Emphasizing the losses or the gains: Comparing situational and individual moderators of framed messages to promote fruit and vegetable intake

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Abstract

Health messages are a commonly used way to promote changes in dietary habits but their efficacy could be enhanced by strategies such as the way in which the presented arguments are framed. This study aimed to test the effectiveness of framed messages (gain vs. loss) on behavioural intention and fruit and vegetable (FV) intake, comparing predictions based on prominent theoretical perspectives on message framing (perceived function of the health behaviour and recipients´ motivational orientation) and by further exploring the role of baseline intentions as a potential moderator of the framing effects. Undergraduate students (*N*= 180) completed the three assessment points in time. At baseline, individual moderators (motivational orientation and intentions) and fruit and vegetable intake were assessed. One week later, participants were randomly assigned to the loss or gain-framed message and indicated their intentions for FV intake the following week. A week later, FV intake over the previous week was assessed. The gain-frame was not conducive, per se, to higher intentions or behaviour. Having intention as the outcome, only baseline intentions moderated the effects of message frame. When considering FV intake as the outcome, both motivational orientation and baseline intentions moderated the effects of message frame, with the loss-frame promoting higher FV intake among individuals who were prevention-oriented and had higher baseline intentions. Findings suggest that the success of framed messages for FV intake depends upon the recipient's characteristics, such as motivational orientation, baseline intentions, and cultural background, with implications for health communication interventions.

Keywords: health communication, message framing moderators, fruit and vegetable intake, behavioural intentions, behaviour change.

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Fruit and vegetable intake is a critical aspect of a healthy diet due to its association with a lower risk for cardiovascular diseases (He, Nowson, Lucas, & MacGregor, 2007), type II diabetes (Carter, Gray, Troughton, Khunti, & Davies, 2010) and certain types of cancer (Liu & Russell, 2008). Despite these benefits, many people fall short of recommended guidelines for daily intake (Hall, Moore, Harper, & Lynch, 2009). Thus, it is vital to understand the conditions under which certain intervention strategies, such as trying to persuade people about the benefits of fruit and vegetable consumption, lead to increases in the adherence to recommended levels of this intake.

One question that can be raised in this regard is whether emphasizing either the costs of non-performing a health behaviour (i.e., the use of a *loss* frame) or the benefits of performing it (i.e., the use of a *gain* frame) make a difference when it comes to persuading people to increase their fruit and vegetable intake. Indeed, two decades of research on message framing support the claim that, even when communicating exactly the same consequences, the particular frame that is used in a message may have a major influence on behavioural outcomes (Gallagher & Updegraff, 2012; Rothman & Salovey, 1997).

The question about which frame might be more helpful in fostering health behaviours has been rapidly transformed into under which conditions a loss- or a gain-frame is particularly effective. The range of framing effect moderators proposed in the literature up to now have been either tied to the particular health behaviour and context (situational moderators) or to the personal characteristics of the individual (dispositional moderators). By far, the two most scrutinized moderators are the perceptions regarding

the function of a particular health behaviour (a situational moderator) and the motivational orientation of the recipient (a dispositional moderator).

However, by and large, both bodies of the literature have developed separately, and up to now few studies have made an explicit attempt to examine how these different classes of moderators, situational and individual, contribute for the prediction of specific behaviours (Rothman & Updegraff, 2011). The present study integrates predictions from these two theoretical perspectives for a single health behaviour – fruit and vegetable (FV) intake - and further explores the role that behavioural intentions might also play as an individual moderator of framing effects.

A situational moderator: Function of the health behaviour

The first framing studies applied to health issues were derived from the Prospect Theory (Tversky & Kahneman, 1981), which sustains that people are risk aversive when contemplating possible gains, but are risk-seeking when confronted with possible losses. The same rationale was applied to the health domain by Rothman and Salovey (1997), who proposed that when thinking about the consequences of performing (or not performing) a health behaviour, people should be more responsive to appeals that emphasize the gains of performing it, as long as the behaviour itself is perceived as safe (i.e., not risky). On the contrary, if performing a health behaviour is perceived as being risky, as might be the case of undergoing a screening test, given that one 'risks' the possibility of finding out that one has a disease, a loss-frame would be more effective. The function of the health behaviour, whether related to illness prevention (e.g., eating a balanced diet) or illness detection (e.g., doing a HIV test) was proposed to work as a heuristic people use to infer the risk of a certain behaviour and should, therefore, be a moderator of framing effects.

Many studies have demonstrated a relative effectiveness of loss-framed messages in the promotion of detection behaviours (e.g., Kalichman & Coley, 1995; Rivers,

Salovey, Pizarro, Pizarro, & Schneider, 2005) and the use of gain-framed messages in the promotion of prevention behaviours (e.g., Detweiler, Bedell, Salovey, Pronin, & Rothman, 1999; Kiene, Barta, Zelenski, & Cothran, 2005). Only a few studies (e.g., Bannon & Schwartz, 2006; Dijkstra et al.,2011) have tested the predictions derived from the Prospect Theory specifically for FV intake in response to framed messages. Results of these studies did not yield a clear advantage of the gain-frame condition for the promotion of FV intake. An exception was found in a study where the messages were personalized in order to be more self-relevant (Dijkstra et al., 2011). However, in this particular study the results were not driven by the gain frame being more effective. On the contrary, they were related to the loss frame being comparatively less effective. Such result was attributed to defensive reactions in response to higher levels of threat induced by the loss-framed message when they were perceived to be more self-relevant.

An individual moderator: Motivational orientation

The recipients´ characteristics, such as differences in motivational orientation, have also been shown to moderate the effects of framed health messages, in what has been called the 'congruency effect' (Mann, Sherman, & Updegraff, 2004). Motivational orientation refers to the dominant motivational system involved in the regulation of behaviour, and the existence of important individual differences towards gains and losses has been demonstrated (Higgins, 1997). Promotion-focused individuals are motivated by opportunities of accomplishment (e.g., eating fruit and vegetables in order to have more energy and feel good), while prevention-focused individuals are motivated by the prospect of preventing negative things from happening (e.g., eating fruit and vegetables to prevent cancer or cardiovascular diseases).

Studies with different health behaviours have shown a clear advantage of the use of gain-framed messages for promotion-focused individuals and of loss-framed messages for prevention-focused individuals (e.g., Gerend & Shepperd, 2007; Latimer

et al., 2008a). Furthermore, in a study on fruit and vegetable intake an interaction between frame and motivational orientation was found, in the expected direction (Latimer et al., 2008b). Nevertheless, the results of this study are not readily comparable to those following the Prospective Theory perspective on framing for FV intake, since the intervention consisted of several materials other than just the framed health messages. In a somewhat comparable study, individuals with high autonomy (i.e., who act in accordance with their inner values or ideals, rather than by pressure of others or 'oughts') were found to increase their FV intake after being exposed to a gain-framed rather than a loss-framed message (Churchill & Pavey, 2012).

Exploring the role of behavioural intention as an individual moderator

Behavioural intention is a key predictor in most of the social-cognitive models of health behaviour (Armitage & Conner, 2000) and it has also been conceptualized as an important marker of individuals´ mindset and their readiness for change (Conner & Norman, 2015; Schwarzer, 2008). Most stage models of health behaviour change use intention as an indicator of the stage at which individuals find themselves (Schüz, Sniehotta, Mallach, Wiedemann, & Schwarzer, 2009), distinguishing motivational processes, leading to intention formation, from volitional ones, leading to behavioural enactment. Considering the recommendation to tailor health messages´ content according to the individuals´ stage of change (Weinstein, Lyon, Sandman, & Cuite, 1998), and given the importance of intention as a turning point in the health behaviour change process (Conner & Norman, 2015), one might ask what type of message frame would be more suitable for individuals at different levels of intention.

Despite the prominence of intention among other social cognitive variables, namely for the prediction of fruit and vegetable intake (Mullan, Allom, Brogan, Kothe, & Todd, 2014) to the best of our knowledge, it has never been explored as a moderator of message framing effects.

Research has, nonetheless, shown that loss frames are more effective when the topic is highly relevant to the receiver of the message and that gain frames are more effective when the topic is lowly relevant to the receiver (de Graaf, van den Putte, & de Bruijn, 2015; Maheswaran & Meyers-Levy, 1990). The moderating effects of issue involvement can be explained by models of attitude change. According to these models, issue involvement should promote a systematic processing of the information contained in the message (Petty & Cacioppo, 1986) and under conditions of systematic information processing, negative information receives greater weight and attention than positive information, due to a negativity bias (Dijksterhuis, & Aarts, 2003). On the contrary, when processing messages using the peripheral route, positive information is used as a heuristic, and it may generate more positive associations with the topic and, therefore, be conducive to higher attitudinal and/or behavioural change (Maheswaran & Meyers-Levy, 1990).

As it is likely that individuals who have strong intentions to change their behaviour are at the same time very involved with information pertaining to that specific behavioural domain, intention stands out as a strong candidate as a moderator of framed health messages. Previous research has, indeed, confirmed the existence of a strong and positive relationship between intentions and issue involvement (e.g., Bae e Kang, 2008; Pieters & Verplanken, 1995; Skumanich & Kintsfather, 1996). Thus, to the extent that individuals who hold the intention to increase their FV intake consider health messages related to FV intake as being more personally relevant than individuals without the intention to increase FV intake, it may be expected the effects of message framing to be moderated by individual´s intentions, similarly to the moderation pattern that has been described for issue involvement (Maheswaran & Meyers-Levy, 1990).

Outcome measures of framing effects

Besides differences in the adopted theoretical perspectives, framing studies often report on different outcome measures for the framing effects. Some studies report the effects of framing on intentions to perform a given health behaviour (e.g., Dijkstra et al., 2011), while others report framing effects on actual behaviour (e.g., Latimer et al., 2008b). Such differences imply that results might not be readily comparable. While a meta-analysis examining the role of framing in intentions to perform prevention behaviours did not offer much support for the use of gain- over loss-framed messages other than for the promotion of dental hygiene behaviours (O´Keefe & Jensen, 2007), when using behaviour as the outcome measure, gain-framed messages were shown to be more effective in the promotion of illness-prevention behaviours such as physical activity, smoking cessation and skin cancer prevention (see Gallagher & Updegraff, 2012).

Framing manipulation

On the basis of the Regulatory Focus Theory (Higgins, 1997), and as stressed in previous research (Dijkstra et al., 2011; Yi & Baumgartner, 2009), both the presence of a positive and rewarding outcome and the absence of a negative and aversive outcome might be considered a 'gain' and both the presence of a negative and aversive outcome or the absence of a positive and rewarding outcome might be considered a 'loss'. This is an important distinction that has been highlighted by Regulatory Focus Theory (Higgins, 1997) and that has been more recently acknowledged in the health framing literature deriving from a Prospect Theory perspective (e.g., Dijkstra, Rothman, & Pietersma, 2011).

Regulatory focus theory further establishes that individuals differ in their sensitivity to the end-states (or reference points) that motivate the behaviour, with promotion-oriented individuals being mostly motivated by the prospect of achieving a positive/desirable outcomes and prevention-oriented individuals being mostly motivated

by the prospect of avoiding negative/ undesirable outcomes (Scholer & Higgins, 2008). Besides, it establishes a difference between (a) needs related to nurturance, accomplishment and growth, which are regulated by representations of ideal end-states ("wants"), and involve a promotion focus, and (b) needs related to security, duty and responsibility ("oughts"), which involve a prevention focus (Scholer & Higgins, 2008).

Given that the different levels at which the messages can be framed have been somewhat confounded in the literature (cf. Dijkstra, Rothman, & Pietersma, 2011), we aimed to disentangle the different levels at which health messages may be more appealing to individuals high in promotion vs. prevention motivational orientation. Thus, we decided to present outcomes related to "wants" (e.g., feeling vs. not feeling energized) and "oughts" (preventing vs. not preventing disease) in the two framed messages, only switching the end-states (or reference points) that motivate the behaviour, i.e., achieving a positive/desirable outcome (e.g., being energised / being healthy) versus avoiding a negative/undesirable outcome (e.g., preventing being with less energy / preventing being ill).

Aims and hypotheses

Several studies have already been conducted on the moderators of health message framing, namely on the function of behaviour and motivational orientation, however their interplay has seldom been studied. Likewise, to our knowledge, no prior study has examined the potential role of intention as a moderator of framing effects. Furthermore, framing studies are not always comparable in the sense that some use intention as the main outcome variable while others use behaviour (either objectively assessed or by means of self-report), and the way in which frame is manipulated may also diverge. Thus, the aim of this experimental study on fruit and vegetable intake is three-fold: 1) to compare predictions based on both theoretical perspectives on framing moderators (i.e., function of health behaviour and motivational orientation), using a more controlled

manipulation of message frame; 2) to explore the role of behavioural intentions as a potential moderator of framing effects; 3) to use both intention after message exposure and behaviour over the following week as the outcome variables.

Drawing from the Prospect Theory and considering that fruit and vegetable consumption is essentially a non-risky behaviour, the first hypothesis is that a gain-frame will be more effective for the promotion of both intentions and actual fruit and vegetable intake. On the basis of the congruency effect, the second hypothesis is that frame and motivational orientation will interact in the prediction of fruit and vegetable intake one week later, in the sense that loss-framed messages will be more effective for prevention-focused individuals and gain-framed messages will be more effective for promotion-focused individuals. Finally, the third hypothesis is that for individuals already holding an intention to change, a loss-frame will be more effective than a gain-frame, whereas for individuals who do not have the intention to change, a gain-framed message will be more effective.

Method

Participants

One hundred and ninety five undergraduates of Psychology, Pharmacy, Dentistry, Medicine, Biology and Chemistry courses were enrolled in the study, fifteen of whom did not participate at all points of the study and were, therefore, excluded from the analyses. The longitudinal sample consisted of 180 participants, 28 men (aged 18-50; M = 24.4; SD = 8.54) and 152 women (aged 18-48; M = 23.0; SD = 4.94) from three different Portuguese universities. At the end of the study, participants were granted a course credit or a 5€ voucher. None of the participants had any allergies or restrictions regarding the consumption of FV.

Procedure

During short breaks in the classes and/or through mailing lists of the students´ associations, students were told that the aim of the study was to find out what the best ways to communicate the results of scientific research to the general public were. Those who agreed to participate provided their e-mail addresses to receive an initial online questionnaire (Time 1) which started by explaining the study in more detail, namely the name of the research centre and the average length of time it took to complete, in addition to reminding participants what the aim of the study was, and assured data confidentiality. Participants then provided their informed consent, in accordance with the ethical standards of the three universities. This first questionnaire assessed motivational orientation, baseline fruit and vegetable intake, intention towards the eating of at least five portions of FV a day, and some demographic data as well as specific questions on food restrictions and allergies. All moderator variables as well as baseline levels of fruit and vegetable intake were measured one week before exposure to the framed messages, so as to discard the possibility that this measurement might have an effect on the dependent variables.

The experimental session (Time 2) was held at the same university to which the participants belonged, approximately one week after completion of the first questionnaire. The reason behind having the participants come to the lab was to ensure they would all see the framed message in very similar conditions. At the beginning of the session, participants were randomly assigned by the software to either the gain- or loss-framed message. They were then asked about their intention to increase their FV intake in the following week and completed the manipulation check. A further week later (Time 3), participants received the last online questionnaire to assess their FV intake.

Materials

In order to disentangle the notion of gain vs. loss from the presence vs. absence of

the outcomes, message framing was manipulated by presenting only the *presence* of gains as a result of compliance (gain-framed message) vs. the *presence* of losses as a result of non-compliance (loss-framed message), while referring in both versions to exactly the same outcomes (i.e., *same consequences* framing). Also, according to the Regulatory Focus Theory, some outcomes are intrinsically promotional (e.g., having more energy), whereas others are intrinsically preventive (e.g., having better health). Therefore, to control for such confoundedness, both types of outcomes (promotional and preventive) were presented in both loss- and gain-framed messages.

The gain-framed message (412 words) explained the positive effects of eating at least 5 portions of FV a day, whereas the loss-framed message (417 words) presented the negative effects of not eating this same amount of FV (see Appendix A). The framed messages were presented in a video format, where participants could read the text presented in white font on a black screen, while simultaneously listening to a voice over reading the text aloud. This presentation format intended to control for the effects of other stimuli besides the message content and ensure that – even whenever not reading the message carefully – all participants would at least hear it. The video presentation lasted approximately two minutes in both message conditions.

Measures

Motivational Orientation. Motivational orientation was operationalized through the Promotion/Prevention Scale by Lockwood, Jordan and Kunda (2002), which enables assessment of both general and context-specific (i.e., academic) motivational orientation. Since the interest here was to evaluate general motivational orientation, the four items specifically related to academic motivations were excluded from the questionnaire. The promotion sub-scale was composed of seven items related to the prosecution of aspirations and an ideal self (e.g., *'I frequently imagine how I will achieve my hopes and aspirations', 'I often think about the person I would ideally like*

to be in the future'), whereas the prevention sub-scale was originally composed by seven items related to the avoidance of negative events and a feared self (e.g., *'I often think about the person I am afraid I might become in the future', 'I often imagine myself experiencing bad things that I fear might happen to me'*). Responses were given on a 9-point scale ranging from 1 ('not at all true of me') to 9 ('very true of me').

In order to examine the underlying structure of the scale in our sample, an exploratory factor analysis was conducted using the principal components method of factor extraction followed by varimax rotation. Considering that the final goal was to extract only two factors – one for prevention and one for promotion - this was used as an *a priori* criteria for the number of factors to be extracted (Hair, Black, Babin, & Anderson, 2010). Results showed that communalities were very low (< .40) for items 1 and 15 of the original scale. Therefore, both items were removed, and the procedure was repeated. In this second solution, there was still one item (item 2) that showed a rather low communality (<.50) and was, therefore, removed. The final solution comprised all the original seven items for the promotion sub-scale (loadings >.59), and four items for the prevention sub-scale (loadings >.69), and enabled explanation of 61.5% of the total variance.

The reliability of both sub-scales (Promotion Cronbach's α= .87; Prevention Cronbach's α= .82) was slightly higher than the original ones (see Lockwood et al., 2002). The motivational orientation index was created by subtracting the mean of prevention scores from the mean of promotion scores, so that positive values indicated a prevalence of promotion orientation, whereas negative values were indicative of prevention orientation predominance. The values of this index could vary between -8 and +8.

Intention. Three items were used to access intentions regarding FV intake: *'I intend to eat at least 5 portions of fruit and vegetables a day from today on'*, *'From now*

335 *on, I have the goal of eating 5 or more portions of fruit and vegetables a day'* and *'I*
336 *want to eat a minimum of 5 portions of fruit and vegetables a day, everyday'*. Answers
337 were given on a 7-point scale ranging from 1 ('totally disagree') to 7 ('totally agree') and
338 showed good reliability (T1 Cronbach´s α =.96; T2 Cronbach´s α = .95).

339 **Fruit and vegetable intake.** Two items, one for fruit and one for vegetables,
340 assessed FV intake: *'In the (last two weeks* (T1)*/ last week* (T3)*) how many (pieces of*
341 *fruit / portions of vegetables) have you eaten every day?'*. Some examples were
342 provided to help define the concept of portion (e.g., a soup, one bowl of salad, a glass of
343 freshly squeezed and 100% fruit juice) and it was clarified that potatoes should not be
344 considered. A similar self-report measure of FV intake has been validated against
345 dietary biomarkers and a food frequency questionnaire (Steptoe et al., 2003). Responses
346 were given on a 6-point scale ranging from 0 ('less than a portion per day') to 5 ('four
347 portions or more a day'). A fruit and vegetable intake index was created by summing the
348 reported number of pieces of fruit and vegetable portions.

349 **Message involvement.** Six items (Cronbach's α = .94) similar to those used by
350 Cox and Cox (2001) assessed participants´ evaluation of their involvement with the
351 message: *'I got involved in what the message had to say', 'The message seemed relevant*
352 *to me', 'This message really made me think', 'This message was thought-provoking', 'The*
353 *message was very interesting'; 'I felt strong emotions while reading this message'*. The
354 response scale ranged from 1 ('totally disagree') to 10 ('totally agree').

355 **Perceived message quality.** A further two questions were used to create an index
356 of 'perceived message quality' (Cronbach's α = .93). The first was: *'In your opinion,*
357 *how persuasive was the message?'* and answers were given on a 10-point scale ranging
358 from 'not persuasive at all' to 'very persuasive'. The other question was: *'How would you*
359 *rate the message?'* and the scale ranged from 1 ('not credible at all') to 10 ('extremely
360 credible').

Tone of information. A question similar to the one presented in Rothman, Martino, Bedell, Detweiler and Salovey (1999) was used to ensure the success of the framing manipulation. Participants were asked to rate the tone of the information contained in the message on a 9-point scale ranging from 'mostly negative' (-4) to 'mostly positive' (+4).

Analytic Strategy

Four regression hierarchical linear regression models were estimated[1] in order to test our three hypotheses on message framing effects on intention after message exposure and fruit and vegetable intake over the subsequent week. In order to test our first hypothesis, that a gain frame would be more effective in the promotion of intention and fruit and vegetable intake (i.e., that there would be a main effect of frame), frame was introduced in the second step[2] in all four regression models. In order to test our second and third hypotheses, i.e., whether motivational orientation - or baseline intention - moderated the effects of message frame over intention and fruit and vegetable intake, the interaction terms between frame condition (gain vs. loss) and motivational orientation (promotion focus vs. prevention focus) or baseline intention (high baseline intention vs. low baseline intention) were entered at the fourth step[3].

Whenever a significant interaction was found between the frame and a moderator, procedures by Aiken and West (1991) were followed, to test for differences across message frame conditions at low (i.e., mean minus one SD) and high (i.e., mean plus one SD) levels of the continuous moderator.

Results

[1] Prior to inclusion in the regression models, the frame was dummy coded (with 0 corresponding to loss-frame and 1 to gain-frame) and all continuous variables were centred.
[2] In the first step, baseline fruit and vegetable intake (measured at Time 1), age and gender were included in the four tested models to control for their potential effects on the outcome variables.
[3] In the third step, Motivational orientation - or baseline intention - were included in the third step to control for any effects of these variables on both intention and fruit and vegetable intake.

383 **Manipulation checks**

384 A difference was found between gain and loss conditions in the rating of the tone
385 of the information presented. Considering that '0' corresponded to the 'neutral' point,
386 participants in the gain-framed message rated the message as presenting mostly positive
387 information (M = 1.48; SD = 2.18), whereas participants in the loss-framed message
388 rated the message as presenting information that was slightly negative (M = -0.08; SD =
389 2.72), $F(1,178) = 18.31$, $p < .001$, attesting the success of the framing manipulation.
390 Importantly, ratings of involvement with the message and the perceived quality of the
391 message did not differ across message frame conditions (p´s > .25).

392 **Drop-out analyses, randomization check and descriptive statistics**

393 Analyses of variance (ANOVA´s) showed no significant differences regarding the
394 levels of fruit and vegetable intake at baseline, intention, motivational orientation and
395 age between the longitudinal sample and those who dropped out (all p´s >.47), and a
396 chi-square test revealed no gender differences between the groups.

397 The descriptive statistics for both message conditions as well as the inter-
398 correlations of the study variables, at the corresponding measurement time, are
399 presented in Table 1. A randomization check showed no differences across framing
400 conditions in age, gender, motivational orientation, intention for fruit and vegetable
401 increase and actual fruit and vegetable intake at baseline (all p´s >.32).

402

Table 1.

Bivariate correlations between study variables and descriptive statistics by message frame condition

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	Gain-Frame *M* (*SD*)	Loss-Frame *M* (*SD*)
1. Age	1									22.12 *(4.57)*	22.63 *(6.70)*
2. Motiv. Orientation	.01	1								1.34 *(1.50)*	1.38 *(1.48)*
3. Intention (T1)	.02	.04	1							4.52 *(1.67)*	4.28 *(1.50)*
4. FV Intake (T1)	.03	.06	.31**	1						2.56 *(2.25)*	2.70 *(2.09)*
5. Intention (T2)	.01	.11	.67**	.34**	1					4.97 *(1.37)*	5.06 *(1.33)*
6. M. Involvement (T2)	.11	-.08	.25**	.04	.42**	1				6.81 *(1.79)*	6.48 *(1.99)*
7. M. Quality (T2)	.13	-.08	.25**	.04	.43**	.75**	1			6.51 *(1.80)*	6.21 *(2.10)*
8. Intention (T3)	.06	.09	.64**	.29**	.76**	.44**	.37**	1		4.63 *(1.61)*	4.58 *(1.58)*
9. FV Intake (T3)	.01	.06	.36**	.57**	.49**	.10	.16*	.47**	1	2.38 *(1.79)*	2.54 *(2.06)*

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

Message frame effects on intention and fruit and vegetable intake

Baseline fruit and vegetable intake was, as anticipated, a significant predictor of both intention at Time 2 (ß =.34, $p < .001$) and fruit and vegetable intake at Time 3 (ß =.57, $p < .001$). The message frame, as entered in the second step of the four hierarchical multiple regressions (Table 2), did not increase the amount of variance explained beyond what was already accounted for by the baseline FV intake (for intention, $\Delta R^2 < .001$, $F(1,177) = 0.08$, $p = .78$, and for FV intake, $\Delta R^2 = .001$, $F(1,175) = 0.16$, $p = .69$).

The first hypothesis that a gain frame would be more effective than a loss frame was, therefore, not confirmed, given that the message frame was neither a significant predictor of intention to increase fruit and vegetable intake (ß = -.02, $p = .78$) nor of fruit and vegetable intake one week later (ß = -.03, $p = .69$).

Table 2.

Message frame and motivational orientation (or baseline intention) as predictors of intention (Time 2) and fruit and vegetable consumption (Time 3)

Outcome variable	Step	Variables entered		ß (Step 1)	ß (Step 2)	ß (Step 3)	ß (Step 4)	Semi-partial R^2
Intention (T2)	1	Baseline FV intake		.34 ***	.34 ***	.33 ***	.32 ***	.10
	2	Message frame			-.02	-.02	-.02	.00
	3	MO				.114	.07	.00
	4	Frame x MO					.06	.00
			R^2	.11	.11	.13	.13	
			?R^2	.11	.00	.01	.00	
			ΔF	22.72 ***	0.08	2.63	0.28	
	1	Baseline FV intake		.34 ***	.34 ***	.14.2 *	.15 **	.02
	2	Message frame			-.02	-.07	-.07	.01
	3	BI				.63 ***	.75 ***	.24
	4	Frame x BI					-.17 *	.01
			R^2	.11	.11	.47	.48	
			ΔR^2	.13	.00	.36	.01	
			ΔF	22.72 ***	0.08	119.90 ***	3.95 *	
FV Intake (T3)	1	Baseline FV intake		.57 ***	.57 ***	.57 ***	.55 ***	.30
	2	Message frame			-.03	-.02	-.02	.00
	3	MO				.030	-.10	.00
	4	Frame x MO					.18 †	.01
			R^2	.33	.33	.33	.34	
			ΔR^2	.33	.00	.00	.01	
			ΔF	85.41 ***	0.16	0.23	3.69 *	
	1	Baseline FV intake		.57 ***	.57 ***	.51 ***	.54 ***	.25
	2	Message frame			-.03	-.04	-.04	.00
	3	BI				.20 **	.41 ***	.07
	4	Frame x BI					-.30 **	.04
			R^2	.33	.33	.36	.40	
			ΔR^2	.33	.00	.04	.04	
			ΔF	85.41 ***	0.16	9.45 **	10.53 **	

Note. Message frame is a dummy variable (0 = loss-frame; 1= gain-frame); MO = motivational orientation; BI = baseline intention; Semi-partial R^2 are presented for each predictor in the final model (Step 4).

† p <.10; * p <.05; ** p <.01; *** p <.001.

Motivational orientation as a moderator of framing effects on intention and fruit and vegetable intake

Motivational orientation, entered at the third step, failed to increase the amount of variance explained for both intention (T2), $\Delta R^2 = .013$, $F(1, 176) = 2.63$, $p = .11$, and for fruit and vegetable intake (T3), $\Delta R^2 = .001$, $F(1, 174) = 0.23$, $p = .64$ (Table 2). Moreover, no interaction between motivational orientation and frame was found in the prediction of intention to increase fruit and vegetable intake (T2) at the fourth step, ß = .06, $p = .60$, $\Delta R^2 = .001$, $F(1,175) = 0.28$, $p = .60$. However, and as expected, motivational orientation and frame interacted in the prediction of fruit and vegetable intake. When the interaction term was included at the fourth step, the overall amount of explained variance increased, $\Delta R^2 = .014$, $F(1, 173) = 3.69$, $p = .056$, with the final model explaining a total of 34.2% of the variance (see Table 2). This interaction between the message frame and motivational orientation (ß = .175, $p = .056$) in the prediction of FV intake (T3) is depicted in Figure 1.

At lower levels of motivational orientation, the message frame was found to be a significant predictor of FV intake (ß = - 0.23, $p = .03$), meaning that for increasingly prevention-focused individuals, FV intake increased in response to a loss-framed message. However, at higher levels of motivational orientation, the message frame was not a significant predictor of FV intake (ß =.16, $p = .13$), which means that for increasingly promotion-focused individuals, loss- and gain-framed messages were equally effective in the promotion of FV intake.

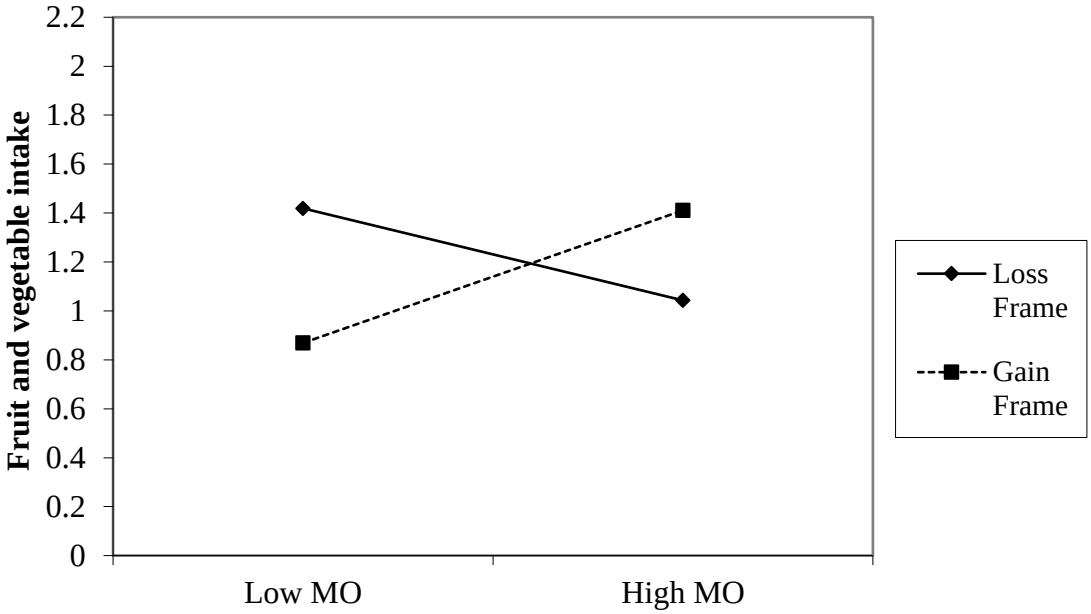

*Figure 1.*Regression of fruit and vegetable intake on motivational orientation (MO) for participants in the loss- and gain-framed message conditions, controlling for baseline fruit and vegetable intake.

Baseline intention as a moderator of framing effects on intention and fruit and vegetable intake

Baseline intention introduced in the third step was a significant predictor of both intentions after message exposure, ß =.63, p <.001, and of FV intake one week later, ß =.20, p =.002, explaining 35.9% of the variance of intention (T2) and 3.5% of the variance of FV intake (Table 2).

The interaction term between baseline intention and frame entered at the fourth step also proved to be significant for both the prediction of intention after message exposure (T2), ß = -.17, p =.049, and FV intake one week later (T3), ß = -.30, p =.001, and both models were significant [ΔR^2 =.012, F(1, 175) = 3.95, p =.049, for intention, and ΔR^2 =.037, F(1, 173) = 10.53, p =.001, for FV intake] (see Table 2). The interaction between baseline intention and frame over intention (T2) is presented in Figure 2 and the interaction over FV intake (T3) is presented in Figure 3.

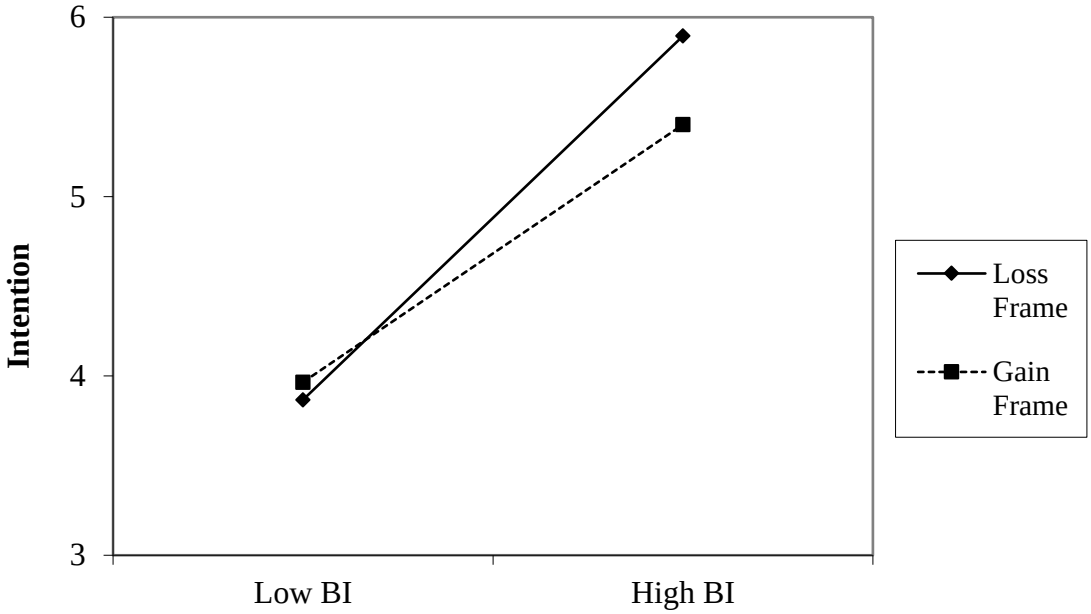

*Figure 2.*Regression of intention to increase fruit and vegetable intake after message exposure on baseline intention (BI) for participants in the loss- and gain-framed message conditions, controlling for baseline fruit and vegetable intake.

A further inspection of the effects of frame at low and high levels of baseline intention on intention after message exposure (T2) revealed that, at lower levels of baseline intention, the frame was not a significant predictor of intention after message exposure (T2), ß =.01, p =.91. However, at higher levels of baseline intention, the frame was a significant predictor (ß = -.17, p =.03), such that as baseline intentions increased, a loss-frame was conducive to higher intentions after message exposure (T2).

Exactly the same pattern was found for the effects of frame on FV intake, with results showing that at lower levels of baseline intention, the frame was not a significant predictor of FV intake (T3), ß = -.06, p =.57, but with loss-frame being conducive to higher FV intake (T3) as baseline intentions increased, ß = -.192, p =.058.

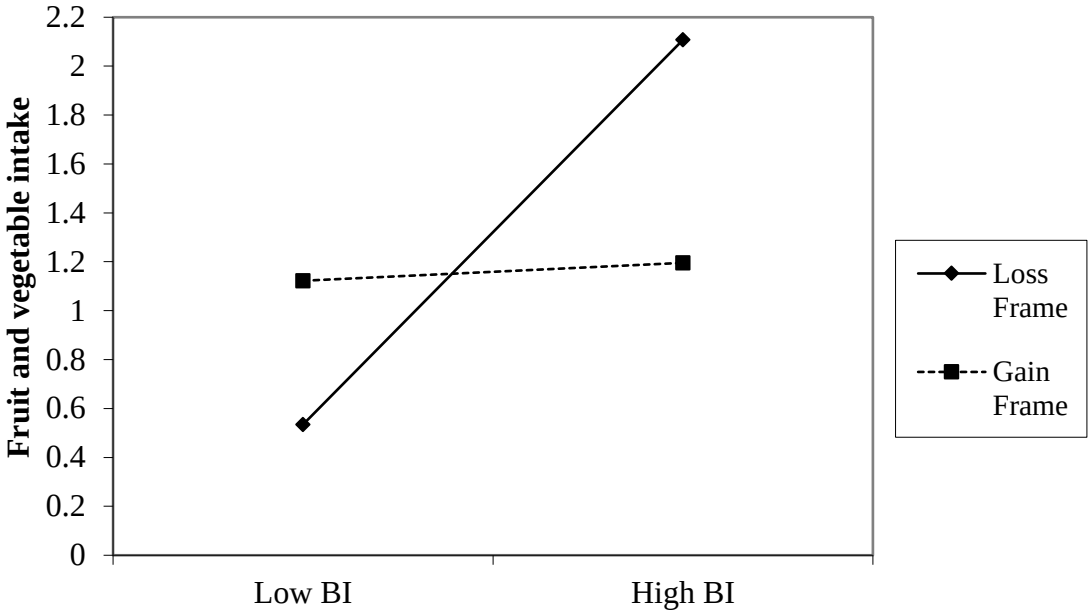

*Figure 3.*Regression of fruit and vegetable intake on baseline intention (BI) for participants in the loss- and gain-framed message conditions, controlling for baseline fruit and vegetable intake.

Three-way interaction among frame, motivational orientation and baseline intention predicting fruit and vegetable intake

Given that message frame interacted both with the individual´s motivational orientation and baseline intention for the prediction of FV intake at time 3, the full model, with all the previous predictors plus the three-way interaction among frame, motivational orientation and baseline intention was calculated. The new interaction term was not significant, ß = -.001, p =.99, and failed to increase the explanatory value of model, $\Delta R^2 = .000$, $\Delta F(1, 169) = .075$, $p = .79$, revealing baseline intentions and motivational orientation work as independent moderators of framing effects over fruit and vegetable intake.

Discussion

The function of the health behaviour and motivational orientation are among the most studied moderators of health messages´ framing effects, but their interplay has seldom been examined (Rothman & Updegraff, 2011). In the present study, motivational orientation was found to moderate the effects of frame over FV intake, with the loss-framed message leading to higher FV intake among prevention-focused individuals. However, contrarily to what would be expected since fruit and vegetable intake is an illness prevention behaviour, the gain frame was not, per se, conducive to either increased intention or fruit and vegetable intake. These results corroborate those of previous studies where an advantage of a gain-framed message for FV intake promotion was not found (e.g., Bannon & Schwartz, 2006; Van Assema, Martens, Ruiter, & Brug, 2001) and that of a study where an interaction between frame and motivational orientation was found for FV intake (Latimer et al., 2008b). As other authors have suggested (Rothman, Wlaschin, Bartels, Latimer, & Salovey, 2008), it might be the case that FV intake does not induce a very strong set of beliefs or that there is considerable variability regarding the way the behaviour is construed (i.e., either as health-promoting or illness-preventing), rendering the framing effects more dependent on the personal characteristics of the individuals.

Contrary to the results of Latimer and colleagues (2008b) and those of Churchill and Pavey (2012), where the framing effect was particularly salient for promotion focused individuals (or high in autonomy) when exposed to the gain-framed message, in the present study the reverse occurred, with the most clear framing effects being for prevention focused individuals when exposed to loss-framed messages. Such difference might be due to cultural reasons. In fact, a body of research has demonstrated that cultural factors play an important role in the effectiveness of health communications (see Kreuter & McClure, 2004). More recently, studies specifically analysing the impact of the individuals´ cultural background on the effect of health messages´ framing have

shown that individuals from cultures where a promotion focus is more pervasive (i.e., individualistic cultures) were more persuaded by gain-framed messages, whereas individuals belonging to a more preventive focus type of culture (i.e., collectivist cultures) were more persuaded by loss-framed messages (Sherman, Uskul, & Updegraff, 2011; Uskul, Sherman, & Fitzgibbon, 2009). In the same vein, other research has shown that greater cultural exposure to the US culture (which emphasises individualism) predicted a greater effectiveness of gain-framed messages, whereas lower cultural exposure led to advantages of loss-framed messages (Brick et al., 2015). Given that the Portuguese culture has proven to be close to Eastern cultures in terms of collectivism (Gouveia & Ros, 2000), this might explain the obtained results, in the sense that there was a maximal effect of frame when it matched the individuals´ dispositions as well as the prevalent cultural background.

The fact that framing effects were found for behaviour one week later, but not for intentions immediately after message exposure is also worth noting, although it is not completely new. Framing effects for the adoption of prevention behaviours such as smoking cessation, skin cancer prevention and physical activity have been found on behaviour, but not necessarily on attitudes or intentions (Gallagher & Updegraff, 2012). This pattern of findings leads to the question of identifying the psychological processes that might mediate the observed effects, which clearly remains an important avenue for future research.

The role of a new moderator - baseline intentions - in the message frame was also demonstrated, with the loss-frame conducing to higher intention and behaviour among participants who already had the intention to change, as predicted. This finding is relevant for tailoring health messages according to the stage of change (Godinho, Alvarez, & Lima, 2013; Godinho, Alvarez, Lima, & Schwarzer, 2015; Lhakhang, Godinho, Knoll, & Schwarzer, 2014; Weinstein, Lyon, Sandman, & Cuite, 1998),

suggesting that loss-frames are preferable when targeting volitional individuals. Nevertheless, it is advisable to replicate these findings for other behaviours and in other cultures, in order to attest their generalisability. For example, it would be important to test whether, in a more promotion-oriented type of culture, gain-frames might be more effective for individuals who do not yet intend to change their behaviour. Future research should also examine whether framing tailored messages according to the stage of change results in increased effectiveness.

Some aspects of the present study might limit the generalisation of the above conclusions. The sample of the study was composed by well-educated and mostly female participants. Considering that women and highly educated people tend to already eat more fruit and vegetables (De Irala-Estevez et al., 2000; Giskes, Turrell, Patterson, & Newman, 2002; OECD, 2013) future studies should seek to replicate the presented findings using more heterogeneous samples. All measures were collected by self-report, including the assessment of FV intake, which might introduce some bias due to difficulties in recollecting and/or evaluating the required information. Thus, it is advisable that future studies complement the assessment of fruit and vegetable intake with a food frequency questionnaire. In spite of these limitations, disentangling gains and losses from the presence vs. absence of outcomes in the framing manipulation, the inclusion of a manipulation check, the control of baseline behaviour, and testing the different predictions both for intentions and behaviour are strengths of this study that must be acknowledged.

In the present study some significant effects were found, despite being modest in size. This should not be surprising if we recall that our aim was to change a very complex behaviour that is influenced by a myriad of different factors, through a minimal and very brief intervention consisting of a single exposure to differently framed health messages. Moreover, the comparisons established are not between an

intervention and a non-intervention control group; the effect of a congruent and incongruent message is being contrasted, which although theoretically less effective for a specific audience segment, provides, nonetheless, persuasive information for changing fruit and vegetable intake. Thus, despite their relatively modest size, these effects may still be considered important effect sizes. From an epidemiological point of view, small effects in a risk factor among a large group of people tend to lead to considerable and meaningful changes at a population level (Rose, 1992).

To conclude, characteristics of the message recipient, rather than aspects of the health behaviour, were found to be relevant for the choice of frame in messages aiming to promote the increase of fruit and vegetable intake. In particular, when targeting prevention-focused individuals, a loss-frame is recommended. The pronounced framing effect for prevention focused individuals is attributed to the relevance of these individuals' disposition in a collectivist culture, and highlights the importance of considering the individual´s cultural background when evaluating the effects of message framing in health behaviour change. Moreover, the finding that for individuals already holding an intention to change, a loss-framed message is more effective, proved to be the most innovative result, and has practical implications for the targeting of health messages according to the individual´s readiness for change.

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Appendix A.

Outcomes related to eating (or not) the recommended amount of FV referred in each message frame type.

Gain-Framed Message	Loss-Framed Message
If you *eat* at least 5 portions of FV a day…	**If you *do not eat* at least 5 portions of FV a day…**
One in five gastrointestinal cancers **may be prevented** by **adequate** F&V consumption.	One in five gastrointestinal cancers **are caused** by **low** F&V consumption.
You will be protecting yourself against this disease.	**You will be unprotected** against this disease.
You will be provided with vitamins and mineral salts which perform the fundamental role of protecting the body.	**This will result in a lack of** vitamins and mineral salts which perform the fundamental role of protecting the body.
…it will **help** the functions of the immune system, which **works to** keeping you healthy	… it will **jeopardize** the functions of the immune system, which **will fail in** keeping you healthy
[it may keep you] **safe from** diseases such as cancer.	**It may trigger** diseases such as cancer.
Increase in energy, **increase** in positive emotional states and sense of satisfaction and pleasure.	**Reduction** in energy, **reduction** of positive emotional states and sense of satisfaction and pleasure.
You will feel **proud of** yourself,	You will feel **disappointed with** yourself,
For having been **capable** of doing it.	For having been **incapable** of doing it.
It may contribute to **preventing** a number of diseases,	It may contribute to **triggering** a number of diseases,
Feeling good about yourself	**Feeling bad** about yourself
And having **better** health.	And having **poorer** health.