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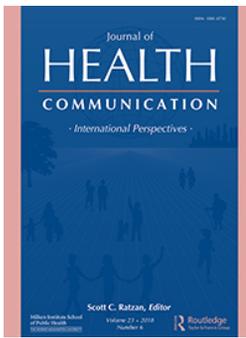
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Reading or Listening to a Gain- or Loss-Framed Health Message: Effects of Message Framing and Communication Mode in the Context of Fruit and Vegetable Intake

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Gain-framed health messages are found to be more effective when targeting prevention behaviors. However, framing research has only minimally investigated the role of communication mode, another important factor in health communication. This study explored the role of communication mode in interaction with message framing, and the influence of two individual differences related to involvement as conditions under which gain framing can lead to health behavior change. Participants ($N = 258$) were exposed to either an auditory or written health message concerning fruit and vegetable intake, with either gain- or loss-framed arguments. In addition, the online experiment consisted of baseline and posttest measures, among which intention to consume sufficient fruit and vegetables. Moderating effects of perceived baseline fruit and vegetable consumption and baseline intention were assessed. A significant interaction between message framing and communication mode was observed: In case of a gain-framed message, an auditory message resulted in a higher intention than a written message. This pattern was most explicitly found among those with a lower perceived fruit and vegetable intake at baseline. Although further research is warranted in health persuasion research, the findings can possibly be used to target health interventions better at specific groups of people who behave less healthy.

Insufficient fruit and vegetable intake has been documented worldwide, referring to an intake lower than the recommended amount of at least five servings a day (Hall, Moore, Harper, & Lynch, 2009). Although limited availability and accessibility might partially contribute to this insufficient intake in at least some parts of the world, psychological factors such as personal preferences and knowledge on the health benefits of fruit and vegetables also play a role (Brug, Debie, van Assema, & Weijts, 1995). Interventions targeting such psychological factors might help to increase fruit and vegetable consumption. For instance, it can be useful to develop effective persuasive health messages.

The content of such health messages can vary in terms of valence, that is, it can communicate positive or negative outcomes. Based on regulatory focus theory (Higgins, 1997), a distinction can be made between four types of messages (Dijkstra, Rothman, & Pietersma, 2011). On the one hand, messages with a positive valence

can mention the gains or the non-losses that are associated with the proposed behavior. For instance, eating sufficient fruit and vegetables can gain good health, or it can be said not to lead to poor health (gain vs. non-loss). On the other hand, messages with a negative valence can indicate the losses or the non-gains associated with the behavior. That is, eating insufficient fruit and vegetables can lead to a worse health (loss) or it can be said not to lead to an improved health (non-gain). Overall, messages including gains and losses, indicating the presence of an outcome, are considered to be more persuasive compared to messages including non-losses or non-gains, indicating the absence of an outcome (Dijkstra et al., 2011).

Conclusions with regard to the effectiveness of these gain- and loss-framed health messages largely differ (Akl et al., 2011; Gallagher & Updegraff, 2012; Latimer, Brawley, & Bassett, 2010; Rothman & Salovey, 1997). The function of the target behavior, either preventing or detecting health problems, can potentially influence the effects of message framing. That is, gain-framed messages are found to be more effective in case of prevention behaviors such as fruit and vegetable intake (Gallagher & Updegraff, 2012; Rothman, Bartels, Wlaschin, & Salovey, 2006; Rothman & Salovey, 1997), whereas loss-framed messages are more likely to be effective for detection behaviors such as breast self-examination (Meyerowitz & Chaiken, 1987; Rothman & Salovey, 1997). On the one hand, gain-framed messages may induce a state of risk-averseness. Prevention behaviors are usually considered safe, making people more willing to engage in this behavior to maintain health and minimize health risks (prospect theory; Tversky & Kahneman, 1981). On the other hand, loss-

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framed messages may make people more likely to accept the risks that are associated with a detection behavior.

Based on this, a gain-framed message about fruit and vegetable intake will likely lead to higher intentions than a loss-framed message, although the use of prospect theory to understand message framing effects is criticized (e.g., Van 't Riet et al., 2016). For instance, inconsistencies are found across health domains: the effectiveness of gain-framed messages has been confirmed in the domain of physical activity (Latimer et al., 2010) and smoking cessation (Toll et al., 2007), but it is not yet well established for prevention behaviors concerning diet and nutrition (O'Keefe & Jensen, 2007). Reverse effects are also found (for instance, in case of treatment messages; Akl et al., 2011) and the effects for detection behaviors are smaller compared to the effects that have been found for prevention behaviors (Gallagher & Updegraff, 2012).

In addition to function of the target behavior, the communication mode through which the message is delivered is currently an overlooked but other relevant factor that can serve as a condition under which message framing can have effects (Pența & Băban, 2017). The role of communication mode deserves attention due to increasing technology resulting in the delivery of health messages in various ways (Tuong, Larsen, & Armstrong, 2014), but has not yet been well elucidated, at least in the context of health persuasion. That is, contradictory findings are reported when the effects of communication mode on message persuasiveness or behavioral intentions are studied (Braverman, 2008; Elbert, Dijkstra, & Oenema, 2016; Soetens, Vandelandotte, De Vries, & Mummery, 2014; Stanczyk et al., 2014). In these studies, a distinction is often made between the written, auditory, and audiovisual mode. While some studies suggest that there are no differences between the modes with regard to behavioral outcomes (Soetens et al., 2014), others suggest that informational *written* messages are more persuasive than informational *auditory* messages (Braverman, 2008).

Furthermore, there is evidence in favor of audio-tailored messages (Elbert et al., 2016) and video-tailored interventions (Stanczyk et al., 2014) to stimulate prevention behaviors. This is in line with findings from other domains such as (tele-)marketing and interpersonal communication, showing that audiovisual messages might adopt a warmer communication style compared to written messages (Pfau, Holbert, Zubric, Pasha, & Lin, 2000). In addition, auditory messages might lead to more feelings of trust and cooperation and increased feelings of social proximity and salience: the information can be perceived as more direct and personal (Chaiken & Eagly, 1983; Jensen, Farnham, Drucker, & Kollock, 2000). Finally, in auditory messages, the mental representation of the content may be more clear by the addition of nonverbal information; voice characteristics can enhance the clarity of the message by emphasizing certain phrases or words that support the listener in how to understand the message (Elbert & Dijkstra, 2014; Nolan, 2006). This can all possibly work as a peripheral cue enhancing the effectiveness of audiovisual messages (Petty & Cacioppo, 1986).

While there is some research on the effectiveness on health messages being dependent upon communication mode directly, these effects are not well established yet in relation to message framing. One study found message framing effects to be

independent of communication mode (Schneider et al., 2001), and another study suggested that audiovisual positively framed messages induce the highest motivation to comply with recommendations from a health message (Lee & Cameron, 2017). The higher persuasiveness of the auditory gain-framed message might be explained by a combination of perspectives on framing and communication mode: Pointing out the positive consequences of performing a behavior might lead to more positive attitudes and lower defensiveness (Lee & Cameron, 2017), and the specific features of auditory messages can make the outcomes of the message more clear and salient and more directly aimed at the recipient (Pfau et al., 2000).

Finally, the effectiveness of message framing can be influenced by individual differences of message recipients (Covey, 2014). Individuals with low issue-involvement have been found to be more easily persuaded by positively framed messages (Maheswaran & Meyers-Levy, 1990). Individuals' intentions and their perceived consumption of fruit and vegetables at baseline may be an indicator of involvement with the topic, and can possibly affect the persuasiveness of framed messages. Loss-framed messages have been found to be more effective among those with a higher baseline intention (Godinho, Alvarez, & Lima, 2016), and there is some initial evidence that gain-framed messages are especially effective for those with a low baseline consumption (Gerend & Shepherd, 2016). Overall, the effects of indicators of involvement in relation to message framing are still somewhat ambiguous (De Bruijn, Visscher, & Mollen, 2015; Gerend & Shepherd, 2016) and have not been investigated in interaction with communication mode through which a message is presented. Yet, based on the available evidence, it can initially be expected that gain-framed messages are especially effective for people with a lower baseline consumption or intention, and it seems valuable to explore these effects in interaction with communication mode as well.

The present study will therefore focus on the effects of message framing and the mode of communication when targeting fruit and vegetable intake, while taking into account an individual difference (two indicators of issue-involvement). The aim of the study is to increase our knowledge on message framing and the different conditions under which gain- and loss-framed messages can lead to health behavior change. First, it is hypothesized that a gain-framed message will lead to higher intentions compared to a loss-framed message (H1). Second, it is expected that an auditory health message will lead to higher intentions compared to a written message (H2). Third, we expect that a gain-framed message will lead to higher intentions when it is presented as an auditory message (H3) and finally, the moderating effect of indicators of issue-involvement (perceived baseline consumption and baseline intention) will be taken into account. It is initially expected that the interaction effect will be most explicitly found among those with a lower perceived fruit and vegetable consumption (lower intention) at baseline (H4).

Method

Recruitment and Design

In the present study, the use of message framing (gain vs. loss) and communication mode (textual vs. auditory) was investigated in a

2 × 2 between-participants design.¹ The study consisted of an online questionnaire (created with the program Qualtrics), including three parts: baseline measures, a manipulation, and posttest measures. The majority of the participants (96%) was approached via online newsletters of health-related websites (such as Gezond Nu) and via messages on Facebook-pages related to health and associated topics (such as the Netherlands Nutrition Centre and Psychology Magazine). Participants who completed the study had a chance to win 1 of 30 €10 gift cards. The remaining 4% of the participants were students from the university participant pool and received credits upon their participation.

Procedure

By clicking on the link, participants were directed to the online questionnaire. A short introduction was provided and participants were asked for their informed consent. When the participants agreed to participate, they were presented with the baseline measures. Subsequently, participants were randomly assigned to a condition in which the (gain- or loss-framed) health message was presented either as a textual or auditory message. To guarantee that the level of the volume of the auditory message was sufficient and convenient, a sound test was offered before the participants were exposed to the actual health message. Participants were then asked to listen to the health message or read the presented health message. The time spent on the page was assessed to indicate to what extent participants were exposed to the message. Posttest questions represented manipulation checks, the intention to eat more fruit and vegetables as our main dependent variable, and several process measures. The study lasted about 15 minutes and when the participants completed all questions, a debriefing was presented. Finally, the participants were asked for their e-mail addresses used for sending the results of the study and to be able to distribute the gift cards.

The Persuasive Message

In the present study, a gain- and a loss-framed messages were used (Appendix A). The messages were similar in content and only differed regarding the framing of the arguments. The gain-framed message (237 words) included the positive outcomes of consuming sufficient fruit and vegetables (e.g., it would lower the risk of cardiovascular diseases), whereas the loss-framed message (242 words) mentioned the negative outcomes of consuming insufficient fruit and vegetables (e.g., it is related to an increased risk of cardiovascular diseases). Both the auditory and the written messages were adopted from previous research (Elbert & Dijkstra, 2014, 2015). The average duration of the audiotapes was 1 minute and 48 seconds. The messages were recorded in collaboration with a professional recording studio, in which the actors were asked to read the health messages in a neutral way, like a professional newsreader. The voices were selected for their neutral sound and did not contain potentially disturbing elements.

¹Originally, participants either listened to a male or female voice. However, we did not find any relevant effects of gender on intention, and therefore we decided to drop this factor.

Measures

The first part of the study consisted of questions regarding the demographic status of the participants (age, gender, and cultural background). Subsequently, educational level of the participants was enquired and answer categories were merged into low, medium, and high level of education. Next, perceived own health status was assessed with an item referring to the extent to which participants considered themselves as healthy (based on CBS, 2013). This item could be answered on a six-point scale varying from 'very good' [1] to 'very poor' [6] and was recoded for the sake of interpretation.

Participants were asked about the intention to consume a sufficient amount of fruit and vegetables in the next month based on two questions. The first question was 'How much do you plan to ...' and the second question was 'How likely is it that ...'. Both response scales varied from 'not at all planning to ...' or 'not at all likely to ...' [1] to 'very much planning to ...' or 'very likely to ...' [7] and a composite measurement was created that represented baseline intention ($r = .80, p < .05$). Next, the perceived fruit and vegetable consumption of the participants was measured using a response scale varying from 'too little' [1] to 'more than sufficient' [6]. Finally, several other baseline questions not relevant to the current study were administered.

After exposure to the health message, posttest questions were presented. Two questions were included to ensure the validity of the message framing manipulation. Participants were asked to what extent the message included positive arguments and to what extent the message included negative arguments to consume sufficient fruit and vegetables. Both answers were given on a nine-point scale ranging from 'not at all ...' [1] to 'a lot of ...' [9]. Furthermore, the overall comprehensibility of the health message was assessed by asking the participants whether they had understood the message. Answers could be given on a five-point scale varying from 'yes, totally' [1] to 'no, not at all' [5].

Next, participants were asked for their intention to eat a sufficient amount of fruit and vegetables in the next month, representing our main dependent variable. Four questions varying from 'no, not at all' [1] to 'very much' [9] were combined into a mean score ($\alpha = .95$). These questions included 'How strong are you planning to ...?', 'How likely is it that ...?', 'Do you think you will eat a sufficient amount of fruit and vegetables in the next month?' and 'Are you willing to eat a sufficient amount of fruit and vegetables in the next month?'

Additionally, eight single-item questions assessed several process measures regarding the extent to which participants could imagine the consequences of low fruit and vegetable consumption: how clear, lively, and emotional this mental representation was; the credibility of the message; the extent to which participants could identify themselves with the messenger; the overall persuasiveness of the message; and the extent to which participants worried about the content of the message. All answers could be given on five-point scales ranging from 'not at all ...' [1] to 'very much ...' [5].

Statistical Analyses

First, randomization and attrition analyses were performed. Moreover, the validity of the message framing was assessed

with a one-way analysis of variance. To assess the effect of message framing and communication mode, a one-way analysis of covariance was used (with message framing and communication mode as independent variables and posttest intention as a dependent variable). Baseline intention, perceived baseline fruit and vegetable consumption, and self-reported health status were added as covariates as they are likely to be conceptually related to the outcome measure. In addition, the interactions between framing, communication mode, and the proposed moderators perceived fruit and vegetable intake at baseline and intention at baseline were tested. To interpret the latter interaction effect, perceived intake of fruit and vegetables was modeled to a 'high' and 'low' group that were formed by adding and subtracting one standard deviation from the standardized mean scores on this measure (Cohen, Cohen, West, & Aiken, 2003).

Results

Participants and Randomization Check

In total, 311 participants completed the study.² The extent to which people were exposed to the message was observed, and we excluded participants that took less than 25% of the time to listen to the original audio fragment ($n = 22$) or participants that took less than 25% of the time expected for reading the fragment (based on the average reading speed of 250 words per minute in Dutch language (Gibson & Levin, 1975) ($n = 12$)).³ Furthermore, possible duplicates based on IP address were removed ($n = 19$). Finally, 258 participants were included for further analyses. The sample consisted mostly of highly educated (77.5%), Dutch (93.8%), and female (84.5%) participants, with an age ranging from 17 to 75 years ($M = 35.56$, $SD = 16.62$). Attrition analyses showed that those included in the analyses did not differ significantly from those who were not included. The sample is further described in terms of demographic and self-reported health variables in Table 1.

The participants were randomly distributed over the conditions: gain framing/textual health message ($n = 74$); gain framing/auditory health message ($n = 45$); loss framing/textual health message ($n = 57$); loss framing/auditory health message ($n = 82$). No significant differences between the conditions were found on baseline measures such as gender ($\chi^2(3) = 5.99$, $p = .11$), cultural background ($\chi^2(12) = 15.87$, $p = .20$), educational level ($\chi^2(18) = 11.48$, $p = .87$), age ($p = .35$), perceived fruit and vegetable consumption ($p = .80$), perceived health status ($p = .09$), and baseline intention ($p = .82$).

Manipulation Check

A manipulation check was included to ensure the validity of the message framing. As expected, participants in the gain-framed

Table 1. Demographic and self-reported health variables of the sample ($n = 258$).

Demographic variables	
Age (years) ^a	35.6 (16.6)
Gender ^b	
Male	40 (15.5)
Female	218 (84.5)
Nationality ^b	
Dutch	242 (93.8)
Belgian	1 (0.4)
German	11 (4.3)
Other (European)	2 (0.8)
Other (non-European)	2 (0.8)
Level of education ^b	
Low (primary education, lower level secondary school, lower vocational education)	9 (3.6)
Medium (middle-level secondary school, intermediate vocational education)	47 (13.9)
High (higher-level secondary school, higher vocational education, university)	192 (77.5)
Self-reported health variables	
Perceived own health status ^a	4.79 (0.84)
Dieting status ^b	
Yes	30 (11.6)
No	228 (88.4)
Having a chronic disease ^b	
Yes	83 (32.2)
No	175 (67.8)
Baseline intention ^a	5.87 (1.19)
Perceived fruit and vegetable intake ^a	3.74 (0.86)
Vitamin supplements intake ^b	
No, never	108 (41.9)
Yes, sometimes	100 (38.8)
Yes, always	50 (19.4)
Self-efficacy ^a	4.33 (0.55)

^aValues are means with standard deviation in parentheses.

^bValues are numbers of the sample with valid % in parentheses. Regarding educational level, data were missing of 10 participants ($n = 248$).

message condition perceived the arguments as significantly more positive compared to participants in the loss-framed message condition; $F(1, 256) = 16.14$, $p < .001$, $\eta_p^2 = .06$ ($M = 7.84$, $SE = 0.15$ vs. $M = 7.03$, $SE = 0.14$). Likewise, participants in the loss-framed message condition perceived the arguments as significantly more negative compared to participants in the gain-framed message condition; $F(1, 256) = 25.55$, $p < .001$, $\eta_p^2 = .09$ ($M = 2.29$, $SE = 0.21$ vs. $M = 3.73$, $SE = 0.19$). Therefore, the manipulation of message framing seemed to be successful. Finally, the overall comprehensibility of the message was rated as relatively positive ($M = 1.47$, $SD = .89$). This illustrates that our message was suitable for the current study's purpose.

Effects on Intention

First, the main effect of framing on intention was not significant (H1); $F(1, 251) < 1$, $p = .752$, $\eta_p^2 = .00$, with the following means; gain-framed message: $M = 7.63$, $SE = 0.07$ vs. loss-framed message: $M = 7.60$, $SE = 0.06$. The main effect of

²A total of 433 people clicked on the distributed link, of whom 118 did not complete the study and for 4 respondents, the time being exposed to the manipulation could not be retrieved.

³When looking at the main analyses on intention, using a more strict 50% cutoff score ($n = 236$) resulted in similar F - and p -values and did not alter the interpretation of our findings.

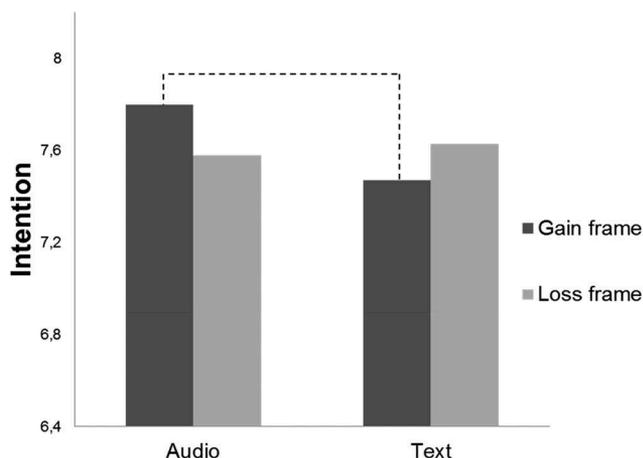


Fig. 1. The interaction between framing and communication mode, controlled for baseline intention, baseline consumption, and self-reported health status.

communication mode was not significant either (H2): $F(1, 251) = 2.50, p = .115, \eta_p^2 = .01$. The means were as follows: text message: $M = 7.69, SE = 0.06$ vs. auditory message: $M = 7.55, SE = 0.07$.

However, a significant interaction was found between message framing and communication mode (H3); $F(1, 251) = 4.39, p = .037, \eta_p^2 = .02$. The mean scores were as follows (as graphically displayed in Figure 1): gain-framed text message: $M = 7.47, SE = 0.11$; loss-framed text message: $M = 7.63, SE = 0.09$; gain-framed auditory message: $M = 7.80, SE = 0.08$; loss-framed auditory message: $M = 7.58, SE = 0.08$. *Post hoc* analyses showed that intention was significantly higher after being exposed to the gain-framed auditory message compared to the gain-framed textual message ($p = .014$), and marginally significantly higher than the loss-framed auditory message ($p = .056$).

Moderation Analyses⁴

A significant three-way interaction was found between message framing, communication mode, and perceived fruit and vegetable consumption at baseline (H4); $F(1, 248) = 6.00, p = .015, \eta_p^2 = .02$. Figure 2 displays the means in the conditions for people with low and high perceived fruit and vegetable consumption. In case of low perceived fruit and vegetable consumption, the interaction between message framing and communication mode was significant: $F(1, 248) = 10.72, p = .001, \eta_p^2 = .04$. The mean scores reflecting intention were as follows: gain-framed text message: $M = 6.76$; loss-framed text message: $M = 7.21$; gain-framed auditory message: $M = 7.56$; loss-framed auditory message; $M = 7.18$.

⁴Besides perceived baseline consumption and baseline intention, participants were asked to which extent their own health status was important to them to measure issue-involvement. Answer categories ranged from 'not very important' [1] to 'very important' [7]. The three-way interaction between message framing, communication mode, and issue-involvement was not significant: $F(1, 247) = 2.09, p = .150, \eta_p^2 = .00$.

Post hoc contrasts showed that intention after being exposed to the auditory gain-framed message for this group was significantly higher compared to the gain-framed textual message ($p < .001$) and the loss-framed auditory message ($p = .018$). It was marginally significantly higher than the loss-framed textual message ($p = .052$). In addition, intention was significantly lower after being exposed to the gain-framed text message than the loss-framed text message ($p = .022$) and the loss-framed auditory message ($p = .024$). This means that the pattern of the interaction between message framing and communication mode was most explicitly found in the group perceiving the own fruit and vegetable intake as insufficient.

In case of high perceived fruit and vegetable consumption, the interaction between message framing and communication mode became nonsignificant; $F(1, 248) < 1, p = .883, \eta_p^2 = .00$. The means were all relatively high: gain-framed text message: $M = 8.14$; loss-framed text message: $M = 8.03$; gain-framed auditory message: $M = 8.05$; loss-framed auditory message; $M = 7.99$.

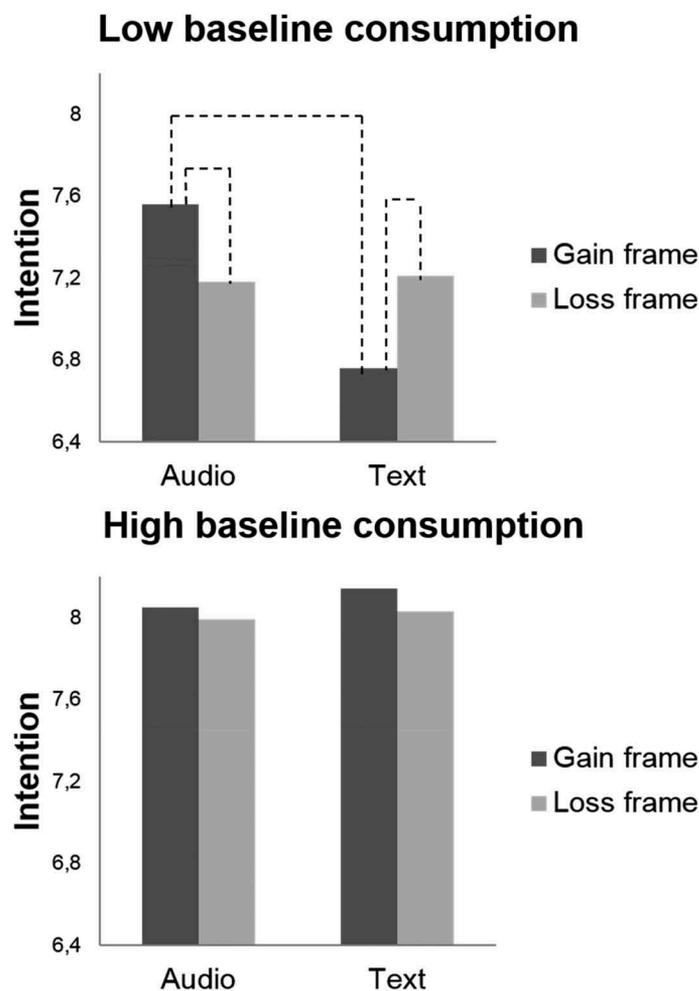


Fig. 2. The interaction between framing and communication mode, controlled for baseline intention and self-reported health status, moderated by baseline consumption.

In the saturated model including baseline fruit and vegetable consumption, the two-way interaction between communication mode and message framing was still significant; $F(1, 248) = 4.94, p = .027, \eta_p^2 = .02$. Moreover, the main effect of communication mode was marginally significant ($F(1, 248) = 3.01, p = .084, \eta_p^2 = .01$), showing that *listening* to a message ($M = 7.69, SE = 0.06$) yielded a higher intention than *reading* a health message ($M = 7.54, SE = 0.07$), which was found in case of lower baseline consumption as well ($F(1, 248) = 8.84, p = .003, \eta_p^2 = .03$).

Additionally, the effect of another potential moderator was tested, referring to the baseline intention to increase fruit and vegetable intake. Similar effects were found; the three-way interaction between message framing, communication mode, and baseline intention was significant; $F(1, 248) = 5.44, p = .020, \eta_p^2 = .02$. Moreover, the same pattern as reflected in the moderation of perceived fruit and vegetable intake was found, showing that especially people with a lower baseline intention are affected by message framing and communication mode ($F(1, 248) = 10.57, p = .001, \eta_p^2 = .04$).

Besides testing the effects on intention, we also analyzed the effects of message framing and communication mode on the process measures. No significant effects were found, except for a significant difference between a gain-framed ($M = 5.14, SD = 1.43$) and loss-framed message ($M = 4.73, SD = 1.74$) regarding the extent to which participants could identify themselves with the messenger ($F(1, 254) = 3.91, p < .05, \eta_p^2 = .02$).

Discussion

In the present study, the effects of message framing and communication mode on the intention to consume a sufficient amount of fruit and vegetables were assessed. There were no significant main effects for both message framing and communication mode (H1 and H2). However, a significant interaction was found, showing that a gain-framed auditory message led to a higher intention than a gain-framed written message (H3). In addition, this pattern was most explicitly found in people with a lower perceived fruit and vegetable intake (or a lower intention) at baseline, compared to those with a higher baseline intake or intention (H4).

Our results first suggest that communication mode played a role in message framing effects, showing a difference between an auditory and a written message being conditional upon the message frame. More specifically, when a message was presented in terms of gains, an auditory message resulted in a higher intention than a written message. Similar effects with regard to a loss-framed message were not found. This is in line with findings from a recent study showing that the combination of an auditory gain-framed message was most effective (Lee & Cameron, 2017). This can possibly be explained by the fact that a gain-framed auditory message generates more positive associations than a gain-framed written message (Jensen et al., 2000; Pfau et al., 2000) and can lead to more clear and salient outcomes of the message through the unique characteristics of auditory communication (Pfau et al., 2000). These positive associations might increase the persuasiveness of the message, possibly through heuristic processing (Petty & Cacioppo, 1986). In the current study, we were however not able to detect any

differences with regard to the process measures, that, among others, evaluated whether the auditory message was perceived as being more lively, emotional, and credible. Further research should therefore focus on the underlying mechanisms of the current findings.

In addition, our results revealed a significant moderation effect of perceived fruit and vegetable consumption and intention at baseline. Especially among those with a low baseline consumption or intention, auditory gain-framed messages resulted in the highest intention. Although issue-involvement itself was not found to moderate the effects, perceived baseline consumption and baseline intention were used as indicators of issue-involvement. That is, individuals with a low baseline consumption or intention were expected to be less involved with the topic and were therefore expected to be more easily persuaded by the gain-framed message. It might be that these more implicit indicators of involvement are more exactly tapping into the individual difference relating to involvement. Although not with auditory messages, previous studies have confirmed that, especially for those with low issue-involvement and low baseline consumption, gain-framed messages are more persuasive (Gerend & Shepherd, 2016; Maheswaran & Meyers-Levy, 1990). In addition, studies have reported higher fruit consumption after being exposed to a positive frame for participants with a higher perceived fruit intake at baseline (De Bruijn et al., 2015), while others showed that loss-framed messages resulted in higher fruit and vegetable intake when baseline intentions were higher (Godinho et al., 2016). To the best of our knowledge, this is the first study to explore the moderating effects of baseline consumption and intention in relation to both message framing and communication mode. Overall, the current study contributed to the body of evidence regarding the interaction between message framing and communication mode, while taking into account an important individual difference.

Unexpectedly, a written loss-framed message resulted in a higher behavioral intention than a gain-framed written message for those with a low baseline consumption. It has been proposed that messages about the negative consequences of one's behavior can induce feelings of self-threat (Van 't Riet & Ruiters, 2013) that may especially be present for auditory messages, because these are found to be more salient to the recipient (Chaiken & Eagly, 1983). In case of a *written* message, positive auditory features of the message are absent, but it might be that the current written loss-framed message did not induce a sufficiently high level of threat to lead to a lower intention as a defensive response. Therefore, further research should investigate the role of perceived threat and different thresholds under which threat can lead to higher or lower intentions, especially in the perspective of message framing and communication mode effects.

Besides focusing on the underlying mechanisms of the effects as found in the current study, future research could distinguish between various types of message framing. In the current study, only gain- and loss-framed messages were used, since these are supposedly more effective than their non-gain and non-loss counterparts (Dijkstra et al., 2011). Further research could investigate whether a combination of both positive and negative message framing is equally effective. Moreover, studies could investigate whether the effect of *perceived* consumption of fruit and vegetables can be replicated when baseline consumption is

conceptualized in terms of actual intake (e.g., De Bruijn et al., 2015). In addition, studies can investigate whether other indicators of involvement show similar effects in interaction with message framing and communication mode, and other moderators such as approach and avoidance orientation could be taken into account (Covey, 2014; Sherman, Mann, & Updegraff, 2006). Finally, it would be interesting to replicate this study in a community sample while including socioeconomic status as a moderator variable. Regarding the outcome measure, further research could investigate whether the findings can be replicated on behavior, attitudes, and knowledge, although the use of intention seems appropriate given the exploratory nature of our study.

Overall, the current study helped to broaden our view on the effectiveness of message framing and increased our knowledge about the conditions under which message framing can be effective. The results suggested that a gain-framed auditory message is most effective, especially in people who perceive their own fruit and vegetable intake as low or have a low baseline intention. In practice, this means that when people perceive their own fruit and vegetable intake as low or have a low intention to change, it is especially important to consider effects of message framing and communication mode. For people who perceived that they are already performing the behavior sufficiently, it does not seem to matter which message they are exposed to. These findings need to be further investigated and more knowledge on the underlying mechanisms is necessary to be translated to policy or intervention recommendations. Especially vulnerable groups of individuals associated with less healthy behavior should be the target of future research and health interventions as they could potentially benefit from the use of auditory gain-framed health messages.

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References

- Akl, E. A., Oxman, A. D., Herrin, J., Vist, G. E., Terrenato, I., Sperati, F., ... Schünemann, H. (2011). Framing of health information messages. *The Cochrane Library Systems Reviews*, (12). doi:10.1002/14651858.CD006777.pub2
- Braverman, J. (2008). Testimonials versus informational persuasive messages: The moderating effect of delivery mode and personal involvement. *Communication Research*, 35(5), 666–694. doi:10.1177/0093650208321785
- Brug, J., Debie, S., Van Assema, P., & Weijts, W. (1995). Psychosocial determinants of fruit and vegetable consumption among adults: Results of focus group interviews. *Food Quality and Preference*, 6(2), 99–107. doi:10.1016/0950-3293(95)98554-V
- Centraal Bureau voor de Statistiek (CBS, 2013). Begrippen - Ervaren gezondheid (Definitions - Experienced health). Retrieved June, 14, 2017 from <http://www.cbs.nl>.
- Chaiken, S., & Eagly, A. H. (1983). Communication modality as a determinant of persuasion: The role of communicator salience. *Journal of Personality and Social Psychology*, 45(2), 241–256. doi:10.1037/0022-3514.45.2.241
- Cohen, J., Cohen, P., West, S. G., & Aiken, L. S. (2003). *Applied multiple regression correlation analyses for the behavioral sciences*. Mahwah, NJ: Lawrence Erlbaum.
- Covey, J. (2014). The role of dispositional factors in moderating message framing effects. *Health Psychology*, 33(1), 52–65. doi:10.1037/a0029305
- De Bruijn, G. J., Visscher, I., & Mollen, S. (2015). Effects of previous fruit intake, descriptivemajority norms, and message framing on fruit intake intentions and behaviors in Dutch adults across a 1-week period. *Journal of Nutrition Education and Behavior*, 47(3), 234–241. doi:10.1016/j.jneb.2015.02.001
- Dijkstra, A., Rothman, A., & Pietersma, S. (2011). The persuasive effects of framing messages on fruit and vegetable consumption according to regulatory focus theory. *Psychology & Health*, 26(8), 1036–1048. doi:10.1080/08870446.2010.526715
- Elbert, S. P., & Dijkstra, A. (2014). An experimental test of the relationship between voice intonation and persuasion in the domain of health. *Psychology & Health*, 29(9), 1014–1031. doi:10.1080/08870446.2014.903482
- Elbert, S. P., & Dijkstra, A. (2015). Source reliability in auditory health persuasion: Its antecedents and consequences. *Journal of Applied Biobehavioral Research*, 20(4), 211–228. doi:10.1111/jabr.12038
- Elbert, S. P., Dijkstra, A., & Oenema, A. (2016). A mobile phone app intervention targeting fruit and vegetable consumption: The efficacy of textual and auditory tailored health information tested in a randomized controlled trial. *Journal of Medical Internet Research*, 18(6). doi:10.2196/jmir.5056
- Gallagher, K. M., & Updegraff, J. A. (2012). Health message framing effects on attitudes, intentions, and behavior: A meta-analytic review. *Annals of Behavioral Medicine*, 43(1), 101–116. doi:10.1007/s12160-011-9308-7
- Gerend, M. A., & Shepherd, M. A. (2016). When different message frames motivate different routes to the same health outcome. *Annals of Behavioral Medicine*, 50(2), 319–329. doi:10.1007/s12160-015-9757-5
- Gibson, E. J., & Levin, H. (1975). *The psychology of reading*. Cambridge, Mass: MIT press.
- Godinho, C. A., Alvarez, M. J., & Lima, M. L. (2016). Emphasizing the losses or the gains: Comparing situational and individual moderators of framed messages to promote fruit and vegetable intake. *Appetite*, 96, 416–425. doi:10.1016/j.appet.2015.10.001
- Hall, J. N., Moore, S., Harper, S. B., & Lynch, J. W. (2009). Global variability in fruit and vegetable consumption. *American Journal of Preventive Medicine*, 36(5), 402–409. doi:10.1016/j.amepre.2009.01.029
- Higgins, E. T. (1997). Beyond pleasure and pain. *American Psychologist*, 52(12), 1280–1300. doi:10.1037/0003-066X.52.12.1280
- Jensen, C., Farnham, S. D., Drucker, S. M., & Kollock, P. (2000). The effect of communication modality on cooperation in online environments. In Proceedings of the SIGCHI conference on Human Factors in Computing Systems 470–477. ACM. doi: 10.1145/332040.332478
- Latimer, A. E., Brawley, L. R., & Bassett, R. L. (2010). A systematic review of three approaches for constructing physical activity messages: What messages work and what improvements are needed? *International Journal of Behavioral Nutrition and Physical Activity*, 7(1), 36. doi:10.1186/1479-5868-7-36
- Lee, H., & Cameron, G. T. (2017). Utilizing audiovisual and gain-framed messages to attenuate psychological reactance toward weight management health messages. *Health Communication*, 32(1), 72–81. doi:10.1080/10410236.2015.1099506
- Maheswaran, D., & Meyers-Levy, J. (1990). The influence of message framing and issue involvement. *Journal of Marketing Research*, 361–367. doi:10.2307/3172593
- Meyerowitz, B. E., & Chaiken, S. (1987). The effect of message framing on breast self-examination attitudes, intentions, and behavior. *Journal of Personality and Social Psychology*, 52(3), 500. doi:10.1037/0022-3514.52.3.500
- Nolan, F. (2006). Intonation. In B. Aarts & A. McMahon (Eds.), *Handbook of English Linguistics* (pp. 433–459). Oxford, UK: Blackwell Publishing Ltd. doi:10.1002/9780470753002.ch19
- O’Keefe, D. J., & Jensen, J. D. (2007). The relative persuasiveness of gain-framed loss framed messages for encouraging disease prevention

- behaviors: A meta-analytic review. *Journal of Health Communication*, 12(7), 623–644. doi:10.1080/10810730701615198
- Pența, M. A., & Băban, A. (2017). Message framing in vaccine communication: A systematic review of published literature. *Health Communication*, 1–16. doi:10.1080/10410236.2016.1266574
- Petty, R. E., & Cacioppo, J. T. (1986). The elaboration likelihood model of persuasion. *Advances in Experimental Social Psychology*, 19, 123–205. doi:10.1016/S0065-2601(08)60214-2
- Pfau, M., Holbert, R. L., Zubric, S. J., Pasha, N. H., & Lin, W.-K. (2000). Role and influence of communication modality in the process of resistance to persuasion. *Media Psychology*, 2, 1–33. doi:10.1207/S1532785XMEP0201_1
- Rothman, A. J., Bartels, R. D., Wlaschin, J., & Salovey, P. (2006). The strategic use of gain-and loss-framed messages to promote healthy behavior: How theory can inform practice. *Journal of Communication*, 56(1), S202–S220. doi:10.1111/j.1460-2466.2006.00290.x
- Rothman, A. J., & Salovey, P. (1997). Shaping perceptions to motivate healthy behavior: The role of message framing. *Psychological Bulletin*, 121(1), 3–19. doi:10.1037/0033-2909.121.1.3
- Schneider, T. R., Salovey, P., Pallonen, U., Mundorf, N., Smith, N. F., & Steward, W. T. (2001). Visual and auditory message framing effects on tobacco smoking. *Journal of Applied Social Psychology*, 31(4), 667–682. doi:10.1111/j.1559-1816.2001.tb01407.x
- Sherman, D. K., Mann, T., & Updegraff, J. A. (2006). Approach/avoidance motivation, message framing, and health behavior: Understanding the congruency effect. *Motivation and Emotion*, 30(2), 164–168. doi:10.1007/s11031-006-9001-5
- Soetens, K. C., Vandelanotte, C., De Vries, H., & Mummery, K. W. (2014). Using online computer tailoring to promote physical activity: A randomized trial of text, video, and combined intervention delivery modes. *Journal of Health Communication*, 19(12), 1377–1392. doi:10.1080/10810730.2014.894597
- Stanczyk, N., Bolman, C., Van Adrichem, M., Candel, M., Muris, J., & De Vries, H. (2014). Comparison of text and video computer-tailored interventions for smoking cessation: Randomized controlled trial. *Journal of Medical Internet Research*, 16(3), e69. doi:10.2196/jmir.3016
- Toll, B. A., O'malley, S. S., Katulak, N. A., Wu, R., Dubin, J. A., Latimer, A., ... Salovey, P. (2007). Comparing gain-and loss-framed messages for smoking cessation with sustained-release bupropion: A randomized controlled trial. *Psychology of Addictive Behaviors*, 21(4), 534. doi:10.1037/0893-164X.21.4.534
- Tuong, W., Larsen, E. R., & Armstrong, A. W. (2014). Videos to influence: A systematic review of effectiveness of video-based education in modifying health behaviors. *Journal of Behavioral Medicine*, 37(2), 218–233. doi:10.1007/s10865-012-9480-7
- Tversky, A., & Kahneman, D. (1981). The framing of decisions and the psychology of choice. *Science*, 211, 453–458. doi:10.1007/978-3-642-70634-9_6
- Van 't Riet, J., Cox, A. D., Cox, D., Zimet, G. D., De Bruijn, G., Van Den Putte, B., & Ruijter, R. A. C. (2016). Does perceived risk influence the effects of message framing? Revisiting the link between prospect theory and message framing. *Health Psychology Review*, 10, 447–459. doi:10.1080/17437199.2016.1176865
- Van 't Riet, J., & Ruiters, R. A. (2013). Defensive reactions to health-promoting information: An overview and implications for future research. *Health Psychology Review*, 7(sup1), S104–S136. doi:10.1080/17437199.2011.606782

Appendix A

The gain- and loss-framed health messages as translated from Dutch

Gain-framed message

What you eat affects how healthy you are. Especially eating sufficient vegetables and fruit contributes to good health. This appears from a study by the University of Maastricht from 2007. A diet with sufficient fruit and vegetables contains an adequate amount of vitamins and minerals. This leads to lower blood pressure and lower levels of cholesterol. Thus, eating sufficient fruit and vegetables leads to a smaller risk of cardiovascular disease. In addition, it leads to better physical fitness. Someone who regularly eats fruit and vegetables will get enough antioxidants, such as beta-carotene, vitamin C, and vitamin E. These elements play an important role in all processes in which oxygen is required, including physical activity. Furthermore, scientific research shows that consuming sufficient fruit and vegetables leads to a lower chance of cancer. This can partly be explained by antioxidants counteracting the effects of the so-called free radicals. That is also the reason why people look healthier when they eat sufficient fruit and vegetables: fewer free radicals means less aging and therefore a healthier skin and healthier hair. Moreover, in 2005, the University of Groningen conducted research into the relationship between fruit and vegetable consumption and concentration. This shows that students can concentrate more easily during mental efforts (such as exams) by consuming sufficient fruit and vegetables. These effects of fruit and vegetables are independent of genetic and environmental factors. (In Dutch: 237 words; in English: 228 words)

Loss-framed message

What you eat affects how healthy you are. Especially eating insufficient fruit and vegetables contributes to poor health. This appears from a study by the University of Maastricht in 2007. A diet with insufficient fruit and vegetables does not contain an adequate amount of vitamins and minerals. This leads to higher blood pressure and higher levels of cholesterol. Thus, eating insufficient fruit and vegetables leads to a greater risk of cardiovascular disease. In addition, it leads to worse physical fitness. Someone who eats insufficient fruit and vegetables will not get enough antioxidants, such as beta-carotene, vitamin C, and vitamin E. These elements play an important role in all processes in which oxygen is required, including physical activity. Furthermore, scientific research shows that consuming insufficient fruit and vegetables leads to a higher chance of cancer. This can partly be explained by antioxidants not counteracting the effects of the so-called free radicals. That is also the reason why people look less healthy when they eat insufficient fruit and vegetables: more free radicals means more aging and therefore an unhealthy skin and unhealthy hair. Moreover, in 2005, the University of Groningen conducted research into the relationship between fruit and vegetable consumption and concentration. This shows that students have more difficulty concentrating during mental exertion (such as exams) by consuming insufficient fruit and vegetables. These effects of fruit and vegetables are independent of genetic and environmental factors. (In Dutch: 242 words; in English: 233 words)