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Elbert, Sarah P.; Dijkstra, Arie

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Source Reliability in Auditory Health Persuasion: Its Antecedents and Consequences

SARAH P. ELBERT¹ AND ARIE DIJKSTRA

University of Groningen

Persuasive health messages can be presented through an auditory channel, thereby enhancing the salience of the source, making it fundamentally different from written or pictorial information. We focused on the determinants of perceived source reliability in auditory health persuasion by investigating it from two distinct angles. First, inferences on the voice (pleasantness) and person (e.g., similarity) significantly predicted perceived source reliability. In a second (experimental) study, three contextual factors (message framing, level of processing, gender matching) affected perceived reliability independently. Furthermore, perceived reliability mediated the effect of message framing on persuasion. The evaluation on source reliability in auditory persuasion seems to be affected by several factors, partly unique to auditory communication. These studies may inspire further research on auditory (health) persuasion.

Health information is mostly communicated through text and images and might be presented as a reminder on a package of cigarettes or as a health message on television. However, health information can also be presented through an auditory channel. A classic form of auditory communication is the radio, which is available all over the world. Research shows that 84.8% of the American people older than 12 years listen to the radio on a daily basis (Downey, 2002; e.g., similar high percentages are found in the United Kingdom (RAJAR, 2014)). In addition, the use of online radio is on the rise (Webster, 2011). Moreover, new technological developments facilitate the use of auditory channels. In particular, MP3 is a technological advancement broadly disseminated in modern society and used by millions of people. It is now included in easy portable MP3 players, smartphones, and tablets, which makes the potential value and reach of MP3 as a channel of auditory information enormous.

The present studies are on auditory health persuasion in which recipients listen to a voice that provides information concerning healthy behaviors.

¹Correspondence concerning this article should be addressed to Sarah Elbert, University of Groningen, Social Psychology, Grote Kruisstraat 2/1, 9712 TS Groningen, The Netherlands. E-mail: s.p.elbert@rug.nl

Although the content information—arguments and recommendations—may be similar to those used in visual forms of persuasion (e.g., written or pictorial), the nonverbal cues differ essentially as no visual cues are available in auditory persuasion (Chaiken & Eagly, 1983). Auditory information contains nothing to see, that is to say neither fonts, colors, movements, nor images. Therefore, the perception of voice and speech characteristics, such as voice pitch and speech rate, becomes relatively salient. Voice characteristics are an important part of nonverbal communication and may provide the recipient with additional information regarding the speaker's emotions and personality traits (Brown & Bradshaw, 1985). In contexts in which no visual cues are available (e.g., a telephone conversation) voice can play a major role in for example impression formation and stereotyping (Ko, Judd, & Blair, 2006). Thus, when no other information regarding the source of the message is available, the source is perceived mainly based on the voice. Therefore, voice and speech characteristics are important aspects in the study of auditory persuasion.

To gain insight into the processes involved in auditory persuasion, a closer look at models of persuasion is useful. The elaboration likelihood model (Petty & Briñol, 2012; Petty & Cacioppo, 1986) distinguishes between two distinct routes to persuasion. The central route refers to the processing of issue-relevant information, which is likely to be similar to the information presented in other communication modes. On the other hand, the peripheral route refers to the processing of peripheral, nonlinguistic cues, including prosody and paralinguistic aspects in auditory persuasion (Street, 1990). Other aspects can also work as peripheral cues, such as message framing or the number and ordering of arguments (Maheswaran & Meyers-Levy, 1990; Petty & Cacioppo, 1984), as present in both visual and auditory forms of persuasion.

In addition, the heuristic systematic model (Chaiken, Liberman, & Eagly, 1989) provides further insight into how available peripheral cues might influence persuasion: Heuristics are used to formulate quick, efficient judgments about the persuasive message. In auditory persuasion, this may concern the processing of voice and speaker characteristics (e.g., "The speaker sounds very nice, so I trust him") as well as contextual aspects of the content (e.g., "It sounds familiar, so it must be true"). Heuristic processing may affect persuasion by its own, but it can also influence the systematic processing of the information (Chaiken & Maheswaran, 1994). For example, listening to health information provided by a highly credible source may positively bias systematic information processing. Especially in audio- or videotaped (vs. written) messages, voice aspects are very salient and might in turn exert a relatively large impact on persuasion (Chaiken & Eagly, 1983).

Thus, different aspects of the voice can be characterized as peripheral cues that activate heuristics (Gélinas-Chebat, Chebat, & Vaninsky, 1996). These aspects and how they are perceived can affect source perceptions, for example,

slow talking speakers are judged as less credible and trustworthy (Apple, Streeter, & Krauss, 1979; Chebat, El Hedhli, Glinas-Chebat, & Boivin, 2007). In persuasion, evaluations of source credibility are central and specify whether the message can be believed and considered as valid (Petty & Cacioppo, 1984; Pornpitakpan, 2004). Related to this are perceived trustworthiness and honesty (Pornpitakpan, 2004), which are associated with perceived message accuracy, a potential determinant of persuasion (Priester & Petty, 1995). With this, high perceived source reliability might be related to enhanced persuasion as well. In the current studies, perceived credibility, perceived trustworthiness and perceived honesty of the source are conceptualized as *perceived source reliability*.

In sum, two studies addressed the determinants and consequences of source reliability in persuasion by exposing respondents to auditory health information communicated by a voice, either male or female. The concept of perceived source reliability is investigated from distinct angles: In Study 1, the perceptions of voice and person characteristics are tested as predictors of perceived source reliability. In Study 2, three contextual message aspects—message framing, level of processing, and source gender—were studied experimentally with perceived source reliability and persuasion (intention to eat more fruit and vegetables) as dependent variables.

Study 1

In the first study, it is assessed how one kind of perception—the reliability of the source—is related to other perceptions on characteristics of the voice and the person. The reflection construction model (Jussim, 1991) was applied to structure the different types of perceptions; the model describes the relationships between social perceptions and social reality. While the background information is (semi-)objectively based on no or simple inferences, in the construction process this information is interpreted using mental schemas, assumptions, heuristics, inferences, etc. In the present context of auditory persuasion, the background information refers to the perceived voice characteristics (e.g., speech rate), while the constructions refer to more advanced interpretations about the characteristics of the source and its behavior (communicating a health message). Here, after listening to one of the two speech recordings (either a male or female voice), these judgments are assessed and it is explored how both the voice perceptions and source judgments contribute to the perceived reliability of the source.

The voice characteristics under study (the background information) are perceived speech rate, voice intensity, voice pitch, and intonation. These characteristics are the most relevant dimensions of voice cues (see also Apple et al., 1979; Glinas-Chebat et al., 1996). To evaluate these cues, few assumptions have to be made. In this study, we also assess the perceived pleasantness of the voice as

background information, as it is also formed without many inferences and it is a primary direct evaluation of the voice (instead of the person). It can be conceptualized as an affective component of an attitude ("I like oranges"). In our theorizing, perceptions of source characteristics are formed on the basis of the background information that is available. In the context of persuasive communication and health education, relevant source characteristics related to source reliability are perceived similarity and persuasive intent (being faced with the communicator's explicit "desire to influence"; Petty & Cacioppo, 1984; Pornpitakpan, 2004; Reinhard, Messner, & Sporer, 2006). Related to the latter is whether the speech is perceived as exaggerated. In addition, the vocal expression of enthusiasm is found to be relevant in judging others (Wexley, Fugita, & Malone, 1975). Conclusions on similarity, persuasive intent, exaggerated speech, and enthusiastic speech demand higher levels of inference: They require more imagination and are based on ideas and perceptions regarding the (speech of the) source and his or her psychological state and motivation. These aspects are generally based on the available background information and might contribute to perceived source reliability as well.

In sum, we will investigate how perceived voice characteristics (e.g., speech rate) and evaluations on the source (e.g., similarity) are related to perceived source reliability when the only source information is the voice heard. It is expected that perceptions of similarity and enthusiasm will be positively related to the perception of source reliability, whereas perceived persuasive intent and exaggeration might negatively affect perceived source reliability. Correlations across the ratings of individual listeners are computed and the perceived voice and person characteristics are regressed on perceived source reliability.

Method

Recruitment and Design. The present study was an online survey. To recruit respondents, requests were sent to Dutch Internet web sites (e.g., a local newspaper web site and web sites regarding health, such as Health Magazine) to publish the link to the survey. Participants were randomly assigned to a health message spoken by a male or female voice (between-subjects design).

Procedure. Respondents were introduced to the research by a screen with an informed consent form, stating the confidentiality and the duration of the research (<15 minutes). First, respondents were asked to answer socio-demographic questions. Next, respondents were exposed to a screen with an audio-player, with the possibility to start the recording themselves and to adjust the level of the volume of the health message to their individually preferred level. After listening to the health message, the respondents were asked to answer questions regarding the voice and source.

The Health Message. Two professional actors with a voice characterized as gender congruent (a woman with a feminine, higher pitched voice and a man with a masculine and lower pitched voice) without idiosyncratic, specific cultural, or habitual elements (such as an accent) were selected by the authors in collaboration with a professional recording studio. The message (237 words) was recorded in the studio by giving the actors instructions to read it like a professional newsreader. Both versions were almost identical in terms of length (105 seconds [male voice]; 107 seconds [female voice]). The outcomes presented in the message are based on Dijkstra, Rothman, and Pietersma (2011). The message advocated fruit and vegetable consumption in a positive frame; to gain good health. It presented two major positive physical outcomes of sufficient fruit and vegetable consumption: a decreased risk for cancer and for heart diseases. In addition, sufficient consumption was said to lead to looking more healthily, to improve physical stamina and concentration on mental tasks. Two intermediary positive physical states were presented to be related to these consequences: low blood pressure and low levels of cholesterol.

Measures. Socio-demographic variables assessed were gender, age, and highest level of completed education, coded as low, medium, or high. After exposure to the auditory message, participants got general instructions to answer the questions on source perceptions. Based on O'Sullivan, Ekman, Friesen, and Scherer (1985), 7-point scales were used to rate source judgments. The items on source honesty and trustworthiness ranged from "not at all honest/trustworthy" to "very honest/trustworthy." In addition, an item was added on source credibility, ranging from "not at all credible" to "very credible." The average of these three ratings constituted the measurement of perceived source reliability; $\alpha = .82$, $M = 5.39$, $SD = .98$. Voice characteristics assessed were perceived speech rate, voice intensity, voice pitch, intonation, and the experience of a pleasant voice. Person characteristics assessed were similarity and intentionality ("To what extent do you think the speaker . . . is similar to you/was trying to persuade you?") and the extent to which the speech was perceived as enthusiastic and as exaggerated. Participants could respond to these 1-item measures on 7-point scales with item-specific end points, for example, ranging from "very slow" to "very quick" or from "not at all similar" to "very similar." Finally, some other questionnaires not pertinent to the current study were administered.

Results and Discussion

Participant Characteristics. The total sample consisted of 271 participants (197 women, 73%), varying in age from 18 to 73 years ($M = 47.08$, $SD = 13.72$). Most participants had an intermediate level of education, $n = 114$ (42%); low

education $n = 85$ (31%); and high education $n = 72$ (27%). Because of the wide range of both age and level of education and the possibility that these variables are related to the reception of health messages, they were added as covariates in the below regression analyses.

Manipulation Check. It was analyzed whether the voices were actually perceived as male ($n = 139$) or female ($n = 132$). Voice pitch is the most important cue to differentiate between male and female voices (Ko et al., 2006), measured by fundamental frequency in hertz (Hz).¹ The female voice was perceived as significantly higher in pitch compared with the male voice; $F(1, 269) = 47.29$, $p < .001$, $\eta^2 = .15$ ($M = 4.11$, $SD = .73$ vs. $M = 3.45$, $SD = .86$). For the female voice, this differed significantly from the midpoint of four ($p < .001$); for the male voice, this difference was marginally significant ($p = .075$). Relatively high scores on perceived pleasantness were found for both the male and female voice, not differing significantly ($p = .36$) from each other: $M = 5.19$ ($SD = 1.50$) and $M = 5.35$ ($SD = 1.24$), respectively, both differing significantly from the midpoint of four ($p < .001$).

Correlational Analyses. Table 1 shows the correlations between the variables under study; the perceived voice characteristics, perceived person characteristics, and perceived source reliability. Source reliability was significantly related to perceived speech rate, intonation, and the experience of a pleasant voice (correlations $r = .13$, $r = .35$, $r = .58$, respectively). In addition, source reliability was significantly related to the person characteristics similarity, the perception of enthusiastic and exaggerated speech (correlations $r = .41$, $r = .49$, $r = -.32$, respectively).

Regression Analyses. To test the multivariate relations of perceived voice and person characteristics with perceived source reliability, a regression analysis was conducted. Besides age and level of education, gender matching was included as a covariate.² These control variables did not contribute significantly to the explained variance in perceived source reliability ($R^2 = .003$). Subsequently, all voice and person characteristics were simultaneously included for exploratory purposes; together, these variables added 46.8% to the explained variance;

¹The male voice averaged 117 Hz and the female voice 174 Hz, as measured with the software program "Praat" (Boersma, 2004), using a .01 seconds interval of measurement.

²Although it was not the aim of the current study to investigate gender-based similarity in relation to perceived source reliability, the factor referring to male/female voice was recoded into a respondent/speaker gender matching ($n = 142$) or mismatching ($n = 129$) variable, which seems at least more informative than analyzing the results by voice. However, no main effect of matching was found on perceived source reliability.

Table 1

Correlations Between Perceived Source Reliability and the Voice and Person Characteristics

	1	2	3	4	5	6	7	8	9	10
1. Reliability	—									
2. Speech rate	.13*	—								
3. Intensity	.10	.25**	—							
4. Voice pitch	.02	.08	.24**	—						
5. Intonation	.35**	.15*	.22**	.18**	—					
6. Pleasantness	.58**	.20**	.11	.04	.40**	—				
7. Similarity	.41**	.18**	.08	.11	.28**	.37**	—			
8. Intentionality	.10	.00	.19**	.06	.12	-.02	.10	—		
9. Enthusiasm	.49**	.24**	.17**	.18**	.53**	.48**	.26**	.22**	—	
10. Exaggeration	-.32**	-.28**	.01	.06	-.21**	-.30**	-.20**	.12*	-.15*	—

Note. **Correlations are significant at the .01 level (two-tailed), *correlations are significant at the .05 level (two-tailed).

$F_{\text{change}}(9, 258) = 25.35, p < .001$. The perception of a pleasant voice predicted source reliability significantly ($b = .252, SE = .041; t = 6.19, p < .001$). Perceived speech rate, intensity, pitch, and intonation were not significantly related to source reliability in this multivariate model.

Regarding the person characteristics, perceived similarity ($b = .114, SE = .028; t = 4.12, p < .001$), perceiving the speech as enthusiastic ($b = .193, SE = .043; t = 4.53, p < .001$), and exaggerated ($b = -.096, SE = .030, t = -3.24, p < .01$) were significant predictors of source reliability (in the expected direction). Perceived intentionality did not significantly contribute.

While the perceptions of the voice cues (e.g., speech rate) did not significantly predict perceived source reliability, the perception of a pleasant voice did, as well as the perceived person characteristics similarity, enthusiasm, and exaggeration. Similarity predicted reliability beyond our gender-matching variable that might be interpreted as an objective parameter of similarity. It seems that gender only was not a relevant aspect of similarity in auditory persuasion, at least not in this broad naturalistic sample. These data partly support the hypothesis that perceptions of voice and person characteristics help people to construct a mental image of the source, especially regarding perceived source reliability.

Study 2

The first study suggested that recipient's ideas about source reliability are based on perceptions of both voice and person characteristics. Yet, to cover a broad perspective on auditory persuasion, Study 2 was designed to experimentally investigate contextual factors that also may influence source reliability: message framing, mode of processing (peripheral or central), and gender matching.

The positive or negative framing of a message is one way to vary "what is said," and can be interpreted as a peripheral cue that activates a heuristic: The message may "just sound negative or positive" apart from the actual content (Maheswaran & Meyers-Levy, 1990). Several studies have shown that when peripheral aspects of framing are processed, positive framing was more persuasive than negative framing (e.g., Maheswaran & Meyers-Levy, 1990). In addition, based on the prospect theory (Tversky & Kahneman, 1981), a positive frame is expected to be more effective in stimulating prevention behaviors such as fruit and vegetable intake (as advocated here) compared with a negative frame (Rothman & Salovey, 1997). That is, a positive frame activates the notion of "play it safe," which is congruent with prevention behaviors on approaching possible positive outcomes (in contrast, a negative frame activates the notion of "nothing to lose," and therefore would more strongly stimulate detection behaviors; approaching possible negative outcomes). Thus, in auditory persuasion, the positive frame may be relevant as it is a peripheral cue with positive valence, and

it is congruent with a message on fruit and vegetable consumption (Broemer, 2004). The congruence within the positively framed message condition is expected to transfer to the reliability of the source, whereas this fit is lacking in the negatively framed message. Although for prevention behavior messages, relatively small differences between positive and negative message framing persuasiveness were reported in a meta-analysis (O'Keefe & Jensen, 2007), here, it is expected that a positive frame leads to higher perceived source reliability.

In addition, the voice and source are disproportionally salient in auditory persuasion (Chaiken & Eagly, 1983); both are integrated in the speech itself, which means that the peripheral cues are received simultaneously with the content information. In auditory persuasion, it may be that the voice as a peripheral cue captures a lot of processing capacity, thereby leading to relatively less central processing of the content information. Thus, assuming that the source is evaluated especially on the basis of the voice, the source evaluation may change when recipients are enticed to process the auditory message more centrally. Based on the vocal attractiveness stereotype (Zuckerman & Driver, 1989), we can reason that perceived source reliability may be judged positively given a voice experienced as pleasant. In Study 1, the used voices were rated relatively high on perceived pleasantness. Therefore, it can be expected that perceived source reliability is lowered when participants' processing of the auditory message moves away from the pleasant voice (that is related to higher reliability) toward more central processing. To assess these possible processes, we will apply a self-affirmation procedure that is known to induce central processing of persuasive information (Correll, Spencer, & Zanna, 2004). Self-affirmation may thus lead to lower perceived source reliability in auditory persuasion. This effect might be most explicit after listening to the positively framed message when the source is perceived as reliable as the induction of central processing moves the respondent's attention away from the positive peripheral cue; away from the voice, but in this case also away from the positive valence of the message (Maheswaran & Meyers-Levy, 1990). Earlier studies also showed that self-affirmation led to more negative thoughts and less positive thoughts, specifically when the message was positively framed (Zhao & Nan, 2010).

Matching the gender of the source to the respondent's gender will be added as an additional factor that can affect persuasion. Besides the receiver's gender, knowing the gender of the source may influence source evaluations, which is mainly investigated in radio advertising contexts or sales research (Dwyer, Richard, & Shepherd, 1998; Whipple & McManamon, 2002). A gender match, which is a basic form of similarity, might lead to higher perceived source reliability and more persuasion (Dwyer et al., 1998). However, the communicator's gender in interaction with the gender of the receiver did not affect the relationship between voice characteristics and perceived source credibility in a telemarketing

context (Chebat et al., 2007). Although Study 1 showed no effect of gender matching on perceived source reliability in a health context as well, it will be examined among university students in Study 2.

Thus, the starting point is the three-way interaction between message framing, self-affirmation, and gender matching. We expect that a gender match will only lead to higher perceived source reliability and more subsequent persuasion when the congruency effect occurs, that is, when the message is framed positively. In addition, self-affirmation will only lower reliability and persuasion in case of a gender match in positive framing. The dependent variables are perceived source reliability and intention to eat more fruit and vegetables (as an indicator of persuasion).

Method

Design. The study applied a 2 (message frame: positive, negative) $\times$ 2 (self-affirmation, no self-affirmation) $\times$ 2 (respondent/speaker gender matching: match, mismatch) between-participants factorial design. The experiment was conducted in the laboratory of the Faculty of Behavioral and Social Sciences among students from the University of Groningen. Participants received either partial course credit or were given a monetary compensation.

Procedure. On arrival in the laboratory, participants were welcomed and allocated to one of four individual cubicles. Assessments and manipulations were all presented on a computer. The participants were randomly assigned to one of the experimental conditions and they were told that the study (<30 minutes) included an auditory message and questions on personal values. After a first set of questions, the self-affirmation procedure was applied. Then, auditory instructions on adapting the volume of the headphone were given and respondents could adjust the volume to their individually preferred level. Then, the respondents listened to one of the health messages (the same voices as in Study 1 are used). The positive framing message as in Study 1 was used and a negative framing message (242 words) was designed to differ only in the framing of the arguments; to prevent bad health instead of gaining good health (Dijkstra et al., 2011; Rothman & Salovey, 1997). For example, insufficient consumption was now said to decrease physical stamina. Next, several questions were asked representing the manipulation checks and dependent variables. Finally, participants were debriefed and dismissed.

Materials and Measures. The first set of questions included two items on pretest intention to consume more fruit and vegetables in the next year: "Are you planning to . . . within one year" and "How likely is it that you . . . within one

year.” Both items could be answered on 5-point scales ranging from “*absolutely not*” to “*absolutely*” and were averaged to create a composite measure ($r = .68$, $p < .001$, $M = 3.29$, $SD = .90$).

The self-affirmation procedure was based on Allport, Vernon, and Lindzey’s (1960) “study of values” (e.g., Correll et al., 2004). Participants selected their most and least valued domain from the following list: “theoretical,” “economic,” “aesthetic,” “social,” “political,” and “religious.” In the self-affirmation condition, ten dichotomous questions were asked, of which eight included one answering option concerning their most important value. Thus, respondents were mostly given the opportunity to choose the option reflecting their most important value, which is thought to comprise the self-affirmation. In the no self-affirmation condition, the ten dichotomous questions mainly contained options concerning their least important value.

Perceived source reliability was measured as in Study 1 ($\alpha = .78$, $M = 5.62$, $SD = .74$). The participant’s intention to increase fruit and vegetable intake was assessed within three different time frames (1 month, 6 months, and 5 years, respectively). To lower the probability of participants answering strategically (remembering their pretest score), these items could be answered on 7-point scales ranging from “*absolutely not*” to “*absolutely*” ($\alpha = .94$, $M = 5.04$, $SD = 1.32$). Finally, some other questions not pertinent to the current study were administered.

Results and Discussion

Participant Characteristics. The initial sample consisted of 106 participants of whom 100 completed all questions (77 women) and procedures. The participants varied in age from 18 to 38 years ($M = 20.75$, $SD = 2.76$).

Manipulation Checks. One-way analysis of variance (ANOVA) showed that participants in the positive framing condition perceived the arguments as significantly more positive compared with participants in the negative framing condition; $F(1, 98) = 21.67$, $p < .001$, $\eta^2 = .18$ ($M = 7.75$, $SD = 1.31$ vs. $M = 5.92$, $SD = 2.49$). Likewise, participants in the negative framing condition perceived the arguments as significantly more negative compared with participants in the positive framing condition; $F(1, 98) = 16.31$, $p < .001$, $\eta^2 = .14$ ($M = 4.85$, $SD = 3.11$ vs. $M = 2.67$, $SD = 2.25$). The framing manipulation seemed to have been successful.

As in Study 1, we analyzed whether the voices were actually perceived as male or female. Indeed, the female voice was rated as significantly higher in pitch compared with the male voice; $F(1, 98) = 59.49$, $p < .001$, $\eta^2 = .38$ ($M = 4.30$,

$SD = .76$ vs. $M = 3.06$, $SD = .84$). Both means differed from the midpoint of four, $p < .01$.

A manipulation check of the self-affirmation procedure should have been conducted right after the procedure (before exposure to the message). However, to prevent reactivity, no manipulation check was conducted regarding self-affirmation.

Main Analyses

Effects on Source Reliability. In an ANOVA, the three-way interaction in the saturated model (framing $\times$ self-affirmation $\times$ gender matching) on perceived source reliability was not significant; $F(1, 92) = .18$, ns. There were no significant two-way interactions either, but we found three significant main effects that were significant as well in a simplified model that only tested the main effects.

First, the main effect of message framing, $F(1, 92) = 5.00$, $p < .05$, $\eta^2 = .05$, showed that the positive frame led to higher perceived source reliability ($M = 5.77$, $SD = .75$) compared with the negative frame ($M = 5.47$, $SD = .70$), which is in line with our expectation.

Second, the main effect of self-affirmation, $F(1, 92) = 4.97$, $p < .05$, $\eta^2 = .05$, meant that self-affirmed participants perceived the source as less reliable ($M = 5.48$, $SD = .80$) compared with when they were not self-affirmed ($M = 5.79$, $SD = .63$). When the voice as a peripheral cue is perceived as pleasant, invoking central processing will increase distance toward this peripheral cue, thereby lowering source reliability.

Finally, the main effect of matching, $F(1, 92) = 5.01$, $p < .05$, $\eta^2 = .05$, showed that the source was perceived as more reliable after gender matching ($M = 5.78$, $SD = .50$) compared with mismatching ($M = 5.46$, $SD = .90$). This finding indicates that source gender is a relevant cue in evaluating source reliability among student participants. In sum, not only the perceived voice and person characteristics as addressed in Study 1, but also other message aspects may contribute to perceived source reliability in auditory persuasion.

Effects on Intention. In an analysis of covariance (ANCOVA), the three-way interaction in the same saturated model with intention as dependent variable (and pretest intention as covariate) was not significant; $F(1, 91) = .00$, ns. Two-way interactions were not significant as well. Only a significant main effect of framing was found; $F(1, 91) = 7.85$, $p < .01$, $\eta^2 = .08$: The positive frame led to a higher intention ($M = 5.34$, $SE = .15$) compared with the negative frame ($M = 4.72$, $SE = .16$).

Bootstrapping analyses were conducted to test whether perceived source reliability mediated the effect of message framing on intention (pretest intention as covariate). The indirect effect was estimated and significance is assessed via 95%

confidence intervals (CI). The overall model was significant, adjusted $R^2 = .41$, $F(3, 96) = 23.66$, $p < .001$, as well as the coefficient for the indirect effect of message framing on intention through the proposed mediator ($b = -.15$, $SE = .09$, 95% CI $-.36; -.01$) as the CI did not include zero (Hayes & Preacher, 2014; Preacher & Hayes, 2008). In a causal theory, a positive message frame may increase perceived source reliability, which may increase persuasion. However, with regard to self-affirmation and gender matching, this mediation could not be demonstrated.

General Discussion

Participants seemed to be able to form an impression of source reliability based on hearing a voice only. Two different perspectives were used and combined to investigate the determinants of perceived source reliability in auditory persuasion. The results in Study 1 showed that both background information (lower inference perceptions; the perception of a pleasant voice) and higher inference perceptions were related to perceived source reliability. These findings can be understood in terms of the reflection construction model in which background information as well as constructed perceptions affect an overall source impression (Jussim, 1991). The results in Study 2 showed that contextual factors were important as well in evaluating the source in auditory persuasion: message framing, level of processing (invoked by self-affirmation), and gender matching had an effect on perceived source reliability. These factors affected perceived source reliability independently; contrary to our hypotheses, no interactions were found. The source was perceived as more reliable after listening to a positively framed message, when no self-affirmation procedure was applied or when the message was communicated by a source of the same gender as the receiver. Furthermore, after listening to a positive frame, a higher intention to increase fruit and vegetable intake was reported. This was in line with our theoretical assumptions, formulated independently of the mode of persuasion (Rothman & Salovey, 1997). However, the effects of self-affirmation and gender matching did not transfer to our measure of persuasion, which is at least surprising as the effect sizes of all three main effects were similar.

Based on the results of Study 1, we conclude that perceptions of both voice and person characteristics contributed to perceived source reliability. It is important to notice that this conclusion only holds when the “pleasantness of the voice” is conceptually grouped as a voice characteristic, as this was the only voice characteristic predicting perceived reliability. Although this characteristic is based on few inferences and it seems a primary and direct evaluation of the voice (instead of the person), one could reason that it is a more complex and normative judgment compared with ratings of more “physical” voice characteristics, such as speech rate or voice pitch. Thus, it seems that there are alternative ways to

interpret our data from Study 1 when the perception of a pleasant voice would not have been grouped as a voice characteristic.

Whereas the current studies increased our insight in auditory persuasion, it cannot be ruled out that similar effects would have been found using text-based messages. For instance, other peripheral cues will then be present, but this is most likely no idiosyncratic information on the source as is provided by the voice in auditory communication. Our studies were however not designed to contrast the auditory mode with other modes; rather, they were exploratory in that the voice as peripheral cue was not contrasted with other peripheral elements. Future research could further study the uniqueness of the auditory mode of persuasion. For example, when the source is no longer presented by its voice, it is the question whether respondents still would have ideas about the source reliability, based on the peripheral cues available in textual forms of persuasion such as the number of arguments and the framing of outcomes (Petty & Cacioppo, 1984).

In Study 2, a match between the gender of the respondent and the speaker led to significantly higher perceived source reliability. It is unclear why this occurred given the null finding in Study 1. The question whether (and for whom) a male or female voice is more efficient is especially relevant in advertising contexts (Whipple & McManamon, 2002). The present studies did not aim to resolve this issue; further research might investigate the conditions under which gender matching in auditory persuasion is relevant.

A basic premise in persuasion research is that perceived source reliability is important as it influences persuasion. However, in Study 2, source reliability only mediated the effect of framing on persuasion, suggesting that the effect of voice-based perceived source reliability on persuasion may depend on the context. For example, the potential positive effects of source reliability may be overruled by other factors, such as defensiveness caused by content arguments (Sherman, Nelson, & Steele, 2000). This might be especially true for the domain of health; as most people value their health, persuasive health messages are always about relevant, mostly physical, outcomes. This issue needs further study.

The recordings used in the current study did not actually vary in pleasantness. A suggestion for further research is to vary the speech recordings in terms of pleasantness (or other voice characteristics) in order to test how this affects source reliability and possibly, persuasion. These kinds of experimental studies can provide us with more information on the possible causal link between these judgments.

Some other limitations of our studies should be taken into account when weighing the results. For example, the actual content information and topic familiarity may have influenced source reliability evaluations. In addition, actors' specific voices are used and referred to, which clearly limits the generalization of our findings. We addressed this issue by choosing neutral voices to be regarded as "prototypical" without idiosyncratic and possibly distracting elements. At the

same time, the influence of common idiosyncratic elements of human speech could not be addressed in this research. Moreover, we studied perceived voice characteristics, not so much the absolute effects of the unique voice. In addition, the subjective perception of a voice cue (e.g., voice pitch) is not only determined by the objective parameter (e.g., fundamental frequency). That is, the same fundamental frequency may be evaluated differently depending on the context, such as the source gender.

Another limitation refers to our measurement of intention. We asked respondents about their intention to eat more fruit and vegetables, which might have been interpreted differently by people who eat a little or a lot of fruit and vegetables already. Indeed, people who already eat sufficient fruit and vegetables might answer that they have a low intention to increase their consumption, which may have influenced our results. Yet, we do think that the own perception of eating sufficient or insufficient fruit and vegetables will actually contribute to the own formulation of a high or low intention to increase fruit and vegetable intake. Finally, it has to be acknowledged that the effects found in Study 2 were only small. Other factors that can affect the perception of source reliability and persuasion might overrule our effects. In the current context, truthful information is communicated by a neutral voice about a topic that is valuable and familiar to most people. With this, it is possible that the variance regarding these aspects (the topic and source) was already low and did not help people in their intention formation. These studies indeed showed the complexity of studying how a voice affects perceptions and persuasion, as for example, hearing a specific voice might (unconsciously) boost associations with other people's voices or stereotypes such as the vocal attractiveness stereotype (Zuckerman & Driver, 1989).

In sum, it seems useful for the field of (health) persuasion to take into account the possible influence of auditory persuasion. Perceived source reliability was studied in relation to perceived voice and person characteristics and contextual factors in persuasion. Although our studies have some relevant limitations, they increased our insight into auditory persuasion processes and may inspire future work in the domain of health.

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