The effects of message framing in promoting healthy eating behaviours among young and elderly consumers

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Paper prepared for presentation at the EAAE-AAEA Joint Seminar
'Consumer Behavior in a Changing World: Food, Culture, Society"

March 25 to 27, 2015
Naples, Italy

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Introduction

Numerous studies have shown that a balanced diet rich in fruit and vegetables is one of the main factors responsible for good health, psycho-physical wellbeing and reduced risk of morbidity and mortality (Hu, Stampfer & Colditz 2000; Sauvaget, Nagano, Allen & Kodama, 2003; Gariballa, 2004, Darmon, Kaiser, Bauer, Sieber & Pichard, 2010). Conversely malnutrition, which concerns not only the quantity but also the quality and type of chosen food, is connected with the increased risk of contracting various disorders, including obesity, cancer, type 2 diabetes, hypertension, cardiovascular disease, etc. (Sharpe, Vaca, Sargent, White, Gu & Corwin, 1996; Volkert, 2005; Keller, 2007; Williams-Piehota, Latimer, A. E., Katulak, Cox, Silvera, Mowad & Salovey, 2009; Darmon et al., 2010).

A balanced diet combined with regular physical activity is also one of the main factors responsible for active ageing (Gariballa, 2004, Trichopoulou, Costacou, Bamia & Trichopoulos, 2003; Huijbregts, Feskens, Räsänen, Fidanza, Nissinen, Menotti & Kromhout 1997; Haveman-Nies, de Groot, Burema, Cruz, Osler& van Staveren, 2002; Knoops, de Groot, Kromhout, Perrin, Moreiras-Varela, Menotti & van Staveren, 2004). Active aging is defined as a process accessible to everyone, that allows the maintenance of good vital functions, preserving autonomy and wellbeing in later years of life (Peel, McClure & Bartlett,2005).

As recent world demographic trends show that global ageing is a rising phenomenon (Komp & Aartsen 2013), attention on the processes and themes linked with ageing is also increasing. In particular, various disciplines are interested in how to support individuals at this delicate stage of their life. Promoting active ageing means preventing age-related disorders and illnesses, making the health and welfare system more sustainable, but also offering an important part of the population a higher number of years in good health, greater independence and activity, and therefore a better quality of life (Amarantos, Martinez & Dwyer, 2001; Gariballa, 2004). In this way, people aged between 65 and 74 could become a segment of the population from which to draw resources for voluntary work, self-help etc., at

the same time cutting on extensive and costly social and health care interventions (Kalache, Berreto & Keller 2005; Guimarães, 2007; Kruse & Schmitt, 2012).

Therefore, the adoption of correct eating habits is one of the main factors in promoting health and preventing diseases and disorders typical of the elderly (Gariballa, 2004; Williams-Piehota et al., 2009; Darmon et al., 2010). Furthermore, diet is particularly important since, unlike other factors, it is highly controllable by the individual, who can effectively correct his/her eating habits according to current needs (Keller, 2007).

Calls by the health authorities to adopt a healthier dietary regime , however, rarely result in the desired effect (Williams-Piehota et al., 2009; van't Riet, Ruiter, Werrij & De Vries, 2008; van't Riet, Ruiter, Smerecnik & de Vries, 2010, van Beek, Antonides & Handgraaf, 2013), as long-established eating habits which are hard to change. To encourage people to adopt correct eating habits, the risks and benefits connected with nutrition must be effectively communicated. Results of psychosocial research on effective communication show that the accurate formulation of the messages can lead to actual change in eating habits (Williams-Piehota et al., 2009; van't Riet et al., 2010, van Beek et al., 2013).

Framing in health communication

Among the various strategies available, framing can be decisive in the construction of effective health campaigns. By framing we mean emphasizing different aspects of a message, which leads to different interpretations (Tversky & Kahneman, 1981; Myers, 2010). A first level of framing concerns the value of the possible consequences of a certain behaviour: the most often analysed form of framing, Risky Choice Framing (Tversky & Kahneman, 1981), distinguishes between messages framed in terms of *gain*, emphasising the advantages of a certain type of behaviour, or on the contrary in terms of *loss*, underlining the negative consequences. Therefore, for example, the emphasis can be placed on the possible benefits for the individual of a diet based on a higher consumption of fruit and vegetables, or vice versa the negative effects of an excessive consumption of meat.

Past research provides conflicting results concerning this type of framing: although many studies have shown that the positive frame is more effective (Detweiller, Bedell, Salovey, Pronin & Rothman, 1999, Schneider, Nagano, Allen & Kodama, 2001), many other studies found the contrary (Kahneman & Tversky, 1979; Meyerowitz & Chaiken, 1987;

Tversky & Kahneman, 1981; Van't Riet et al., 2011). Therefore, at the moment a greater effectiveness of a particular type of frame over another has not been demonstrated.

Past research on message framing has investigated different forms of framing (Levin, Schneider, & Gaeth, 1998), but their possible integration and interaction have not been considered in depth yet. A comprehensive model of message framing has been proposed by Cesario, Corker, and Jelinek (2013). This model considers four different levels of framing, namely hedonic consequences, outcome sensitivities, regulatory concerns and goal-pursuit strategies, each connecting with different regulatory needs in recipients (Higgins, 1998; Higgins, Shah, & Friedman, 1997). The first level of framing, the *hedonic consequences level*, pertains to the hedonic valence of the consequences of behaviours described in persuasive messages, either positive or negative. The second level, the *outcome sensitivities level*, pertains to how such positive or negative consequences are presented, either as the presence of gains (or absence of losses), in the case of positive consequences, or as the presence of losses (or the absence of gains), in the case of negative consequences. The third level, the *regulatory concern level*, regards how the consequences described in persuasive messages affect different recipients' basic needs. Messages can be defined *growth-framed*, when they describe the given behavioral consequences referring to human self-assertiveness and ambition needs, or *safety-framed*, or rather when messages appeal to the recipients' needs, drawing how recommended behaviours can affect individual survival needs. For instance, in the nutrition field messages can stress the effects of a balance diet on well-being and fitness (growth-framed messages), or otherwise stress the effects on health and disease prevention (safety-framed). Finally, the fourth level of framing, the *goal-pursuit strategy* level, pertains to how messages describe the suggested behaviours as means to achieve a desired state. Research by Cesario and colleagues (2013) showed that persuasive messages with a different growth regulatory concern activate a promotion regulatory focus in recipients, whereas messages with a safety regulatory concern activate a prevention regulatory focus in recipients. These different message-induced regulatory focuses can increase or decrease the persuasiveness of messages framed according to the other levels of framing, in what has been defined "*regulatory fit*" (Cesario, Higgins, & Scholer, 2008; Freitas & Higgins, 2002; Higgins, 2000). Recent research found that messages are more persuasive when framed

congruently across multiple levels of framing, e.g. hedonic consequences and regulatory concern, or outcome sensitivities and regulatory concern (Bertolotti & Catellani, 2014; Cesario, et al., 2013).

Framing and hypothetical reasoning

As shown by previous research on framing and self-regulation, the persuasiveness of framed messages, whether growth framed or safety framed, depends on how message recipients process information about the consequences of suggested behaviours, and the proposed means to achieve or avoid such consequences. Research on counterfactual and prefactual reasoning (Roese & Olson, 1995) has shown that inducing people to think about the consequences of their behavior in hypothetical terms (i.e., "If X then Y") is an effective way to induce influence their attitudes toward a recommended behaviour (Richard, Van der Pligt, & De Vries, 1996). This effect is related to the so-called "preparatory function" of counterfactual and prefactual reasoning (Catellani & Milesi, 2011; Epstude & Roese, 2008; Markman & McMullen, 2003; Sirois, Monforton, & Simpson, 2010; Smallman & Roese, 2009). In counterfactual reasoning, considering how different *past* behaviours and decisions would have led to a more positive outcome than the actual one, is associated with negative emotions, such as regret (Zeelenberg, van Dijk, Manstead, & van der Pligt, 2000), but also to a greater motivation to act in order to achieve this positive result in the future (Markman et al., 1993, 1995; Markman & McMullen, 2003; Nasco & Marsh, 1999; Roese, 1994). Similar effects were found regarding prefactual reasoning, which is a reflection about the possible *future* positive or negative outcomes of one's very own behavior (Bakker, Buunk, & Manstead, 1997).

A study on weight loss programs conducted by Bagozzi, Moore & Leo (2004) showed that the attitudes towards different prefactual scenarios (e.g. "Imagine you're following a diet and achieving weight loss", or vice versa "Imagine you're following a diet and not achieving weight loss") predicted the intention to actually implement such behavior. Thus, the motivational drive underneath prefactual thought is determined by the degree to which individuals are able to imagine the pleasant or unpleasant outcome of that thought (Roese & Olson, 1995; Bagozzi, Moore & Leone, 2004). However, more research is needed to determine the effectiveness of prefactual communication, especially in health-promotion

campaigns. If on one hand this particular form of reasoning can highlight the connection between one's behaviour and its future consequences, on the other hand presenting future outcomes in a hypothetical form reflects a degree of uncertainty that makes people more reluctant to take action (Tversky and Shafir, 1992; van Dijk and Zeelenberg, 2003).

It is possible that the effectiveness of factual and prefactual communication about health and nutrition depends on the regulatory concern it activates. In fact, when a message concerns growth opportunities (as in the case of messages about fitness and well-being), the hypothetical prefactual formulation might encourage recipients' engagement, because it depicts how enacting the recommended behaviors can help achieving a future outcome. Conversely, when there is a safety concern (as in messages about health and disease prevention), a factual formulation might be more effective, because it focuses on the outcomes that one wants to reach or avoid.

Framing and temporal perspective

Temporal perspective is often considered among the factors influencing decision-making regarding health and nutrition. Research has investigated how individuals' time orientation affect message acceptance, showing that messages emphasizing the long-term or, conversely, the short term effects of the same behavior can lead to different outcomes according to recipients' time orientation (Orbell & Kyriakaki, 2008; Adams, 2012; van Beek et al., 2013). Kees and collegues (2010) demonstrated that messages emphasizing the future consequences of a particular behavior were evaluated more positively by future-oriented individuals, whereas present-oriented recipients evaluated messages concerning immediate effects more positively. For example, they have shown that the effectiveness of messages containing goal-pursuit strategies regarding weight control was related to participants' time perspective, specifically by the degree to which they were concerned by the future consequences of their actions (Kees et al., 2010).

Other research indicated that individuals' time orientation is not a stable and uniform construct, but it varies depending on the relative salience of different domains (Adams, 2012; van Beek et al., 2013). Consequently, the time perspective inherent to persuasive messages might affect recipients' own time orientation, which in turn might increase or decrease their acceptance of persuasive messages. In particular, messages referring to a long-term

perspective might induce recipients to think about the suggested behavioural changes as something gradual and therefore more easily manageable. Conversely, messages referring to a short-term perspective might induce participants to think about the suggested behaviours as something to enact immediately, and therefore less easily manageable. This difference in the persuasiveness of messages with a long-term or short-term perspective, however, might not necessarily apply to all potential recipients. Individuals with a greater sense of control over their behaviour might be able to adapt to both short-term and long-term outlooks when planning behavioural change. Less self-confident individuals, conversely, might see behavioural change in a short-term perspective as too challenging for their perceived abilities and easily give up and lose motivation.

Individual differences in framing effects

Past research has investigated the role of individual differences in perceived behavioural control, individual self-efficacy (Bandura, 1986) in particular, in the effectiveness of message framing of health communication. Witte (1992) found that negatively-framed messages containing a strong appeal to fear, if combined with high levels of self-efficacy, lead to a "risk control" state. Subsequent research showed that such reaction to persuasive messages is an adaptive cognitive process that in turn leads individuals to accept the behavior recommended in the message (Van't Riet et al., 2008). Only when people feel they have the necessary skills to perform what the message recommends, they are more motivated to accept it, effectively changing their behavior (van't Riet et al., 2008; van 't Riet, Ruiter, Smerecnik, & De Vries, 2010; van 't Riet, Ruiter, Werrij, & De Vries, 2010; Tudoran et al., 2012). When they don't feel able to deal with the requests, conversely, they tend to activate defense mechanisms that lead to rejection of the threatening message (van't Riet et al., 2008; van 't Riet, Ruiter, Smerecnik, & De Vries, 2010; van 't Riet, Ruiter, Werrij, & De Vries, 2010). So facing negative messages, individuals with higher levels of self-efficacy, feeling more secure about their ability to cope with the demands, will most likely accept its terms, following what is recommended. People with low self-efficacy instead, will most likely reject the negative message considering it too threatening because they don't feel they have the skills to do what the message suggests (van't Riet et al., 2008; van 't Riet, Ruiter, Smerecnik , & De Vries, 2010; van 't Riet, Ruiter, Werrij, & De Vries, 2010; Cauberghe et al., 2009; Tudoran et al.,

2012). When designing health campaigns it is therefore important to consider the moderating role of self-efficacy, so that these messages can be effective, increasing the likelihood that people will adopt the recommended behavior (Tudoran et al., 2012).

Research overview

The present research aims to assess the effectiveness of different messages in promoting healthy eating habits among older and younger individuals. With this purpose, we conducted three studies in which different groups of participants were presented with different versions of a fictitious article concerning the *negative* effects of meat consumption. According to research on the negativity bias (Fiske, 1980; Kanouse, 1984; Van 't Riet et al., 2008), the negative messages are often proved to be the most effective ones (Meyerowitz & Chaiken, 1987; Van't Riet et al., 2011). In Study 1, following the distinction between different frame levels proposed by Cesario and colleagues (2013), we manipulated the *regulatory concern* by highlighting the negative effects of meat consumption on well-being (i.e., a growth concern), or vice versa highlighting its negative consequences on health (i.e., a safety concern). In addition, we manipulated the messages formulating them either factually (e.g., "eating a lot of meat significantly increases the risk of serious diseases such as cardiovascular disease, diabetes, obesity and cancer.") or prefactually (e.g., "if you eat a lot of meat, the risk of serious diseases such as cardiovascular disease, diabetes, obesity and cancer will increase significantly."). We hypothesized that the growth-framed messages would be evaluated more positively, eliciting greater engagement and higher influence on participants' attitudes, when expressed through prefactual formulation, because the hypothetical formulation best addresses the possibility of growth and action activated by the growth regulatory concern. The safety-framed messages, conversely, would be more effective when expressed through factual formulation, since recipients' concern for their health would be best addressed by punctual, factual statements.

However, in line with the theory of planned behavior (Ajzen, 1991), we expected that the behavioral intentions of the participants would not depend exclusively on message framing, but also on recipients' self-efficacy. We therefore hypothesized that participants' self-efficacy would moderate framing effects: prefactual growth-framed and factual safety-framed messages, would be more effective than incongruently-framed (factual growth-framed

and prefactual safety-framed) messages for individuals with higher self-efficacy, whereas we expected no significant differences for participants with lower levels of self-efficacy.

In Study 2 and 3 we introduced also time perspective as a variable, manipulating the articles by highlighting the short- vs long-term effects of meat consumption. We hypothesized that congruently-framed messages would be most effective when describing the long-term consequences of meat consumption, because a long-term perspective encourages adherence of the recommended behaviors. Conversely, we hypothesized messages describing the short-term consequences to be less effective, regardless of their regulatory concern and formulation. However, we hypothesized that self-efficacy would moderate the effects of framing in the case of messages describing the short-term consequences of meat consumption: only individuals with high self-efficacy would be persuaded by congruently-framed messages even in a short-term perspective because, as they are confident about their ability to perform the recommended behavior.

We tested the effectiveness of messages with different regulatory concern, formulation and time perspective on participants of different ages: seniors over 60 years (Study 2) and students under 30 years (Study 3). We hypothesized that, despite the age difference, the interaction between time perspective, message formulation and framing would have similar effects on both groups of participants.

Study 1

In Study 1, we presented different groups of seniors with a fictitious article describing the results of research credited to the World Health Organization (WHO) on the negative effects of meat consumption. The article was manipulated in its regulatory concern (either growth or safety) and formulation (either factual or prefactual).

Method

Participants and procedure

A total of 84 volunteers (44 women and 40 men) aged between 58 and 92 years (M = 74.90, SD = 8:41) participated in our research. The 88.5% of them was currently retired, 51.2% was married, 37.8% was widower and the remaining 10.9% was unmarried/single or separated. The questionnaires was administered with the patronage of the City of Milan in different socio-recreational centers for the elderly, such as Centers of Multifunctional Aggregation

(CAM), Socio-Cultural and Recreational Centers (CSRC), occupational laboratories and integrated daycare center (CDI). First, participants were welcomed and the purpose of the research was briefly explained, then they were asked to individually complete the questionnaire. The average time of completion was 20 minutes.

Message manipulation

Participants were asked to read a short text (about 120 words) concerning the effects of meat consumption on health or well-being, coming from multiple sources in the public domain but presented as the result of several studies conducted by the WHO. The article was redacted in four different versions depending on the manipulated variables: regulatory concern (growth vs. safety) and message formulation (factual vs. prefactual).

The full text of the versions concerning the effects on health in a factual ("…*eating a lot of* meat significantly *increases* the risk of serious diseases such as cardiovascular disorder, diabetes, obesity and cancer") and prefactual formulation ("*if you eat* a lot of meat the risk of serious diseases, such as cardiovascular disorder, diabetes, obesity and cancer, *will increase* significantly") are reported below.

Safety-framed message, factual formulation

The World Health Organization states that "a diet with a high content of meat *is bad for health.*" Epidemiological studies have shown that life expectancy is significantly shorter for those who make an abundant consumption of meat.

In particular, the spokesman for the World Health Organization says that *eating a lot of* meat significantly *increases* the risk of serious diseases, such as cardiovascular disorder, diabetes, obesity and cancer. A recent study presented by the World Health Organization showed that *eating* a lot of meat *heightens* the occurrence of type two diabetes and *increases* the risk of heart attack and stroke.

Other studies have also shown that a diet plenty with animal protein and fat also *increases* the risk of cancer of

Safety-framed message, prefactual formulation

The World Health Organization states that "*if you follow* a diet with a high content of meat your health *will worsen*." Epidemiological studies have shown that *if you make* an abundant meat consumption, life expectancy *will be* significantly shorter.

In particular, the spokesman for the World Health Organization says that *if you eat* a lot of meat the risk of serious diseases, such as cardiovascular disorder, diabetes, obesity and cancer, *will increase* significantly. A recent study presented by the World Health Organization has shown that *if you eat a lot of meat* it *will heighten* the occurrence of type two diabetes and *increase* the risk of heart attack and stroke.

Other studies have also found that *if you follow* a diet plenty with animal protein and fat, you *will* also *increase* the risk

the digestive system.	of cancer of the digestive system.

The remaining two versions of the article described the consequences of excessive meat consumption on well-being, in a factual or prefactual formulation.

Growth-framed message, factual formulation	**Growth-framed message, prefactual formulation**
The World Health Organization states that "a diet with a high content of meat *decreases* the psychophysical well-being". Epidemiological studies have shown that the quality of life *is worse* in those who make an abundant consumption of meat. In particular, the spokesman for the World Health Organization says that *eating* a lot of meat *hinders* the well-being, making digestion more difficult and worsening bowel regularity and physical fitness. A recent study presented by the World Health Organization has shown that *eating* a lot of meat *slow* down the metabolism, thus reducing the consumption of body fat. Other studies have also found that a diet plenty with animal protein and fats has a negative impact on mood and psychological well-being.	The World Health Organization states that "*if you follow* a diet high in meat it *will decrease* the psychophysical well-being". Epidemiological studies have shown that *if you make* an abundant meat consumption, it *will worsen* your life quality. In particular, the spokesman for the World Health Organization says that *if you eat* a lot of meat it *will hinder* the well-being, making digestion more difficult and worsening bowel regularity and physical fitness. A recent study presented by the World Health Organization has shown that *if you eat* a lot of meat it *will slow* down the metabolism, thus reducing the consumption of body fat. Other studies have also found that *if you follow* a diet plenty with animal protein and fats, it *will have* negative impact on mood and psychological well-being.

Measures

Eating habits. First, participants were asked to indicate their current consumption of different types of food (red meat, white meat, cured meat, raw vegetables, cooked vegetables, legumes, potatoes and fresh fruit), on a 7 points Likert scale (1 = never , 2 = less than once per week, 3 = 1-2 times per week, 4 = 3-4 times per week, 5 = 5-6 times per week, 6 = once per day, 7 = several times a day).

Manipulation check

After participants read the article, we evaluated their understanding of the text-stimulus. The effectiveness of the manipulation of regulatory concern was measured with one item: "In your opinion, the content of the article concerns the effects of meat consumption on health (e.g. Risk of illness and disease prevention) or the effects of meat consumption on the

psychophysical well-being (e.g. physical fitness and quality of life)?"always on a 7 points Likert scale from 1 (" Effects of meat consumption on health ") to 7 (" Effects of meat consumption on the psychophysical well-being ").

Message evaluation. Participants then indicated how convincing and credible the message was, always using a 7 points Likert scale from 1 (Not at all) to 7 (Very much).

Engagement. Participants' engagement was measured by asking them to indicate how interested, involved and motivated to improve their nutrition they were as a result of reading the article, using a 7 points Likert scale from 1 (Not at all) to 7 (Very much).

Attitude concerning meat consumption. Attitude towards meat consumption was measured through the agreement with the statement: "I like meat", measured by a 7 points Likert scale from 1 (Strongly disagree) to 7 (Strongly agree).

Purposes of improving nutrition. Participants were then encouraged to reflect on what they just read by indicating what they think they could do in the future to improve their diet to make it healthier, listing up to five possible actions.

Behavioural intentions. Consumption intentions for the following month were measured using of a 7 points Likert scale, from 1 (Less than before), 7 (Much more than before), where 4 indicated "As before".

Socio-demographic information . Finally, we first collected information about participants' health status; it was investigated whether they were following a specific diet, if they had specific nutritional needs and if they suffered from any illness or disease. Then, socio-demographic information (gender, age, marital status and employment status) were collected.

Results

Manipulation check

Participants recognised the growth-framed messages as describing the effects of food on well-being rather than health ($M = 4.49$, $SD = 2.26$), whereas they recognised the safety-framed messages as describing the effects of food on health rather than well-being, ($M = 2.88$, $SD = 2.00$), $F(1,74) = 9.23$, $p < .01$, $\eta = .11$. Neither the formulation of the message nor its interaction between message formulation and regulatory concern had a significant effect, $F(1,74) = 2.62$, $p > .11$, $\eta < .03$.

Effects of message regulatory concern and formulation on participants' message evaluation

We performed a 2 (message regulatory concern: growth vs. safety) × 2 (message formulation: factual vs. prefactual) ANOVA with the evaluation of the message (to what extent the message was considered convincing and credible) as the dependent variable. Results showed no main effects of message regulatory concern, $F(1,75) = 0.20$, $p = .88$, $\eta < .01$, or message formulation, $F(1,75) = 0.28$, $p = .60$, $\eta < .01$. We found instead an interaction effect between message regulatory concern and formulation, $F(1,75) = 6.42$, $p < .05$, $\eta = .08$. Follow-up separate *t*-tests showed that growth-framed messages were evaluated more positively when formulated in prefactual ($M = 5.53$, $SD = 1.88$) rather than factual terms ($M = 4.78$, $SD = 1.32$), $t(36) = 1.45$, $p = .15$. Conversely, safety-framed messages were evaluated more positively when formulated in factual ($M = 5.78$, $SD = 1.14$) than prefactual terms ($M = 4.64$, $SD = 2.21$), $t(39) = 2.14$, $p < .05$.

We then performed an ANOVA on the evaluation of the message source, which yielded similar results. Namely, we found no main effect of regulatory concern, $F(1,75) = 0.54$, $p = .47$, $\eta < .01$, or formulation, $F(1,75) = 0.01$, $p = .98$, $\eta < .01$, but we found an interaction between message regulatory concern and formulation, $F(1,75) = 8.34$, $p < .01$, $\eta = .10$. Follow-up separate *t*-tests again showed that the source of persuasive was evaluated more positively when participants read a prefactual growth-framed message ($M = 6.04$, $SD = 1.16$) rather than a factual growth-framed message ($M = 5.04$, $SD = 1.39$), $t(36) = 2.31$, $p < .05$. Conversely, the source was evaluated more positively participants read factual safety-framed messages ($M = 5.80$, $SD = 1.53$) than prefactual safety-framed messages ($M = 4.78$, $SD = 1.72$), $t(39) = 1.90$, $p = .066$. Results therefore confirmed our hypothesis that growth-framed messages would be better conveyed by pre-factual formulation, whereas safety-framed messages would be better conveyed by factual formulation. This effect also extended to participants' evaluation of the source, making participants consider it more trustworthy when it presented information in a congruently-framed way than in an incongruently-framed way.

Effects of message regulatory concern and formulation on participants' engagement and attitudes

We performed a 2 (message regulatory concern: growth vs. safety) × 2 (message formulation: factual vs. prefactual) ANOVA with participants' engagement (to what extent they were interested, involved and motivated by the message) as the dependent variable. Results showed

a main effect of message regulatory concern, $F(1,75) = 7.03$, $p < .05$, $\eta = .09$, with participants being more engaged by growth-framed messages ($M = 5.73$, $SD = 1.23$) than by safety-framed messages ($M = 5.02$, $SD = 1.88$). This effect was qualified by an interaction effect between message regulatory concern and formulation, $F(1,75) = 13.51$, $p < .001$, $\eta = .15$. Follow-up separate *t*-tests showed that participants were more engaged by growth-framed messages formulated in prefactual ($M = 6.29$, $SD = 0.92$) rather than factual terms ($M = 5.36$, $SD = 1.29$), $t(36) = 2.40$, $p < .05$. Conversely, participants were more engaged by safety-framed messages formulated in factual ($M = 5.71$, $SD = 1.26$) than prefactual terms ($M = 4.13$, $SD = 2.20$), $t(25.51) = 2.71$, $p < .05$.

We tested the same model on the number of sentences formulated by participants regarding how they would improve their eating habits. The average number of sentences was rather low, $M = 1.05$, $SD = 1.49$, as half of the participants (50.6%) either did not write anything or failed to complete the task (e.g. by stating that they would keep their eating habits rather than changing them). Results of the ANOVA on the number of reported thoughts showed a main effect of message formulation, $F(1,83) = 5.33$, $p < .05$, $\eta = .06$, with participants who read factual messages generating more sentences ($M = 1.38$, $SD = 1.59$) than participants who read prefactual messages ($M = 0.59$, $SD = 1.21$), but no main effect of regulatory concern, $F(1,83) = 2.23$, $p = .14$, $\eta = .03$. We found a regulatory concern by formulation interaction, $F(1,83) = 7.18$, $p < .01$, $\eta = .08$. Follow-up *t*-tests showed that participants formulated more sentences after reading pre-factual growth-framed messages ($M = 1.31$, $SD = 1.58$) than pre-factual safety-framed messages ($M = 0.05$, $SD = 0.21$), $t(15.44) = 3.18$, $p < .005$, whereas they formulated more sentences after reading factual safety-framed messages ($M = 1.56$, $SD = 1.87$) than factual growth-framed messages ($M = 1.20$, $SD = 1.56$), although the latter difference was not statistically significant, $t(42) = 0.80$, $p = .43$.

We further tested the effect of regulatory concern and formulation of the persuasive messages on participants' attitude towards meat consumption. We found no main effect of message regulatory concern, $F(1,75) = 0.07$, $p = .79$, $\eta < .01$, or formulation, $F(1,75) = 0.82$, $p = .37$, $\eta < .01$. We found instead the predicted interaction effect between message regulatory concern and formulation, $F(1,75) = 7.89$, $p < .01$, $\eta = .09$. Follow-up separate *t*-tests showed that participants' attitude towards meat was more negative after reading prefactual growth-

framed messages (M = 2.88, SD = 1.67) than factual growth-framed messages (M = 4.38, SD = 1.66), $t(38) = 2.79$, $p < .05$, whereas participants' attitude was more negative after reading factual safety-framed messages (M = 3.35, SD = 1.56) than prefactual safety-framed messages (M = 4.12, SD = 2.26), although such difference was not significant, $t(38) = 1.28$, $p = .21$ (Figure 1).

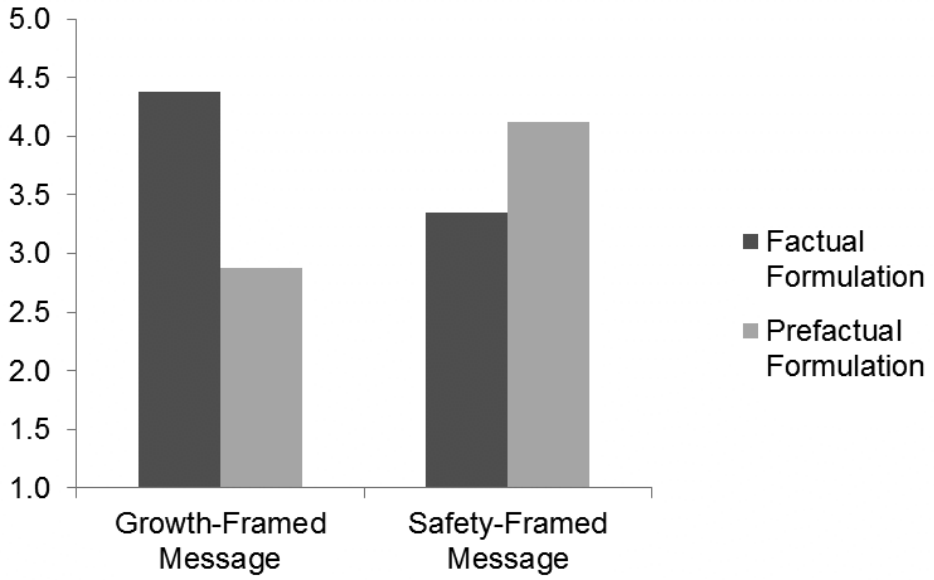

Figure 1. Attitude towards meat as a function of message regulatory concern and formulation (Study 1).

Results therefore confirmed our hypothesis that prefactual growth-framed messages and factual safety-framed messages would engage participants more than prefactual safety-framed and factual growth-framed messages. Such increased engagement resulted in a higher number of reported thoughts regarding dietary changes and in a more negative attitude towards meat consumption, which was consistent with the content of the persuasive message.

Effects of message regulatory concern and formulation on participants' eating intentions

We then analysed how regulatory concern and formulation of the persuasive message influenced participants' eating intentions for the near future, more specifically their intention to eat red and cured meat on one hand, and fresh and cooked vegetables on the other hand. As with other dependent variables, no main effects of either regulatory concern, $F(1,77) < 0.97$, $p > .32$ $\eta < .02$, or formulation were found, $F(1,77) < 1.29$, $p > .26$, $\eta < .02$. Contrary to previous findings, however, no significant interaction effects between regulatory concern and formulation were found, either, except in the case of the intention of eating cured meat,

$F(1,77) = 5.18$, $p < .05$, $\eta < .06$. Follow-up *t*-tests showed that the intention to eat cured meat was lower for participants who read the pre-factual ($M = 2.20$, $SD = 1.42$) rather than the factual growth-framed message ($M = 2.75$, $SD = 1.19$), albeit non-significantly, $t(37) = 1.30$, $p = .20$, whereas their intention was lower after reading the factual ($M = 2.29$, $SD = 1.37$) rather than prefactual safety-framed message ($M = 3.11$, $SD = 1.37$). The latter difference approached statistical significance, $t(40) = 1.92$, $p = .06$. Such results indicated that even if the growth-framed pre-factual messages and the safety-framed factual messages were effective in engaging participants and influencing their attitude towards meat consumption, this advantage over safety-framed prefactual messages and growth-framed factual messages was not strong enough to affect participants' intention to change their eating habits.

Moderation effect of participants' eating self-efficacy

We therefore performed further analyses to test our hypothesis that the persuasiveness of congruently-framed messages was moderated by participants' eating-related self-efficacy.

Separate regression models were performed for growth-framed and safety-framed messages, in order to test whether the effect of message formulation on participants' eating intentions was influenced by participants' self-efficacy. In the first set of regressions, we entered participants' intention to eat red meat as the dependent variable, with self-efficacy (ranging from 1 to 7), message formulation (contrast-coded as -1 for pre-factual messages and +1 for factual messages) and their interaction as predictors. Results showed, in the case of growth-framed messages, no main effect of either self-efficacy, $B = -0.001$, $t = 0.04$, $p = .97$, or message formulation, $B = -0.795$, $t = 1.29$, $p = .21$, but a significant effect of the interaction between the two, $B = 0.283$, $t = 2.07$, $p < .05$. In the case of safety-framed messages, no effect of self-efficacy was found, $B = -0.177$, $t = 1.51$, $p = .13$, and significant effects of both message formulation, $B = 1.355$, $t = 2.68$, $p < .05$, and the self-efficacy by message formulation interaction, $B = -0.303$, $t = 2.68$, $p < .05$, were found. As a result, the congruently-framed messages, that is the growth-framed prefactual message and the safety-framed factual message, resulted in less intention to eat red meat among participants with high self-efficacy, whereas the incongruently-framed messages, that is the growth-framed factual message and the safety-framed prefactual message, showed the opposite trend, as shown in Figure 2.

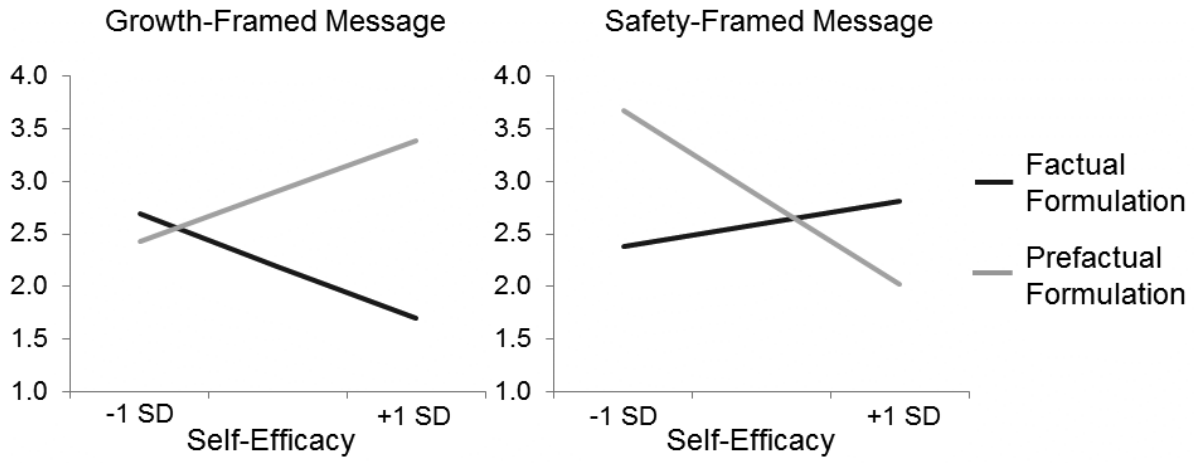

Figure 2. Intention to eat red meat as a function of message regulatory concern and formulation, and participants' self-efficacy (Study 1).

We then applied the same regression models to the other dependent variables, namely the intention to eat cured meat, fresh and cooked vegetables, yielded similar results. The intention to eat cured meat was not influenced by self-efficacy, $B = 0.156$, $t = 1.37$, $p = .18$, but showed a significant effect of both message formulation, $B = -1.093$, $t = 2.13$, $p < .05$, and the message formulation by self-efficacy interaction, $B = 0.333$, $t = 2.92$, $p < .01$, in the case of growth-framed messages, whereas no significant effects of either self-efficacy, $B = 0.177$, $t = 1.33$, $p = .19$, message formulation , $B = 0380$, $t = 0.66$, $p = .51$, or their interaction, $B = -0.226$, $t = 1.69$, $p = .10$, were found in the case of safety-framed messages. The intention to eat fresh vegetables was not significantly influenced by self-efficacy, $B = -0.504$, $t = 2.87$, $p < .01$, or message formulation, $B = 1.070$, $t = 1.35$, $p = .19$, but the effect of the message formulation by self-efficacy interaction was significant, $B = 0.332$, $t = 1.89$, $p = .06$, in the case of growth-framed messages, whereas no significant effects of self-efficacy, $B = 0.018$, $t = 0.16$, $p = .99$, but significant effects of message formulation , $B = -1.395$, $t = 2.76$, $p < .01$ and their interaction, $B = 0.447$, $t = 3.82$, $p < .01$, were found in the case of safety-framed messages. Finally, the same trend was found for the intention to eat cooked vegetables, with no significant effects of self-efficacy, $B = 0.100$, $t = 0.58$, $p = .56$, or message formulation, $B = 1.229$, $t = 1.65$, $p = .11$, and their interaction, $B = -0.263$, $t = 1.54$, $p = .13$ in the case of growth-framed messages, whereas a significant interaction emerged in the case of safety-related messages, $B = 0.292$, $t = 2.17$, $p < .05$, with non-significant effects of message

formulation, B = -0.702, t = 1.17, p = .25, and self-efficacy, B = -0.014, t = 0.10, p = .92. In sum, moderation analyses showed that the persuasive effect of congruently-framed messages observed on participants' engagement and attitude extended to eating intentions only among participants with high self-efficacy, resulting in less intention to eat red and cured meat, and more intention to eat vegetables. Conversely, among participants with low self-efficacy congruently-framed messages were equally or even less effective than incongruently-framed ones.

Study 2

In study 2, we also evaluated the effectiveness of different types of messages on participants' intentions to reduce their meat consumption. This time we also introduced the time dimension by formulating the messages in a short or in a long term perspective, in order to determine whether the introduction of a specific temporal context would have enhanced/modified the results we had in the previous study.

Thus in study 2, the research design was 2 (regulatory concern: messages concerning health-safety vs wellbeing-growth) x 2 (message formulation: factual vs. counterfactual) x 2 (time dimension: short-term vs. long-term).

Methods

Participants and procedures

Participants were 194 volunteers aged between 61 and 92 years (M = 72.34, SD = 7.43) (28 missing), 78% of which were women. Similarly to Study 1, 85% of participants consisted of retirees, 51% were married and 35% widower.

The questionnaires were administered with the patronage of the City of Milan and took place in different socio-recreational centers for the elderly, different than the previous ones, in order to avoid participants from the previous study.

Message manipulation

In this we used the same articles from the Study 1, which was modified by adding the temporal perspective as a manipulated variable. The modified text therefore emphasized either the short-term consequences or the long term-consequences of meat consumption, by stating that the negative effects of excessive meat consumption would appear either "in a few

years" and "shortly" (short-term perspective), or "over the course of many years" and "in the long run" (long-term perspective).

Measures

Eating habits. Participants' current eating habits were measured using the same scale used in the previous study, adding cheeses and fish to the food taken into account.

Manipulation check. As in the previous study, after the article we checked the manipulation through a measure of participants' understanding of the concern. We also included a new item to verify the correct interpretation of the temporal dimension: "And in your opinion the effects of meat consumption reported in the article refers to the short term or the long term?" on a 7 points Likert scale from 1 (Short-term) to 7 (Long term).

Source credibility and perception of the message. We then measured source credibility and the perception of the message as in study 1.

Engagement. To measure participants' engagement, in addition to Study 1 items, we used the items exert by Sharpe and colleagues (1996): "The foods I eat have an effect on my health", "In general I think the food I eat are very important to prevent disease "and" I worry about how I eat", measured on a 7-point Likert scale, from 1 (Strongly disagree) to 7 (Strongly agree).

Behavioural intentions. Intentions of consumption for the following month were then investigated with the same scale of the previous study, a 7 steps Likert scale, from 1 (Never) to 7 (Very often).

Restaurant menu food choice task. In order to determine recipients' effective responses to the article, particularly concerning meat consumption, participants compliance with the suggested behaviour was tested in a realistic food choice task, not too far from their daily experience. We asked them to imagine that they had won a voucher for a complimentary meal in a well-reviewed restaurant. We then presented them the menu of the hypothetical restaurant, asking them to choose the dishes they preferred, with the limit of one choice per course. For each course, except for desserts, the menu consisted of two choices of meat-based dished (e.g., lasagna; steak and fries) and one of vegetable-based dishes (mixed grilled vegetables; aubergine parmigiana). We computed an index of the number of meat-based servings chosen by participants in the simulated restaurant choice task. The index, ranged from 0 (no meat-

based choices, indicating full compliance with the persuasive message) to 3 (all meat-based choices, indicating null compliance).

Socio-demographic information. The final part of the questionnaire was the same one we used in the previous study, except for the item concerning the diet; in this study we asked participants whether they were vegetarian or vegan.

Results

Manipulation checks

Participants recognised the growth-framed messages as describing the effects of food on well-being rather than health ($M = 4.12$, $SD = 1.92$), and the safety-framed messages as describing the effects of food on health rather than well-being ($M = 3.28$, $SD = 1.98$), $F(1,178) = 8.25$, $p < .01$, $\eta = .04$. No other main or interaction effects of the manipulated variables were found, $F(1,178) < 2.80$, $p > .10$, $\eta < .02$. Participants also correctly understood the time perspective manipulation, rating the long-term message as describing long-term consequences of food on health and wellbeing ($M = 5.27$, $SD = 1.81$) and the short-term message as describing the short-term consequence ($M = 4.56$, $SD = 1.69$), $F(1,180) = 7.33$, $p < .01$, $\eta = .04$. No other main or interaction effects of the manipulated variables were found, $F(1,178) < 1.78$, $p > .18$, $\eta < .01$.

Effects of message time perspective, regulatory concern and formulation on participants' engagement

We performed a 2 (message time perspective: long vs. short term) X 2 (message regulatory concern: growth vs. safety) × 2 (message formulation: factual vs. prefactual) ANOVA on participants' engagement. Results showed a main effect of message formulation, $F(1,178) = 4.41$, $p < .05$, $\eta = .02$, with factual messages generally resulting in greater engagement ($M = 5.49$, $DS = 1.39$) than pre-factual messages ($M = 5.07$, $DS = 1.49$). No main effects of either time perspective or regulatory concern were found, Fs$(1,178) < 0.46$, $p > .50$, $\eta < .01$. We then found a two-way interaction between message time perspective and formulation, $F(1,178) = 4.70$, $p < .05$, $\eta = .02$, as long-term messages resulted in greater engagement when they were framed in terms of growth ($M = 5.56$, $DS = 1.41$) than when they were framed in terms of safety ($M = 5.15$, $DS = 1.55$), whereas short-term messages resulted in greater engagement when they were framed in terms of growth ($M = 5.46$, $DS = 1.15$) than when they

were framed in terms of safety (M = 4.95, DS = 1.61), albeit such differences were not statistically significant, ts < 1.61, p > .10. No other significant two-way interactions were found, Fs(1,178) < 0.21, p > .64, η < .01, but a significant three-way interaction was found, F(1,178) = 12.88, p < .001, η = .07. Follow-up separate ANOVAs showed that, as we already found in Study1, in the case of long-term messages pre-factual growth-framed messages (M = 5.75, DS = 1.26) were more effective than factual growth-framed messages (M = 5.36, DS = 1.56), whereas factual safety-framed messages (M = 5.75, DS = 1.27) were more effective than pre-factual safety-framed messages (M = 4.47, DS = 1.61), F(1,91) = 8.01, p < .01, η = .08. In the case of short-term messages the opposite trend was found, as pre-factual safety-framed messages were more effective (M = 5.53, DS = 0.84) than factual safety-framed messages (M = 5.30, DS = 1.44), and factual growth-framed messages (M = 5.50, DS = 1.33) were more effective than pre-factual growth-framed messages (M = 4.44, DS = 1.70), F(1,87) = 5.03, p < .05, η = .06.

Effects of message time perspective, regulatory concern and formulation on participants' evaluation of the message

The same 2 × 2 × 2 ANOVA was performed on participants' evaluation of the message. Results showed a marginally significant main effect of message formulation, F(1,180) = 3.31, p = .07, η = .02, with factual messages being evaluated more positively (M = 5.16, DS = 1.59) than pre-factual messages (M = 4.76, DS = 1.66). We then found the predicted significant three-way interaction among message time perspective, regulatory concern and formulation, F(1,178) = 17.23, p < .001, η = .09. Follow-up separate ANOVAs showed again that, in the case of long-term messages pre-factual growth-framed messages (M = 4.98, DS = 1.40) were more effective than factual growth-framed messages (M = 4.31, DS = 1.54), whereas factual safety-framed messages (M = 5.82, DS = 1.31) were more effective than pre-factual safety-framed messages (M = 4.40, DS = 2.05), F(1,92) = 14.65, p < .001, η = .14. In the case of short-term messages the opposite trend was found, as pre-factual safety-framed messages were more effective (M = 5.41, DS = 1.18) than factual safety-framed messages (M = 5.02, DS = 1.72), and factual growth-framed messages (M = 5.46, DS = 1.44) were more effective than pre-factual growth-framed messages (M = 4.56, DS = 1.70), F(1,88) = 4.12, p < .05, η = .06. No other significant effects were found, Fs(1,180) < 2.19, p > .14, η < .02

Effects of message time perspective, regulatory concern and formulation on participants' eating intentions

We then performed the same 2 × 2 × 2 ANOVA on participants' intentions to eat red and cured meat, and fresh and cooked vegetables. Results showed no significant main effects or two-way interactions on the intention to eat red meat, Fs(1,176) < 0.51, p > .47, η < .01, and a significant two-way interaction between time perspective and formulation on the intention to eat cured meat, $F(1,92) = 3.98$, $p < .05$, η = .02., similarly to what we found in the case of participants' engagement. We then found the predicted significant three-way interactions among message time perspective, regulatory concern and formulation, $F(1,176) = 5.74$, $p < .05$, η = .03 for red meat and $F(1,175) = 9.17$, $p < .01$, η = .05 for cured meat. As shown in Table 1, participants had lesser intentions to eat red and cured meat when they read prefactual growth-framed and factual safety-framed messages describing the long-term effects of meat consumption than when they read factual growth-framed and prefactual safety-framed messages describing the long-term effects of meat consumption. Conversely, participants reported lesser intention to eat red and cured meat when they read factual growth-framed and prefactual safety-framed messages describing the short-term effects of meat consumption than when they read prefactual growth-framed and factual safety-framed messages describing the short-term effects of meat consumption.

As for participants' intention to eat vegetables, fresh and cooked, results showed no significant main effects or two-way interactions on either intention, Fs(1,177) < 2.09, p > .15, η < .02, and $F(1,177) < 2.23$, p > .14, η < .02 respectively. We found instead the predicted significant three-way interactions, $F(1,177) = 4.85$, $p < .05$, η = .03 and $F(1,177) = 7.75$, $p < .05$ η = .04 respectively. As shown in Table 1, participants had greater intentions to eat vegetables when they read prefactual growth-framed and factual safety-framed messages describing the long-term effects of meat consumption than when they read factual growth-framed and prefactual safety-framed messages describing the long-term effects of meat consumption. Conversely, participants' intention to eat vegetables was greater when they read factual growth-framed and prefactual safety-framed messages describing the short-term

effects of meat consumption than when they read prefactual growth-framed and factual safety-framed messages describing the short-term effects of meat consumption.

	Long-term perspective				*Short-term perspective*			
	Growth concern		*Safety concern*		*Growth concern*		*Safety concern*	
	Factual message	Prefactual message	Factual message	Prefactual message	Factual message	Prefactual message	Factual message	Prefactual message
Red meat	3.36	2.52	2.38	2,48	2.23	2.96	3.26	2,50
Cured meat	2.86	2.12	2.40	2.78	2.62	2.92	2.85	2.33
Fresh vegetables	5.05	5.76	6.04	4.83	5.41	5.54	5.55	6.08
Cooked vegetables	5.36	5.56	6.12	4.87	5.64	5.17	5.25	6.21

Table 1. Intentions to eat red and cured meat, and fresh and cooked vegetables as a function of message time perspective, regulatory concern, and formulation (Study 2).

Effects of message time perspective, regulatory concern and formulation on compliance in the restaurant food choice task

To further test the persuasiveness of the different messages, we computed an index of the number of meat-based servings chosen by participants in the simulated restaurant choice task. The index, ranged from 0 (no meat-based choices, indicating full compliance with the persuasive message) to 3 (all meat-based choices, indicating null compliance). A small number of participants ($N = 13$) failed to correctly complete the food choice task, either by selecting more than one choice on the menu or by not selecting any. These participants were consequently excluded from the analyses.

We performed the 2 × 2 × 2 ANOVA on the compliance index, finding a significant main effect of the message regulatory concern, $F(1,174) = 4.19$, $p < .05$, $\eta = .02$, as participants complied more with the message when it was framed in terms of safety ($M = 1.09$, $DS = 0.82$) than when it was framed in terms of growth ($M = 1.37$, $DS = 0.97$). A marginal effect of the message time perspective was also found, with long-term messages resulting in stronger compliance ($M = 1.11$, $DS = 0.87$) than short-term messages ($M = 1.36$, $DS = 0.91$), $F(1,174) = 3.59$, $p = .06$, $\eta = .02$. We then found the predicted three-way interaction among message time perspective, regulatory concern and formulation, $F(1,174) = 7.20$, $p < .01$, $\eta = .04$. As we predicted, compliance was stronger when participants read the prefactual growth-framed ($M = 1.00$, $DS = 0.80$) and factual safety-framed messages ($M =$

0.72, *DS* = 0.61) describing the long-term effects of meat consumption than when they read factual growth-framed (*M* = 1.46, *DS* = 1.02) and prefactual safety-framed messages (*M* = 1.27, *DS* = 0.88) describing the long-term effects of meat consumption. Conversely, participants′ compliance was stronger when they read factual growth-framed (*M* = 1.32, *DS* = 0.82) and prefactual safety-framed messages (*M* = 1.21, *DS* = 0.92) describing the short-term effects of meat consumption than when they read prefactual growth-framed (*M* = 1.70, *DS* = 1.02) and factual safety-framed messages (*M* = 1.21, *DS* = 0.78) describing the short-term effects of meat consumption.

Moderating effect of self-efficacy on participants' eating intentions

After we found that time perspective moderated the effects of message framing on participants' attitudes and intentions, we tested whether the effects of messages describing the short-term consequences of meat consumption depended on participants' self-efficacy. As in Study 1, we expected that congruently-framed short-term messages would be more effective for participants with high self-efficacy than for participants with low self-efficacy.

To test this hypothesis, we ran a series of multiple regression models in which we regressed participants' intention to eat red and cured meat, and fresh and cooked vegetables on the regulatory concern (coded -1 for safety-framed messages and +1 for growth-framed messages) and formulation (coded -1 for factual messages and +1 for prefactual messages) of short-term messages, and on participants' self-efficacy score. Results are presented in Table 2. For all four dependent variables we found significant interaction effects among message regulatory concern and formulation, and participants' self-efficacy. Therefore, participants with high self-efficacy reported having lesser intention to eat red and cured meat and greater intention to eat fresh and cooked vegetables after reading congruently-framed messages describing the short-term consequences of meat consumption than after reading incongruently-framed messages.

	Eating Intention											
	Red Meat			Cured Meat			Fresh Vegetables			Cooked Vegetables		
	B	*S.E.*	*T*	*B*	*S.E.*	*t*	*B*	*S.E.*	*t*	*B*	*S.E.*	*t*
Constant	3.70	0.46	8.06***	3.83	.49	7.91***	4.69	.66	7.15***	2.62	.56	4.67***
Regulatory Concern	1.11	0.46	2.43*	0.38	.49	0.78	-0.49	.66	0.75	-0.56	.56	1.00

Formulation	-0.02	0.46	0.04	-0.25	.49	0.51	0.98	.66	1.49	-0.12	.56	0.22
Self-Efficacy	-0.23	.09	2.53*	-0.25	.10	2.56*	0.23	.13	1.74*	0.64	.11	5.66***
Regulatory Concern × Formulation	1.41	.46	3.08**	1.65	.49	3.41	-1.35	.66	2.05*	-1.64	.56	2.92**
Regulatory Concern × Self-Efficacy	-0.21	0.09	2.28*	-0.10	.10	1.06	0.05	.13	0.37	0.08	.11	0.73
Formulation × Self-Efficacy	-0.02	0.09	0.17	0.05	.10	0.48	-0.17	.13	1.28	0.04	.11	0.32
Regulatory Concern × Formulation × Self-Efficacy	-0.26	0.09	2.84**	-0.28	.10	2.86**	0.27	.13	2.07*	0.31	.11	2.72**
R^2		.21			.23			.13			.37	

* $p < .05$; ** $p < .01$; *** $p < .001$

Table 2. Effects of time perspective, regulatory concern, formulation, and their interactions, on participants' intentions to eat red and cured meat, and fresh and cooked vegetables.

STUDY 3

In Study 3 we repeated procedures from Study 2 on a sample of university students. Participants' age ranged between 19 and 30 years old ($M = 23.75$, $DS = 5.52$) and mostly females (26.7%). The questionnaire, including the manipulated persuasive messages, were administered online through the university e-learning platform.

The research design was again a 2 (regulatory concern: messages concerning health-safety vs wellbeing-growth) x 2 (formulation of the message: factual vs. counterfactual) x 2 (time perspective: short-term vs. long-term) .

Method

Message manipulation

The same manipulated text we used in Study 2 was used in this study.

Measures

Measures were the same of Study 2. First, current eating habits were assessed through a 7 points Likert scale.

We then assessed source credibility and message perception. Participants' engagement was measured on a 7 points Likert scale, as their intention to consume certain food in the future. We then used the same practical task and track their socio-demographical information.

Results

Manipulation checks

Young participants recognised the growth-framed messages as describing the effects of food on well-being more than health ($M = 4.58$, $SD = 1.73$), and the safety-framed messages as describing the effects of food on health rather than well-being ($M = 2.24$, $SD = 1.57$), $F(1,114) = 67.45$, $p < .001$, $\eta = .37$. No other significant effects of the manipulated variables were found, $F(1, 114) < 2.50$, $p > .11$, $\eta < .02$. Participants also correctly understood the time perspective manipulation, rating the long-term message as describing long-term consequences of food on health and wellbeing ($M = 6.14$, $SD = 0.75$) and the short-term message as describing the short-term consequence ($M = 4.77$, $SD = 1.77$), $F(1,114) = 30.39$, $p < .001$, $\eta = .21$. No other significant effects of the manipulated variables were found, $F(1, 114) < 2.36$, $p > .13$, $\eta < .02$.

Effects of message time perspective, regulatory concern and formulation on young participants′ engagement

We performed a 2 (message time perspective: long vs. short term) × 2 (message regulatory concern: growth vs. safety) × 2 (message formulation: factual vs. prefactual) ANOVA on participants′ engagement. Results showed no main effects of time perspective, regulatory concern or formulation, Fs$(1,114) < 1.91$, $p > .17$, $\eta < .02$, nor significant two-way interactions , Fs$(1,114) < 0.80$, $p > .34$, $\eta < .02$, but only the predicted three-way interaction, $F(1,114) = 4.28$, $p < .05$, $\eta = .04$. Follow-up separate ANOVAs showed that in the case of long-term messages pre-factual growth-framed messages ($M = 5.13$, $DS = 1.08$) were more effective than factual growth-framed messages ($M = 4.44$, $DS = 1.54$), whereas factual safety-framed messages ($M = 4.98$, $SD = 1.14$) were more effective than pre-factual safety-framed messages ($M = 4.11$, $SD = 1.51$), $F(1,56) = 5.02$, $p < .05$, $\eta = .08$. In the case of short-term messages no significant differences were found among factual safety-framed ($M = 3.96$, $SD = 1.49$), prefactual safety-framed ($M = 4.36$, $SD = 1.71$), factual growth-framed ($M = 4.56$, $SD =$

1.45), and prefactual growth-framed messages (M = 4.33, SD = 1.53), $Fs(1,58) < 0.62$, $p > .43$, $\eta < .01$.

Effects of message time perspective, regulatory concern and formulation on young participants' compliance in the restaurant food choice task

We performed the 2 × 2 × 2 ANOVA on the compliance index, finding a marginally significant main effect of the message regulatory concern, $F(1,114) = 3.68$, $p = .058$, $\eta = .03$, as participants complied more with the message when it was framed in terms of safety (M = 1.54, SD = 0.91) than when it was framed in terms of growth (M = 1.87, SD = 0.88). We then found the predicted three-way interaction among message time perspective, regulatory concern and formulation, $F(1,114) = 8.74$, $p < .01$, $\eta = .06$. As we predicted, compliance was stronger when participants read the prefactual growth-framed (M = 1.50, DS = 0.85) and factual safety-framed messages (M = 1.44, SD = 1.03) describing the long-term effects of meat consumption than when they read factual growth-framed (M = 2.00, DS = 0.97) and prefactual safety-framed messages (M = 1.93, SD = 0.83) describing the long-term effects of meat consumption. Conversely, participants′ compliance was stronger when they read factual growth-framed (M = 1.60, SD = 0.91) and prefactual safety-framed messages (M = 1.33, SD = 0.98) describing the short-term effects of meat consumption than when they read prefactual growth-framed (M = 2.31, SD = 0.60) and factual safety-framed messages (M = 1.50, SD = 0.73) describing the short-term effects of meat consumption.

General discussion

Message design in communication about health and nutrition

The results of our research show that the persuasiveness of messages promoting healthy eating habits depends on their formulation, regulatory concern, and temporal perspective. We found that messages focusing on the effects of food on health are more convincing when formulated factually than prefactually, whereas the messages focusing on the effects of food on wellbeing are more convincing when formulated prefactually than when formulated factually. This finding confirms and extends previous findings from research on message framing communication (Bertolotti & Catellani, 2014; Cesario & Higgins, 2008), and in health communication in particular (Cesario, Corker, & Jelinek, 2013), which indicated that subtle features of message delivery, such as its formulation or framing, contribute to

recipients' engagement in the content of a persuasive message. We found that a prefactual formulation is more suitable to present the consequences of eating habits on personal wellbeing (i.e., a growth concern), as it conveys the idea that psychosocial wellbeing, physical fitness, and higher life quality are achieved by incremental efforts in a prolonged time period. Factual formulation, conversely, seems more suitable to present the consequences of eating habits on health (i.e., a safety concern), as it conveys the idea that threats to one's health such as diseases are associated to clear-cut and punctual behaviours that one can avoid in order to stay safe and healthy. These findings also contribute to our understanding of the conditions under which hypothetical reasoning, such as prefactual reasoning, can effectively foster motivation to change one's behaviour, as past research (Bagozzi et al., 2004; Tversky and Shafir, 1992; van Dijk & Zeelenberg, 2003) did not consider different regulatory orientations as a possible moderating factor.

Our findings provide some useful suggestions on how to design communication promoting healthy eating habits, showing how different ways to propose healthy behaviours (reducing meat consumption, in the texts we used) can be more or less convincing depending on the basic needs they address. Communication aimed at people concerned with their health status, such as communication by physicians and health professionals, seems to be more convincing when formulated factually, in a way that precisely pinpoints the effects of certain behaviours on one's health. Communication aimed at people concerned with their well-being and quality of life, conversely, seems to be more convincing when formulated prefactually, in a way that stresses the conditional nature of the desired (or undesired) outcomes, and the actions that may be undertaken to achieve (or avoid) such outcomes. Other combinations of regulatory concern framing and factual or prefactual formulation seems to be less effective in addressing the basic needs of recipients, thus failing to engage and convince them.

Future studies might investigate the role of further levels of framing in the persuasiveness of nutrition-related messages. According to the self-regulatory framework of message framing proposed by Cesario and colleagues (2013), messages with a growth regulatory concern might benefit from particular emphasis on the positive effects of healthy eating habits (i.e. framing of the positive hedonic consequences of nutrition on well-being), whereas messages with a safety regulatory concern might benefit from emphasis on the

negative effects of unhealthy eating habits (i.e., the negative hedonic consequences of nutrition on health). Another possible interaction worth investigating is the one between message regulatory concern and different goal-pursuit strategies proposed to improve recipients' eating habits: messages promoting consumption of healthier food products (e.g., vegetables, organic food, dietary-supplemented products) might be more persuasive in addressing growth concerns, whereas messages proposing the reduction of unhealthy food consumption (e.g., meat, processed food, high-fat high-carbohydrate food) might be more persuasive in addressing safety concerns.

The moderating role of individual self-efficacy

We found, however, that the effect of framing at the regulatory concern level and factual or prefactual formulation did not automatically extend to recipients' intention to change their eating behaviour. The congruently-framed messages resulted in stronger intentions to reduce meat consumption and increase vegetables consumption only among recipients with a high level of self-efficacy. This finding is consistent with past research on health-promoting communication (Witte, 1992), which had already found recipients' perception of being able to effectively enact the suggested behaviours as the key moderator of framing effects. Results from Study 1 showed that for some people, those with little confidence in their ability to control their diet, even convincing and well-designed messages are not sufficient to change behavioural intentions. It is therefore important to find a way to bridge the gap between message acceptance and engagement and actual intentions.

Future research might investigate the processes underlying the lack of effectiveness of otherwise convincing persuasive messages. In particular, it might be interesting to assess negative reactions to persuasive messages (e.g., avoidance, denial, reactance), their possible causes, and their relation to eating intentions and behaviours.

Time perspective and age

In our second set of studies, 2 and 3, we tested the role of time perspective as a moderator of the effectiveness of message framing and formulation. We found that congruently-framed messages are more engaging and, notably, result in greater intention to change one's behaviour when they describe a long-term perspective than a short-term perspective. A long-term outlook on the effects of nutrition on health and wellbeing seems therefore to promote

the acceptance of persuasive messages and compliance with them, as evidenced also by the result of the restaurant menu choice task. As suggested by previous research (Gerend & Cullen, 2008), a long-term perspective contributes to the perception of control over one's eating habits, even among people with low self-efficacy. A short-term perspective, conversely, reduced the effectiveness of congruently-framed messages, in particular for participants with low self-efficacy. Therefore only individuals with a high level of confidence in their ability to control and improve their eating behaviour seem to be persuaded by congruently-framed messages regardless of the additional challenge of a short-term perspective. As we found in Study 2, a short-term perspective actually even reverses recipients' preferences for factual or prefactual formulations of persuasive messages, resulting in higher agreement and engagement with factual growth-framed and prefactual-safety framed messages than with prefactual growth-framed and factual safety-framed messages. This might be due to the regulatory concern activated by the message, particularly in the case of a safety concern: when people are concerned with health, prefactual formulation might help mitigating preoccupation deriving from temporally close consequences of unhealthy eating habits described in the message, whereas factual formulation presents them as more certain, and therefore more threatening. Future research, as discussed above, might further investigate this hypothesized link, by measuring the joint effects of message framing, formulation and time perspective on perceived risk, threat and different coping mechanisms associated with them.

Finally, we tested our hypotheses on the effects of time perspective, regulatory concern and formulation of persuasive messages on different groups of younger and older participants, to test for possible differences in the effectiveness of differently framed messages. As results were similar in the two studies, we might conclude that the mechanisms underlying the interaction between regulatory concern and message formulation are the same across different age groups. Future research should nevertheless investigate more in depth the possible differences between younger and older audiences in their acceptance of communication regarding health and nutrition, as well as differences in their compliance with such recommendations. It is very likely that as people advance in age, their chronic regulatory focus shifts towards prevention rather than promotion (Heckausen, 1997; Miceli &

Castelfranchi, 2005), thus making growth-framed messages generally less persuasive for this part of the population.

In sum, our research shows that we can use carefully designed communication to activate the individual process that leads to behavioural change and, eventually, the adoption of healthy eating habits. When designing such communication, however, we should also consider the characteristics of the potential audience, and ideally anticipate the individual factors that may hinder their ability and willingness to adopt a healthy balanced diet. Considering the growing social and economic costs of health care, effective communication aimed at improving the quality of nutrition of both younger and older people might provide a powerful and relatively inexpensive tool to improve the health and well-being of the whole population.

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