Auditory information and its parameters in health persuasion
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Chapter 7
Effects of tailoring ingredients on fruit and vegetable intake in auditory persuasion
Abstract

This experimental study focused on the effects of tailoring ingredients in health persuasion when the information is provided auditory. It is worthwhile to study this form of health persuasion as an increased use of MP3 and other auditory communication channels can be observed. Tailored messages might bring the health information closer to the self, and it is expected that recipients with poor or good perceived own health and low or high self-efficacy may respond differently to this threat. Three tailoring ingredients were tested separately and compared to a fourth condition with a generic health message (between-participants design). The tailoring ingredients tested are personalization (using the recipient’s first name), providing feedback (on the personal state), and adapting the message to the recipient’s value. The study consisted of three parts: 1) a pre-test; 2) exposure to the health message and an immediate post-test; 3) a follow-up measurement two weeks later that assessed respondents’ (N = 112) fruit and vegetable intake. The highest intention was found after listening to the health message with personal feedback, and this pattern was especially found in people with a poor perceived own health. For recipients with low self-efficacy at pre-test, tailoring did affect fruit and vegetable intake: After listening to the personalization message, fruit and vegetable intake was higher compared to the other conditions. No significant differences were found for recipients with high self-efficacy, but fruit and vegetable intake was the lowest after the personalization message. The results are discussed within the perspectives of self-regulatory defensiveness and effort investment. This study suggests that auditory forms of tailoring can affect behavior. It seems relevant to take into account individual differences in the development of auditory tailored health interventions.

Chapter 7 is based on Elbert, S.P., Dijkstra, A., & Rozema, A. (submitted). Effects of tailoring ingredients on fruit and vegetable intake in auditory persuasion.
Effects of tailoring ingredients on fruit and vegetable intake in auditory persuasion

To stimulate the adoption of healthy behaviors, it can be useful to tailor persuasive information to individual characteristics of the recipient (Dijkstra, 2005; Hawkins, Kreuter, Resnicow, Fishbein, & Dijkstra, 2008). Research suggests that tailored information can be more effective compared to non-tailored information (e.g., Dijkstra, 2005; Lustria et al., 2013; Noar, Benac, & Harris, 2007; Sutton & Gilbert, 2007). Until now, tailored health interventions are almost all delivered via the visual communication mode, in which recipients read the tailored information. To the best of our knowledge, computer-tailoring has not been investigated yet within the auditory mode of communication, while there is a potential value and reach of the auditory mode of communication. For instance, with technological advancements such as Audiobooks, smartphone applications and MP3-technology, persuasive texts can now also be delivered via an auditory mode in which recipients listen to the information. The auditory communication mode differs from visual forms of communication (e.g., written or pictorial) in some essential ways. For example, in auditory persuasion, the voice of the source is clearly imposed onto the recipient and the source can be perceived as salient, providing an enhanced sense of social proximity (Chaiken & Eagly, 1983; Jensen, Farnham, Drucker, & Kollock, 2000). In the current study, we aim to gain more understanding on the effects of tailoring ingredients when applied within the auditory mode of communication.

Tailoring is a ‘multidimensional communication strategy’ to develop individualized messages that can potentially lead to behavior change (Lustria et al., 2013). A tailored persuasive message typically includes one or multiple tailoring ingredients. These ingredients are the core aspects of tailored messages that target psychological processes which are not or to a lesser degree addressed by non-tailored messages. Three broad classes of tailoring ingredients can be distinguished (e.g., Dijkstra, 2005; 2008; Hawkins et al., 2008; Kreuter, Strecher, & Glassman, 1999): personalization, feedback, and adaptation.

First, personalization is the incorporation of one or more individual characteristics in a generic text, for example by stating: “Dear Alice, hereby we provide you with some new information on the outcomes related to insufficient fruit and vegetable consumption”. In this example the receiver’s first name, the personalization ingredient, is incorporated into a generic text. In personalization, the recipient is addressed explicitly. Second, it is possible to add individualized feedback about a certain attitude or behavior, such as medication adherence: “You indicated that you experience few difficulties with taking your medication, that is very good”. Feedback is also explicitly referring to the recipient.
Finally, adaptation or content matching refers to an adjustment of the content information (arguments, recommendations) in a way that it matches with relevant characteristics of the individual recipient. An adapted persuasive text for an adolescent on alcohol consumption might differ from a text aimed at older people, for instance by taking into account social aspects of drinking for adolescents. In adaptation, the recipient may not be aware that the information is designed for him or her personally. There is evidence available for the effectiveness of the three ingredients separately in textual messages (Cesario, Grant, & Higgins, 2004; Dijkstra, 2005; Oenema & Brug, 2003; Skinner, Strecher, & Hoshers, 1994), but not in auditory messages.

Investigating the tailoring ingredients might further increase understanding on the parts of the message that can be effective. In addition, different studies investigated why tailored messages can have beneficial effects on persuasion by looking at the underlying psychological processes involved (Hawkins et al., 2008; Kreuter, Bull, Clark, & Oswald, 1999). Most importantly, individually tailored information (including elements of personalization, feedback and/or adaptation) is perceived as personally relevant. This can be understood as self-referent encoding: Recipients interpret the information against the background of the self (Rogers, Kuiper, & Kirker, 1977). For instance, a study on personalization showed that it increased the number of self-referent thoughts of recipients (Haviastra & Ballast, 2012). In addition, the information that is perceived as personally relevant might receive more attention. Based on the elaboration likelihood model (ELM; Petty & Brinol, 2012; Petty & Cacioppo, 1986), the personally relevant information can lead to careful consideration and higher elaboration, which in turn associated with higher potential for persuasion (Kreuter et al., 1999a; Oenema, Tan, & Brug, 2005). Self-referent encoding might thus stimulate central processing of the content persuasive information (Dijkstra, 2008; Rogers et al., 1977).

Typically, in the domain of health with its aversive health outcomes, this self-refering and central processing may elicit a state of threat (based on the extended parallel process model; Maloney, Lapinski, & Witte, 2011; Witte, 1992, 1994). Especially personalization and feedback that are explicitly addressing the recipient might induce a threat. This threat may be the primary motivation to comply to the persuasive message. Whether this threat is transferred into behavior may however depend on individual differences in self-efficacy (Peters, Ruiter & Kok, 2012; Witte, 1992). Therefore, besides testing the efficacy of the tailoring ingredients in auditory persuasion, it is investigated how these effects vary for recipients differing in their perception of the own health and self-efficacy.

People who perceive the own health as relatively poor or good may react differently to the information on relevant health outcomes, for example, related to cancer prevention through fruit and vegetable consumption. When the own health is perceived as relatively poor, the information might be more relevant; recipients with a poor perceived
health have more to gain from the information as they can use the information to improve the own health. It is expected that these recipients will be persuaded by the persuasive health information, regardless of the applied tailoring ingredients. In contrast, the information is less relevant for recipients who perceive the own health as relatively good; these recipients may have the feeling that they cannot necessarily use the information. Therefore, a defensive response can initially be expected in these recipients, potentially after the information becomes more self-relevant when tailoring ingredients are applied.

Self-efficacy refers to beliefs about one’s capabilities to adequately perform a certain behavior, and it has been shown to be an important predictor of fruit and vegetable intake, the behavior that will be central in the current study (Guillaumie, Godin, & Vézina-Im, 2010; Kreausukon, Gellert, Lippke, & Schwarzer, 2012). Recipients who report difficulties eating sufficient fruit and vegetables (i.e., having low self-efficacy regarding this behavior) may be expected to display defensive self-regulatory processes after being exposed to the threatening health information (fear control), as they might experience they are unable to perform the behavior. This might consequently lead to lower persuasion. On the other hand, recipients high in self-efficacy may experience no or few difficulties in performing the behavior and possibly have found ways and resources to perform the behavior themselves. The threat can be transferred into behavior change in those people (danger control; Maloney et al., 2011; Witte, 1992, 1994).

In sum, tailoring ingredients bring the persuasive information, probably to a different degree, closer to the self. The threat they induce may be solved by changing the health behavior in the advocated direction, but this can depend on the perceived own health and self-efficacy expectations. The present study aims to test the effect of each of the three tailoring ingredients in an auditory persuasive message. Personalization was operationalized as mentioning the respondent’s first name in the message three times; feedback was given on the self-reported fruit and vegetable consumption, and adaptation was operationalized as providing persuasive information that was congruent with the respondent’s choice of his or her most important value (i.e., enjoying life versus health). The control condition comprised of a generic auditory persuasive message. Perceived own health status and self-efficacy regarding the intake of sufficient fruit and vegetables were tested as moderators and the dependent variables were represented by both the intention to increase fruit and vegetable intake (assessed immediately after the manipulation) and self-reported fruit and vegetable intake at 2-week follow-up.

**Method**

**Design.** The current study investigated the persuasive influence of the tailoring ingredients personalization, feedback and adaptation in auditory persuasion in a between-participants design. Besides these three experimental conditions, a fourth condition with a generic health message was included as a control condition.
Self-efficacy, or the perceived difficulty of the behavior, was tested as a moderating variable. In total, the study consisted of three parts: 1) a pre-test; 2) exposure to the health message and an immediate post-test, and; 3) a follow-up measurement two weeks after the immediate post-test. This seems a relevant and appropriate period in relation to the low intensity of the intervention (respondents were only exposed to the information once).

**Recruitment.** Respondents were either recruited as first-year psychology students of the University of Groningen or as (former) students from a participant pool of the local psychology department with a general interest in joining scientific research. Respondents were told that they would participate in an online study on communication and lifestyle and received either partial (first-year psychology) course credits or a monetary compensation (€ 6) for completing all three parts. Data were only included in the statistical analyses when they were available from all three measurements.

**Procedure.** The measurements and the tailored auditory health message were all presented online. At pre-test, a screen with informed consent information was presented to the respondents, addressing the confidentiality and duration of the study (<15 minutes per study part). Then, respondents could answer the pre-test questions, partly consisting of questions for tailoring purposes. After having filled in the pre-test, respondents were sequentially assigned to one of the four experimental conditions in order of completion of the pre-test. The first names of participants who were assigned to the personalization condition were, then, used to develop a personalized message for each respondent in a professional recording studio. After this recording session, 17 extra respondents signed up and completed the pre-test questionnaire. These exceptions were distributed evenly across the three remaining conditions, for logistical reasons only. On average, about one month after the pre-test, the manipulations and immediate post-test were distributed. The time between the pre-test and the manipulation varied between 8 and 53 days ($M = 26, SD = 9.9$).

Respondents were then exposed to an auditory message advocating fruit and vegetable consumption, that was either generic, personalized, that provided feedback, or that was adapted. To ascertain that the volume of the actual health message was sufficient and convenient, an auditory recording was presented with instructions on volume regulation. While listening to this instructive recording, respondents could adjust the volume to their individually preferred level. Subsequently they listened to the health message. Finally, post-test measurements were taken immediately after exposure to the health message. Two weeks after having filled in the immediate post-test, respondents received the link to the follow-up questionnaire on fruit and vegetable intake by e-mail. The time between the immediate post-test and the moment that we received the follow-up data varied between 13 and 31 days ($M = 15.4, SD = 3.5$). If respondents did not fill in the post-test or follow-up questionnaire within five days, a reminder was sent.
via e-mail. When necessary, more reminders were sent (maximally three reminders per questionnaire).

**The tailoring conditions.** The auditory health messages were all spoken by a female actress who was selected in collaboration with the recording studio. It was the intention to select a voice that was gender congruent; that is, a high-pitched and feminine voice. The professional actress was instructed to use her voice as normal and natural as possible and to speak as a newsreader. All messages were recorded in one session. The tailored messages were created by copying and pasting different auditory fragments in such a way that it sounded natural.\(^1\) Thus, in all four conditions, respondents were exposed to an auditory health message in which one specific tailoring ingredient was applied (except for the generic health message; see Appendix 1e and 2, QR-codes 8 and 9 to get an impression of the messages). The recordings were mastered in 96 kHz 24 bit and converted to standard mono MP3 format (128 kbps).

- **The generic message.** The generic health message was positively framed, referring to both positive health outcomes that can be approached (e.g., increased physical stamina) and negative health outcomes that can be prevented (e.g., a decreased risk for cancer and heart diseases; 223 words in total, 88 seconds). The presented outcomes were based on an earlier study that applied textual health messages on fruit and vegetable consumption (Dijkstra, Rothman, & Pietersma, 2011). In addition, the generic text contained two sentences (approximately 10% of the total amount of text) referring to the hedonic aspects of fruit and vegetable consumption (e.g., smell, freshness, taste, ease). The message ended with a closing sentence (“Thus, eating sufficient fruit and vegetables does not necessarily take a lot of effort and it contributes to a healthy lifestyle”).

- **The personalized message.** The personalized message (231 words in total, 92 seconds on average) consisted of the same content as the generic health message, but now with the incorporation of the respondents’ first name for three times. The message started with “Dear [respondent’s first name]”; it was incorporated halfway the message by stating “So, dear [respondent’s first name], if you eat sufficient fruit and vegetables…”, and in one of the final sentences as well by stating “Furthermore, fruit and vegetables do have a nice smell and taste, don’t you think [respondent’s first name]?\(^1\)

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\(^1\) More specifically, the feedback and personalization sentences were carefully integrated with the generic health message content (which was recorded independently for the personalization version), while taking into account the speech rate and natural pauses of the speaker.
• **The feedback message.** In the feedback message, before listening to the generic text, three sentences on the self-reported fruit and vegetable intake were added. Four feedback versions were created (on average 255 words, 98 seconds) based on the respondents’ reported fruit and vegetable intake of the previous week, as indicated at pre-test. Based on this measurement, it was calculated whether it was sufficient or insufficient against the background of the contemporary Dutch recommendations for fruit and vegetable intake (see later). Then, the feedback was provided on a combination of either sufficient or insufficient fruit and vegetable consumption, respectively (sufficient fruit and vegetable consumption \( n = 4 \), insufficient fruit and vegetable consumption \( n = 8 \), sufficient vegetable consumption but insufficient fruit consumption \( n = 5 \), or sufficient fruit consumption but insufficient vegetable consumption \( n = 10 \)). Each combination consisted of three types of feedback, based on Dijkstra (2008) and Oenema & Brug (2003): “You indicate that you eat (in)sufficient fruit and vegetables [objective feedback / personal feedback], that is very good (that is a shame) [evaluative feedback]. Try to continue this (try to make some changes) [action-oriented feedback / adjustment feedback]; what people eat influences how healthy they are and how they feel”. In any case, the last sentence of the feedback replaced the first sentence of the generic health message and it was designed and recorded in a way that it could easily be implemented.

• **The adaptation message.** In the adaptation message, the content was adapted to the respondents’ “most important value in life” as indicated at pre-test. This is based on the concept of values that are important in defining oneself and that may consequently determine which arguments one will find persuasive (e.g., Snyder & DeBono, 1985). Two versions of the generic health message were created. When respondents indicated that health is their most important value in life, they were exposed to a message on the positive health effects of sufficient fruit and vegetable intake only (e.g., lowering health risks and preventing weight gain, without referring to any hedonic aspects of fruit and vegetable consumption; 229 words in total, 91 seconds). When respondents indicated that ‘enjoying life’ is their most important value, they were exposed to a hedonic text that only stressed the unique smell and taste of fruit and vegetables, and the ease of eating fruit and vegetables (242 words in total, 101 seconds). Prior to both messages a short title was mentioned (‘the vulnerability of life’ versus ‘enjoying life’).

• **Tailoring questions.** Throughout the pre-test, several questions for tailoring purposes were asked. Firstly, the information needed for the personalization message was the respondents’ first name. Secondly, for the feedback message, distinct indexes for fruit and vegetable consumption were used to determine whether fruit and vegetable consumption was (in)sufficient, according to recommendations as formulated by the Netherlands Nutrition Centre (2011): A daily consumption of two pieces of fruit and two-hundred grams of vegetables for an adult population. For respondents who received the feedback message, the combination of these scores was used to determine which...
feedback the respondent would be provided with. More specifically, cut-off points for sufficient weekly consumption were set at 28 (7 x 4) portions of 50 grams of vegetables and 14 (7 x 2) pieces of fruit (two tangerines were calculated as one piece, as well as five table spoons of apple sauce, a commonly used product in the Netherlands), respectively.

Finally, for the adaptation message, the respondents’ “most important value in life” was assessed with the question: “People differ in what they find important, in the values that they strive for. What is most important to you?” The answering options were ‘health’ and ‘enjoying life’, and 79% of all respondents chose ‘enjoying life’ over ‘health’. For respondents who were assigned to the adaptation message condition (n = 29), the answer on this item was used to determine which version of the auditory persuasive text had to be used. Only three respondents received the health-adaptation message.

Measures • Pre-test measures. At pre-test, gender, age and cultural background were assessed. Next, participants were asked to indicate to what extent they considered themselves as healthy (perceived own health status, based on CBS, 2013). This item could be answered on a six-point scale with answering options (“my health is…”) ‘very good’ [1], ‘good’ [2], ‘fair’ [3], ‘moderate’ [4], ‘poor’ [5] and ‘very poor’ [6]. The item was recoded to indicate that high scores corresponded with good perceived health ($M = 4.88$, $SD = .71$).

Next, the intention to start consuming more fruit and vegetables in the next year was assessed in two formats: “I am planning to…”, and “It is likely that I will…”. These items could be answered on seven-point scales ranging from ‘absolutely not’ / ‘very unlikely’ [1] to ‘absolutely’ / ‘very likely’ [7]. The item scores were averaged to create a composite measure score of pre-test intention ($r = .77$, $p < .001$, $M = 4.12$, $SD = 1.31$).

In addition, two items assessed perceived consumption of fruit and vegetables, respectively. These items could be answered on a five-point scale (‘minimal’ [1] / ‘few’ [2] / ‘slightly insufficient’ [3] / ‘sufficient’ [4] / ‘more than sufficient’ [5]). Again, a composite measurement was created ($r = .45$, $p < .001$, $M = 3.52$, $SD = .89$).

Two items assessed perceived difficulty of performing the advocated behavior, eating sufficient fruit and vegetables, respectively: “How difficult is it for you to eat sufficient fruit/vegetables”? Both items could be answered on five-point scales (‘not difficult at all’ [1] / ‘not difficult’ [2] / ‘neutral’ [3] / ‘difficult’ [4] / ‘very difficult’ [5]). A composite measurement was created ($r = .15$, ns; $M = 2.41$, $SD = .78$), with the low correlation reflecting the differential nature of fruit consumption and vegetable consumption.

Finally, respondents were asked to complete a detailed and validated frequency questionnaire on their fruit and vegetable intake (self-reported fruit and vegetable intake, as used for tailoring purposes as well; Bogers, van Assema, Kester, Westerterp, & Dagnelie, 2004). Respondents could indicate how often on average they ate or drank
products from several fruit and vegetable categories during the previous week. The answering options ranged from ‘never or less than 1 day a week’ [0], ‘1 day a week’ [1] to ‘every day’ [7]. Next, they were asked to indicate the amount of intake per category of fruit or vegetables (answering options ranged from ‘no pieces / glasses / serving spoons’ to ‘five or more pieces / glasses / serving spoons’). The main categories were ‘cooked vegetables’, ‘raw vegetables / salad’, ‘fruit / vegetable juice’, ‘tangerines’, ‘oranges / grapefruits / lemons’, ‘apples / pears’, ‘bananas’, ‘other fruit’ and ‘apple sauce’. The average number of days per week and the pieces of fruit and vegetable portions (defined as 50 grams each) were multiplied for each category and added to create a composite index of weekly fruit and vegetable intake (scale ranging from 5 to 128; $M = 40.5$, $SD = 17.4$).

**Post-test measures.** At the immediate post-test, questions regarding message understanding, message credibility and the extent to which the information was perceived as personally directed were asked to check whether the manipulations were received as intended. The questions were “To what extent was the information directed at you personally?”, “To what extent were you able to understand the message?” and “To what extent do you think the message was credible?” These 1-item measures could be answered on seven-point scales ranging from ‘not personal at all’ [1] to ‘very personal’ [7], from ‘not at all’ [1] to ‘very good’ [7] and from ‘not credible at all’ [1] to ‘very credible’ [7]. The main dependent variable at the immediate post-test, intention to start consuming more fruit and vegetables, was assessed with six items regarding the planning and likelihood of starting to perform the behavior in one month, six months, and five years respectively ($\alpha = .97$, $M = 5.05$, $SD = 2.09$). To lower the probability of participants answering strategically (remembering their pre-test score), these items could be answered on nine-point scales ranging from ‘absolutely not’ / ‘very unlikely’ [1] to ‘absolutely’ / ‘very likely’ [9]. Subsequently, process variables not pertinent to the current study were administered. At the 2-week follow-up, the main dependent variable was administered: Respondents completed the frequency-questionnaire on their personal fruit and vegetable consumption of the last week, as assessed at pre-test (Bogers et al., 2004).

**Statistical analyses.** ANOVAs and ANCOVAs were used to perform the manipulation checks and the main analyses, respectively. In the main analyses, immediate post-test intention and self-reported fruit and vegetable consumption two weeks later were the dependent variables. Pre-test intention, perceived own health, perceived difficulty of eating sufficient fruit and vegetables, perceived and self-reported intake of fruit and vegetables were standardized and included as covariates in the main analyses, as these variables are conceptually related to the reception of health messages on fruit and vegetable intake. In addition, perceived own health and perceived difficulty of eating sufficient fruit and vegetables (as a measure of self-efficacy) were tested in interaction with condition in a saturated model to see whether there were any moderating
effects on self-reported fruit and vegetable intake. To further explore interaction effects, simple main analyses were conducted at two levels (low/high) of the moderator. To this purpose, the complete dataset was used to model participants as scoring high or low, by adding and subtracting one standard deviation to the standardized means, respectively (Cohen, Cohen, West, & Aiken, 2003).

Results

Participants. In total, 137 respondents completed the online pre-test questionnaire. Eighty-four percent of them (n = 115) listened to the health message in one of the four conditions and completed the immediate post-test. After that, another three respondents dropped out (82% response rate of the total sample). The final sample consisted of 112 respondents (80% females), varying in age from 17 to 54 years (M = 23.7, SD = 7.00), randomly distributed over the four conditions: Generic message (n = 32); personalized message (n = 24); feedback message (n = 27); adaptation message (n = 29). On the basis of the self-reported fruit and vegetable consumption at pre-test (the frequency scores on fruit and vegetable consumption), 21% of the respondents was classified as consuming insufficient vegetables (but sufficient fruit), 24% was classified as consuming insufficient fruit (but sufficient vegetables), 35% was classified as consuming both insufficient fruit and vegetables, and 20% was classified as consuming both sufficient. The measure of self-reported fruit and vegetable consumption at pre-test had a significant and positive correlation with the perceived consumption of fruit and vegetables (r = .64, p < .001) and this correlation remains similar when controlled for the perceived own health and pre-test intention.

Randomization check. Univariate analyses were conducted to analyze whether the conditions differed on relevant pre-test measures. No significant differences between conditions were found regarding the distribution of gender (p = .21), age (p = .21), pre-test intention (p = .21), self-reported fruit and vegetable consumption at pre-test (p = .55; when dichotomized as insufficient versus sufficient, p = .06 and p = .37 for fruit and vegetable consumption, respectively), the most important value (p = .38), perceived own health status (p = .21), the time it took respondents to complete one of the measurements (respondents who did not complete it in one session were excluded in this analysis; ps > .34), time between pre-test and immediate post-test measurements.

Footnote: Four respondents indicated they had a non-Dutch cultural background. Furthermore, two types of recruitment were used; exactly half of the respondents were first-year psychology students and the other half were mostly (former) students interested in joining scientific research. When we conducted the main analyses without the four non-Dutch respondents, the interaction between condition and self-efficacy on self-reported fruit and vegetable intake became non-significant, including contrasts (p = .13, η² = .06). In addition, we did not control for the type of recruitment in our main analyses as the pattern of results did not change after including this factor as a covariate.
(p = .72), time between post-test and follow-up measurements (p = .89), and number of sent reminders at immediate post-test (p = .18) or follow-up (p = .73). Only perceived fruit and vegetable consumption and perceived difficulty of the behavior were not randomly distributed across conditions (ps < .05). Therefore, all subsequent analyses were performed while controlling for these variables.

**Attrition analyses.** We assessed whether dropouts after T1 significantly differed from the respondents who completed the study. The groups were compared on gender, age, pre-test intention, perceived and self-reported fruit and vegetable consumption at pre-test, perceived own health status, the most important value, and perceived difficulty of the behavior. The results showed that dropouts significantly differed on the variable pre-test intention (dropouts reported a significantly lower intention, p = .031), and marginally significantly on the most important value (dropouts reported health as their most important value more often; p = .052) and on self-reported fruit and vegetable consumption (dropouts reported a higher fruit and vegetable intake at pre-test; p = .062). Condition did not affect whether or not respondents completed the study (p = .62).

**Manipulation checks.** Respondents who received the personalized message or who received feedback on their own fruit and vegetable consumption perceived the information as more personally directed at them (M = 4.25, SD = 1.62 and M = 4.00, SD = 1.44, respectively) compared to respondents who were exposed to the generic message (M = 2.94, SD = 1.32) or adaptation message (M = 2.62, SD = 1.27); F(3, 108) = 8.70, p < .001, ηp² = .20, contrasts ps < .01.

Furthermore, the conditions did not differ significantly regarding the extent to which respondents reported to understand the message, p = .58, ηp² = .02. A significant difference was found on perceived message credibility: F(3, 108) = 4.32, p < .01, ηp² = .11: The message in the adaptation condition was perceived as significantly less credible compared to the messages in the other three conditions, contrasts ps < .05. This seemed to be caused particularly by the low credibility ratings of the respondents who received the hedonic version of the message. However, when this variable was controlled for in the main analyses on behavior, only minor changes in F-values and p-values were found that did not alter the interpretation of the findings.

**Effects on intention.** The main effect of condition on the intention to increase fruit and vegetable intake was significant, F(3, 103) = 3.52, p < .05 ηp² = .09. The highest intention was found after listening to the health message with personal feedback (M = 5.92, SE = .37), which was significantly higher compared to the personalized message (M = 4.31, SE = .37, p = .004) and the generic message (M = 4.73, SE = .32, p < .05). A marginally significant difference was found between the personalization and adaptation message (M = 5.20, SE = .34, p = .075).

Next, the interaction between condition and perceived own health was added to the statistical model; this interaction was significant as well, F(3, 100) = 2.80, p < .05
\( \eta_p^2 = .08 \). Within this model, the main effect of condition remained significant. Figure 7.1 displays the means in the conditions for people with a poor and a good perceived health status.

**Figure 7.1** The effect of condition on the intention to increase fruit and vegetable intake for respondents with a poor and good perceived health status, respectively.
In case of poor perceived health, there was still a significant main effect of condition, $F(3, 100) = 4.37, p = .006, \eta^2_p = .12$. The mean intentions were as follows: Generic message: $M = 4.67$; personalized message: $M = 3.48$; feedback message: $M = 5.92$; adaptation message: $M = 5.37$. Intention was significantly lower after the personalized message compared to the feedback message ($p = .005$) and the adaptation message ($p = .002$) and it was marginally significantly lower than the generic message ($p = .057$). The remaining contrasts were not significant.

In case of good perceived health, condition did not significantly affect intention, $F(3, 99) = 1.48, p = .22, \eta^2_p = .04$. The mean intentions were as follows: Generic message: $M = 4.74$; personalized message: $M = 5.48$; feedback message: $M = 6.07$; adaptation message: $M = 5.02$. No significant contrasts could be reported, but a marginally significant contrast was found between the generic message and the feedback message ($p = .052$).

Furthermore, the interaction between condition and perceived difficulty of the behavior (self-efficacy) was tested; this effect was however not significant ($p = .65, \eta^2_p = .02$). Thus, self-efficacy did not moderate the effect of condition on intention, but perceived own health status did. This effect seemed especially caused by the intention in the personalization condition depending on the perceived own health status. This was further studied by computing correlations between perceived own health and intention (while controlling for the covariates as used in the model tested above). Overall, this correlation was positive, but low ($r = .16, p = .10$), and it was significant in the personalization condition only ($r = .59, p < .01$).

**Effects on health behavior.** The same analyses as reported above were conducted with self-reported fruit and vegetable intake as dependent variable. Now, the main effect of condition was not significant; $F(3, 103) = 1.03, p = .38, \eta^2_p = .03$, neither was the interaction of condition with perceived own health status; $F(3, 100) < 1, p = .64, \eta^2_p = .02$. A significant interaction was found, however, between condition and perceived difficulty of performing the behavior, $F(3, 100) = 2.72, p < .05, \eta^2_p = .08$. Figure 7.2 displays the means in the conditions for people with low and high self-efficacy.
Figure 7.2 The interaction between condition and self-efficacy on fruit and vegetable intake at 2-week follow-up ▼

Note. The estimated means of weekly fruit and vegetable intake (in portions) are given, controlled for the pre-test measures intention, the perceived own health, perceived and self-reported consumption of fruit and vegetables.
In case of low self-efficacy, condition had a significant effect on behavior, $F(3, 100) = 2.91, p < .05, \eta^2_p = .08$. The mean scores reflecting weekly fruit and vegetable intake were as follows: Generic message: $M = 38.65$; personalized message: $M = 45.46$; feedback message: $M = 35.90$; adaptation message: $M = 35.15$. Post-hoc contrasts showed that the intake of fruit and vegetables after listening to the personalized health message for this group of people was significantly higher compared to the adaptation message ($p = .006$), and marginally significantly higher compared to the generic and the feedback message ($ps < .10$).

In case of high self-efficacy, no significant effect of condition was found $F(3, 100) < 1, p = .56, \eta^2_p = .02$. For these people, tailoring did not significantly affect fruit and vegetable intake after two weeks. The means reflecting weekly fruit and vegetable intake were as follows: Generic message: $M = 42.59$; personalized message: $M = 37.50$; feedback message: $M = 43.83$; adaptation message: $M = 43.15$. No significant contrasts were found.

In order to illustrate our findings on behavior, the correlation between perceived difficulty and self-reported fruit and vegetable consumption (controlled for the covariates as used in the above model) was inspected. This was not significant overall and in all four conditions separately. Yet, the correlations reflected the observed pattern; it was positive in the personalized message condition ($r = .35, p = .13$), whereas it was negative in the other three conditions, approaching significance in the adaptation message condition ($r = -.35, p = .08$).

**Additional analyses.** First, we performed the analyses on behavior in two samples with selected respondents only. For instance, it can be reasoned that the 17 respondents who signed up later would show differences compared to those who signed up more quickly, for example in terms of research interest or enthusiasm, which could in turn affect differences between the conditions. Thus, the analyses on behavior were performed without these respondents. In addition, it can be reasoned that the respondents who already consumed sufficient fruit and vegetables were not in need of a tailored health message. The analyses on behavior were performed without these respondents as well. However, in both cases only small differences in F-values and p-values were observed, that did not alter the interpretation of the findings on behavior.

Second, as there was substantial variance in: a) the number of days between pre-test and post-test and between post-test and follow-up; b) the (electronically assessed) time in minutes it took the respondent to complete the measurements (respondents were excluded for these analyses when they did not complete the questionnaire in one session), and; c) the number of reminders sent for the post-test and follow-up, the above statistical analyses were repeated when controlling for these variables one by one. Again, only minor changes in F-values and p-values were observed, that did not alter the interpretation of findings.
Discussion

In the current study, we examined the influence of tailoring ingredients in auditory health persuasion aimed at increasing fruit and vegetable intake. The observed effects on intention and behavior give us a first indication that tailoring ingredients can influence persuasion when applied via the auditory mode of communication. The found patterns on both intention and behavior were not in line with the initial expectations. Recipients who perceived the own health as good showed no significant differences on intention between the conditions, and recipients who perceived the own health as poor showed a significantly lower intention after listening to the personalization message. Tailoring did influence self-reported fruit and vegetable intake two weeks later as well, but only in people who perceived performing the behavior as relatively difficult. Yet, the finding that this group showed a significantly higher fruit and vegetable intake after listening to the personalization message was not expected on forehand.

The auditory message with feedback on the individual's fruit and vegetable intake led to the highest intention. Feedback may have provided new information that was not available in both other conditions: An interpretation of the individual's fruit and vegetable consumption against food guidelines. Besides this, the feedback is explicitly self-referencing (Dijkstra, 2008; Rogers et al., 1977), which also may have contributed to its effect. However, the feedback condition was marginal significantly more persuasive compared to the personalization condition that was also explicitly self-referencing. In line with earlier findings this suggests that self-referencing can also backfire (Dijkstra & Ballast, 2012; Dijkstra, 2014). In addition, the moderation effect of perceived own health showed that the persuasive effect of personalization strongly depended on perceived own health, while feedback was effective independent of perceived own health. It seems that the specific way of self-referencing can make an essential difference. Process research is needed to further corroborate our theorizing on the effects of personalization and the differences between personalization and feedback.

As no main effect on self-reported fruit and vegetable intake was detected, it can be concluded that none of the three tailoring ingredients was more effective than the generic message when it comes to actually influencing behavior. However, the effect was moderated by self-efficacy, also when respondents who already consumed sufficient fruit and vegetables were excluded. In people with low self-efficacy the personalization condition stood out: It led to the highest consumption compared to the other conditions; even somewhat higher than the highest fruit and vegetable consumption reported in people with high self-efficacy. It may be that personalization was so strong that it motivated people with low self-efficacy to make a larger investment, thereby engaging in an increased level of effort spending. It may be that the combination of: 1) personalization and; 2) auditory persuasion, was especially powerful. In auditory personalization the source of the persuasive information actually pronounces the recipient’s first name, which
may bring the persuasive information even more close to the self, as if someone is speaking to the recipient personally (Chaiken & Eagly, 1983; Jensen et al., 2000).

The question why personalization led to more persuasion in those with low self-efficacy may be related to an empirical matter regarding the level of threat that was induced: When the level of threat becomes higher, as in the combination of personalization and auditory persuasion, thresholds may be passed and different reactions may occur. For example, we did not expect a defensive reaction in people high in self-efficacy. Still, it was found that the extreme closeness of the personalized information led to a relative drop in persuasion even in those with high self-efficacy. On the other hand, people with low self-efficacy were expected to get defensive when they would be threatened. It may be that the auditory personalization was so powerful in self-referencing for this group that it reinstated unbiased and more central processing (Dijkstra & Ballast, 2012). With regard to the relative drop in persuasion after personalization in people with high self-efficacy, two other interpretations are possible. This group might have been distracted by the personalization elements as peripheral cues while being engaged in central processing, or the manipulation of their own name being mentioned three times might have been too explicit and served as a forewarning, thereby eliciting a response that was relatively defensive (Dijkstra, 2008). All in all, it may be that tailoring in auditory persuasion, in contrast to written/pictorial tailoring, induces some effects that are unknown yet.

The results should be interpreted against the background of some limitations. First, the adaptation message was perceived as less credible compared to the other versions of the message. Indeed, one can imagine that the hedonic perspective on fruit and vegetable intake without addressing the health benefits lacked credibility. In addition, the adapted information was not perceived as personally directed to the respondent. This replicates earlier findings regarding adaptation as a tailoring ingredient (Dijkstra, 2005), and it proposes that adaptation as tailoring ingredient may work through other processes than self-referencing (Dijkstra, 2005; Williams-Piehota, Schneider, Pizarro, Mowad, & Salovey, 2003). Furthermore, the distribution of the respondents between the two adaptation versions was skewed: Almost all respondents listened to the hedonic health message. However, this might not have influenced the results as we did not aim to compare the effects of the two adaptation versions. It seems that in this sample of mostly (former) students, the question on one’s most important value that was the basis of the adaptation did not assess much variation, although this might be different in other populations. Indeed, this specific sample was appropriate to join this study on basic tailoring mechanisms, but they are possibly not representative for other populations.

As the current study did not compare the auditory mode of communication with the commonly used visual mode, it remains unclear whether and how auditory tailoring works qualitatively different from textual tailoring. Although one can think of (audio-)visual...
intervention elements that can be persuasive as well (e.g., avatars or video fragments), we focused on dismantling the effects of three tailoring ingredients in auditory persuasion without any visual cues being available. In addition, we aimed to look at the effects after only one single moment of exposure to the auditory presented tailored information. This means the findings in this study might be useful in developing long-term tailored health interventions applied via the auditory mode of communication.

In sum, the current results suggest that auditory tailoring can have effects on behavior up to two weeks later after a single moment of exposure (about 90 seconds) to the tailored information only. It is possible that the auditory mode of communication in itself did enhance the salience of the information as the voice of the source is very clearly imposed onto the recipient (Chaiken & Eagly, 1983). The results showed that auditory tailoring can be effective in some particular circumstances. Respondents with high self-efficacy showed relatively high fruit and vegetable intake scores after listening to either the generic message, the feedback message or the adaptation message. For respondents with low self-efficacy only high fruit and vegetable intake scores were found after listening to the personalization message. It seems relevant to take into account individual differences in the development of auditory tailored health interventions but possibly also in health persuasion contexts in daily life (e.g., telephone counselling with a dietician). Furthermore, it can be recommended to apply personalization in a careful way, as for some people this might have negative effects in the process of behavior change. This is in line with earlier studies that show positive as well as negative effects of personalization (Dijkstra, 2014; Dijkstra & Ballast, 2012). With this study that applied a new way of computer-tailoring in persuasion via the auditory mode of communication, we hope to inspire more research and practical applications in the context of developing (auditory) web-based tailored health interventions.