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Be Part of the Conversation: Audiology Messaging During a Hearing Screening

Craig Richard St. Jean,[1] Jacqueline Cummine,[1] Gurjit Singh,[2,3,4] and William E. Hodgetts[1,5]

Objectives: The moment patients learn the results from a hearing assessment can be a critical juncture on their journey to rehabilitation. Message framing (e.g., the positive or negative manner in which information is presented) has been explored in a wide range of health contexts as a method for shaping patients' decision-making. This study investigated whether attitudes toward hearing loss treatment varied as a function of how messages about treatment were framed, and whether such attitudes differed as a function of participants being led to believe they had failed a hearing screening.

Methods: Sixty-four participants (18 to 39 years of age) took the Hearing in Noise Test. In the sound booth, participants saw a poster bearing either a gain-framed or loss-framed message about hearing loss treatment. During the test, half the participants were interrupted by the researcher who stated that their performance appeared to suggest a hearing loss, with the caveat that it might be due to an equipment malfunction. While the researcher investigated the problem, the participants completed an 11-item questionnaire asking about their attitudes toward help seeking for hearing loss. Participants in the control group completed the same questionnaire with no interruption.

Results: Statistical analyses revealed no significant interaction effect between message type and experimenter feedback condition, though a significant main effect was present for message type. Post hoc testing showed medium to large effect sizes as a function of message type on five of the 11-questionnaire items. These data indicated that participants were more likely to endorse health-positive responses (i.e., greater interest in hearing treatment) when exposed to the gain-framed message than the loss-framed message.

Conclusions: The greater likelihood of health-positive responses in the presence of the gain-framed message suggests that this framing strategy may have a positive influence on attitudes toward hearing health behaviors among individuals under 40 years of age with no history of hearing loss.

Key words: Health attitudes, Hearing loss, Hearting treatment, Message framing.

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[1]Department of Communication Sciences and Disorders, Faculty of Rehabilitation Medicine, University of Alberta, Edmonton, Alberta, Canada; [2]Phonak Canada, Mississauga, Ontario, Canada; [3]Department of Speech-Language Pathology, University of Toronto, Toronto, Ontario, Canada; [4]Department of Psychology, Ryerson University, Toronto, Ontario, Canada; and [5]Institute for Reconstructive Sciences in Medicine, Faculty of Rehabilitation Medicine, University of Alberta, Edmonton, Alberta, Canada.

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INTRODUCTION

Message framing refers to the manner and context in which information is communicated. A common framing technique involves emphasizing either the gain that may result from adopting a particular behavior (gain framing) or the loss that may result from the failure to adopt that behavior (loss framing). This technique has been investigated across the healthcare spectrum to better understand effective promotion of sunscreen use (e.g., Detweiler et al. 1999), smoking cessation (e.g., Schneider et al. 2001), cancer screening (e.g., Toll et al. 2008), and vaccine acceptance (e.g., Nan et al. 2012), among other behaviors. While gain and loss-framed approaches have been separately found to be effective in promoting desired health attitudes or behaviors in different health domains, meta-analyses have not consistently revealed broad preferences for one framing technique over the other (e.g., O'Keefe & Jensen 2007; Gallagher & Updegraff 2012). In other words, a host of factors play a role in a message frame's persuasiveness, including the type of health behavior being targeted (e.g., preventative, detective, or recuperative), personal characteristics of the audience (e.g., age and gender), the target health issue's level of personal relevance to the audience (e.g., Rothman & Salovey 1997; Toll et al. 2008; Shamaskin et al. 2010), and the audience's temporal construal of behaviors associated with the target health issue (e.g., de Bruijn et al. 2016).

Hearing messaging matters because rehabilitation of hearing loss is underaccessed and underused. Despite continual advances in the capability and accessibility of hearing aids, as few as 20% of individuals who could benefit from them actually use them (McCormack & Fortnum 2013; Orji et al. 2020). As the links between untreated hearing loss and diminished mental health become clearer, these figures point to a looming healthcare burden, particularly in regions with aging populations (e.g., Lin et al. 2013; Amieva et al. 2015; Livingston et al. 2017). While perceived social stigma and concerns about hearing aid cost and comfort figure among the reasons for poor rates of uptake and adherence to treatment, the role of messaging strategies in shaping hearing health attitudes and behavior remains underexplored (e.g., Hartley et al. 2010; Jenstad & Moon 2011; Öberg et al. 2012). The success of messaging strategies in promoting health-positive behaviors in other domains suggests that fine-tuning health messages in hearing care may be a worthwhile pursuit.

Within audiology, public messaging strategies (e.g., posters that encourage visiting an audiologist) have been shown to shape attitudes toward hearing health. A 2017 study, involving 769 adults (72% female; 69% aged 40 or older—further specifics on participants' ages were not reported) recruited through American and Canadian hard of hearing associations, probed reactions to competing hearing health advertisements designs (Hodgetts et al. 2017). Participants who were presented with a

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loss-framed advertisement—"Don't fade into the background - book an appointment with an audiologist"—were 20% more likely to say they would seek or recommend hearing treatment than those who saw a gain-framed advertisement—"Be part of the conversation - book an appointment with an audiologist." Elsewhere, loss-framed messages highlighting short-term consequences (e.g., pain and sensitivity in the ears over the next few hours or days) were shown to significantly change adolescents' intentions to listen to music through headphones at lower volume (de Bruijn et al. 2016). These two studies represent promising progress in understanding the role that public messaging strategies may play in shaping attitudes toward hearing health. However, research must look beyond designs in which individuals are directly presented with health messages and asked to answer questions in response. Such designs help establish the types of messages that appeal to particular demographics, but do not mirror situations in which individuals interact with such messages in real life.

One strategy to bridge this gap is to create scenarios in which participants passively encounter messages in the research environment. Particular to audiology, incorporating messages into a hearing testing procedure would create the opportunity to measure the attitudinal impact of competing frames in conditions that approximate those in which an actual hearing messaging campaign might be deployed (e.g., on bulletin boards in the waiting room of a hearing clinic). Attitudes measured in these circumstances would arguably be more helpful in guiding recommendations for messaging strategies used in clinics than would attitudes measured in less representative situations, such as those gathered from an online survey (e.g., methods used by Hodgetts et al. 2017). To illustrate, consider the moment patients learn that they have a hearing loss following an audiologic assessment. Having just received this new information, the patient is at a critical juncture on the pathway to rehabilitation. Whether to pursue treatment will be a decision guided by many factors, potentially including recently encountered messaging cues that may frame the patient's thinking on the issue.

The Current Study

The current study seeks to explore whether attitudes toward hearing rehabilitation may differ following passive exposure to either a gain- or loss-framed hearing health poster advertisement during a hearing screening procedure. This study builds on the work of Hodgetts et al. (2017) by using two of its original message frame designs in a simulated clinical context, namely speech-in-noise testing. In response to Hodgetts and colleagues' observation that individuals under the age of 40 expressed significantly greater liking of their study's gain-framed message, and in recognition that individuals' past experiences and present situations with a health condition may play a role in moderating the influence of messaging (Rothman & Salovey 1997), this study represents an early step in investigating the nature of the relationship between age, hearing health messaging, and attitudes toward rehabilitation. Here, we focus solely on adults aged 18 to 39 with no history of hearing loss, and explore whether the greater liking of the gain-framed design by Hodgetts et al.'s younger participants may be predictive of a differential effect in attitudes toward hearing treatment following passive exposure to the two message frames. Forthcoming work will focus on older adults.

As the majority of our present sample (i.e., healthy, aged 18 to 39, recruited on a university campus) would be expected to perform within normal limits in speech-in-noise testing, we included an "experimenter feedback" manipulation such that half the participants were presented with information that their performance on the screening was consistent with hearing loss, while the other half were not presented with any comment on their performance. This was done in an attempt to simulate the psychological experience of patients with a hearing loss when experiencing a hearing assessment. Overall, we seek to answer the following two questions: (1) Are participants' attitudes to hearing loss rehabilitation influenced by how messages about treatment are framed? and (2) Are participants' attitudes to rehabilitation influenced by temporarily invoking the belief that they had failed the hearing screening?

MATERIALS AND METHODS

Participants

Sixty-four participants (52 females and 12 males; M age = 23.25; SD = 5.73) were recruited through online advertisements, posters, and e-mail at the University of Alberta. An a priori power analysis conducted with G*Power 3.1 software determined that, with 4 groups in a 2 × 2 design, an N of 64 would be required to achieve statistical power (where $\alpha = 0.05$, and $1 - \beta = 0.80$). Inclusion criteria included being aged between 18 and 39 years, English language proficiency, and reporting no history of hearing problems. No participants who were recruited were excluded from the study. All participants were either students or employees at the University of Alberta. Ethical approval was received from the Research Ethics Office at the University of Alberta. All participants provided informed consent, were debriefed upon completion, and were offered a chance to withdraw after they participated. A $5 gift card was offered upon completion of the study.

Materials

The Hearing in Noise Test (HINT) was chosen as the hearing screening tool for this study (Nilsson et al. 1994). The HINT was an appealing choice for several reasons: its standardization, allowing us to offer referrals in case any participants performed outside normal, its adaptive nature, which makes it challenging even for individuals with healthy hearing (an important consideration in setting the context for the experimenter feedback condition, discussed below); and its widespread familiarity in the audiological community. The HINT procedure was run via a Windows PC. The test was performed in soundfield, using left and right loudspeakers placed together on a desk inside a sound booth, measured at 1 m from the head of the seated test-taker. Of the four available HINT conditions, we used the unaided "Noise Front" condition, whereby the speakers are calibrated so that a fixed 65 dB SPL pink noise is presented along with every sentence. There are 20 sentences per block, and the level of each sentence is adjusted adaptively depending on whether the participants repeated the entire sentence correctly (next sentence is quieter) or incorrectly (next sentence is louder). For each test block, the HINT software automatically stored the average signal-to-noise ratio at which each participant could perform with 50% accuracy.

To conduct the message framing intervention, illustrated 24″ by 36″ posters with competing messages were printed. The posters included either a gain-framed message ("Be part of the conversation: Book an appointment with an audiologist") or a loss-framed message ("Don't fade into the background: Book an appointment with an audiologist"; See Appendix A in Supplemental Digital Content 1, http://links.lww.com/EANDH/A803 for poster designs). The posters were sized to fit comfortably on the wall participants would face while completing the HINT in the laboratory soundbooth. An 11-item questionnaire, designed to measure participants' attitudes and openness toward hearing loss treatment, was developed by incorporating original items with items that had been used in related studies (Saunders et al. 2014; Hodgetts et al. 2017). Statements were alternately framed either positively or negatively to discourage automatic response patterns. The questionnaire used a visual analog scale, where participants were instructed to mark the strength of their agreement with each statement along a 100-mm line, with the left and right endpoints of the line representing "strongly disagree" and "strongly agree," respectively. The same two poster designs that were displayed on the wall of the sound booth were also alternately used on the cover sheet of the questionnaire. See Appendix B in Supplemental Digital Content 2, http://links.lww.com/EANDH/A802 for the full questionnaire.

Procedure

Participants were initially blinded to the primary purpose of the experiment (i.e., they responded to recruitment materials that stated that the purpose of the study was to validate an updated set of HINT speech samples). Upon completion of the information and consent process, participants were randomly assigned to one of four conditions: (1) Gain-framed poster + Experimenter feedback (14 females, 2 males, M age = 24.0); (2) Loss-framed poster + Experimenter feedback (13 females, 3 males, M age = 22.8); (3) Gain-framed + No experimenter feedback (14 females, 2 males, M age = 23.2); and (4) Loss-framed + no experimenter feedback (11 females, 5 males, M age = 23.0). The experimenter feedback consisted of the researcher reporting to the participant that their performance on the HINT was consistent with hearing loss.

Inside the sound booth, participants were seated directly facing the loudspeakers. The illustrated posters were displayed above the loudspeakers, directly within the participants' field of view. Importantly, the experimenter *did not* draw participants' attention to the presence of the poster on the wall in any condition. Participants in all conditions began the experiment by receiving two blocks of HINT sentences. After the second HINT block, participants in the experimenter feedback condition were informed by the experimenter that he needed to come over to their side of the sound booth for a moment. The experimenter then opened the sound booth door and told the participants "I'm not quite sure what's going on. It looks like you have a hearing loss, but it might just be a problem with my equipment. Do you mind if I take a moment to have a look?" He then examined the cables connected to the loudspeaker and microphones while the participant remained seated. The experimenter asked the participant to wait for a moment, and then exited the sound booth to bring the participant a clipboard with the questionnaire. The participant was asked to complete the questionnaire while the experimenter continued to investigate the equipment setup. After the participant completed the questionnaire, the experimenter informed him or her that it had turned out to be a problem with a software setting, and asked whether the participant was willing to take the test again, at which point a further two blocks of the HINT were administered.

Under the "no feedback" conditions, participants were told after the first two HINT blocks that they would take a short break, during which time they were presented with the questionnaire. Once they had completed the questionnaire, the HINT resumed for a further two blocks. Following the four HINT blocks, participants under all conditions were debriefed about the deception that had been employed. They were presented with a debriefing and reconsent form, and were offered the opportunity to withdraw their data from our analysis at any point between that time and 7 days hence. No participants withdrew. In the case of an actual failed hearing screening, the experimenter was prepared to provide participants with an information sheet directing them to audiological resources in the community. No participants failed the hearing screening.

Analysis

Participants' responses on the questionnaire's 100-mm visual analog scale were measured from left to right with a ruler to produce a number between 0 and 100 for each statement. These numbers were converted to scores out of 10 (e.g., 93 mm became 9.3). To guard against spurious variability stemming from careless responses, individual responses more than 2.0 standard deviations away from the group mean were removed before analysis (3.69% of data points) (e.g., Meade & Craig 2012). Distributions of participants' responses to the eleven questionnaire items are displayed in Figure 1. A two (poster type: gain- vs. loss-frame) × two (feedback vs. no feedback) ANOVA was conducted to examine the extent to which poster type and feedback impacted participants' attitudes and openness toward hearing loss treatment.

RESULTS

The two-way ANOVA revealed a significant main effect of poster type ($F_{(11, 50)} = 3.086$, $p = 0.003$), but no significant main effect was found for experimenter feedback ($F_{(11, 50)} = 1.045$, $p = 0.423$). No significant interaction effect was observed between poster type and experimenter feedback ($F_{(11, 50)} = 0.064$, $p = 0.580$), nor were any significant interaction effects observed with demographic indicators (e.g., gender, level of education, etc.). We therefore collapsed across experimenter feedback to compare statement response means by poster type. Among the 11-questionnaire statements, post hoc t-tests indicated statistically significant differences on group response means ($p < 0.05$) for statements 1, 2, 3, 7, and 9. Differences between group means on statements 4, 5, 6, 8, 10, and 11 were not found to be statistically significant. To guard against type 1 error inflation across the 11 comparisons, we applied a Bonferroni correction to the family-wise p value whereby 0.05 was divided by 11. This meant that for any one t-test of means to be deemed significantly different, the p value associated with that comparison had to be lower than 0.005. Under this more stringent criterion, only statements 1 and 7 achieved statistical significance.

Despite the loss of statistical significance for statements 2, 3, and 9 following correction, it should be noted that medium to large effect sizes were observed for these statements, as well as

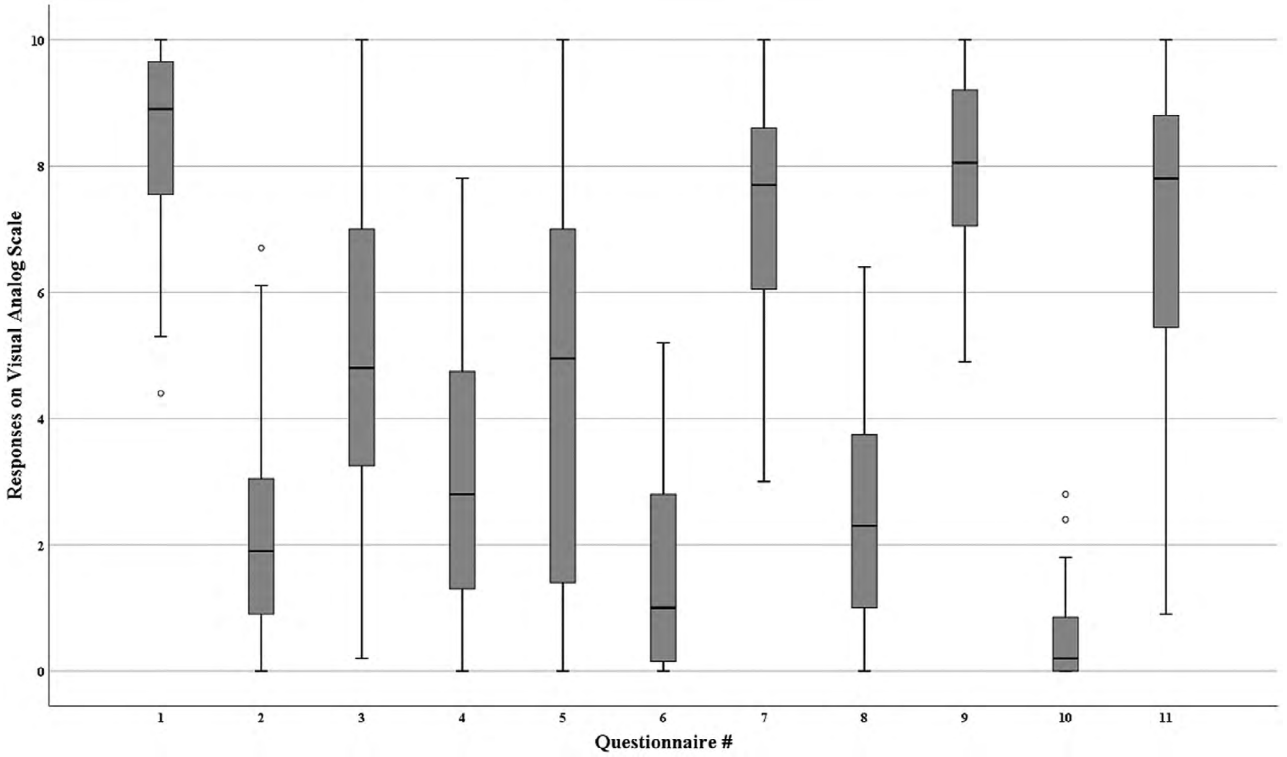

Fig. 1. Distributions of participant responses on 11-item questionnaire (all conditions combined), with 95% confidence intervals. Lines within bars represent means. Open dots represent outliers.

for statements 1 and 7 (i.e., $d \geq 0.5$; Cohen 1988). Also notable is that the group means which differed significantly before correction for type 1 error rate all differed in the same direction, with means in the gain-framed condition all rating as more "health positive," that is, stronger agreement than the loss-framed group on statements where the issue was formulated positively (statements 1, 3, 7, and 9) and weaker agreement where the issue was formulated negatively (statement 2). Results of comparisons and accompanying effect sizes (Cohen's *d*) are listed in Table 1. Differences between the 11-questionnaire statement response means by poster type are displayed in Figure 2.

DISCUSSION

This study sought to investigate whether openness to treatment for hearing loss, as measured through strength of agreement with questions assessing attitudes, would vary as a function of (1) exposure to either a gain-framed or loss-framed message and (2) whether the participant received feedback from the experimenter that their performance on the HINT seemed to indicate impaired hearing. Our data demonstrate medium to large effect sizes on five of 11-questionnaire items as a function of message type. Exposure to the gain-framed message—"Be part of the conversation: Book an appointment with an audiologist"—was

TABLE 1. Post hoc comparisons by poster type

Questionnaire Statement	Mean Difference (Inclusion – Exclusion)	Standard Deviation	*t* (df)	Significance (2 tailed)	Cohen's *d*
1. If I were concerned about my hearing, I would seek help from a professional	1.36	1.44	3.63 (58)	0.001†	0.94
2. If I were concerned about my hearing, I would rather cope with it than try to do something about it	1.22*	1.81	–2.64 (59)	0.010	0.68
3. If I were concerned about my hearing, I would know where to get help	1.33	2.55	2.08 62)	0.042	0.52
4. Once you have hearing loss, there's not much you can do about it	0.29*	2.31	–0.49 (61)	0.628	0.13
5. I've heard you should get your hearing tested now and then	0.42	3.16	0.53 (62)	0.596	0.13
6. I don't think hearing aids are a good way to improve hearing	0.13*	1.65	–0.31 (59)	0.760	0.08
7. I would be willing to try a hearing aid if recommended by a hearing expert	1.43	1.64	3.34(58)	0.001†	0.87
8. I would think the costs of using hearing aids would outweigh the benefits	0.66*	1.76	–1.45 (59)	0.152	0.38
9. People with hearing loss would benefit from a hearing aid	0.87	1.46	2.33 (60)	0.023	0.59
10. People who have hearing problems should just forget about them	–0.01*	0.74	0.041 (59)	0.967	0.00
11. I think having a hearing loss would limit my daily activities	–0.50	2.50	–0.78 (59)	0.440	0.20

Standard Deviation reported is an average of the two poster type groups.
**Mean difference (Inclusion – Exclusion) calculated using reversed response values (e.g., 1.9 expressed as 8.1).*
†Statistical significance at $p \leq 0.005$ following Bonferroni correction for multiple comparisons.

associated with significantly increased willingness to seek and accept help from a hearing care professional (item 1; item 7), greater confidence in finding and succeeding with hearing treatment (item 3; item 9), and decreased willingness to attempt coping with hearing loss without rehabilitation (item 2). Given the documented low rates of seeking, uptake, and adherence to rehabilitation for hearing loss, these findings represent a preliminary indication that adults under the age of 40 may be more open to these behaviors, or more open to recommending them to others, when exposed to gain-framed messages about the issue.

Our findings are consistent with predictions as set out by prospect theory, in which people tend to weigh losses more heavily than equivalent gains. Specifically, foregrounding potential losses is more motivating than potential gains when cautioning against high-risk behaviors, but that foregrounding gains is more motivating when encouraging low-risk behavior (Kahneman & Tversky 1979; Banks et al. 1995). In the context of this study, the instruction to "book an appointment with an audiologist" may be construed as a relatively low risk behavior, even if the appointment carries with it the risk of detecting a hearing loss. While bearing in mind Gallagher and Updegraff's (2012) observation that people vary widely in their beliefs about their susceptibility to health conditions, we consider here the possibility that individuals like those who participated in this study (younger than 40, healthy hearing) may experience less apprehension than older adults at the thought of scheduling an appointment with an audiologist. As Wallhagen (2010) has noted, older adults, and particularly those who have noticed struggles with their hearing may, in contrast, experience greater apprehension around taking a health action with the potential to confirm a condition that is frequently perceived as stigmatizing and indicative of advancing age. Had the intent of the messaging focused on discouraging a risky behavior, such as excessive noise exposure through ear-bud use (e.g., de Bruijn et al. 2016), or had a demographic characteristically more concerned about their hearing (e.g., older adults) participated in this study, a different response trend may have been observed.

Indeed, it has been suggested that perceived personal relevance of a health condition influences the effectiveness of loss or gain-framed health messages. In cases of health issues perceived as highly relevant, loss-framed messages have been shown to be more persuasive, whereas the opposite has been observed when the relevance of the issue is considered lower (e.g., Millar & Millar 2000). Given the age cutoff and history of healthy hearing required for participation in this study, it is reasonable to assume that our participants were less likely than older individuals (or those with a history of hearing problems) to feel that hearing loss and rehabilitation were personally relevant issues. With these factors in mind, the observed trend toward greater willingness to engage in health-positive behaviors in the presence of the gain-framed message is perhaps unsurprising. Still, our participants were made to feel involved with their hearing through their participation in a difficult screening procedure (and doubly so for our participants in the experimenter feedback condition). It may be the case that foregrounding the sensory modality (and its limitations) was not enough to even temporarily overcome a sense among the participants that their hearing was of little concern. Notably, a number of previous studies have shown loss-framed message to be effective in promoting openness to detection behaviors among only those participants who believed themselves to be at risk for the target health condition (e.g., Maheswaran & Meyers-Levy 1990; Apanovitch et al. 2003; Gallagher et al. 2011).

Construal Level Theory (Trope & Liberman 2000, 2010) presents another potentially age-related explanation for the observed trends, namely that psychological distance from a concept affects a person's construal of behaviors that may be enacted in response to that concept. The notion of adopting a stricter diet, for instance, may be construed in simple, abstract terms when thinking ahead to the coming new year, but would take on a more concrete configuration (involving discrete details and contingencies) when considering tomorrow's dinner plans. Concordantly, when future actions are conceptualized in terms of pros and cons, a greater number of pro arguments tend to be

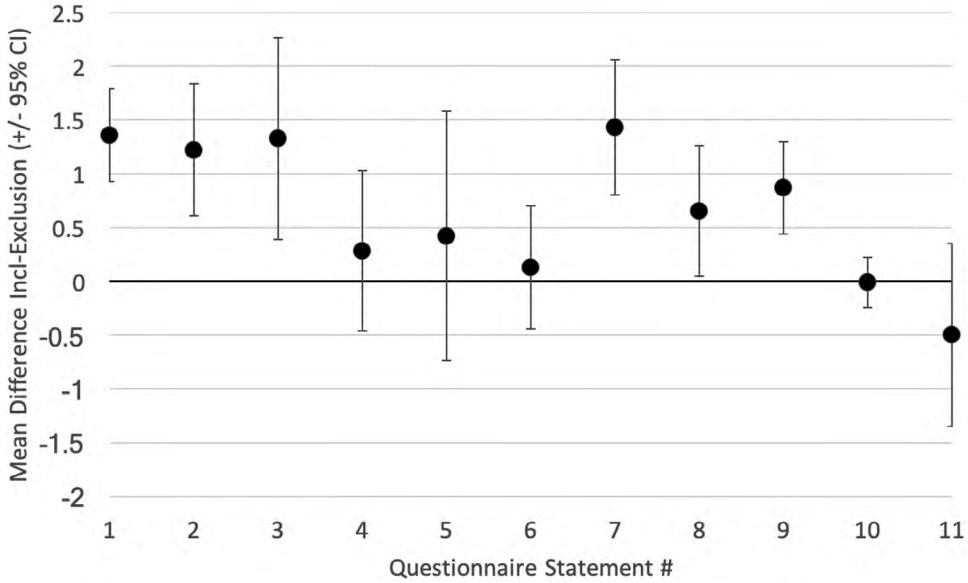

Fig. 2. Mean difference (Inclusion – Exclusion) scores (dots) for each questionnaire item. Error bars represent 95% confidence intervals. Items 2, 4, 6, 8, and 10 are reverse coded.

generated when the occasion for action is perceived as temporally distant, whereas more con arguments are generated when considering the proximate future (Eyal et al. 2009). Among the healthy young adult sample in the present study, the thought of seeking treatment for hearing loss may understandably register as distant, suggesting that such participants would be likelier to construe the concept of treatment in positive terms. The messages they encountered were both pro treatment-seeking, but the positive valence of the gain-framed message may have been perceived as more coherent with the inclination to frame pro arguments in terms of attaining gains rather than avoiding losses. This message may have been more resonant with the sample's psychologically distant, and therefore presumably more favorable, orientation toward the notion of visiting an audiologist. Ultimately, additional work that explicitly considers this perspective is needed to fully understand the impact that psychological distance may have on hearing related beliefs and attitudes.

When examined alongside the two previous studies that have examined the role of message framing in hearing health, the presently observed gain-framed advantage notably trends in the opposite direction of de Bruijn et al. (2016), whose participants were similarly healthy and young, and Hodgetts et al. (2017), whose design used the same visuals and messages used here. Our divergence from de Bruijn's main observation, that loss-framed messaging was more effective in promoting willingness to listen to music at safer volumes (to avoid pain in the ears), is consistent with Construal Level Theory's prediction that temporal distance from a concept plays a role in how associated behaviors are construed. In contrast with de Bruijn, the consequences highlighted by our loss-framed message—that untreated hearing loss may lead one to "fade into the background"—may have been seen by our sample as distant, lacking in imminent danger, and therefore less resonant than the benefits identified by our gain-frame with the anticipated tendency to positively construe temporally distant actions (i.e., visiting an audiologist). In turn, our divergence from Hodgetts et al.'s loss-framed advantage may potentially owe to differences in the age of each study's sample—ours entirely under 40, Hodgetts et al.'s primarily over 40. As noted above, loss-framed health messaging has been shown to be more persuasive when the target health issue is considered highly personally relevant by its audience (e.g., Millar & Millar 2000).

These divergences underscore two important and potentially related characteristics that deserve consideration in future audiology messaging research. First, age may be a relevant factor in attitudes and intentions toward hearing rehabilitation. Older individuals likely experience hearing loss as a more relevant health concern, and for that reason, are perhaps more likely to view an appointment with an audiologist as "risky," for its potential to reveal the unwanted presence of a hearing loss. Both these personal factors are predictive of an advantage for loss-framed messaging. Indeed, among Hodgetts et al.'s participants, those who were shown the message "don't fade into the background" were 20% more likely to say that they would seek or recommend hearing treatment than those who were shown "be part of the conversation." Second, temporal distance from the condition (for instance, pain in the ears vs. permanent hearing loss) addressed by a messaging intervention may play a role in the extent to which gain- or loss-framing resonates with the audience's construal of behavior related to the condition.

A third and more novel characteristic unveiled by the current study is that the observed tendencies in participants' questionnaire responses occurred without having their attention overtly drawn to the health message posters. Whereas in Hodgetts et al. participants were explicitly asked to look and think about the messages, we provide evidence that responses on the questionnaire were message-condition dependent even without direct attention paid to them.

Limitations

The present findings offer a preliminary indication that certain message framing strategies may be more effective than others in promoting health positivity toward hearing rehabilitation, even when individuals encounter those messages passively (e.g., via a poster on a wall). While this study found a gain-framed messaging advantage among a group of healthy young adults, we do not know whether these findings would generalize to other populations (most notably individuals with hearing loss, the majority of whom are older than the participants who completed this study). Our participants were recruited from around the University of Alberta's campus community. In addition to age and hearing health, the demographic characteristics of our sample may differ from other populations of interest in a number of important ways.

For instance, four fifths of our sample identified as female. We were unable to observe any significant differences in questionnaire responses as a function of gender, but we are likewise unable to judge whether this would hold true for a sample with a different gender distribution. Additionally, every participant was either enrolled in or had already completed a University program (45% of participants held a Bachelor's degree or higher). Higher educational attainment is associated with increased health literacy (e.g., Jansen et al. 2018), suggesting that the present sample's pre-existing health beliefs and reactions to the materials used in this study may not be generalizable to populations with more diverse educational attainment.

We also wish to highlight once more that controlling for the increase in family-wise error rate across the multiple comparisons in our analysis eliminated three of five originally observed statistically significant differences in responses to the study's questionnaire statements. However, medium to large effect sizes were observed for these five comparisons, suggesting that our message type manipulation was meaningful in these instances. In suggesting that a gain-framed advantage was observed, we are considering the family of effects as a whole and we caution readers against drawing conclusions about any individual reported effect. We treat these findings as a first step in further explorations of framing effects in the context of hearing rehabilitation, and we invite attempts at replication.

CONCLUSION

The findings presented here suggest a gain-framed messaging advantage in measurements of health positivity toward hearing rehabilitation among a group of healthy adults under 40. Further research is needed to better understand whether similar techniques—passive exposure to competing message frames in hearing assessment contexts—will reveal advantages for one type of message over another among populations more directly affected by hearing loss. Additionally, we view the use of eye-tracking technology as a necessary next step in permitting

concrete claims about the salience of message designs and the attention paid to them.

While the current work cannot yet inform the incorporation of messaging strategies into audiological practice, our findings offer promising results indicating that people do not need to be explicitly engaged with a message for it to impact their attitudes toward hearing health. From a public health perspective, if a branch of a hearing health messaging campaign aimed to motivate young adults who may act as advocates on behalf of older family members, friends, or community members for whom hearing related services are needed, our findings would advise the adoption of a gain-framed approach.

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Address for correspondence: William E. Hodgetts, University of Alberta, Edmonton, Alberta, Canada. E-mail: hodgetts@ualberta.ca

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REFERENCES

Amieva, H., Ouvrard, C., Giulioli, C., Meillon, C., Rullier, L., Dartigues, J. F. (2015). Self-reported hearing loss, hearing aids, and cognitive decline in elderly adults: A 25-year study. *J Am Geriatr Soc*, *63*, 2099–2104.

Apanovitch, A. M., McCarthy, D., Salovey, P. (2003). Using message framing to motivate HIV testing among low-income, ethnic minority women. *Health Psychol*, *22*, 60–67.

Banks, S. M., Salovey, P., Greener, S., Rothman, A. J., Moyer, A., Beauvais, J., Epel, E. (1995). The effects of message framing on mammography utilization. *Health Psychol*, *14*, 178–184.

Cohen, J. (1988). *Statistical Power Analysis for the Behavioral Sciences*. (2nd ed.). Erlbaum.

de Bruijn, G. J., Spaans, P., Jansen, B., van't Riet, J. (2016). Testing the effects of a message framing intervention on intentions towards hearing loss prevention in adolescents. *Health Educ Res*, *31*, 161–170.

Detweiler, J. B., Bedell, B. T., Salovey, P., Pronin, E., Rothman, A. J. (1999). Message framing and sunscreen use: Gain-framed messages motivate beach-goers. *Health Psychol*, *18*, 189–196.

Eyal, T., Liberman, N., Trope, Y. (2009). Psychological distance and consumer behavior: A construal level theory perspective. In M. Wänke (Ed.), *The Social Psychology of Consumer Behavior* (pp. 61–83). Psychology Press.

Gallagher, K. M., Updegraff, J. A., Rothman, A. J., Sims, L. (2011). Perceived susceptibility to breast cancer moderates the effect of gain- and loss-framed messages on use of screening mammography. *Health Psychol*, *30*, 145–152.

Gallagher, K. M., & Updegraff, J. A. (2012). Health message framing effects on attitudes, intentions, and behavior: A meta-analytic review. *Ann Behav Med*, *43*, 101–116.

Hartley, D., Rochtchina, E., Newall, P., Golding, M., Mitchell, P. (2010). Use of hearing AIDS and assistive listening devices in an older Australian population. *J Am Acad Audiol*, *21*, 642–653.

Hodgetts, B., Ostevik, A., Aalto, D., Cummine, J. (2017). Don't fade into the background: A randomized trial exploring the effects of message framing in audiology. *Can J Speech Pathol Audiol*, *41*, 175–202.

Jansen, T., Rademakers, J., Waverijn, G., Verheij, R., Osborne, R., Heijmans, M. (2018). The role of health literacy in explaining the association between educational attainment and the use of out-of-hours primary care services in chronically ill people: A survey study. *BMC Health Serv Res*, *18*, 394.

Jenstad, L., & Moon, J. (2011). Systematic review of barriers and facilitators to hearing aid uptake in older adults. *Audiol Res*, *1*, e25.

Kahneman, D., & Tversky, A. (1979). Prospect theory: An analysis of decision under risk. *Econometrica*, *47*, 263–291.

Lin, F. R., Yaffe, K., Xia, J., Xue, Q. L., Harris, T. B., Purchase-Helzner, E., Satterfield, S., Ayonayon, H. N., Ferrucci, L., Simonsick, E. M.; Health ABC Study Group. (2013). Hearing loss and cognitive decline in older adults. *JAMA Intern Med*, *173*, 293–299.

Livingston, G., Sommerlad, A., Orgeta, V., Costafreda, S. G., Huntley, J., Ames, D., Ballard, C., Banerjee, S., Burns, A., Cohen-Mansfield, J., Cooper, C., Fox, N., Gitlin, L. N., Howard, R., Kales, H. C., Larson, E. B., Ritchie, K., Rockwood, K., Sampson, E. L., Samus, Q., et al. (2017). Dementia prevention, intervention, and care. *Lancet*, *390*, 2673–2734.

Maheswaran, D., & Meyers-Levy, J. (1990). The influence of message framing and issue involvement. *J Mark Res*, *27*, 361–367.

McCormack, A., & Fortnum, H. (2013). Why do people fitted with hearing aids not wear them? *Int J Audiol*, *52*, 360–368.

Meade, A. W., & Craig, S. B. (2012). Identifying careless responses in survey data. *Psychol Methods*, *17*, 437–455.

Millar, M. G., & Millar, K. U. (2000). Promoting safe driving behaviors: The influence of message framing and issue involvement. *J Appl Soc Psychol*, *30*, 853–866.

Nan, X., Xie, B., Madden, K. (2012). Acceptability of the H1N1 vaccine among older adults: The interplay of message framing and perceived vaccine safety and efficacy. *Health Commun*, *27*, 559–568.

Nilsson, M., Soli, S. D., Sullivan, J. A. (1994). Development of the hearing in noise test for the measurement of speech reception thresholds in quiet and in noise. *J Acoust Soc Am*, *95*, 1085–1099.

Öberg, M., Marcusson, J., Nägga, K., Wressle, E. (2012). Hearing difficulties, uptake, and outcomes of hearing aids in people 85 years of age. *Int J Audiol*, *51*, 108–115.

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. *J Health Commun*, *12*, 623–644.

Orji, A., Kamenov, K., Dirac, M., Davis, A., Chadha, S., Vos, T. (2020). Global and regional needs, unmet needs and access to hearing aids. *Int J Audiol*, *59*, 166–172.

Rothman, A. J., & Salovey, P. (1997). Shaping perceptions to motivate healthy behavior: The role of message framing. *Psychol Bull*, *121*, 3–19.

Saunders, G. H., Dann, S. M., Griest, S. E., Frederick, M. T. (2014). Development and evaluation of a questionnaire to assess knowledge, attitudes, and behaviors towards hearing loss prevention. *Int J Audiol*, *53*, 209–218.

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. *J Appl Soci Psychol*, *31*, 667–682.

Shamaskin, A. M., Mikels, J. A., Reed, A. E. (2010). Getting the message across: Age differences in the positive and negative framing of health care messages. *Psychol Aging*, *25*, 746–751.

Toll, B. A., Salovey, P., O'Malley, S. S., Mazure, C. M., Latimer, A., McKee, S. A. (2008). Message framing for smoking cessation: The interaction of risk perceptions and gender. *Nicotine Tob Res*, *10*, 195–200.

Trope, Y., & Liberman, N. (2000). Temporal construal and time-dependent changes in preference. *J Pers Soc Psychol*, *79*, 876–889.

Trope, Y., & Liberman, N. (2010). Construal-level theory of psychological distance. *Psychol Rev*, *117*, 440–463.

Wallhagen, M. I. (2010). The stigma of hearing loss. *Gerontologist*, *50*, 66–75.