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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.

53   Emphasizing the losses or the gains: Comparing situational and individual moderators

54   of framed messages to promote fruit and vegetable intake

55   Fruit and vegetable intake is a critical aspect of a healthy diet due to its

56   association with a lower risk for cardiovascular diseases (He, Nowson, Lucas, &

57   MacGregor, 2007), type II diabetes (Carter, Gray, Troughton, Khunti, & Davies, 2010)

58   and certain types of cancer (Liu & Russell, 2008). Despite these benefits, many people

59   fall short of recommended guidelines for daily intake (Hall, Moore, Harper, & Lynch,

60   2009). Thus, it is vital to understand the conditions under which certain intervention

61   strategies, such as trying to persuade people about the benefits of fruit and vegetable

62   consumption, lead to increases in the adherence to recommended levels of this intake.

63   One question that can be raised in this regard is whether emphasizing either the

64   costs of non-performing a health behaviour (i.e., the use of a *loss* frame) or the benefits

65   of performing it (i.e., the use of a *gain* frame) make a difference when it comes to

66   persuading people to increase their fruit and vegetable intake. Indeed, two decades of

67   research on message framing support the claim that, even when communicating exactly

68   the same consequences, the particular frame that is used in a message may have a major

69   influence on behavioural outcomes (Gallagher & Updegraff, 2012; Rothman & Salovey,

70   1997).

71   The question about which frame might be more helpful in fostering health

72   behaviours has been rapidly transformed into under which conditions a loss- or a gain-

73   frame is particularly effective. The range of framing effect moderators proposed in the

74   literature up to now have been either tied to the particular health behaviour and context

75   (situational moderators) or to the personal characteristics of the individual (dispositional

76   moderators). By far, the two most scrutinized moderators are the perceptions regarding

77   the function of a particular health behaviour (a situational moderator) and the

78   motivational orientation of the recipient (a dispositional moderator).

79   However, by and large, both bodies of the literature have developed separately,

80   and up to now few studies have made an explicit attempt to examine how these different

81   classes of moderators, situational and individual, contribute for the prediction of

82   specific behaviours (Rothman & Updegraff, 2011). The present study integrates

83   predictions from these two theoretical perspectives for a single health behaviour – fruit

84   and vegetable (FV) intake - and further explores the role that behavioural intentions

85   might also play as an individual moderator of framing effects.

86   **A situational moderator: Function of the health behaviour**

87   The first framing studies applied to health issues were derived from the Prospect

88   Theory (Tversky & Kahneman, 1981), which sustains that people are risk aversive

89   when contemplating possible gains, but are risk-seeking when confronted with possible

90   losses. The same rationale was applied to the health domain by Rothman and Salovey

91   (1997), who proposed that when thinking about the consequences of performing (or not

92   performing) a health behaviour, people should be more responsive to appeals that

93   emphasize the gains of performing it, as long as the behaviour itself is perceived as safe

94   (i.e., not risky). On the contrary, if performing a health behaviour is perceived as being

95   risky, as might be the case of undergoing a screening test, given that one 'risks' the

96   possibility of finding out that one has a disease, a loss-frame would be more effective.

97   The function of the health behaviour, whether related to illness prevention (e.g., eating a

98   balanced diet) or illness detection (e.g., doing a HIV test) was proposed to work as a

99   heuristic people use to infer the risk of a certain behaviour and should, therefore, be a

100   moderator of framing effects.

101   Many studies have demonstrated a relative effectiveness of loss-framed messages

102   in the promotion of detection behaviours (e.g., Kalichman & Coley, 1995; Rivers,

103   Salovey, Pizarro, Pizarro, & Schneider, 2005) and the use of gain-framed messages in

104   the promotion of prevention behaviours (e.g., Detweiler, Bedell, Salovey, Pronin, &

105   Rothman, 1999; Kiene, Barta, Zelenski, & Cothran, 2005). Only a few studies (e.g.,

106   Bannon & Schwartz, 2006; Dijkstra et al.,2011) have tested the predictions derived

107   from the Prospect Theory specifically for FV intake in response to framed messages.

108   Results of these studies did not yield a clear advantage of the gain-frame condition for

109   the promotion of FV intake. An exception was found in a study where the messages

110   were personalized in order to be more self-relevant (Dijkstra et al., 2011). However, in

111   this particular study the results were not driven by the gain frame being more effective.

112   On the contrary, they were related to the loss frame being comparatively less effective.

113   Such result was attributed to defensive reactions in response to higher levels of threat

114   induced by the loss-framed message when they were perceived to be more self-relevant.

115   **An individual moderator: Motivational orientation**

116   The recipients´ characteristics, such as differences in motivational orientation,

117   have also been shown to moderate the effects of framed health messages, in what has

118   been called the 'congruency effect' (Mann, Sherman, & Updegraff, 2004). Motivational

119   orientation refers to the dominant motivational system involved in the regulation of

120   behaviour, and the existence of important individual differences towards gains and

121   losses has been demonstrated (Higgins, 1997). Promotion-focused individuals are

122   motivated by opportunities of accomplishment (e.g., eating fruit and vegetables in order

123   to have more energy and feel good), while prevention-focused individuals are motivated

124   by the prospect of preventing negative things from happening (e.g., eating fruit and

125   vegetables to prevent cancer or cardiovascular diseases).

126   Studies with different health behaviours have shown a clear advantage of the use

127   of gain-framed messages for promotion-focused individuals and of loss-framed

128   messages for prevention-focused individuals (e.g., Gerend & Shepperd, 2007; Latimer

129   et al., 2008a). Furthermore, in a study on fruit and vegetable intake an interaction

130   between frame and motivational orientation was found, in the expected direction

131   (Latimer et al., 2008b). Nevertheless, the results of this study are not readily comparable

132   to those following the Prospective Theory perspective on framing for FV intake, since

133   the intervention consisted of several materials other than just the framed health

134   messages. In a somewhat comparable study, individuals with high autonomy (i.e., who

135   act in accordance with their inner values or ideals, rather than by pressure of others or

136   'oughts') were found to increase their FV intake after being exposed to a gain-framed

137   rather than a loss-framed message (Churchill & Pavey, 2012).

138   **Exploring the role of behavioural intention as an individual moderator**

139   Behavioural intention is a key predictor in most of the social-cognitive models of

140   health behaviour (Armitage & Conner, 2000) and it has also been conceptualized as an

141   important marker of individuals´ mindset and their readiness for change (Conner &

142   Norman, 2015; Schwarzer, 2008). Most stage models of health behaviour change use

143   intention as an indicator of the stage at which individuals find themselves (Schüz,

144   Sniehotta, Mallach, Wiedemann, & Schwarzer, 2009), distinguishing motivational

145   processes, leading to intention formation, from volitional ones, leading to behavioural

146   enactment. Considering the recommendation to tailor health messages´ content

147   according to the individuals´ stage of change (Weinstein, Lyon, Sandman, & Cuite,

148   1998), and given the importance of intention as a turning point in the health behaviour

149   change process (Conner & Norman, 2015), one might ask what type of message frame

150   would be more suitable for individuals at different levels of intention.

151   Despite the prominence of intention among other social cognitive variables, namely for

152   the prediction of fruit and vegetable intake (Mullan, Allom, Brogan, Kothe, & Todd,

153   2014) to the best of our knowledge, it has never been explored as a moderator of

154   message framing effects.

155 Research has, nonetheless, shown that loss frames are more effective when the

156 topic is highly relevant to the receiver of the message and that gain frames are more

157 effective when the topic is lowly relevant to the receiver (de Graaf, van den Putte, & de

158 Bruijn, 2015; Maheswaran & Meyers-Levy, 1990). The moderating effects of issue

159 involvement can be explained by models of attitude change. According to these models,

160 issue involvement should promote a systematic processing of the information contained

161 in the message (Petty & Cacioppo, 1986) and under conditions of systematic

162 information processing, negative information receives greater weight and attention than

163 positive information, due to a negativity bias (Dijksterhuis, & Aarts, 2003). On the

164 contrary, when processing messages using the peripheral route, positive information is

165 used as a heuristic, and it may generate more positive associations with the topic and,

166 therefore, be conducive to higher attitudinal and/or behavioural change (Maheswaran &

167 Meyers-Levy, 1990).

168 As it is likely that individuals who have strong intentions to change their

169 behaviour are at the same time very involved with information pertaining to that

170 specific behavioural domain, intention stands out as a strong candidate as a moderator

171 of framed health messages. Previous research has, indeed, confirmed the existence of a

172 strong and positive relationship between intentions and issue involvement (e.g., Bae e

173 Kang, 2008; Pieters & Verplanken, 1995; Skumanich & Kintsfather, 1996). Thus, to the

174 extent that individuals who hold the intention to increase their FV intake consider health

175 messages related to FV intake as being more personally relevant than individuals

176 without the intention to increase FV intake, it may be expected the effects of message

177 framing to be moderated by individual´s intentions, similarly to the moderation pattern

178 that has been described for issue involvement (Maheswaran & Meyers-Levy, 1990).

179 **Outcome measures of framing effects**

180   Besides differences in the adopted theoretical perspectives, framing studies often

181   report on different outcome measures for the framing effects. Some studies report the

182   effects of framing on intentions to perform a given health behaviour (e.g., Dijkstra et al.,

183   2011), while others report framing effects on actual behaviour (e.g., Latimer et al.,

184   2008b). Such differences imply that results might not be readily comparable. While a

185   meta-analysis examining the role of framing in intentions to perform prevention

186   behaviours did not offer much support for the use of gain- over loss-framed messages

187   other than for the promotion of dental hygiene behaviours (O´Keefe & Jensen, 2007),

188   when using behaviour as the outcome measure, gain-framed messages were shown to be

189   more effective in the promotion of illness-prevention behaviours such as physical

190   activity, smoking cessation and skin cancer prevention (see Gallagher & Updegraff,

191   2012).

192   **Framing manipulation**

193   On the basis of the Regulatory Focus Theory (Higgins, 1997), and as stressed in

194   previous research (Dijkstra et al., 2011; Yi & Baumgartner, 2009), both the presence of

195   a positive and rewarding outcome and the absence of a negative and aversive outcome

196   might be considered a 'gain' and both the presence of a negative and aversive outcome

197   or the absence of a positive and rewarding outcome might be considered a 'loss'. This is

198   an important distinction that has been highlighted by Regulatory Focus Theory

199   (Higgins, 1997) and that has been more recently acknowledged in the health framing

200   literature deriving from a Prospect Theory perspective (e.g., Dijkstra, Rothman, &

201   Pietersma, 2011).

202   Regulatory focus theory further establishes that individuals differ in their

203   sensitivity to the end-states (or reference points) that motivate the behaviour, with

204   promotion-oriented individuals being mostly motivated by the prospect of achieving a

205   positive/desirable outcomes and prevention-oriented individuals being mostly motivated

206 by the prospect of avoiding negative/ undesirable outcomes (Scholer & Higgins, 2008).

207 Besides, it establishes a difference between (a) needs related to nurturance,

208 accomplishment and growth, which are regulated by representations of ideal end-states

209 ("wants"), and involve a promotion focus, and (b) needs related to security, duty and

210 responsibility ("oughts"), which involve a prevention focus (Scholer & Higgins, 2008).

211   Given that the different levels at which the messages can be framed have been

212 somewhat confounded in the literature (cf. Dijkstra, Rothman, & Pietersma, 2011), we

213 aimed to disentangle the different levels at which health messages may be more

214 appealing to individuals high in promotion vs. prevention motivational orientation.

215 Thus, we decided to present outcomes related to "wants" (e.g., feeling vs. not feeling

216 energized) and "oughts" (preventing vs. not preventing disease) in the two framed

217 messages, only switching the end-states (or reference points) that motivate the

218 behaviour, i.e., achieving a positive/desirable outcome (e.g., being energised / being

219 healthy) versus avoiding a negative/undesirable outcome (e.g., preventing being with

220 less energy / preventing being ill).

221 **Aims and hypotheses**

222   Several studies have already been conducted on the moderators of health message

223 framing, namely on the function of behaviour and motivational orientation, however

224 their interplay has seldom been studied. Likewise, to our knowledge, no prior study has

225 examined the potential role of intention as a moderator of framing effects. Furthermore,

226 framing studies are not always comparable in the sense that some use intention as the

227 main outcome variable while others use behaviour (either objectively assessed or by

228 means of self-report), and the way in which frame is manipulated may also diverge.

229 Thus, the aim of this experimental study on fruit and vegetable intake is three-fold: 1) to

230 compare predictions based on both theoretical perspectives on framing moderators (i.e.,

231 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

257   During short breaks in the classes and/or through mailing lists of the students´

258   associations, students were told that the aim of the study was to find out what the best

259   ways to communicate the results of scientific research to the general public were. Those

260   who agreed to participate provided their e-mail addresses to receive an initial online

261   questionnaire (Time 1) which started by explaining the study in more detail, namely the

262   name of the research centre and the average length of time it took to complete, in

263   addition to reminding participants what the aim of the study was, and assured data

264   confidentiality. Participants then provided their informed consent, in accordance with

265   the ethical standards of the three universities. This first questionnaire assessed

266   motivational orientation, baseline fruit and vegetable intake, intention towards the

267   eating of at least five portions of FV a day, and some demographic data as well as

268   specific questions on food restrictions and allergies. All moderator variables as well as

269   baseline levels of fruit and vegetable intake were measured one week before exposure

270   to the framed messages, so as to discard the possibility that this measurement might

271   have an effect on the dependent variables.

272   The experimental session (Time 2) was held at the same university to which the

273   participants belonged, approximately one week after completion of the first

274   questionnaire. The reason behind having the participants come to the lab was to ensure

275   they would all see the framed message in very similar conditions. At the beginning of

276   the session, participants were randomly assigned by the software to either the gain- or

277   loss-framed message. They were then asked about their intention to increase their FV

278   intake in the following week and completed the manipulation check. A further week

279   later (Time 3), participants received the last online questionnaire to assess their FV

280   intake.

281   **Materials**

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

283   the outcomes, message framing was manipulated by presenting only the *presence* of

284   gains as a result of compliance (gain-framed message) vs. the *presence* of losses as a

285   result of non-compliance (loss-framed message), while referring in both versions to

286   exactly the same outcomes (i.e., *same consequences* framing). Also, according to the

287   Regulatory Focus Theory, some outcomes are intrinsically promotional (e.g., having

288   more energy), whereas others are intrinsically preventive (e.g., having better health).

289   Therefore, to control for such confoundedness, both types of outcomes (promotional

290   and preventive) were presented in both loss- and gain-framed messages.

291   The gain-framed message (412 words) explained the positive effects of eating at

292   least 5 portions of FV a day, whereas the loss-framed message (417 words) presented

293   the negative effects of not eating this same amount of FV (see Appendix A). The framed

294   messages were presented in a video format, where participants could read the text

295   presented in white font on a black screen, while simultaneously listening to a voice over

296   reading the text aloud. This presentation format intended to control for the effects of

297   other stimuli besides the message content and ensure that – even whenever not reading

298   the message carefully – all participants would at least hear it. The video presentation

299   lasted approximately two minutes in both message conditions.

300   **Measures**

301   **Motivational Orientation.** Motivational orientation was operationalized through

302   the Promotion/Prevention Scale by Lockwood, Jordan and Kunda (2002), which enables

303   assessment of both general and context-specific (i.e., academic) motivational

304   orientation. Since the interest here was to evaluate general motivational orientation, the

305   four items specifically related to academic motivations were excluded from the

306   questionnaire. The promotion sub-scale was composed of seven items related to the

307   prosecution of aspirations and an ideal self (e.g., *'I frequently imagine how I will*

308   *achieve my hopes and aspirations', 'I often think about the person I would ideally like*

309   *to be in the future'*), whereas the prevention sub-scale was originally composed by

310   seven items related to the avoidance of negative events and a feared self (e.g., *'I often*

311   *think about the person I am afraid I might become in the future', 'I often imagine myself*

312   *experiencing bad things that I fear might happen to me'*). Responses were given on a 9-

313   point scale ranging from 1 ('not at all true of me') to 9 ('very true of me').

314   In order to examine the underlying structure of the scale in our sample, an

315   exploratory factor analysis was conducted using the principal components method of

316   factor extraction followed by varimax rotation. Considering that the final goal was to

317   extract only two factors – one for prevention and one for promotion - this was used as

318   an *a priori* criteria for the number of factors to be extracted (Hair, Black, Babin, &

319   Anderson, 2010). Results showed that communalities were very low (< .40) for items 1

320   and 15 of the original scale. Therefore, both items were removed, and the procedure was

321   repeated. In this second solution, there was still one item (item 2) that showed a rather

322   low communality (<.50) and was, therefore, removed. The final solution comprised all

323   the original seven items for the promotion sub-scale (loadings >.59), and four items for

324   the prevention sub-scale (loadings >.69), and enabled explanation of 61.5% of the total

325   variance.

326   The reliability of both sub-scales (Promotion Cronbach's α= .87; Prevention

327   Cronbach's α= .82) was slightly higher than the original ones (see Lockwood et al.,

328   2002). The motivational orientation index was created by subtracting the mean of

329   prevention scores from the mean of promotion scores, so that positive values indicated a

330   prevalence of promotion orientation, whereas negative values were indicative of

331   prevention orientation predominance. The values of this index could vary between -8

332   and +8.

333   **Intention.** Three items were used to access intentions regarding FV intake: *'I*

334   *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').

361   **Tone of information.** A question similar to the one presented in Rothman,

362   Martino, Bedell, Detweiler and Salovey (1999) was used to ensure the success of the

363   framing manipulation. Participants were asked to rate the tone of the information

364   contained in the message on a 9-point scale ranging from 'mostly negative' (-4) to

365   'mostly positive' (+4).

366   **Analytic Strategy**

367   Four regression hierarchical linear regression models were estimated[1] in order to

368   test our three hypotheses on message framing effects on intention after message

369   exposure and fruit and vegetable intake over the subsequent week.   In order to test our

370   first hypothesis, that a gain frame would be more effective in the promotion of intention

371   and fruit and vegetable intake (i.e., that there would be a main effect of frame), frame

372   was introduced in the second step[2] in all four regression models. In order to test our

373   second and third hypotheses, i.e., whether motivational orientation - or baseline

374   intention - moderated the effects of message frame over intention and fruit and

375   vegetable intake, the interaction terms between frame condition (gain vs. loss) and

376   motivational orientation (promotion focus vs. prevention focus) or baseline intention

377   (high baseline intention vs. low baseline intention) were entered at the fourth step[3].

378   Whenever a significant interaction was found between the frame and a moderator,

379   procedures by Aiken and West (1991) were followed, to test for differences across

380   message frame conditions at low (i.e., mean minus one SD) and high (i.e., mean plus

381   one SD) levels of the continuous moderator.

382   **Results**

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[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

403   Table 1.

404   *Bivariate correlations between study variables and descriptive statistics by message*

405   *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)

406   *Note.* $^*p <.05;$$^{**}p <.01.$

Message frame effects on intention and fruit and vegetable intake

408   Baseline fruit and vegetable intake was, as anticipated, a significant predictor of

409   both intention at Time 2 (ß =.34, $p <.001$) and fruit and vegetable intake at Time 3 (ß

410   =.57, $p <.001$). The message frame, as entered in the second step of the four hierarchical

411   multiple regressions (Table 2), did not increase the amount of variance explained

412   beyond what was already accounted for by the baseline FV intake (for intention, Δ

413    $R^2<.001$, $F(1,177) = 0.08$, $p = .78$, and for FV intake, Δ $R^2 = .001$, $F(1,175) = 0.16$, $p =$

414   .69).

415   The first hypothesis that a gain frame would be more effective than a loss frame

416   was, therefore, not confirmed, given that the message frame was neither a significant

417   predictor of intention to increase fruit and vegetable intake (ß = -.02, $p =.78$) nor of fruit

418   and vegetable intake one week later (ß = -.03, $p =.69$).

419

420   Table 2.

421   *Message frame and motivational orientation (or baseline intention) as predictors of*

422   *intention (Time 2) and fruit and vegetable consumption (Time 3)*

423

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 **	

424

425   *Note.* Message frame is a dummy variable (0 = loss-frame; 1= gain-frame); MO =

426   motivational orientation; BI = baseline intention; Semi-partial R^2 are presented for each

427   predictor in the final model (Step 4).
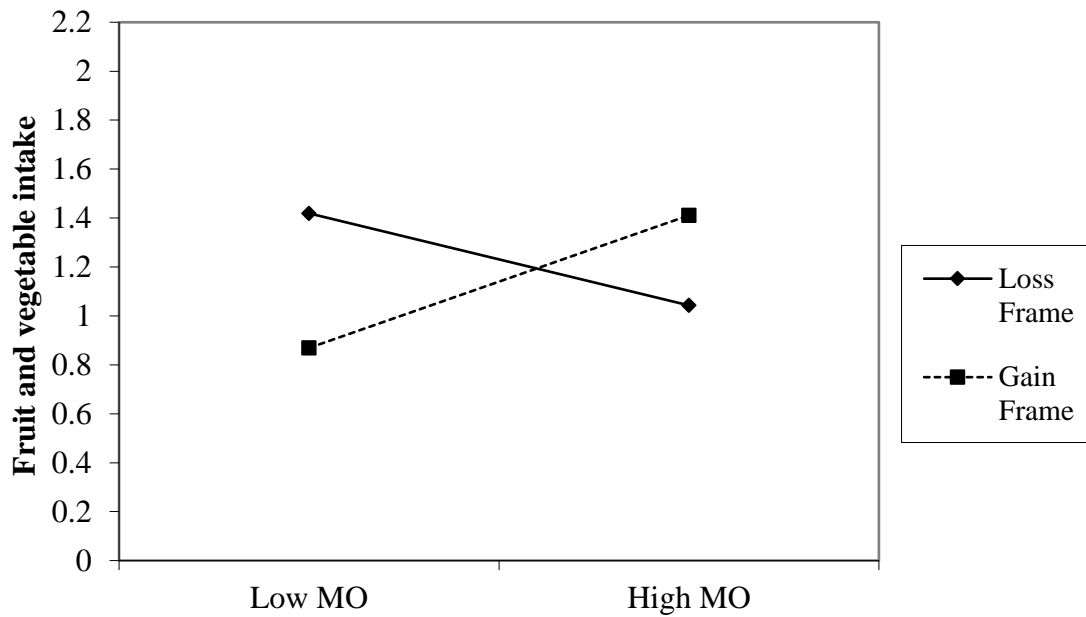
428   † $p <.10$; * $p <.05$; ** $p <.01$; *** $p <.001$.

429

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.
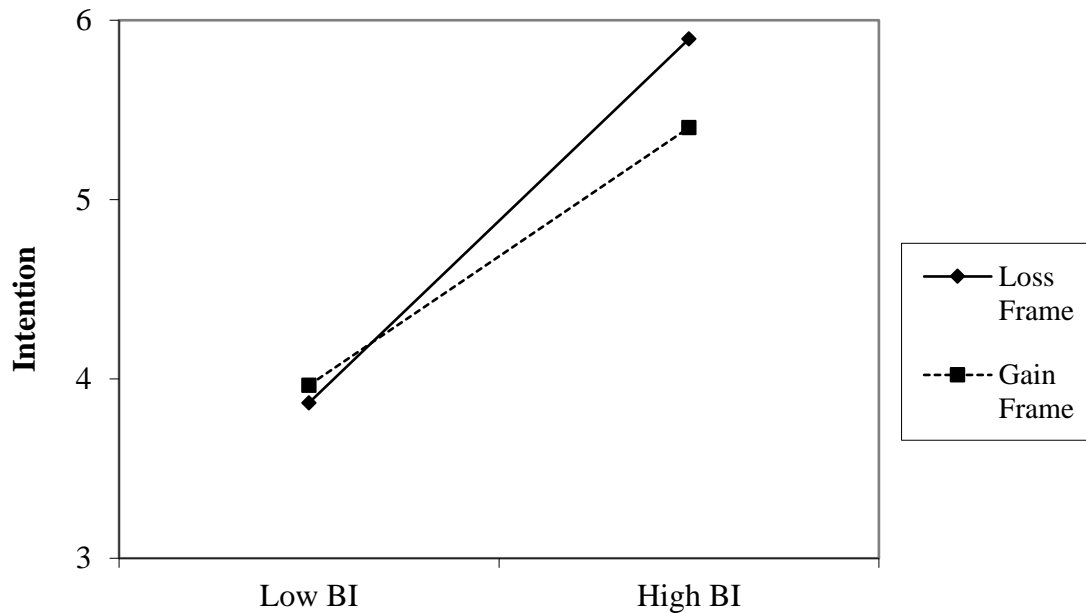
452

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.

469

470   *Figure 2.*Regression of intention to increase fruit and vegetable intake after message

471   exposure on baseline intention (BI) for participants in the loss- and gain-framed

472   message conditions, controlling for baseline fruit and vegetable intake.

473

474   A further inspection of the effects of frame at low and high levels of baseline

475   intention on intention after message exposure (T2) revealed that, at lower levels of

476   baseline intention, the frame was not a significant predictor of intention after message

477   exposure (T2), ß =.01, *p* =.91. However, at higher levels of baseline intention, the frame

478   was a significant predictor (ß = -.17, *p* =.03), such that as baseline intentions increased,

479   a loss-frame was conducive to higher intentions after message exposure (T2).

480   Exactly the same pattern was found for the effects of frame on FV intake, with

481   results showing that at lower levels of baseline intention, the frame was not a significant

482   predictor of FV intake (T3), ß = -.06, *p* =.57, but with loss-frame being conducive to

483   higher FV intake (T3) as baseline intentions increased, ß = -.192, *p* =.058.

484
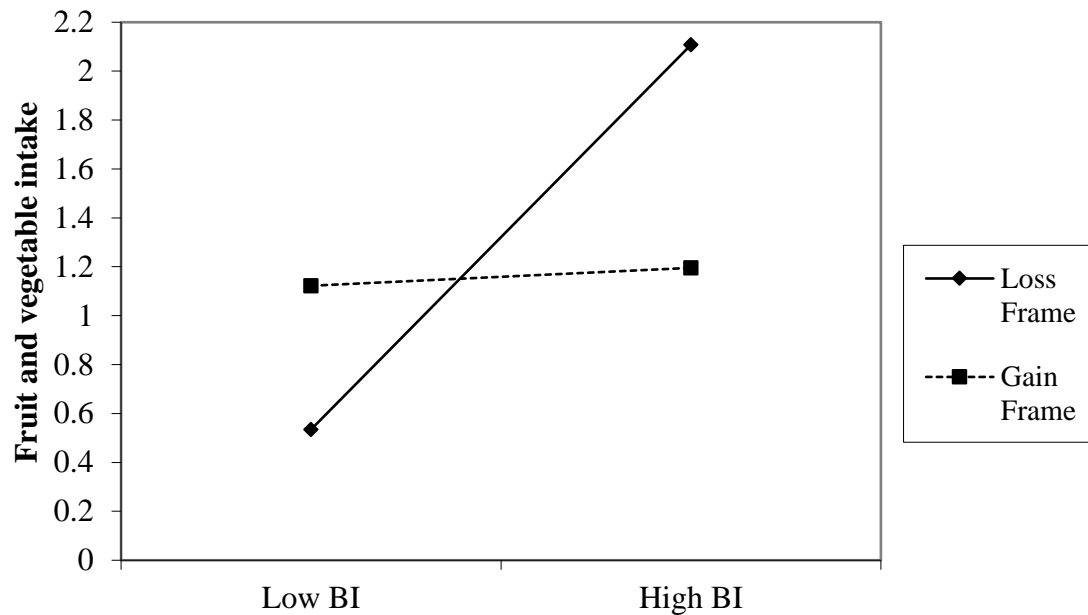
485

486   *Figure 3.*Regression of fruit and vegetable intake on baseline intention (BI) for

487   participants in the loss- and gain-framed message conditions, controlling for baseline

488   fruit and vegetable intake.

489

Three-way interaction among frame, motivational orientation and baseline

490

intention predicting fruit and vegetable intake

491

492   Given that message frame interacted both with the individual´s motivational

493   orientation and baseline intention for the prediction of FV intake at time 3, the full

494   model, with all the previous predictors plus the three-way interaction among frame,

495   motivational orientation and baseline intention was calculated. The new interaction term

496   was not significant, ß = -.001, *p* =.99, and failed to increase the explanatory value of

497   model, ΔR^2 = .000, $\Delta F(1, 169)$ = .075, *p* = .79, revealing baseline intentions and

498   motivational orientation work as independent moderators of framing effects over fruit

499   and vegetable intake.

500   **Discussion**

501   The function of the health behaviour and motivational orientation are among the

502   most studied moderators of health messages´ framing effects, but their interplay has

503   seldom been examined (Rothman & Updegraff, 2011). In the present study,

504   motivational orientation was found to moderate the effects of frame over FV intake,

505   with the loss-framed message leading to higher FV intake among prevention-focused

506   individuals. However, contrarily to what would be expected since fruit and vegetable

507   intake is an illness prevention behaviour, the gain frame was not, per se, conducive to

508   either increased intention or fruit and vegetable intake. These results corroborate those

509   of previous studies where an advantage of a gain-framed message for FV intake

510   promotion was not found (e.g., Bannon & Schwartz, 2006; Van Assema, Martens,

511   Ruiter, & Brug, 2001) and that of a study where an interaction between frame and

512   motivational orientation was found for FV intake (Latimer et al., 2008b). As other

513   authors have suggested (Rothman, Wlaschin, Bartels, Latimer, & Salovey, 2008), it

514   might be the case that FV intake does not induce a very strong set of beliefs or that there

515   is considerable variability regarding the way the behaviour is construed (i.e., either as

516   health-promoting or illness-preventing), rendering the framing effects more dependent

517   on the personal characteristics of the individuals.

518   Contrary to the results of Latimer and colleagues (2008b) and those of Churchill

519   and Pavey (2012), where the framing effect was particularly salient for promotion

520   focused individuals (or high in autonomy) when exposed to the gain-framed message, in

521   the present study the reverse occurred, with the most clear framing effects being for

522   prevention focused individuals when exposed to loss-framed messages. Such difference

523   might be due to cultural reasons. In fact, a body of research has demonstrated that

524   cultural factors play an important role in the effectiveness of health communications

525   (see Kreuter & McClure, 2004). More recently, studies specifically analysing the impact

526   of the individuals´ cultural background on the effect of health messages´ framing have

527   shown that individuals from cultures where a promotion focus is more pervasive (i.e.,

528   individualistic cultures) were more persuaded by gain-framed messages, whereas

529   individuals belonging to a more preventive focus type of culture (i.e., collectivist

530   cultures) were more persuaded by loss-framed messages (Sherman, Uskul, &

531   Updegraff, 2011; Uskul, Sherman, & Fitzgibbon, 2009). In the same vein, other

532   research has shown that greater cultural exposure to the US culture (which emphasises

533   individualism) predicted a greater effectiveness of gain-framed messages, whereas

534   lower cultural exposure led to advantages of loss-framed messages (Brick et al., 2015).

535   Given that the Portuguese culture has proven to be close to Eastern cultures in terms of

536   collectivism (Gouveia & Ros, 2000), this might explain the obtained results, in the

537   sense that there was a maximal effect of frame when it matched the individuals´

538   dispositions as well as the prevalent cultural background.

539   The fact that framing effects were found for behaviour one week later, but not for

540   intentions immediately after message exposure is also worth noting, although it is not

541   completely new. Framing effects for the adoption of prevention behaviours such as

542   smoking cessation, skin cancer prevention and physical activity have been found on

543   behaviour, but not necessarily on attitudes or intentions (Gallagher & Updegraff, 2012).

544   This pattern of findings leads to the question of identifying the psychological processes

545   that might mediate the observed effects, which clearly remains an important avenue for

546   future research.

547   The role of a new moderator - baseline intentions - in the message frame was also

548   demonstrated, with the loss-frame conducing to higher intention and behaviour among

549   participants who already had the intention to change, as predicted. This finding is

550   relevant for tailoring health messages according to the stage of change (Godinho,

551   Alvarez, & Lima, 2013; Godinho, Alvarez, Lima, & Schwarzer, 2015; Lhakhang,

552   Godinho, Knoll, & Schwarzer, 2014; Weinstein, Lyon, Sandman, & Cuite, 1998),

553 suggesting that loss-frames are preferable when targeting volitional individuals.

554 Nevertheless, it is advisable to replicate these findings for other behaviours and in other

555 cultures, in order to attest their generalisability. For example, it would be important to

556 test whether, in a more promotion-oriented type of culture, gain-frames might be more

557 effective for individuals who do not yet intend to change their behaviour. Future

558 research should also examine whether framing tailored messages according to the stage

559 of change results in increased effectiveness.

560   Some aspects of the present study might limit the generalisation of the above

561 conclusions. The sample of the study was composed by well-educated and mostly

562 female participants. Considering that women and highly educated people tend to already

563 eat more fruit and vegetables (De Irala-Estevez et al., 2000; Giskes, Turrell, Patterson,

564 & Newman, 2002; OECD, 2013) future studies should seek to replicate the presented

565 findings using more heterogeneous samples. All measures were collected by self-report,

566 including the assessment of FV intake, which might introduce some bias due to

567 difficulties in recollecting and/or evaluating the required information. Thus, it is

568 advisable that future studies complement the assessment of fruit and vegetable intake

569 with a food frequency questionnaire. In spite of these limitations, disentangling gains

570 and losses from the presence vs. absence of outcomes in the framing manipulation, the

571 inclusion of a manipulation check, the control of baseline behaviour, and testing the

572 different predictions both for intentions and behaviour are strengths of this study that

573 must be acknowledged.

574   In the present study some significant effects were found, despite being modest in

575 size. This should not be surprising if we recall that our aim was to change a very

576 complex behaviour that is influenced by a myriad of different factors, through a

577 minimal and very brief intervention consisting of a single exposure to differently

578 framed health messages. Moreover, the comparisons established are not between an

579 intervention and a non-intervention control group; the effect of a congruent and

580 incongruent message is being contrasted, which although theoretically less effective for

581 a specific audience segment, provides, nonetheless, persuasive information for changing

582 fruit and vegetable intake. Thus, despite their relatively modest size, these effects may

583 still be considered important effect sizes. From an epidemiological point of view, small

584 effects in a risk factor among a large group of people tend to lead to considerable and

585 meaningful changes at a population level (Rose, 1992).

586   To conclude, characteristics of the message recipient, rather than aspects of the

587 health behaviour, were found to be relevant for the choice of frame in messages aiming

588 to promote the increase of fruit and vegetable intake. In particular, when targeting

589 prevention-focused individuals, a loss-frame is recommended. The pronounced framing

590 effect for prevention focused individuals is attributed to the relevance of these

591 individuals' disposition in a collectivist culture, and highlights the importance of

592 considering the individual´s cultural background when evaluating the effects of message

593 framing in health behaviour change. Moreover, the finding that for individuals already

594 holding an intention to change, a loss-framed message is more effective, proved to be

595 the most innovative result, and has practical implications for the targeting of health

596 messages according to the individual´s readiness for change.

597

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770   Appendix A.

771   *Outcomes related to eating (or not) the recommended amount of FV referred in each*

772   *message frame type.*

773

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.

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