percentage than in most other European countries [4]. Ensuring that Dutch homeowners are willing and able to invest in the sustainability of their homes is a challenge for (local) policymakers. This research experimentally examines how public communication by means of message framing affects pro-environmental behaviour.

Message framing can potentially be used to strategically shape perceptions of promoted behaviour and, when combined with specific characteristics of the target audience, substantially enhance adoption intentions for the advocated behaviour [5–9]. Although message framing has proven effective in influencing behaviour in a variety of contexts, such as health communication, studies addressing this concept in the context of the energy transition are scarce. To gain a better understanding of how message framing can be applied for different types of people in the context of the energy transition, more research is needed. Therefore, this study aims to connect insights from framing theory with message processing theory and regulatory focus theory to see whether public communication can effectively affect pro-environmental behavioural change. Specifically, it examines whether outcome

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framing (emphasizing gains versus losses) and point-of-reference-framing (emphasizing outcomes for the self versus outcomes for the environment) can be applied to positively affect the attitudes and intentions (both short- and long-term) of homeowners towards investing in insulation and alternative heating solutions for their houses. Additionally, whether the homeowner's self-regulatory orientation (promotion versus prevention) towards future end-goals, referred to as the regulatory focus, moderates the effects of outcome framing and the point of reference on message effectiveness is examined.

The central research question is as follows:

To what extent does framing the outcome and point of reference of a persuasive appeal advocating pro-environmental behaviours positively affect homeowner attitudes and behavioural intentions towards the advocated behaviours?

2. Theoretical background

2.1. Pro-environmental behaviour

Although scholars use various names for behaviour that benefits the environment (e.g., mitigative behaviour [10]; environmentally conscious behaviour [11]; prosocial behaviour [12]), this study uses Stern's [13] conceptual framework for advancing theories of environmentally significant behaviour to specify this type of behaviour. According to Stern, environmentally significant behaviour is defined as "behavior that is undertaken with the intention to change (normally, to benefit) the environment" [13], p. 408]. The framework distinguishes among environmental activism, non-activist behaviours in the public sphere, and private-sphere environmentalism. Private-sphere environmentalism is particularly relevant for this study, as it covers "the purchase, use and disposal of personal and household products that have environmental impact" [13], p. 409]. Examples of environmentally significant behaviours that fall under private-sphere environmentalism are the purchase or use of automobiles, energy for the home, recreational travel and home heating and cooling systems [13].

The environmentally significant behaviours that are of interest in this study are investing in insulation and investing in an alternative heating system, as these are necessary conditions for disconnection from the gas grid. According to Geels, Schwanen, Sorell, Jenkins, and Sovacool [14], incremental and radical innovations should be differentiated when distinguishing between these two types of behaviour. Investing in insulation is considered an incremental innovation, as it takes place within the same energy system and aims to improve existing capabilities. Investing in an alternative heating system requires a system transformation and a change in behaviour and can therefore be considered a radical innovation. Geels et al. [14], p. 23] emphasize, "while incremental innovations are important in the short-term, they face diminishing returns in the long term, since their potential for further diffusion is limited". Investing in insulation is not sufficient to allow disconnection from the gas grid, but radical innovations will be over the long term. Initially, radical innovations often have poor price/performance characteristics and are therefore considered high risk at first. Often, these innovations are developed by small networks of dedicated actors in so-called niches [14], p. 26]. The introduction of radical innovations into society is much more difficult than the introduction of incremental innovations given the wide range of uncertainties, such as techno-economic, financial, cognitive, and social uncertainties, that need to be reduced. In this case, the introduction requires not only the creation of (positive) expectations of an alternative heating system but also the development of tacit and formalized knowledge for how to implement a heating system, financial resources, and networks of institutions, including regulations and formal norms [14]. Given these uncertainties, a persuasive appeal that focuses on the need for an alternative heating system might not be sufficient for actual adoption of this system. However, it is interesting to study whether

such a persuasive appeal influences positive attitudes and behavioural intentions. Furthermore, given the less complex innovation processes involved in incremental change, which in this study, concerns the insulation of houses, it is interesting to study whether a persuasive appeal has an influence on attitudes and behavioural intentions regarding this type of innovation. In addition to differentiating between incremental and radical pro-environmental behaviour, the dependent variables in this study, we distinguish between short-term behaviour (the next five years) and long-term behaviour (the next 15 years).

2.2. Framing theory

The most-cited definition of the concept of framing is by Entman [15], p. 52]: "selecting some aspects of a perceived reality and make them more salient in a communicating text, in such a way as to promote a particular problem definition, causal interpretation, moral evaluation, and/or treatment recommendation". Framing theory aims to understand how related sets of ideas in the public sphere are presented, constructed and debated [16] and refers to emphasizing certain aspects of a particular issue such that the recipient of the communication is led to focus on that issue from a particular angle, affecting meaning construction and sense making [17,18]. Consequently, the framing of technologies in these processes influences opinion formation and the shaping of shared expectations and visions [18]. Various actors at multiple levels engage in framing, including the media, social movement actors, and policy makers [17].

Levin, Schneider and Gaeth [19] distinguish among three different types of message frames: risky choice framing, attribute framing and outcome framing. The first involves "the outcomes of a potential choice involving options differing in level of risk are described in different ways" [19], p. 150]. By manipulating the set of options with different risk levels, the risk preference of a recipient is affected. In the second, attribute framing, "some characteristics of an object or event serve as the focus of the framing manipulation" [19], p. 150]. By manipulating the valence of attributes or characteristics of an issue or object, the recipient's evaluation of a particular issue or object could be affected. Finally, in outcome framing, "the goal of an action or behavior is framed" [19], p. 150]. By framing the consequence or outcome of a behaviour, the impact of a persuasive message could be affected. The most conventional way of framing the outcome of the advocated behaviour is in terms of either the pleasures of adhering to the advocated action (gains) or the pains of not adhering to the advocated action (losses) [12].

In the context of the energy transition, outcome framing is the most relevant type of valence frame, as both the gain frame and the loss frame promote the same behaviour. Pro-environmental behaviour is advocated by focusing on the consequences of the behaviour to prevent great disasters, which will happen with global warming exceeding 2 degrees Celsius, and to promote a better and cleaner living environment. This research aims to examine which outcome frame and under which circumstances is most effective at convincing individuals to adopt sustainable household technologies and to invest in good insulation for their homes.

2.3. Explaining outcome-framing effects

In the literature, two different explanations and effects of outcome framing have been proposed [19]. The first explanation stems from Tversky and Kahneman's prospect theory, suggesting that the effectiveness of either gain outcomes or loss outcomes depends on the riskiness of the intended behaviour [19]. When the intended behaviour is perceived as risky (e.g., detection behaviour in health science), using a loss frame is more effective, whereas a gain frame is more effective when the intended behaviour is perceived as cautious or less risky (e.g., preventive behaviour in health sciences) [20]. Substantial evidence supports this explanation in the context of health communication and

persuasion [12,21]. Under the assumption that pro-environmental behaviour could be considered preventive behaviour, Segev et al. [21] found, congruent with prospect theory, that gain-framed messages are more effective than loss-framed message in positively affecting consumer responses to green advertising. Other scholars (e.g., [22]) have questioned this explanation based on prospect theory, noting the complexity of determining the relative riskiness of choice options in the messages in which the outcome of a certain behaviour is framed. In other words, it is difficult to objectively determine whether the choice options of adhering to the advocated behaviour or not adhering to the advocated behaviour actually differ in the degree of risk involved.

The second explanation for outcome-framing effects is that people have a negativity bias when processing information [19]. Regardless of whether the riskiness of an action is implicit or explicit, negative information has systematically stronger effects on people's assessments than objectively equivalent positive information. This explanation is grounded in the notion of loss aversion [19]. Following this line of reasoning, Chang and Lee [23], for example, found that a loss-framed message is more effective than a gain-framed message in the context of donating to charity. In contrast to what one would expect based on prospect theory, drawing on loss aversion, a negative frame for persuasive messages aimed at stimulating pro-environmental behaviour will be the most effective.

The inconsistent findings of studies addressing outcome-framing effects could be explained by two factors that are not taken into account: the point of reference used in a persuasive appeal [12,21] and the receiver's regulatory focus [24]. Therefore, the present study examines the relationships among outcome framing, the point of reference of a message and the recipients' regulatory focus as well as how these factors affect the effectiveness of persuasive appeals in the context of pro-environmental behaviour.

2.4. Point of reference

An important factor that may account for mixed findings regarding outcome-framing effects is the point of reference used in persuasive appeals, which refers to the target affected by the outcomes of the behaviour addressed in the message [12,21]. Loroz [12] distinguishes between *self-referencing* messages and *other-referencing* messages. Self-referencing messages focus solely on the consequences of the behaviour for the individual. This triggers an independent self-view that relies on a rich representational structure. Once activated, it evokes a high level of involvement in the persuasive appeal by increasing the cognitive resources available for processing the information [12,21]. In contrast, when the focus is on others, the consequences are evaluated only for others. An interdependent self-view is activated in which these well-developed schemas are not activated because the representational structure of others is less rich and distinctive. As a consequence, message involvement is lower [12]. Self-referencing messages are more common in health communication because health issues and associated prevention or detection behaviours are primarily of concern to the individual targeted. Other-referencing messages are more common in environmental communication because pro-environmental behaviours generally affect others (e.g., the community, the environment or future generations). Schweizer et al. [25], for example, found that when advocating for pro-environmental behaviour the common good is often invoked. They argue that the benefits for the individual should be emphasized.

In research on environmental communication, a reference to others can range from others who are close to the self, such as family and friends (e.g., [12]), to more distant others, such as the environment in general (e.g., [21]). This study distinguishes between a reference to the self by referring to the outcomes of the individual's behaviour for him- or herself and a reference to the other by referring to the outcomes of the individual's behaviour for the environment. In terms of framing persuasive messages, following Loroz [12] and Segev et al. [21], the

assumption is that self-referencing messages are more effective than environment-referencing messages. Based on this presumption, the following hypothesis is formulated:

H1: A message with a reference to the self affects attitude towards pro-environmental behaviour (both short- and long-term intention to invest in insulation and an alternative heating system) more positively than a pro-environmental message with a reference to the environment.

2.5. Point of reference and outcome framing

The point of reference of a message plays an important role in the relationship between outcome frames and message effectiveness. Loroz [12] found that loss-framed messages appear to be more persuasive in promoting recycling behaviour when they are self-referencing, while gain frames are more persuasive when the messages reference the other. Kareklas, Carlson and Muehling [26] found comparable results indicating that gain-focused appeals performed better when participants were situationally primed with an interdependent self-view, and loss-focused appeals performed better when participants were primed with an independent self-view. The reasoning behind the interaction between outcome frames and points of reference is that loss frames can be seen as high-fear appeals and gain frames as low-fear appeals [12]. For both high-fear appeals and loss frames, extensive cognitive resources are needed to process the message and utilize coping mechanisms to avoid the problem at hand [12]. Although gain frames also present potential problems faced by recipients, the negative effect of the message is substantially reduced by focusing on the benefits of adopting the behaviour. Therefore, gain-framed messages require fewer resources than loss-framed messages. Inasmuch as processing gain-framed and loss-framed messages has different resource demands, it could be expected that the outcome frame will interact with the point of reference used in a persuasive message to affect its effectiveness. In the present study, insights from Loroz [12] and Kareklas et al. [26] are used to test the interaction between outcome framing (gain versus loss) and point of reference (self-referencing versus environment-referencing) to predict message effectiveness. Based on this expected relationship, the following hypothesis is formulated:

H2: A message presented in a loss (gain) frame combined with a reference to the self (environment) affects attitude towards pro-environmental behaviour (both short- and long-term intention to invest in insulation and an alternative heating system) more positively than a loss frame (gain) combined with a reference to the environment (self).

2.6. Regulatory focus and outcome framing

Cesario et al. [24] argued that outcome-framing effects cannot be understood without considering how these frames relate to the message recipients' regulatory focus. 'Regulatory focus' refers to a person's self-regulatory orientation towards future end states. The basic notion of regulatory focus theory is that a person can be guided by either growth and nurturance needs or safety and security needs to reach these future end states [27,28]. If a person is guided by growth and nurturance needs, this is expressed in a promotion focus in which the person tries to align himself with his ideal self. The self-standards that are important for such a focus are based on the aspirations and wishes of the person they ideally would like to become. Therefore, persons with a promotion focus are highly receptive to potential gains. Conversely, if an individual is guided by safety and security needs, this is expressed in a prevention focus in which the person tries to align himself with his 'ought self'. The self-standards that are important for persons with a prevention focus are based on felt responsibilities, duties and avoiding undesired end states, and they are highly concerned with avoiding potential losses [27,28].

Further, it is known that the regulatory focus may occur as both a dispositional focus and a situational focus [27]. Dispositional regulatory focus is relatively stable over time and could be derived from a

person's history of failure and success with strategies related to avoidance and approach [27,28]. In contrast, a person's situational regulatory focus changes over time and could be induced by message framing. By framing a problem in terms of gains or non-gains, a situational promotion focus is induced, and when a problem is framed in terms of losses or non-losses, a situational prevention focus is induced [27]. As dispositional and situational regulatory foci operate independently, they might both be present in either congruent or incongruent combinations. Congruence occurs when a person with a dispositional prevention focus is exposed to a loss-frame message or when a person with a dispositional promotion focus is exposed to a gain-frame message [27]. This congruence is referred to as regulatory fit [24]. According to regulatory fit theory, communication is more effective under conditions of regulatory fit because information is processed more easily [24,29,30]. Based on these expectations, the following hypothesis is formulated:

H3: Attitude towards pro-environmental behaviour (both short- and long-term intention to invest in insulation and an alternative heating system) is higher (lower) when the outcome frame used is congruent (incongruent) with a recipient's regulatory focus.

2.7. Regulatory focus and point of reference

Aside from the impact on the effectiveness of outcome frames in persuasive appeals, an individual's regulatory focus may interact with the reference point of a persuasive message. Aaker and Lee [29] found that messages focusing on promotion are more persuasive for individuals with an active, independent self-view, whereas messages focusing on prevention are more persuasive for individuals with an active, interdependent self-view. The theoretical explanation for this relationship is goal compatibility. Independent goals are more compatible with a promotion focus because they are associated with autonomy and success. Conversely, interdependent goals are more compatible with a prevention focus because they are associated with a desire to be part of a collective and corresponding obligations and responsibilities [26,29]. It should however be noted that Aaker and Lee [29] applied a different conceptualization of regulatory focus, as their subjects were exposed to either promotion-framed or prevention-framed information. They operationalized regulatory focus as a function of the persuasive message by exposing recipients to either promotion-focused appeals or prevention-focused appeals rather than considering the recipient's dispositional regulatory focus. This study examines whether recipient dispositional regulatory also interacts with the point of reference of a message. The insights of Aaker and Lee [29] are used to test the interaction between point of reference (self versus environment) and regulatory focus (promotion versus prevention). To test this presumption, the following hypotheses are formulated:

H4: Attitude towards pro-environmental behaviour (both short- and long-term intention to invest in insulation and an alternative heating system) is higher when the message is presented in a self-referencing (environment-

referencing) frame to a recipient with a promotion (prevention) focus.

Fig. 1 depicts the conceptual model that is central in this research.

3. Method

3.1. Design and procedure

To investigate how the *outcome framing, point of reference and regulatory focus* influence pro-environmental behaviour, an online experiment with a 2 (outcome framing: gain versus loss) \times 2 (point of reference: self versus environment) between-group design was conducted. Regulatory focus (prevention vs. promotion) was experimentally measured to compute a regulatory predominance score. Participants were asked to fill out an online questionnaire on natural-gas-free living. After participants gave their consent, they completed questions about demographic characteristics, followed by questions measuring the participants' regulatory focus. Participants were then randomly assigned to one of four communal newsletters addressing the issue of disconnecting private houses from the gas grid and advocating for investment in sustainable home energy solutions for private houses. To disconnect houses from the gas grid, the Dutch government has made municipalities responsible for implementing the transition in their neighbourhoods. A municipal newsletter was selected as the vehicle for communicating the message, as it is a common way for municipalities to inform and engage with their residents about issues related to sustainability [31]. Indeed, in this specific context, various municipalities have informed their residents about plans for disconnecting from the gas grid through newsletters [32,33]. After reading the newsletter, participants were asked to score items about their attitudes and behavioural intentions towards investing in the sustainability of their homes.

3.2. Stimulus materials

The outcome frame was manipulated by focusing on either the positive outcomes of adopting sustainable energy solutions for the home (gain-framed message) or the negative consequences of not adopting sustainable energy solutions for the home (loss-framed message). To strengthen the outcome frame manipulation, the newsletter contained visual elements as well. Plus signs were included in the gain condition to emphasize positive outcomes, whereas minus signs were included in the loss condition to emphasize negative outcomes. The point of reference was manipulated by emphasizing either the outcomes for the individual (reference to the self) or the outcomes for the environment (reference to the environment). To strengthen this manipulation, a visual element was added as well. An image of an individual was included in the self condition, whereas an image of a globe was included in the environment condition. The gain/self message emphasized positive outcomes of adopting sustainable energy solutions that only affect the recipient's personal situation (e.g., lower energy bills). The positive/

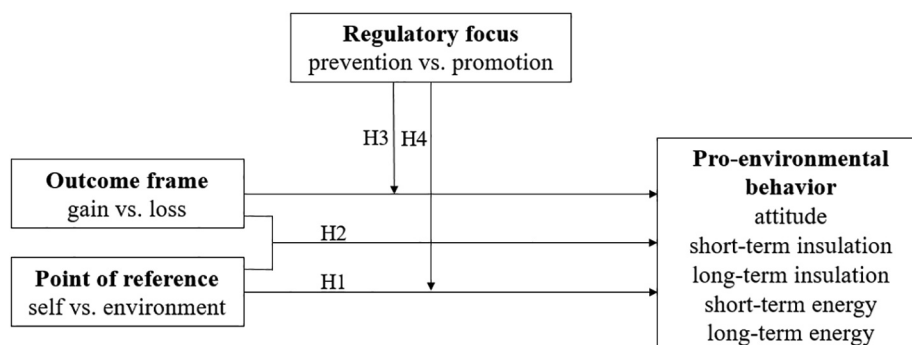


Fig. 1. Conceptual model for examining the effects of message framing on homeowners' pro-environmental behavioural intentions.

environment message emphasized positive outcomes for the recipient's environment (e.g., a cleaner and healthier living environment). The loss/self message emphasized negative outcomes of refraining from sustainable energy solutions that affect the recipient's personal situation (e.g., a reduction in the value of the recipient's house). Finally, the negative/environment message emphasized negative outcomes of refraining from adopting sustainable energy solutions for the recipient's environment (e.g., an unsafe living environment for inhabitants of areas in which gas extraction takes place).

3.3. Measures

3.3.1. Manipulation checks

Two items were used to assess whether the outcome frame was manipulated as intended (on a 5-point Likert-scale; 1 = strongly disagree, 5 = strongly agree): "*The newsletter stated the advantages [drawbacks] of [not] investing in the sustainability of my house*". After reverse scoring one of the items, Cronbach's alpha was calculated ($\alpha = 0.64$). To check whether the point of reference was noticed, two items were used (on a 5-point Likert-scale; 1 = strongly disagree, 5 = strongly agree): "*The newsletter stressed the consequences for [...] the value of my house and my energy bills [my living environment and that of residents of earthquake zones]*". After reverse scoring one of the items, Cronbach's alpha was calculated ($\alpha = 0.79$). An analysis of variance was used to test whether the outcome frame and the point of reference were successfully manipulated. Regarding the outcome frame manipulation, participants experienced more positive outcomes in the gain condition ($M = 4.24$) compared to participants in the loss condition ($M = 3.41$) ($F(1, 168) = 34.17p < .001$). Furthermore, participants experienced more negative outcomes in the loss condition ($M = 3.56$) compared to participants in the gain condition ($M = 2.17$) ($F(1, 168) = 74.89, p. < 0.001$). Regarding the point-of-reference manipulation, participants perceived that the outcomes affected the environment more in the environment condition ($M = 3.91$) compared to participants in the self condition ($M = 2.00$) ($F(1, 168) = 139.16, p. < 0.001$). Furthermore, participants perceived that they were more personally affected by the outcomes in the self condition ($M = 3.89$) compared to participants in the environment condition ($M = 2.13$) ($F(1, 168) = 145.96, p. < 0.001$).

3.3.2. Dispositional regulatory focus

Dispositional regulatory focus was measured using an adapted version of the 11-item Regulatory Focus Questionnaire (RFQ) [34]. The RFQ operationalizes dispositional regulatory focus as a history of failure and success with strategies related to prevention and promotion. The original scale consists of 6 items measuring the 'promotion focus' sub-construct (e.g., "*I feel like I have made progress towards being successful in my life*") and 5 items measuring the 'prevention focus' sub-construct (e.g., "*Growing up, did you ever act in ways that your parents thought were objectionable?*"). The items were translated into Dutch and transformed to fit a 5-point Likert-scale (1 = strongly disagree, 5 = strongly agree). A principle component analysis extracted four different components. The 5 prevention focus items all loaded on the same component (Cronbach's $\alpha = 0.83$). The promotion items, however, loaded on three different components, indicating a lack of coherence among these items. Since a score for promotion focus is an important prerequisite for calculating regulatory predominance, whether combining two or more items would lead to a reliable promotion scale was examined. However, none of the combinations produced a reliable promotion scale. Therefore, a single promotion item ("*I feel like I have made progress towards being successful in my life*") was selected to calculate regulatory predominance. The reason for selecting this particular item was twofold. First, of all the promotion items, this item scored the highest negative loading on the component that extracts all prevention items, indicating that participants who report higher scores on the prevention items report lower scores on this item. Second, in the

study by Higgins et al. [34], this item showed the highest loading of all items that loaded on the component that extracted the promotion items. To create an index of regulatory predominance, the mean score of the prevention scale was subtracted from the score of the single promotion item. This resulted in a single continuous measure, with negative or lower numbers indicating a predominant prevention focus and positive or higher numbers indicating a predominant promotion focus. In the main analysis, regulatory predominance was treated as a continuous measure. However, to make the results easier to interpret, the (estimated marginal) means are based on a median split. Hereafter, regulatory predominance will be referred to as regulatory focus.

3.3.3. Message effectiveness and pro-environmental behaviour

Message effectiveness consisted of five separate measurements. Attitude towards investment in the sustainability of one's house was measured using an adapted version of Dillard, Shen and Vail's [35] 5-item measure of attitudes towards message advocacy, which consists of 5-point semantic differential measures. The following word pairs were used: very favourable/very unfavourable, very desirable/very undesirable, very unattractive/very attractive, very unwise/very wise and positive/negative (Cronbach's $\alpha = 0.82$). Behavioural intentions were measured using an adapted version of a three-item semantic differential scale used by Segev et al. [21]. On a 5-point scale, participants reported whether it was very unlikely/very likely, impossible/very possible, and very improbable/very probable that they would perform the stated behaviour. Behavioural intention was disaggregated into short-term intention to invest in insulation (Cronbach's $\alpha = 0.95$), long-term intention to invest in insulation (Cronbach's $\alpha = 0.98$), short-term intention to invest in an alternative heating system (Cronbach's $\alpha = 0.95$) and long-term intention to invest in an alternative heating system (Cronbach's $\alpha = 0.98$).

3.4. Covariates

To address individual differences in pre-existing attitudes towards concepts related to investment in sustainable energy technology, environmental concern was measured using Kilbourne and Pickett's [36] six-item scale. On a 5-point Likert (1 = strongly disagree, 5 = strongly agree), participants scored items like "*I am very concerned about the environment*" and "*Humans are severely abusing the environment*" (Cronbach's $\alpha = 0.77$). As homeowners who already live in a sustainable house with proper insulation and a sustainable alternative heating system are less likely to report high investment intentions, differences in the current level of sustainability of the house were taken into account. Participants were asked to indicate the quality of the insulation in their home on a 7-point semantic differential scale, with 1 indicating very bad insulation and 7 indicating very good insulation. To assess whether participants already used an alternative heating system, they were asked to report whether they use natural gas to heat their house (dichotomous variable: yes/no).

3.5. Demographics

In addition to age and level of education, other demographic measures that were expected to be relevant in the context of adopting sustainable energy solutions for houses were added to the survey. Therefore, the questionnaire contained questions about the type of house (recoded as apartment, detached house, corner house, town house or semi-detached house), family composition (recoded as single, single with children, cohabitants, cohabitants with children) and postal code.

3.6. Participants

The online experiment was conducted with $N = 170$ homeowners throughout the Netherlands by means of convenience sampling.

Table 1
Distribution of age, gender, educational level and family composition across conditions.

Characteristic	Condition			
	Gain/Self (n = 43)	Gain/Env (n = 42)	Loss/Self (n = 44)	Loss/Env (n = 41)
Age <i>M</i> (<i>SD</i>), in years	41.5 (11.76)	44.8 (11.55)	45.1 (14.57)	46.0 (12.42)
Gender				
Male	30.2	52.4	36.4	39.0
Female	69.8	47.7	63.6	61.0
Educational level				
Primary/secondary	25.6	26.2	20.5	19.5
Higher education	74.4	73.8	79.5	80.5
Family composition				
Single	9.3	9.5	11.4	12.2
Single with children	11.6	4.8	2.3	2.4
Cohabitants	37.2	47.6	59.1	39.0
Cohabitants with children	41.9	38.1	27.3	46.3

Note. Env = Environment.

Participants had to (co)own the house they live in and be at least 18 years old to participate in the experiment. The average age of the participants is 44.3 years (*SD* = 12.7). The distribution of gender is 39.4 per cent male and 60.6 per cent female. Table 1 shows the distribution of the demographic variables, age, gender, educational level and family composition, across the conditions. An analysis of variance shows that age ($F(3, 166) = 1.031, p > .05$), gender ($X^2(3) = 4,649, p > .05$), educational level ($X^2(3) = 0.847, p > .05$) and family composition ($X^2(12) = 12.447, p > .05$) are all equally distributed across the four conditions.

In addition, analysis of variance revealed that other characteristics relevant to this study, such as the type of house ($X^2(9) = 9.969, p > .05$), insulation grade ($F(3, 166) = 0.129, p > .05$), gas connection ($X^2(3) = 4.845, p > .05$) and environmental concern ($F(3, 166) = 0.455, p > .05$), are also equally distributed across the four conditions.

4. Results

The mean scores of the dependent variables across conditions are shown in Table 2. Only small differences exist in attitudes towards pro-environmental behaviours. The differences of mean scores on short-term intention to invest in insulation and short-term intention to invest in an alternative heating system appear to be larger across conditions.

Table 2
Mean scores on the dependent variables across conditions.

Condition	Dependent variable									
	Attitude		SI_I		LI_I		SI_A		LI_A	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Gain/Self	3.87	0.71	2.92	1.21	3.62	1.11	2.60	1.15	3.51	1.06
Gain/Env	3.88	0.56	3.24	1.14	3.58	1.18	2.97	1.19	3.70	1.10
Loss/Self	3.79	0.68	2.87	1.21	3.55	1.16	3.03	1.05	3.62	1.16
Loss/Env	3.80	0.59	3.06	1.08	3.47	1.09	2.51	1.16	3.36	1.17

Note. Env = Environment; Attitude = Attitude towards investment in sustainability; SI_I = Short-term intention to invest in insulation; LI_I = Long-term intention to invest in insulation; SI_A = Short-term intention to invest in an alternative heating system; LI_A = Long-term intention to invest in an alternative heating system.

4.1. Main effects

ANOVA was performed for each of the dependent variables, where outcome frame and point of reference were the independent variables. Regulatory focus (because of its continuous nature), environmental concern, insulation grade and having a gas connection were included in the model as covariates. Table 3 shows the results for the effects of the independent variables on the different dependent variables. It is evident that neither the outcome frame nor the point of reference affects any of the dependent variables independently. Therefore, hypothesis 1 is not supported. Although no hypotheses were formulated for the main effect of regulatory focus on message effectiveness, the results show an effect of regulatory focus on long-term intention to invest in an alternative heating system ($F(5, 159) = 8.500, p < .01$). Post hoc comparisons using Bonferroni correction indicate that the mean score for long-term intention to invest in an alternative heating system is significantly higher for homeowners with a predominant promotion focus compared to homeowners with a predominant prevention focus ($M_{\text{promotion}} = 3.76; M_{\text{prevention}} = 3.31, F(1, 165) = 8.397, p < .01, \eta^2 = 0.046$).

4.2. Interaction effects

4.2.1. Point of reference and outcome framing

It was hypothesized that message effectiveness is higher when a message is presented in a loss frame with a reference to the self compared to a loss frame with a reference to the environment, and vice versa (H2). The results indeed reveal an interaction effect of point of reference and outcome frame on short-term intention to invest in an alternative heating system ($F(1,162) = 5.534, p < .05, \eta^2 = 0.029$, see also Fig. 2). A simple effects analysis shows that short-term intention to invest in an alternative heating system is higher in the self/loss condition than in the self/gain condition ($M_{\text{self/loss}} = 3.03; M_{\text{self/gain}} = 2.61, F(1, 166) = 4.230, p < .05$). The interaction between point of reference and outcome frame does not account for the remaining dependent variables. Hence, hypothesis 2 is partly supported.

4.2.2. Regulatory focus and outcome framing

It was hypothesized that message effectiveness is higher when the outcome frame used in a message is congruent with a recipient's regulatory focus (H3). The results reveal an interaction effect of regulatory focus and outcome frame on short-term intention to invest in insulation ($F(1,163) = 4.921, p < .05, \eta^2 = 0.027$), which can also be seen in Fig. 3. A simple effects analysis shows that short-term intention to invest in insulation is higher when the message is presented in a gain frame to someone with a promotion focus compared to someone with a prevention focus ($M_{\text{gain/promotion}} = 3.33; M_{\text{gain/prevention}} = 2.79, F(1, 166) = 4.824, p < .05$). Conversely, short-term intention to invest in insulation is higher when the message is presented in a loss frame to someone with a prevention focus compared to someone with a promotion focus ($M_{\text{loss/prevention}} = 3.20; M_{\text{loss/promotion}} = 2.71, F(1, 166) = 3.910, p = .05$).

Therefore, hypothesis 3 is partly supported, as short-term intention to invest in insulation increases when the outcome frame of a message is congruent with the recipient's regulatory focus compared to when outcome frame and regulatory focus are incongruent. The interaction between regulatory focus and outcome frame does not account for the remaining dependent variables.

4.3. Reference point and regulatory focus

It was hypothesized that message effectiveness would be higher if the message is self-referencing and presented to someone with a promotion focus compared to someone with a prevention focus. Moreover, it was hypothesized that message effectiveness would be higher if the message is environment-referencing and presented to someone with a

Table 3
Results of ANOVA for the effects of the independent variables on the dependent variables.

Independent variable	ANOVA				
	Dependent variables				
	Attitude <i>F-value</i>	SI_I <i>F-value</i>	LI_I <i>F-value</i>	SI_A <i>F-value</i>	LI_A <i>F-value</i>
Environmental concern	4.83*	0.75	0.72	2.82	3.77
Insulation grade	3.42	14.23***	5.48*	2.18	5.96*
Gas connection yes/no	3.61	0.49	0.29	2.26	12.39***
Outcome frame	0.72	0.90	0.48	0.00	0.85
Point of reference	0.44	1.02	0.26	0.47	0.99
Regulatory focus	0.61	0.82	0.75	0.39	4.28**
Outcome frame * Point of reference	0.08	0.06	0.00	4.67*	0.99
Outcome frame * Regulatory focus	0.18	4.40*	0.98	0.12	0.20
Point of reference * Regulatory focus	2.39	0.18	0.18	0.10	3.36
Outcome frame * Point of reference * Regulatory focus	0.00	2.11	1.03	0.02	0.31

Note. Attitude = Attitude towards investment in sustainability; SI_I = Short-term intention to invest in insulation; LI_I = Long-term intention to invest in insulation; SI_A = Short-term intention to invest in an alternative heating system; LI_A = Long-term intention to invest in an alternative heating system.

* $p < .05$.

** $p < .01$.

*** $p < .001$.

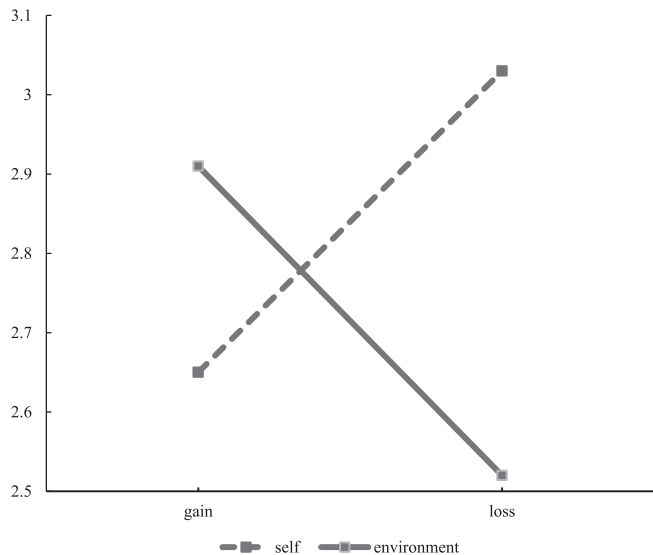


Fig. 2. Interaction effect of point of reference and outcome frame on short-term intention to invest in an alternative heating system.

prevention focus compared to someone with a promotion focus (H4). However, the results do not support these hypotheses. Additionally, testing the interaction between point of reference and regulatory focus across different levels of the covariates shows no effects.

5. Discussion

The results support the anticipated interaction effect between outcome framing and point of reference on message effectiveness. Short-term intention to invest in an alternative heating system is higher when the negative outcomes of not adhering to the advocated behaviour are emphasized but only if the negative outcomes are directed at the individual. Furthermore, the results support the anticipated interaction effect between outcome frame and regulatory focus on message effectiveness. Short-term intention to invest in insulation is higher when the outcome is framed in terms of the gains of engaging in the behaviour for a recipient with a promotion focus compared to a recipient with a prevention focus. The reverse is true as well: short-term intention to invest in insulation is higher when the outcome is framed in terms of the losses of not engaging in the advocated behaviour for a recipient with a prevention focus compared to a recipient with a promotion

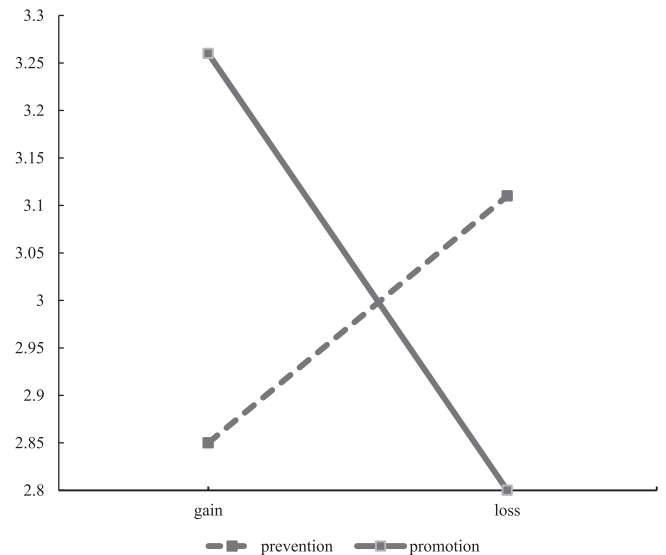


Fig. 3. Interaction effect of regulatory focus and outcome frame on short-term intention to invest in insulation.

focus.

The findings are discussed below in light of the literature; then, directions for further research and the limitations of this study are discussed. Finally, the main conclusion of the research is presented.

5.1. Discussion of the findings

An important finding of this study in light of previous research is that neither the outcome frame of the message nor the point of reference used affects message effectiveness directly. Interestingly, this finding is not consistent with the study by Segev et al. [21] in which main effects were found for both outcome frame (a gain frame was found to be more effective than a loss frame) and point of reference (a reference to the self was found to be more effective than a reference to the environment) for responses to an advertisement for a green washing machine. This discrepancy may be explained by differences in uncertainty involved in the advocated behaviour. It might be that the behavioural outcome of using a green washing machine is more certain than the behavioural outcome of investing in the sustainability of one's house. The outcome of the latter seems far more contingent on a great variety of factors compared to buying a washing machine. Therefore,

the independent effects of the outcome frame and the point of reference might be muted due to the complex nature of the context in which they are applied.

The interaction effects found in this research are, however, in line with the findings of previous research on the interactive nature of outcome-framing effects within the context of pro-environmental communication. Both Loroz [12] and Segev et al. [21] found that loss/self messages are more effective than loss/environment messages. Additionally, they both found that gain/environment messages are more effective than gain/self messages. As in the current research, the difference in effectiveness between gain/environment and gain/self messages was non-significant in both studies. Likewise, the significant interaction between outcome framing and regulatory focus supports the finding of Cesario et al. [24] that the effectiveness of an outcome framed in terms of losses or gains depends upon a recipient's predominant regulatory focus.

With regard to this study's dependent variables, which serve as indicators of message effectiveness, two findings are noteworthy. The first finding in this regard is that, in contrast to the hypotheses, no interaction effects of message framing on long-term intentions to invest in either insulation or an alternative heating solution were found. A potential explanation is that, in general, long-term intentions might be more difficult to influence by means of message framing than short-term intentions. However, more research is needed to empirically support this assertion. Another explanation might be that homeowners are already more willing to invest over the long term and that influencing these stronger behavioural intentions with message framing might be more difficult than influencing weaker intentions.

The second finding with regard to the dependent variables is that different interaction effects are found for the two different short-term intentions. Namely, the interaction between outcome framing and point of reference only appears to have a significant effect on short-term intention to invest in an alternative heating system (radical innovation), whereas the interaction between outcome framing and regulatory focus only appears to have a significant effect on short-term intention to invest in insulation (incremental innovation). Based on this finding, it can be concluded, in line with Geels et al. [14], that homeowners might perceive short-term investment in an alternative heating system and short-term investment in insulation differently. When examining which factor caused these different interaction effects on these specific behavioural responses, it is possible that the answer lies in the associated risks involved in these behaviours. If one assumes that an investment in an alternative heating system is more risky than an investment in insulation because the return on the investment is less certain, then insights from prospect theory may explain the findings of the current study [19]. This theory holds that gain frames are more effective under conditions of low perceived risk, whereas loss frames are more effective under conditions of high perceived risks. This mechanism might have contributed to the strength of the effects and might have caused these confounding findings.

Moreover, another interesting finding is that under the conditions of the original model, no interaction effects were found for attitude towards investment in the sustainability of one's house. There are two possible explanations for this. The first explanation is that the interacting factors have an effect that goes beyond attitude, and they influence behavioural intention directly and rather unconsciously. This would correspond to the typology of Levin et al. [19], which states that, unlike attribute framing, outcome framing does not affect the evaluations of an item but rather the impact of persuasion itself. The second explanation is based on the premise that the pre-existing attitudes towards investment in the sustainability of one's house were already very positive. Influencing these attitudes by means of message framing might be rather difficult.

Finally, the explanation for not finding any interaction between point of reference and regulatory focus should be sought in how these factors were operationalized. For example, Aaker and Lee [29]

situationally primed regulatory focus by focusing on either promotion benefits or prevention benefits of a product, whereas the current research measured dispositional regulatory focus. Thus, the interaction they test is similar to the operationalization of the interaction between outcome frame and point of reference in the current study. Interestingly, they found an interaction effect between benefits framing (promotion versus prevention) and point of reference in exactly the opposite direction as that found in the current study. Namely, promotion/self is more effective than promotion/other, and prevention/others is more effective than prevention/self. Note that these contradicting results are likely caused by the fact that framing benefits, in terms of promotional information or preventative information (as defined by Aaker and Lee [29]), are conceptually different from framing outcomes in terms of pleasure of adherence or pain of non-adherence (as defined in this study).

5.2. Directions for further research

The current research found evidence that homeowners respond differently to interacting message frames when different behaviours are addressed. Both investment in insulation and investment in an alternative heating system are considered important measures to make a house more sustainable and less dependent on natural gas. However, it is apparent that message frames have different effects when different types of behaviours are advocated, although the question of whether these behaviours will actually be performed remains. Therefore, future studies should gain further insight into whether these types of behaviours are really perceived differently by homeowners and, if so, why. Moreover, will intentions translate into pro-environmental behaviours? As a contribution to message framing theory in general, it might be important to examine to what extent the (perceived) riskiness of a behaviour plays a role in how outcome framing, point of reference and regulatory focus interact. This relationship could be studied, for instance, by experimentally manipulating the behaviour that is advocated based on the risks involved in the behaviour (low vs. high) and examining whether differences in framing effects arise between them.

Furthermore, it is expected that if the behaviour promoted by persuasive appeals in the context of the energy transition were further specified in terms of which investments are really necessary in all of the different types of situations homeowners might be in, the effectiveness of message frames would increase. By doing so, homeowners are confronted with outcomes of behaviour that are more vivid, specific and closer to reality. Experiments similar to the current research should be conducted, with the difference being that the behaviour encouraged in the persuasive appeal is more aligned with the specific needs of different types of homeowners. In this way, whether an even more personalized approach is indeed more effective can be examined.

5.3. Limitations of the research

When interpreting the results of this study, three methodological issues should be taken into account. The first is related to the construct validity of regulatory predominance. As mentioned in the methods section, the calculation of the regulatory predominance score differs from the conventional method suggested by Higgins et al. [34]. The reason is that, due to the translation and transformation of the RFQ, the subscale that measures promotion focus appeared not to be reliable. A single promotion item was selected to ensure that a predominance score could be calculated. However, using a single item does not allow the reliability of the scale to be assessed. Therefore, it is unclear whether the measure used is a valid indicator of regulatory predominance. Nonetheless, it could be argued that the interaction, which was statistically significant, together with the direction of the interaction in relation to message effectiveness, provides sufficient evidence of valid operationalization of regulatory predominance. The second methodological issue that should be addressed is related to the reliability of the

manipulation check that was used to test whether outcome framing was successfully manipulated. The two items used for that check had Cronbach's alpha values of $\alpha = 0.64$, which is a level of reliability that is not accepted by all scholars [37]. It could be argued that one cannot be sure that the outcome frame was successfully manipulated if the scale that assesses the extent to which it is successful is not reliable. An explanation for the low reliability of the scale should be sought in the realm of the ambiguity of the item: "The newsletter stated the advantages of investing in the sustainability of my house" (on a 5-point Likert-scale; 1 = strongly disagree, 5 = strongly agree). It is expected that some participants reported high scores on this item even though they were in the loss condition if they viewed the newsletter as indirectly stating advantages of adhering to the behaviour instead of the disadvantages of not adhering to the behaviour. Similar to the issue of calculating regulatory focus predominance, it could be argued that the interactions that were statistically significant, together with the direction of these interactions in relation to message effectiveness, provide sufficient evidence of successful manipulation. Third, convenience sampling was used, leading to potential sampling bias. Although all demographics variables for our sample were equally distributed across the four conditions, skewed results may remain.

6. Conclusion

Overall, it can be concluded that, given the specific context in which the experiment took place, outcome-framing effects exist by virtue of the other factors present or absent in a persuasive appeal. This research proves that the outcome frame itself, when used in a communal newsletter advocating investment in natural-gas-free living, does not affect behavioural intentions directly but only if the point of reference of a message and the recipient's regulatory focus are taken into consideration as well. It can therefore be concluded that to maximize the likelihood that homeowners will invest in an alternative heating system with short notice, the persuasive appeal should contain a loss frame along with a reference to the self. Finally, this research found no evidence of a third interaction that was anticipated: that between point of reference and regulatory focus. It could be concluded that the effect of the point of reference on the message effectiveness of the persuasive appeal does not depend on the recipient's regulatory focus.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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