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The effectiveness of normative messages to decrease meat consumption: The superiority of dynamic normative messages framed as a loss

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Consumer behaviors related to food consumption, such as meat consumption, is acknowledged to be a main contributor to the environmental problems. Recent research supports the efficacy of normative messages to change these behaviors for the good. Normative messages make the social norm salient in the behavioral context. Research shows that the normative messages are effective to encourage “desired” pro-environmental behavior if this behavior is carried out by a numerical majority. However, the pro-environmental consumer behaviors are often carried out by a minority of people only. Making salient these behaviors performed by minority of people in normative messages often backfires because the normative message makes salient that it is normal to perform the “undesirable” environmentally harmful behavior. To overcome this shortfall, research has experimented with highlighting that the desired behavior, although still a behavior by minority people, has increased in prevalence (i.e., a dynamic rather than static normative message). However, when such dynamic normative messages are most effective is less clear. Specifically, according to goal-framing theory, it can be assumed that a dynamic normative message highlighting that an increasing minority of people start carrying out the desirable behavior represents a gain frame, while emphasizing that the behavior performed by majority of people is decreasing indicates a loss frame. So far, research on dynamic normative messages only applied gain frames in their messages. This is surprising, as construal level theory (CLT) suggests that the dynamic normative messages will be more effective when framed as a loss. This study therefore tested whether a dynamic normative message is more effective than a static normative message or no message at all, depending on whether it is framed as a loss or a gain. In a one-way between-subject experimental design, including five experimental conditions [i.e., static descriptive normative message (1) gain framed or (2) loss framed; dynamic descriptive normative message (3) gain framed or (4) loss framed; (5) control condition; $N = 270$], we found that only dynamic normative messages that were framed as a loss were more effective in encouraging a consumer’s intention to reduce meat consumption. Therefore, the dynamic

normative messages are effective to encourage pro-environmental consumer behaviors of minority of people, but especially when they are framed as a loss rather than a gain.

KEYWORDS

goal-framing, social norms, meat consumption, gain-framed message, normative message

Introduction

Various environmental problems such as climate change, pollution, and loss of biodiversity are considered major challenges of the 21st century as they lead to the risk of hindering global health, food, and water supply, as well as economic prospects [Intergovernmental Panel on Climate Change (IPCC), 2022]. The livestock industry has been identified as a key contributor to these problems (IPCC, 2021). For example, livestock animals are one of the main contributors to methane emissions, which is the key driver of the increase in temperature, since it creates large temperature increases (Lynch et al., 2020). It also has a severe impact on the environment by leading to land degradation, especially when done in an intense production form (Scanes, 2018). Moreover, nearly 80% of all land on earth is currently used to grow livestock (Ritchie, 2019). However, all this land only produces about 20% of the total supply in calories worldwide (Ritchie and Roser, 2018). Land degradation entails the diminution of the soil's resource potential and thereby a long-term loss of biodiversity, a good surface soil, and the reduction of water quality and its availability (Scanes, 2018). Finally, with an increasing demand of meat products, farm owners have proceeded in creating more space for food production and pasture by clearing forests, thereby driving deforestation (Ilea, 2009). Next to these unsustainable production processes, there is the expectancy that the world's population will grow to around 10 billion in 2050 (United Nations, 2019), what will result in even more problematic pressure on the environment. Researchers acknowledge that a reduction in consumer's meat consumption could decrease demand which would help to overcome the detrimental effects that our livestock industry has on the environment (De Boer and Aiking, 2018; Godfray et al., 2018; Graca et al., 2019). This study therefore focuses on how we can encourage consumers to reduce their meat consumption. Reducing meat consumption in this context is regarded as a specific type of pro-environmental consumer behavior, which is defined as those behaviors that benefit the environment by changing the availability of materials or energy from the environment or altering the structure and dynamics of ecosystems in a positive way (Steg and Vlek, 2009).

Among the strategies to promote pro-environmental consumer behavior, such as reducing meat consumption,

research supports the importance of social norms (e.g., Cialdini, 2003; Goldstein et al., 2008; Nolan et al., 2008; Allcott, 2011). Social norms are implicit rules among social groups with regard to what is acceptable or unacceptable behavior (Aronson et al., 2010). Indeed, social norms have been acknowledged as an important determinant to positively change pro-environmental consumer intentions and behaviors, especially when made salient in a specific behavioral context (Cialdini et al., 1990; De Groot et al., 2021).

One way of making social norms salient is by framing them in a specific message (De Groot et al., 2021), such as “A majority of consumers do not eat meat.” Normative messages have been used for promoting a variety of pro-environmental consumer behaviors, such as re-using towels (Han et al., 2018), reducing meat consumption (Sparkman and Walton, 2017), paying for carbon offsetting (Huber et al., 2018), and energy conservation (Anderson et al., 2017; Horne and Huddart Kennedy, 2017). These types of messages can make social norms salient for a given situation by making the desired behavior more visible to an individual (Abrahamse and Steg, 2013), which is assumed to increase its influence on acting in accordance with the communicated social norm (Peattie, 2010). Using normative messages is therefore a popular strategy to encourage pro-environmental consumer behaviors, as they have been shown to be simple, cheap, and effective at changing these behaviors (e.g., Ferguson and Lawrence, 2013; De Groot et al., 2021).

Making social norms salient with normative messages is not always an effective strategy though (De Groot et al., 2021). Research shows that people conform to behaving in the desired way when the normative message makes salient that a numerical majority of the group performs the desired behavior (Cialdini et al., 1990). However, a lot of pro-environmental “desired” consumer behaviors, such as reducing meat consumption, are often carried out by a numerical minority only. Making salient that only a minority of people are performing the desired behavior in a normative message, actually emphasizes the belief that the existent social norm is in favor of the undesired, environmentally harmful behavior (i.e., making salient the social norm that most people like themselves are also eating meat). The normative messages making salient desirable minority behavioral norms often lead to counter-productive effects because they emphasize that it is not normal to show the

desirable behavior, as most people like them are not performing it as well (Cialdini et al., 1990; De Groot et al., 2021).

To overcome the counter-productive effect of making salient minority behavioral norms with normative messages, research has focused on other ways to provide normative information. Specifically, recent research has introduced the concept of dynamic norms, emphasizing the dynamic elements of behavioral change over time (Sparkman and Walton, 2017). Rather than making a minority social norm by emphasizing how many people are currently performing the desired behavior (“20% of people do not eat meat”), a dynamic normative message makes salient how the desired behavior has positively changed over time (“20% of people have started reducing their meat consumption”). However, as research on dynamic descriptive normative messages is still in its infancy, little is known about the specific conditions under which dynamically framing of minority-behavior norms might be most effective (De Groot et al., 2021). This study will argue that framing normative messages as gains or losses might provide such condition.

Various studies on pro-environmental consumer behavior assume that people are motivated to make behavioral decisions based on perceived benefits and costs of the behavior (Steg and Vlek, 2009). In this sense, outcomes of a certain behavior can be framed as a gain by highlighting its benefits of performing the behavior, or, as a loss by emphasizing its costs of not performing the behavior (goal-framing theory; Tversky and Kahneman, 1981). In line with this observation, next to making a social norm salient in a specific context, normative messages often seem to imply a gain or a loss when (not) performing the desired behavior. Specifically, a dynamic normative message could highlight that an *increasing minority* of people start carrying out the desirable behavior (i.e., framed as a gain). Alternatively, it could also emphasize a loss by focusing on a message suggesting that *the majority behavior is decreasing*. So far, research on dynamic descriptive normative messages has only applied gain frames in their messages (see e.g., Sparkman and Walton, 2017; Jaeger et al., 2019; De Groot et al., 2021). Based on CLT (Trope et al., 2007), this study will argue that focusing messages on losses might be a more effective strategy than focusing on gains in normative messages, especially when the message is dynamically framed.

In conclusion, normative messages are often regarded as an effective strategy to encourage pro-environmental consumer behavior, although less is known about the conditions under which such messages are most effective. The aim of this study is to contribute the understanding of this effectiveness. In particular, integrating goal-framing theory (Tversky and Kahneman, 1981) with existing research on the effectiveness of normative messages will contribute to further understand the conditions under which such messages can be most effective to promote positive environmental behavioral change in consumers.

Literature review

Social normative messages are popular because they seem to be easily applicable in a lot of practical contexts, while simultaneously research have shown they are relatively effective as a behavior change intervention (De Groot et al., 2021). Normative messages often rely on making salient either an injunctive social norm—specifying what people (dis)approve within a reference group—or a descriptive social norm—emphasizing how the reference group typically behaves in a particular situation (Cialdini et al., 1990). Both injunctive and descriptive social norms have found to be predictive for a variety of pro-environmental consumer intentions and behaviors (e.g., Allcott, 2011; De Groot and Schuitema, 2012; Costa and Kahn, 2013; De Groot et al., 2013). Proportionately more studies have found descriptive normative messages to be more effective than injunctive normative messages in influencing consumers to behave more pro-environmentally (e.g., Goldstein et al., 2008; Louis et al., 2014; Helfinstein et al., 2015; Elgaaied-Gambier et al., 2018; Liu et al., 2019; Zou and Savani, 2019).

Researchers put forward two explanations for the dominance of descriptive over injunctive normative messages. First, consumers comply more easily with descriptive norms through simple imitation as they already reflect the behavior of others, requiring lower cognitive effort (Cialdini, 2003; Melnyk et al., 2019). Second, communicating descriptive norms may introduce the injunctive norm whereas the opposite is not true (Elgaaied-Gambier et al., 2018). Due to the stronger effect on behavioral change, the present study focuses on descriptive normative messages only. Specifically, when we refer to normative messages throughout this article, we refer to descriptive rather than injunctive normative messages.

Promoting the intention to reduce meat consumption: The effectiveness of dynamic vs. static normative messages

Social norms are considered to be one of the major determinants to explain and predict pro-environmental consumer intentions and behaviors (Cialdini et al., 1990; Griskevicius et al., 2007; Goldstein et al., 2008; Christian et al., 2018), including consumers' intentions to reduce one's meat consumption (Sparkman and Walton, 2017; De Groot et al., 2021). Behavioral intentions are defined as self-instructions to engage in a certain behavior to achieve desired outcomes (Sheeran and Webb, 2016). They are considered the best single predictor of behavior. As intentions are assumed to be the best proxy of behavior (Ajzen, 1991; McEachan et al., 2011; Coker and Van der Linden, 2020), this study will focus on the intentions to reduce meat consumption rather than actual behavior to assess the effectiveness of normative messages.

Normative messages have been effectively used for promoting a variety of pro-environmental consumer intentions and behaviors (Anderson et al., 2017; Horne and Huddart Kennedy, 2017; Sparkman and Walton, 2017; Han et al., 2018; Huber et al., 2018). For example, Goldstein et al. (2008) have shown that communicating a descriptive norm that a majority of other hotel guests are re-using towels results in hotel guest re-using their towel more often compared to those guests who just received a general message. A reason why people act on normative messages is because such messages provide information on what is the normal thing to do in such a context (Cialdini et al., 1990). According to the focus theory of normative conduct, people consider norms in their decision making when they are activated or made salient, and normative messages can function as such an “activator” (Cialdini et al., 1990).

Normative messages often rely on making salient a “static” social norm, which addresses the current state of the norm (Sparkman and Walton, 2017). Although static normative messages are shown to be effective to encourage positive pro-environmental behavior change (Abrahamse and Steg, 2013), they reach their limitations as soon as there is no majority behaving in the desirable way (Cialdini, 2003; Schultz et al., 2008). A lot of pro-environmental consumer behavior is performed by a minority group only, resulting in a minority rather than a majority social norm (Jaeger et al., 2019; De Groot et al., 2021). Consequently, making salient a minority norm with normative messages can have a backfiring effect on behavior change, because people are reminded that showing the desired behavior is not the normal thing to do (Cialdini et al., 2006). To overcome this backfiring effect, researchers have introduced a distinction between static and dynamic descriptive norms (Sparkman and Walton, 2017; Jaeger et al., 2019; Loschelder et al., 2019).

Research in dynamic norms argues that what is normal behavior and what not is something that can change over time (Rettie et al., 2014). Moreover, a prior minority behavior can become a majority behavior over time and thereby become socially normalized whereas the prior majority behavior will marginalize (Rettie et al., 2014). In line with this reasoning, the current prevalence of a behavior, as presented in a “static” normative message, may not be the only form of descriptive normative information people rely on to behave in the desired way. Rather, people can also rely on *trending* or *dynamic* descriptive normative information (Sparkman and Walton, 2017). Whereas, static normative messages emphasize which behavior people are currently carrying out, dynamic normative messages extend the static popularity of a behavior by indicating that the desired behavior is increasing in prevalence over time and thereby implying a change of the social norm (Sparkman and Walton, 2017; Jaeger et al., 2019).

Recent in dynamic normative messages has shown that dynamically framed messages are more effective in achieving

compliance with the desired behavior compared to statically framed messages (Sparkman and Walton, 2017; Jaeger et al., 2019). This does apply to majority behaviors as well as minority behaviors, constituting a possibility to achieve compliance with a non-normative behavior, which reducing meat consumption still is. For instance, when providing students with a static message emphasizing that a minority of students makes an effort to reduce their meat consumption, Sparkman and Walton (2017) found that this does not result in a decrease of meat-free meals compared to a message that is not related to food. However, a dynamic descriptive normative message which emphasized that limiting one’s meat consumption is increasing in prevalence among the reference group, however still a minority behavior, nearly doubled the number of meat-free meals (Sparkman and Walton, 2017). Similar results have been found for other non-normative pro-environmental consumer behaviors, such as water usage and donations to environmental causes (Jaeger et al., 2019), and pro-environmental behaviors already performed by a majority, such as water conservation (Sparkman and Walton, 2017). A meta-analysis by Jaeger et al. (2019) found a small-to-medium effect size of dynamic normative messages on conformity with the trending behavior. These results emphasize the effectiveness of dynamic normative messages to promote trending non-normative behaviors such as reducing meat consumption.

The influence of goal framing on the effectiveness of normative messages toward reducing meat consumption

Normative messages are not the only way to promote pro-environmental consumer behaviors. In particular, research in goal framing assumes that messages can be more or less effective depending on whether they are framed as gains or losses by emphasizing positive or negative information, respectively (Davis, 1995). However, so far researchers exclusively applied gain frames on dynamic normative messages (Sparkman and Walton, 2017; Jaeger et al., 2019). That is, the previous research framed dynamic normative messages by informing recipients that an increasing minority is carrying out the desirable behavior. A loss frame, however, would emphasize that a majority is carrying out the undesirable behavior, but this majority is decreasing in prevalence.

Framing in this study refers to behavioral decision making through the context in which a choice is presented (Szmigin and Piacentini, 2018). Several types of framing can be distinguished, of which a popular one is goal framing (Levin et al., 1998). Goal framing is concerned with the impact of perceived gains and losses of performing a certain behavior on decision making (Arbuthnott and Scerbe, 2016). Loss and gain frames present the same underlying situation differently by manipulating the

receiver's perceptions of the outcomes of behaviors. Gain frames underline the behavior's benefits of performing the behavior, whereas loss frames highlight the costs of not engaging in the behavior (Rothman and Salovey, 1997). For instance, a dynamic normative message to promote eating less meat can be framed as a gain by communicating that "3 out of 10 people make an effort to reduce their meat consumption. This has increased from 2 out of 10 people five years ago" or as a loss by stating that "7 out of 10 people do not make an effort to reduce their meat consumption. This has decreased from 8 out of 10 people five years ago".

Framing in losses and gains can significantly influence how a problem is perceived and how possible actions are evaluated (Tversky and Kahneman, 1981). Tversky and Kahneman (1981) postulated a loss aversion, meaning that recipients respond more favorably toward preventing losses compared to achieving equal-sized gains (Dijksterhuis and Aarts, 2003). Thus, recipients should respond more favorably toward a promoted behavior if the consecutive costs of not conforming toward the behavior are framed compared to emphasizing the resulting benefits of conforming toward the behavior. However, a series of meta-analyses were not able to replicate their findings (O'Keefe and Jensen, 2008, 2009). Thus, the effectiveness of gain compared to loss frames seems context-dependent (White et al., 2011). This study argues that making salient dynamic rather than static norms in messages, will provide such a context.

The relevance of low-level construals in the effectiveness of dynamic normative messages

When complying to normative messages, people conform to descriptive norms to make better decisions (Cialdini et al., 1990). That is, focusing on the current popularity of a behavior can provide relevant information into behaviors that may have been beneficial in the past or may be beneficial in the present (Jaeger et al., 2019). Hence, normative messages imply certain benefits when conforming to the promoted behavior as well as losses when not conforming without mentioning these explicitly, which should activate goal framing. As the dynamic normative messages contain further information about the trend of a norm, perceived benefits and costs should differ from those of static normative messages (Sparkman and Walton, 2017). Dynamic normative messages can result in conformity with a minority behavior, as recipients assume that the minority behavior will be the majority behavior in the future. Subsequently, they act toward the minority behavior in the present as if it were already normative (Sparkman and Walton, 2017). Based on CLT (Trope et al., 2007), this study argues that the effectiveness of dynamic normative messages is dependent on whether they have been framed as a loss or a gain.

The CLT describes how the perceived psychological distance of the self to an event influences one's thoughts and behaviors toward it (Trope et al., 2007). Psychological distance is the subjective experience of a stimulus whether being close or far away from the self, here and now. If the psychologically proximal to a stimulus, individuals will use specific and pragmatic low-level construals specifying how a behavior is performed. On the other hand, when psychologically distant to a stimulus, one will make use of high-level construals which are abstract and idealistic specifying why a certain behavior is performed (Trope et al., 2007).

The CLT reflects the social dilemma of many pro-environmental behaviors such as meat consumption: whereas the individual has to give up immediate and certain benefits of meat consumption by cutting out liked food of one's diet, positive collective outcomes on the health and environment are in the future and uncertain (White et al., 2011). The individual has to engage in inconvenient behaviors at a cost for the self in the short-run to achieve collective long-term gains in the long-run (White et al., 2011). Furthermore, only if everybody is conforming, pro-environmental behavior will be effective in the long term (White et al., 2011). Two dimensions of psychological distance contributing to this social dilemma include (1) temporal distance and (2) hypothetical distance. Temporal distance refers to the perceived distance of the event in time. Hypothetical distance is the perceived probability of the event to happen in the future. One of the mechanisms why the dynamic normative messages are more effective in achieving conformity compared to static descriptive normative messages is that the recipients perceive the dynamic norm to be the normative behavior in the future and act on it as if it is already reality (Sparkman and Walton, 2017). Thus, it can be assumed that dynamic descriptive normative messages will activate a low-level construal more so than a static normative or a no normative messages as it reduces the perceived temporal and hypothetical distance that the behavior will be normative soon.

According to CLT, messages are more effective when they are developed on a congruent level of construal (Zwicker and Wilson, 2014). Thus, message elements should activate similar psychological distance in order to be most effective (White et al., 2011). An emerging line of literature shows that loss frames compared to gain frames activate a low-level construal as negative outcomes signal a threat which needs to be addressed and thereby spurs immediate action (e.g., Nan, 2007; White et al., 2011; Chang et al., 2015). Framing losses of limiting one's meat consumption will therefore activate low-level construal, while gain frames will activate high-level construals. Consequently, pairing a dynamic normative message (which will activate low-level construals more so than static or no normative messages) with a loss frame that activates these low-level construals should be most persuasive because then both message elements are processed congruently.

Present study

This study integrates goal-framing theory (Tversky and Kahneman, 1981) with existing research on the effectiveness of normative messages to examine the conditions under which normative messages can be most effective to promote intentions to reduce meat consumption. Based on the literature above, the following hypotheses have been put forward:

Hypothesis 1: A dynamic normative message toward reducing meat consumption framed as a loss is the most effective message increasing the intention to reduce meat consumption.

That is, it is more effective than providing

Hypothesis 1a: no message (control);

Hypothesis 1b: a static normative message toward reducing meat consumption, regardless of whether it is framed as a loss or a gain; and

Hypothesis 1c: a descriptive normative message toward reducing meat consumption framed as a gain.

Methods

Sampling strategy and sample

A convenience sampling strategy was used in which people were approached online and in the field. In the field, people were asked to fill out a survey about meat consumption. The data collection in the field took place in various facilities throughout different places in The Netherlands and Germany where the participants were provided with a link to the survey (e.g., the University Library, the university sports center, Groningen Central Station, Kindergartens in various places in Germany) Online participants were contacted *via* the personal network on social media with a link to the survey. We used this strategy because the purpose of our research was related to examining relationships and internal validity rather than external validity, and, this strategy gave us the opportunity to collect large and varied data points fulfilling this purpose (Etikan et al., 2016). To ensure the quality of our final sample, we used strict inclusion criteria. Specifically, the target population was defined as people who do not follow a vegetarian or vegan diet as only meat eaters are able to reduce their meat consumption. They also had to be 18 years or older so that they represented consumers who can make independent choices. Finally, they had to live in The Netherlands or Germany because the presented reference group in the messages referred to people living in these countries and therefore people living in other countries were assumed to be less affected by the reference group. The participants who did not fulfill the three criteria were immediately guided to the end of the study ($n = 51$). Using strict *a priori* inclusion criteria increased the power of our studies, by increasing the observed effect size (Meyvis and Van Osselaer, 2018).

TABLE 1 Socio-demographic characteristics of total sample ($N = 270$).

Socio-demographics

| | M (SD) = 32.6 (14.2) | |
|-------------------|----------------------|-----------------------|
| Age | | |
| Gender | 45.6% | Male |
| | 54.4% | Female |
| | 0.0% | Other |
| Education | 1.5% | Less than high school |
| | 55.2% | High school graduate |
| | 24.4% | Bachelor's degree |
| | 12.2% | Master's degree |
| | 1.1% | PhD |
| | 5.6% | Prefer not to answer |
| Employment status | 34.4% | Employed full-time |
| | 18.9% | Employed part-time |
| | 3.7% | Unemployed |
| | 5.6% | Retired |
| | 33.0% | Student |
| | 4.4% | Prefer not to answer |

The sample size was calculated using the statistical power analysis software G*Power. For a standard α -error probability of 0.05 and a standard power of 0.80 as well as a medium effect size of Cohen's d 0.50 which was assumed based on the meta-analysis by Jaeger et al. (2019), a total sample size of 51 participants per experimental condition was needed. This equaled 255 participants.

The final sample consisted of 270 participants. Among them, 123 were male and 147 female. A total of 28% stated living in The Netherlands ($n = 75$) and 72% were living in Germany ($n = 195$). The mean age was 33 years, ranging from 18 to 87 years ($SD = 14.17$). Among all respondents, 57% had a high school degree, 24% a bachelor's degree, and another 12% a master's degree. Around a third of all respondents were working full time (34%), another third were students (33%). In line with our convenience sampling strategy, the final sample was not considered representative but it seemed to be large and varied which we aimed for the purpose of our study. The socio-demographic characteristics for the total sample are shown in Table 1.

Design and materials

A one-way between-subject experimental design, including five experimental conditions was used to test the hypotheses. The five conditions included a static normative message that was either (1) gain framed or (2) loss framed; a dynamic normative message that was either (3) gain framed or (4) loss framed; (5)

a control condition. The dependent variable was intentions to reduce meat consumption.

A self-administered questionnaire was created with five different messages for each experimental condition which were randomly presented among participant. To develop the messages several considerations were taken into account. First, the message referred to a reference group of whom a certain percentage make an effort to reduce their meat consumption. Reference groups are groups that are used as a basis for comparison and guidance for behavior (Szmigin and Piacentini, 2018). They are shown to affect the impact of normative messages on the individual. The more an individual can identify or associate with a reference group, the more likely he or she is to conform to the group's norms. To control for the effect of the mentioned reference group on intentions to reduce meat consumptions, all conditions referred to people living in The Netherlands or Germany. It was decided to refer to people living in the country, i.e., "30% of people living in The Netherlands" instead of the nationality, i.e., "30% of Dutchmen" because a good deal of participants was assumed to be students at the University of Groningen in The Netherlands. Groningen is home to a lot of international students who probably do not identify as Dutchmen but still would consider themselves as living in The Netherlands. To keep the manipulation constant, the German version of the questionnaire referred to people living in Germany. By comparing the presented reference group and the stated country the participant is currently living in, non-suitable participants were excluded.

Second, the manipulation of the descriptive normative message displayed a proportion of the reference group who make an effort to reduce their meat consumption. The success of normative messages is related to the credibility of the information presented (Polonec et al., 2006). For instance, Granfield (2002) suggested that a failed social norm intervention in the context of reducing alcohol consumption at a College in the USA may have been because more than 45% of the participants did not believe the presented data. To increase the believability of the presented data in this study, numbers on people reducing their meat consumption were conducted from a pilot study by Sparkman and Walton (2017) in which they asked participants to estimate the number of Americans who make an effort to reduce their meat consumption (i.e., 30%). Since meat consumption in most developed countries is static or declining (Godfray et al., 2018), it was assumed that these numbers were also appropriate for a Dutch and a German convenience sample. Therefore, the messages referred to a number of 30% of the reference group reducing their meat consumption.

Third, to increase the persuasiveness of the message, source credibility was manipulated by referring that these numbers were based on recent research (Fennis and Stroebe, 2016). Because the manipulation was quite subtle, the most important information was presented in bold. Furthermore, the percentages were additionally explained as "this means

TABLE 2 One-way between-subject experimental design: the five experimental conditions.

General message:

"In the first section of this questionnaire, a message based on a recent scientific article will be presented. Please read the following message carefully."

| Condition 1: static normative message, gain frame | Condition 2: static normative message, loss frame |
|---|--|
| <i>"Recent research has shown that 30% of people living in The Netherlands make an effort to limit their meat consumption. This means that 3 out of 10 people living in The Netherlands eat less meat than they otherwise would."</i> | <i>"Recent research has shown that 70% of people living in The Netherlands make no effort to limit their meat consumption. This means that 7 out of 10 people living in The Netherlands eat as much meat as they usually have done."</i> |
| Condition 3: dynamic normative message, gain frame | Condition 4: dynamic normative message, loss frame |
| <i>"Recent research has shown that 30% of people living in the Netherlands make an effort to limit their meat consumption. This means that 3 out of 10 people living in the Netherlands eat less meat than they otherwise would. This has increased from 20% or 2 out of 10 people five years ago."</i> | <i>"Recent research has shown that 70% of people living in The Netherlands make no effort to limit their meat consumption. This means that 7 out of 10 people living in The Netherlands eat as much meat as they usually have done. This has decreased from 80% or 8 out of 10 people five years ago."</i> |
| Condition 5: no message (control) | |

that X out of 10 people" In the dynamic norm condition, the message ended with an additional sentence which emphasized that the minority behavior (i.e., meat consumption) is increasing in prevalence. Therefore, the message concluded that in the last years the number of people making an effort to reduce their meat consumption was increasing. No specific statistics about the number of people who started to reduce their meat consumption among the last years were found. Based on the fact that meat consumption in developed countries is static or declining (Godfray et al., 2018), an increase of 10% of people who reduce their meat consumption among the last 5 years was assumed appropriate because it is a small number but could still reflect a trend. Thus, the message concluded that the number of people who reduce their meat consumption has increased by 10% compared to 5 years ago.

Finally, the manipulation of goal framing determined how the static or dynamic normative message was framed. This framing was based on studies in goal-framing theory (O'Keefe and Jensen, 2009). Whereas, the gain manipulation stated that a minority is reducing their meat consumption, the loss manipulation specified that the majority is not reducing their meat consumption. The four different messages presented in the questionnaire are shown in Table 2.

Procedure and measures

The first question functioned as an icebreaker by asking participants about their favorite kind of meat. Simultaneously, participants who stated that they followed a meat-free diet were excluded as they were considered non-suitable for this study. Afterward, the participants were randomly assigned to one of the five previously mentioned experimental conditions. The survey continued with manipulation checks to check whether participants perceived the normative message as static or dynamic and whether they perceived the message as a gain or a loss. The participants in the control group skipped the message as well as the manipulation checks. Next, the dependent variable, intention to reduce meat consumption, was measured. Finally, the survey asked for some socio-demographics. The questionnaire is included in [Appendix A](#).

The dependent variable, intentions to reduce meat consumption, was measured by three items on a 7-point Likert scale based on [Ajzen \(1991\)](#), ranging from “1 = strongly disagree” to “7 = strongly agree.” The following items were included: “I plan to reduce my consumption of meat,” “I will make an effort to reduce my consumption of meat,” and “I intend to reduce my consumption of meat.” All three items were rated by participants on the extent to which they agreed with each statement. We computed the intention to reduce meat consumption by adding the 3 items and dividing them by 3 (Cronbach's $\alpha = 0.95$).

Manipulation checks were included to examine the validity of the experimental manipulation. Because they were presented right after the manipulation, they functioned as an additional opportunity to make the participants process the message since the manipulation itself was quite subtle. We included checks for both the extent to which participants perceived the normative message as dynamic (vs. static) and the extent to which the participants perceived the message as gain framed (rather than loss framed). Both checks were measured using a 7-point Likert scale ranging from “1 = strongly disagree” to “7 = strongly agree”.

The manipulation of the extent to which participants perceived a dynamic norm toward reducing meat consumption, was measured with a scale developed based on [Sparkman and Walton \(2017\)](#) conceptualization of dynamic norms. Three items measured the perceived dynamic norm, including (1) one item measuring whether participants perceived the norm as increasing in prevalence; (2) one item measuring whether the behavior (i.e., reducing meat consumption) was perceived as a minority behavior; and, (3) one item measuring whether the norm was perceived as a trend. The items formed a reliable construct and were therefore combined together and divided by 3 (Cronbach's $\alpha = 0.95$).

The manipulation check of goal framing was adapted from [Lu et al. \(2018\)](#) who included a manipulation check of goal framing in their research by measuring behavioral benefits and risks associated with the presented message by

participants. They measured this with a one-item 7-point scale only, ranging from “1 = Risks” to “7 = Benefits.” To increase the validity and reliability of this manipulation check and to keep the scale consistent with the other measures, we included two items rather than one on a 7-point Likert scale, including: “The message focused on the risks associated with meat consumption” and “The message focused on the benefits associated with meat consumption.” The two items formed a reliable construct and were therefore combined together and divided by two (Cronbach's $\alpha = 0.62$). The participants in the control condition neither saw a message nor the questions regarding the manipulation checks.

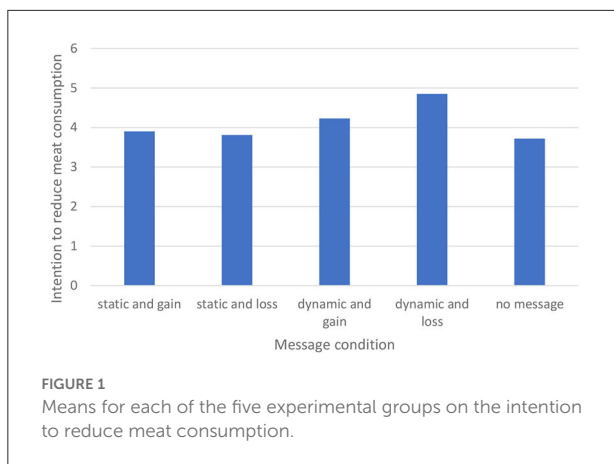
Results

Preliminary analyses

Some preliminary assumptions were checked before testing the main hypothesis. First, an independent *t*-test was conducted to measure whether there were differences between the participants living in Germany and The Netherlands on their intentions to reduce meat consumption to control for the manipulation of the presented reference group. Results showed that there was no significant difference between the participants from Germany ($M = 4.13$, $SD = 1.79$) and The Netherlands ($M = 4.03$, $SD = 1.81$) on intentions to reduce meat consumption, $F_{(1,268)} = 0.179$, $p = 0.67$. Thus, there were no significant differences between both groups on intentions to reduce meat consumption and decided to put and analyze both groups as one.

Second, manipulation checks were done. An independent *t*-test revealed that participants in who perceived dynamic descriptive normative messages ($M = 5.77$, $SD = 0.83$) were significantly more likely to think that the message emphasized that the descriptive social norm toward reducing meat consumption was dynamic than those who were exposed to the static descriptive normative messages ($M = 4.98$, $SD = 1.24$), $t_{(186.68)} = 5.50$, $p < 0.001$. An independent *t*-test showed that participants exposed to the loss-frame messages ($M = 3.57$, $SD = 0.66$) were significantly more likely to think that the message emphasized more risks and less benefits compared to those exposed to the gain-frame messages ($M = 3.96$, $SD = 0.99$), $t_{(214)} = 3.45$, $p = 0.001$. Therefore, both the framing of dynamic vs. static and the goal framing seemed to be successful.

Third, a linear multiple regression analysis checked the extent to which the socio-demographic characteristics contributed to the explanation of the intention to reduce meat consumption, because past research implied that socio-demographics could potentially confound the relationships of interest ([Huber et al., 2018](#)). The regression showed that socio-demographics (age, gender, educational level and employment status) explained a modest but significant 4.7% of variance in the intention to reduce meat consumption, $F_{(4,265)} = 3.24$, $p = 0.013$. Of the four demographics, only gender contributed



significantly to this model ($B = 0.22, p < 0.001$). The final convenience sample included an even distribution of gender. Hence, the likelihood that an uneven distribution of gender would confound the relationships of interest of this study deemed unlikely. Indeed, including socio-demographics as covariates in our ANOVA did not influence the conclusions of the final results. Therefore, the results section below will only report the main ANOVA, without correcting for socio-demographics.

Descriptive statistics

The direction of the means and standard deviations across the five experimental conditions seem to be in line with our main hypothesis, i.e., a dynamic normative message toward reducing meat consumption framed as a loss is the most effective message increasing the intention to reduce meat consumption. The dynamic normative message including a loss frame resulted in the strongest intention to reduce meat consumption ($M = 4.85, SD = 1.70$), followed by the dynamic normative message including a gain frame ($M = 4.23, SD = 1.80$). Both static normative messages ($M_{\text{gain}} = 3.90, SD = 1.64; M_{\text{loss}} = 3.81, SD = 1.52$) and no-message condition ($M = 3.72, SD = 1.79$) resulted in a weaker intention to reduce meat consumption, although the differences in means did not seem to be large. All descriptive statistics are shown in [Figure 1](#) and [Table 3](#).

Testing the effectiveness of a dynamic normative message toward reducing meat consumption framed as a loss: Main analysis

To test the (sub)hypotheses, a one-way analysis of variance (ANOVA) was conducted. Three assumptions were checked

prior conducting the ANOVA, namely, outliers, homogeneity of variances, and normal distribution of the dependent variable (Malhotra, 2009). The first and the second assumptions were met, as no outliers were found, and, homogeneity of variances was confirmed by Levene's test [$F_{(3,212)} = 0.57, p = 0.64$]. However, Shapiro-Wilk tests showed that normal distribution of the dependent variable for each combination of the groups of the two independent variables was violated for the groups dynamic descriptive normative message framed as a gain and dynamic descriptive normative message framed as a loss, $D(54) = 0.95, p < 0.01$ and $D(54) = 0.93, p = 0.01$, respectively, hereby violating the assumption of normal distribution. Although the third assumption was violated, we decided to still continue with the ANOVA as ANOVA is usually robust against violation of this assumption, especially for larger sample sizes such as included in this study (Blanca et al., 2017). Hence, we decided to continue to report the parametric ANOVA below, including Tukey *post-hoc* contrast analysis to interpret which of the five different experimental groups differ significantly from one another. For effect sizes, Cohen's d has been reported for an indication of the effect size of the differences between experimental groups. We use the generic interpretation of these effects: Small ≥ 0.20 , medium ≥ 0.50 , and large ≥ 0.80 (Cohen, 1998).

The one-way ANOVA showed that there was a statistically significant difference in intentions to reduce meat consumption between the five experimental conditions, $F_{(4,265)} = 3.74, p < 0.01$ (See [Table 3](#)). The Tukey *post-hoc* contrast analysis revealed that intention to reduce meat consumption was significantly stronger for those who received the dynamic normative message framed as a loss than from those who did not receive a message at all ($p < 0.01$), with a medium to large effect size (Cohen's $d = 0.60$), hereby providing support for Hypothesis 1a (i.e., a dynamic normative message toward reducing meat consumption framed as a loss is more effective than providing no message).

The participants exposed to the dynamic normative message framed as a loss showed a significantly stronger intention to reduce their meat consumption than those participants who perceived a static gain framed ($p = 0.042$) or a static loss framed message ($p = 0.019$). Both effect sizes were medium to large (Cohen's $d_{\text{static/gain}} = 0.57$; Cohen's $d_{\text{static/loss}} = 0.65$). These results supported Hypothesis 1b (i.e., a dynamic normative message toward reducing meat consumption framed as a loss is more effective than providing a static normative message, regardless of whether this message is framed as a gain or loss).

Finally, although participants who were exposed to the dynamic normative message framed as a loss showed a stronger mean in intention to reduce meat consumption than those who received the dynamic message framed as a gain, *post-hoc* analyses showed that these differences were not significant ($p = 0.35$). However, the effect size calculations showed that the effect size of the difference between the two conditions was small to medium (Cohen's $d = 0.36$). Thus, the t -test

TABLE 3 Descriptive statistics and ANOVA results.

| Condition | M (SD; n) | Dynamic/loss $M_{\text{difference}}$ | Dynamic/gain $M_{\text{difference}}$ | Static/loss $M_{\text{difference}}$ | Static/gain $M_{\text{difference}}$ |
|---------------|-----------------|---|---|--|--|
| 1. | 4.85 (1.70; 54) | – | – | – | – |
| 2. | 4.23 (1.80; 54) | –0.624 | – | – | – |
| 3. | 3.81 (1.52; 54) | –1.043* | –0.420 | – | – |
| 4. | 3.90 (1.64; 54) | –0.951* | –0.327 | 0.093 | – |
| 5. No message | 3.72 (2.07; 54) | 1.136** | 0.512 | 0.093 | 0.185 |

Mean differences between the experimental conditions are reported, including the significance of the Tukey *post-hoc* contrast analysis; ** $p < 0.01$, * $p < 0.05$; Total corrected model: $F_{(4,265)} = 3.736, p = 0.006$.

did not agree with Hypothesis 1c (i.e., a dynamic normative message toward reducing meat consumption framed as a loss is more effective than providing a dynamic normative message framed as a gain) while the descriptive statistics and the small to medium effect size, are in line with this hypothesis. We therefore conclude that Hypothesis 1c is partially supported only.

In conclusion, the results of the descriptive statistics together with the *post-hoc* contrast analyses and effect sizes are largely in favor of our general Hypothesis 1 (i.e., a dynamic normative message framed as a loss is the most effective message to reduce meat consumption).

Discussion

This study integrated goal-framing theory (Tversky and Kahneman, 1981) with existing research on the effectiveness of dynamic normative messages (Sparkman and Walton, 2017; Jaeger et al., 2019; Loschelder et al., 2019) to examine the conditions under which such messages can be most effective to promote pro-environmental consumption behavior. Research on how making salient dynamic norms rather than static norms has shown that dynamic normative messages are typically more persuasive than static normative messages to promote pro-environmental consumer behaviors, especially when these behaviors are performed by a minority only (Sparkman and Walton, 2017). Furthermore, framing normative messages in losses and gains can significantly influence how a problem is perceived and how possible actions are evaluated. Based on the recent research in dynamic normative messages (Sparkman and Walton, 2017) together with goal-framing theory (Tversky and Kahneman, 1981), this study investigated whether a loss-framed dynamic normative message toward reducing meat consumption would be more effective to increase pro-environmental minority behavior, such as the intention to reduce meat consumption, compared to a gain-framed dynamic normative message, a static (gain- or loss-framed) normative message, or no message.

Theoretical and practical implications

Our findings confirmed that a dynamic normative message toward reducing meat consumption framed as a loss is more effective than no message (Hypothesis 1a) or a static normative message, regardless of how it has been framed (hypothesis 1b). These results support the findings of recent research in dynamic normative messages that has shown that dynamically framed messages are more effective in achieving compliance with the desired behavior compared to statically framed messages (Sparkman and Walton, 2017; Jaeger et al., 2019). In particular, dynamic normative messages can emphasize that “normal” behavior is something that can become a majority behavior over time and thereby become socially normalized whereas the prior majority behavior will marginalize (Retrie et al., 2014). In line with this reasoning, our findings support that the dynamic normative messages can extend the static popularity of a behavior by indicating that the desired behavior is increasing in prevalence over time and thereby implying a change of the social norm (Sparkman and Walton, 2017; Jaeger et al., 2019). Thereby, the recipients will assume that the dynamic descriptive norm will be carried out by a majority in the future and conform to it as if it is already normative (Sparkman and Walton, 2017).

Our findings indicated that participants who were exposed to the dynamic normative message framed as a loss showed even stronger intentions to reduce meat consumption than those who received the dynamic message framed as a gain, although only with a small to medium effect (Hypothesis 1c). Our results are the first to show that dynamic normative messages could be even more effective when framed as a loss rather than a gain, as past research in dynamic normative messages have only applied gain-framed messages (Sparkman and Walton, 2017; Jaeger et al., 2019; Loschelder et al., 2019). In line with CLT, one of the mechanisms why dynamic normative messages are more effective in achieving conformity compared to static descriptive normative messages could be that these messages will activate low-level construals more so than static normative or no normative messages as it reduces the perceived temporal and hypothetical distance that the behavior will be normative soon (White et al., 2011). In line with this assumption, our

results provide some initial support that compared to statically framed messages, dynamically framed messages are on a lower level of construal, while the same seems to be true for a loss framed compared to a gain-framed message (White et al., 2011). Consequently, pairing a dynamic normative message (which will activate low-level construals more so than static or no normative messages) with a loss frame that activates these low-level construals should be most persuasive because then both message elements are processed congruently.

Based on the present findings, marketers and policy makers need to take into account two important facets when using normative messages into their behavioral change interventions. First, the normative message will be more effective when the focus will be on the dynamic aspects of the normative behavior. Especially when the behavior is still performed by a minority only, such as reducing meat consumption, emphasizing the dynamic elements of behavioral change over time is a more effective way than focusing on how consumers are performing the behavior at this moment in time only (Sparkman and Walton, 2017). Second, although the previous research in dynamic normative messages has not applied loss framing, our findings show that this simple adjustment in message framing can further increase the effectiveness of normative messages. Hence, framing the normative behavior as a loss (“7 out of 10 people do not make an effort to reduce their meat consumption. This has decreased from 8 out of 10 people five years ago”) rather than as a gain (“3 out of 10 people make an effort to reduce their meat consumption. This has increased from 2 out of 10 people five years ago”) can be a simple, cheap and effective strategy to apply such normative messages.

Limitations, future research directions, and conclusion

Our study included several limitations. First, the sampling procedure was not random resulting in a convenience sample only. The problem with non-random samples is that they are not representative, that is, the findings within the sample are not generalizable to the population. Although the main focus of this study was on the internal rather external validity in relation to the effectiveness of the four normative messages and the no-message condition on intentions to reduce meat consumption, the sample characteristics could interfere with the strength of the relationships. In particular, the convenience sampling strategy resulted in a sample that overrepresented people who were relatively young. Past research has implied that age is relevant for the strength of social norms in relation to pro-environmental behaviors (Huber et al., 2018). Consequently, our convenience sample may have altered the relative contribution of the effectiveness of the types of normative messages. For example, younger people may be relatively more sensitive

for dynamic normative messages because they are more concerned and aware of specific pro-environmental behavioral trends than older people are. Although the findings of our study remained consistent when correcting for such important confounding variables, the conclusion in relation to the strength of our hypothesized relationships will remain tentative until the relative effectiveness of normative messages will be further validated in different representative (sub)samples of the population.

Second, another limitation of this study regards the behavioral measure. Measuring intentions instead of actual behavior is a limitation, especially in a context involving pro-environmental consumer behaviors (De Groot et al., 2021). Although this study has given a strong indication of the relative effectiveness of different types of normative messages, the true impact of such messages might be overestimated in relation to actual behavior. Past research has shown that measuring intentions is a correlated, but imperfect, prediction of actual pro-environmental behavior in the future (Ajzen, 1991). If future research is more interested in the actual impact of normative messages on pro-environmental consumer behavior, using actual behavior rather than intentions will be a more effective approach.

Third, this study did not control for potential confounding variables (except for socio-demographics), which could have further increased the power of our study, especially when combined with a larger sample (Meyvis and Van Osselaer, 2018). Especially participants' frequency of meat consumption is assumed to be a factor which may have influenced these results (see e.g., De Groot et al., 2021). In terms of frequency, a ceiling effect is likely to occur as it gets more and more difficult to reduce one's meat consumption if already eating little meat. To increase the statistical power of the study, future research should control for the effect of frequency of meat consumption as well as other variables which could have further influenced intentions on reducing meat consumption.

Finally, this study focused on a minority pro-environmental consumer behavior. This makes sense, as most pro-environmental consumer behaviors are still performed by a minority only. However, dynamic descriptive normative messages are assumed to have even stronger effects on majority behaviors (Jaeger et al., 2019). Therefore, it can be assumed that loss frames could have even stronger effects for majority behaviors. Hence, it would be interesting to examine the extent to which dynamic normative messages and loss vs. gain frames on conformity toward majority behaviors in the future.

In conclusion, our findings show that dynamic normative messages framed as a loss are most effective in increasing pro-environmental consumer behaviors performed by minority of people, such as the intention to reduce meat consumption. They are more effective than providing no message at all; providing static normative messages, regardless of whether they

are framed as a gain or loss; and, they seem to be even more effective than dynamic normative messages framed as a gain. The results therefore suggest that the effectiveness of normative messages depend on the condition in which they will be framed. Professionals introducing behavior change interventions should consider how to frame their normative messages to increase their societal impact, hereby enabling to contribute to positive sustainable change.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving human participants were reviewed and approved by University of Groningen, Faculty of Economics and Business, Department of Marketing. The patients/participants provided their written informed consent to participate in this study.

Author contributions

JG has done the conceptualization, designed the study, analyses, and written the manuscript.

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Conflict of interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/frsus.2022.968201/full#supplementary-material>

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