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The Effects of Age-Morphing Technology on Older Adult Issue Campaigns: The Interplay of Construal Level, Perceived Probability, and Message Appeal

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Abstract

The current research examined the potential effects of age-morphing technology as a communication tool on reducing ageism and promoting positive attitude and behavioral intention to address issues affecting older adults. Two competing theoretical frameworks—construal level theory (CLT) and perspective taking (PT)—were tested as underlying mechanisms to understand the technology's effects. In two online experiments, we examined the main and interaction effects of construal level manipulated using the technology and perceived probability of getting Alzheimer's Disease on ageism, attitude toward helping older adults, behavioral and donation intentions (Study 1) and explored message appeals as a boundary condition to improve the potential negative outcomes of technology-mediated communication (Study 2). The findings revealed that an age-morphed image led to more concrete construal of one's future life as an older adult. An age-morphed image combined with high perceived probability led to less stereotypical thoughts about older adults and more supporting intentions to address the issue. However, it showed that for low perceived probability, an age-morphed image resulted in less favorable outcomes. The findings showed that a model based on CLT can explain the effects as an underlying mechanism. This research indicates that the effects of age-morphing technology vary but that the technology still can be used as a strategic communication tool that might elicit favorable outcomes depending on how it is combined with perceived probability and message appeals.

Keywords: age-morphing technology; campaigns for older adults; construal level theory; perceived probability; message appeals

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Introduction

Because of its unique capabilities, digital and virtual technologies have demonstrated strong effects on promoting favorable persuasive outcomes of public issue campaigns (see Zorn et al., 2011). These technologies allow people to experience trans-temporal, geographical, and unlikely events by providing rich visual, audio, and/or sensory information about the events. One of these technologies with great potential as a persuasive tool is age-morphing technology, which enables people to see their potential future appearance as an older adult through realistic images. This experience helps people overcome the difficulty of imagining their future life and have concrete

thoughts about their future life, reducing their psychological distance from issues that older adults face. Previous research has revealed that this concrete construal of future life can influence attitude toward older adults and behavioral intention to volunteer and donate to address issues affecting older adults (Lee, 2017; Lee et al., 2020; Oh et al., 2016). Age-morphing technology has shown potential as a strategic tool to communicate about diverse older adult issues that are crucial to address given a rapidly aging society in many countries worldwide.

However, despite the technology's potential application, empirical research on its effect is still nascent. Additionally, previous research has shown varying effects of age-morphing technology, indicating that the technology does not always guarantee favorable outcomes in all conditions (Lee et al., 2020; Rittenour & Cohen, 2016). For example, Rittenour and Cohen (2016) revealed that vivid age-morphed images can elicit negative affective responses that lead to unfavorable outcomes. Thus, the purpose of this research is to examine different message strategies (i.e., perceived probability of experiencing the issue and orientation of benefits—self or other) to learn how, through interplay with the technology, they can lead to favorable or unfavorable persuasive outcomes. To better understand the effects of the technology, two theoretical frameworks—construal level theory (CLT) and perspective taking (PT)—were used as potential underlying mechanisms. Using an older adult health issue campaign as a setting, two online experiments were conducted to investigate the potential effects of the technology as a strategic tool to promote positive perception of older adults, attitude toward helping older adults, and supportive intention to address older adult issues.

The Effects of Age-Morphing Technology

Age-morphing technology refers to digital technology that enables people to experience their potential future appearance by morphing layers of wrinkles, lumpy and darkened skin, and gray hair color onto their current appearance (Hershfield et al., 2011; Van Gelder et al., 2015). The realistic age-morphed graphics allow people to visually experience future appearance and life, helping them imagine future problems as an older adult. This vivid and visual experience enables concrete thinking about future life and older adult issues and elicits certain emotions such as distress and empathy (Lee, 2017; Oh et al., 2016). The cognitive and emotional responses to age-morphing technology can influence people's perceptions, attitude, and subsequent behaviors. For example, virtual experience of one's future self increases one's psychological continuity with one's future, facilitating money-saving behaviors for the future (Hershfield et al., 2011; Macrae et al., 2017) and healthy behaviors to prevent potential negative health risks (Kaplan et al., 2016; Urminsky, 2017; Van Gelder et al., 2013).

Previous research also has substantiated that age-morphing technology can influence people's perception of and attitude toward older adults and behavioral intentions for addressing older adult issues (Lee, 2017; Lee et al., 2020; Oh et al., 2016; Rittenour & Cohen, 2016). Findings have documented both positive and negative effects of the technology. For example, Lee (2017) revealed that age-morphed images of the future self are associated with empathy and sympathy for older adults as well as a reduction in ageism and psychological distance from issues affecting older adults, leading to favorable attitude toward and supportive behaviors for addressing those issues. However, Rittenour and Cohen (2016) revealed negative effects of the technology by showing that aging simulation led to fears of getting old, activating negative perceptions of older adults. That is, people who viewed a photo with self-aging simulation perceived older adults as less competent and felt more pity and less envy toward them. Lee and colleagues (2020) demonstrated that different emotional responses (i.e., personal distress and empathic concern) mediate the relationships between age-morphed images and attitude and behavioral support for older adults. However, the results varied depending on participants' ages. For college students, age-morphed images of themselves led to more personal distress, negatively influencing attitude toward older adults, than age-morphed images of others. However, empathic concern did not work as a mediator. For older populations (aged 21–52), age-morphed images elicited higher personal distress that, unexpectedly, led to positive attitudinal and behavioral outcomes. These findings indicate that age-morphing technology can lead to positive or negative results under different conditions and circumstances. In addition, these results imply that the technology's effects might be better explained with different underlying mechanisms under different conditions.

Mechanism One: CLT – Age-Morphing Technology Creates Concrete Construal

CLT (Liberman & Trope, 1998, 2008) is one of the primary theories that can explain the effects of age-morphing technology. The main tenet of CLT is that psychological distance affects construal levels, determining whether people cognitively process information regarding the issue in an abstract or concrete manner (Liberman et al.,

2007; Liberman & Trope, 2014; Trope & Liberman, 2010). Psychological distance, a key concept of CLT, represents a mental representation of how much individuals feel close to or distant from a certain object, person, or event (Liberman & Trope, 1998, 2008; Trope & Liberman, 2003). Psychological distance can be defined by four dimensions: spatial distance (physical distance between a person to the object or event based on geographical locations), temporal distance (perceived time difference between the present and when the event happened or will happen), social (relational distance between oneself and others), and hypothetical (likelihood, probability, or uncertainty about the possibility of an event happening to a person (Liberman, Trope, & Stephan, 2007; Trope & Liberman, 2003, 2010). According to CLT, when people hold a great psychological distance from an issue, they will think about the issue on an abstract construal level, which means focusing only on the primary characteristics and general features and ideas of the issue by omitting concrete, secondary, and peripheral characteristics. Conversely, when people perceive psychological proximity to an issue, they will consider the issue on a concrete construal level, focusing on incidental or peripheral features instead of superordinate core features (Trope et al., 2007).

Previous research has shown that reducing psychological distance can help promote persuasive outcomes for issue campaigns (Griffioen et al., 2016; Lee et al., 2018; Wiebe et al., 2017). For issues that have temporally distant and uncertain consequences such, proximizing can be an effective strategy in persuasive communication by enabling concrete thoughts about seemingly distant risks and future consequences (Loy & Spence, 2020; Spence et al., 2012; Van der Linden et al., 2015). For example, to promote people's motivations and behavioral supports for climate change, generally considered an issue with temporally distant and uncertain risks and slow progression, communicating future consequences as proximal events helps them hold more favorable persuasive outcomes (Bashir et al., 2014; Spence et al., 2012). Communicating the issue in a psychologically proximal way allows them to think more concretely about future consequences, resulting in supporting intentions. Considering that most young people tend to perceive older adults' issues as psychologically distant and uncertain through lack of detailed information and direct experience, proximizing the issue can be an effective persuasion strategy to promote favorable outcomes.

Previous research has revealed that digital and virtual technologies can be used to communicate effectively distant risks and future consequences of certain issues, eliciting supportive intentions (e.g., donating and volunteering) for related issue campaigns (Ahn, 2015; Ahn et al., 2016; Breves & Schramm, 2021; Duan et al., 2022; Hershfield et al., 2011; Lee, 2017; Oh et al., 2016). Emerging technologies such as virtual reality and morphing technology offer novel means of creating concrete thoughts about potential future consequences in vivid sensory ways, generating more heightened message effects for issue campaigns (Ahn et al., 2013). For example, Ahn (2015) revealed that visualizing negative consequences of sugar-sweetened beverages/soft drinks or cigarettes through image-morphing technologies elicited healthier choices and behaviors. Oh and colleagues (2016) also showed that the experience of imagining life as an older adult using an old-age appearance avatar in immersive virtual environments helped young people feel close to older adults and strengthened intention to communicate even though young people believe older adults create socioeconomic threats to their lives. These studies indicate that age-morphing technology can help individuals create concrete construal of one's future, promoting less ageism and more favorable attitude toward helping older adults as well as supportive intention for addressing older adult issues.

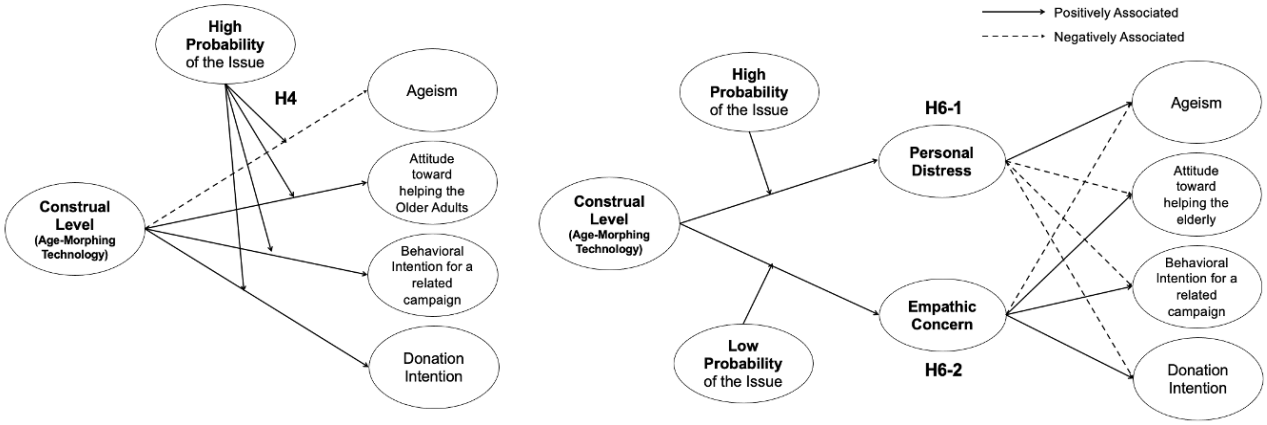
H1: Individuals who view a morphed image of their future self will have a higher level of concrete construal of their future than those who see their current image.

H2: Individuals whose concrete construal about their future is enabled through a morphed image of their future self will demonstrate (a) less ageism, (b) more favorable attitude toward helping older adults, (c) more behavioral intention to support a related campaign to help older adults, and (d) more donation intention than those who see their current image.

Among four dimensions of psychological distance, hypothetical distance, which indicates people's perceived probability of experiencing an issue or event in the future (Todorov et al., 2007; Trope et al., 2007), can change through message cues and framing. How much people feel that an issue affects them in the future can vary based on information delivered through messages (Sungur et al., 2017). That is, for an issue of older adults from which young people feel distant from, messages that discuss and highlight the potential of experiencing the issue can reduce hypothetical distance. The heightened perceived probability of the issue will enable young people to think the issue more concretely, diminishing insensitivity to and abstract thoughts about potential negative future

consequences. Therefore, this study uses postings about Alzheimer's disease[1] to manipulate perceived probability of an older adult issue and construal level of one's future as independent variables (see Figure 1).

Figure 1. *Conceptual Models Using CLT (Left) and PT Theory (Right).*



H3: Individuals who read a message that emphasizes a high probability of getting Alzheimer's disease will have (a) less ageism, (b) more favorable attitude toward helping older adults, (c) more behavioral intention to support a related campaign, and (d) more donation intention than those who read a low probability message.

H4: In the age-morphed image condition, individuals who read a message that emphasizes a high probability of getting Alzheimer's disease will show (a) less ageism, (b) more favorable attitude toward helping older adults, (c) more behavioral intention to support a related campaign, and (d) more donation intention than those who read a low probability message.

Mechanism Two: PT – Age-Morphing Technology Elicits Negative Effects

Another potential explanation for the effects of virtual technology on persuasive communication can be drawn from the literature of PT and emotional response. PT is a cognitive process through which an individual understands others' thoughts and feelings under certain circumstances (Batson et al., 1997; Galinsky & Moskowitz, 2000). PT occurs in two different ways: imagining oneself in the situation (i.e., imagine-self perspective) and imagining the other person's feelings in the situation (i.e., imagine-other perspective) (Batson et al., 1997; Stotland, 1969). When the situation is unfamiliar and unclear, the imagine-self perspective is useful in mentally simulating how people would feel if they were put in the same situation (Batson et al., 1981). The imagine-other perspective involves taking the other's point of view and imagining others' feelings and thoughts (Batson et al., 1997). Both approaches to PT require active mental efforts and elicit different emotional responses—empathic concern and personal distress (Batson et al., 1997).

Empathic concern and personal distress have been perceived as dominant emotional outcomes of PT, invoking different motivations and influencing subsequent perceptions and behaviors (López-Pérez et al., 2013). Personal distress refers to a tendency to experience self-oriented feelings of personal anxiety and unease in tense interpersonal situations. Empathic concern, a tendency to experience other-oriented feelings of sympathy and concern for unfortunate others, occurs when imagining others' feelings in a difficult situation (Batson et al., 1997). Previous research has demonstrated that PT by imagining the self in a difficult situation elicits personal distress, whereas imagining the other's feelings leads to empathic concern. Then, these different emotional responses lead to two distinct motivations, self-oriented and other-oriented, that influence subsequent behaviors. Personal distress leads to self-oriented motivation, whereas empathic concern generates more other-oriented motivation (Eisenberg et al., 1989; Eisenberg & Fabes, 1990; Myers et al., 2014). Both motivations generated through different PT approaches can induce helping behaviors (Batson et al., 2002; Carlo et al., 1999).

However, self-protective motivation has two different behavioral effects: helping others to offset negative emotions or engaging in selfish behaviors (Eisenberg & Fabes, 1990). Self-protective motivation encourages people to engage in prosocial behaviors to relieve their distress and discomfort (Eisenberg et al., 1989). However, when helping behaviors are not expected to remove their emotional burden or when the cost of helping is high, people tend not to engage in other-benefiting behaviors (Stocks et al., 2009). Self-protective motivation activated by personal distress leads people to act out of concern for their own lives rather than out of concern for helping others. Therefore, this study tested the hypothesis that when people take the "imagine themselves" approach (by

seeing their age-morphed images and reading a message emphasizing high probability of being affected by an older adult issue) and do not intuitively connect helping older adults to relieving their own distress, personal distress will generate more ageism and a less favorable attitude toward helping older adults and weaker behavioral intention to address the issue. An "imagine other's feelings" approach and empathic concern (induced with age-morphed images of others and low probability messages) can stimulate other-oriented actions, generating favorable outcomes (Figure 1).

H5: In the age-morphed image condition, individuals who read a message that emphasizes a high probability of getting Alzheimer's disease will show (a) more ageism, (b) less favorable attitude toward helping older adults, (c) less behavioral intention to support a related campaign, and (d) less donation intention than those who read a low probability message.

H6-1: In the high probability message condition, personal distress will mediate the relationship between construal level and (a) ageism, (b) attitude toward helping older adults, (c) behavioral intention to support a related campaign, and (d) donation intention.

H6-2: In the low probability message condition, empathic concern will mediate the relationship between construal level and (a) ageism, (b) attitude toward helping older adults, (c) behavioral intention to support a related campaign, and (d) donation intention.

In the following two experiments, these hypotheses were tested using those two models based on two potential underlying mechanisms—H2, H3, and H4 based on CLT vs. H5, H6-1, and H6-2 drawn from the PT framework. H2 and H3 proposed that concrete construal and hypothetical proximity lead, respectively, to favorable outcomes. H4 and H5 expect different outcomes for the combined effects of construal level and perceived probability. Whereas H4 hypothesized the combined effects of concrete construal and hypothetical proximity promotes positive outcomes, H5 expected negative outcomes. H6-1 and H6-2 proposed the moderated mediating effects of emotional responses during the process.

Study I: Interaction Effects of Technology and Hypothetical Distance and Underlying Mechanism

Study I examined the main and interaction effects of age-morphing technology and participants' perceived likelihood of experiencing an older adult issues on their level of ageism, attitude toward helping older adults, and behavioral intention to support a related campaign to address older adults' issues. Therefore, this study used a 2 (construal level: concrete vs. abstract) by 2 (perceived probability: high vs. low) between-subject factorial design. Also, this study explored potential mechanisms to explain the technology's effects by comparing two competing theories: CLT and PT theory.

Method

Recruitment and Participants

Considering the purpose of the study, millennials born between 1982 and 2004 (Strauss & Howe, 1991) who reside in the United States were recruited through Amazon Mechanical Turk® (M-Turk), a popular online crowdsourcing service for social scientists (Shank, 2016). M-Turk is a useful and inexpensive tool that can provide subjects other than traditional college student samples to obtain high-quality results (Buhrmester et al., 2011; Crump et al., 2013; Sheehan, 2018). Participants in the M-Turk pool were given monetary compensation (i.e., $ 1.40) for their voluntary participation. To determine proper sample size, power analyses were conducted using G*Power (Faul et al., 2009). The a priori power analysis for the ANCOVA showed that 128 participants were recommended for the sample size to detect a medium effect size ($f = 0.25$) with $\alpha = 0.05$ and power = 0.80[2]. Initially, the sample size was 202. However, to ensure the quality of the data, 45 participants who did not upload the images based on the instructions were excluded (e.g., participants who uploaded an image of an animal, an animation character, or their selfies without following the photo guidelines). Also, 23 people who said they have or might have participated in the same study (i.e., pretests) were excluded. Thus, a total of 133 responses remained for the main analyses. The respondent group was 51.9 % ($n = 69$) female, and 80.5% ($n = 91$) were White/Caucasian. The average age was 26.4 ($SD = 4.80$).

Procedure

Study I was administered using an online survey through Qualtrics. Four experimental conditions were developed based on two independent variables—perceived probability of getting Alzheimer's disease and construal level of future as an older adult: (a) high probability and concrete construal, (b) high probability and abstract construal, (c) low probability and concrete construal, and (d) low probability and abstract construal. Participants were asked to read the informed consent form and instructed to read a Facebook post about a fictitious campaign for older adults, called "Hope for the Elderly." Participants were randomly assigned to one of two posts that provided information about Alzheimer's disease. In the high probability post, participants read about a high probability that the disease would affect them. In the low probability condition, participants were exposed to a post that stated the disease was not likely to affect their future (See Appendix, figure A1).

Then, participants were randomly assigned to one of two conditions—future self/age-morphing and current-self. In the future-self condition, participants were asked to take a picture of themselves. Then, they were directed to click on a link to Change My Face (https://changemyface.com/demo), an age-morphing application that provides a vivid and realistic picture of one's older self (See Appendix, figure A2). They then were asked to upload the picture of their age-progressed image. To verify that they had completed this procedure successfully, participants were asked to upload a screenshot of the age-progressed image as a response in the survey. In the current-self condition, participants were asked to take a photo of their current appearance and upload that image.

Participants next were asked to complete a questionnaire about their emotional responses, level of ageism, attitude toward helping older adults, behavioral intention to help older adults through the campaign, and donation intention. Lastly, participants were asked to answer demographic questions. They were then debriefed and thanked for their participation. The study took about 15-20 minutes.

Stimuli Development

For stimuli, two Facebook posts were created to manipulate perceived probability of getting Alzheimer's disease as an older adult. To identify the issue, first, potential topics affecting older adults were searched via Google, particularly sources about aging and older adults care, using "elderly issues/problems," such as mental health issues (e.g., dementia, Alzheimer's disease), physical health issues (e.g., heart conditions, breathing problems, Parkinson's disease), inability to do typical daily activities because of physiological decline, loss of spouse and family, financial difficulties (e.g., hunger, homelessness), social neglect and isolation, loneliness/depression, and senior/elder mistreatment or abuse. Among these various older adult issues, three were initially selected for message development (i.e., Alzheimer's disease, depression/loneliness, and elder abuse) because they were the most discussed issues associated with aging. For each issue, two versions of Facebook posts were created. These post messages were used to determine which issue could generate the strongest responses expressing that the issue could occur for the participants in the future. In the pretests, posts regarding Alzheimer's disease resulted in the most successful manipulation of perceived probability of being affected by the issue, consistently showing a significant difference between the low and high probability message groups. Therefore, posts regarding Alzheimer's disease were used to test the hypotheses (Appendix, figure A1).

Measurement

Future Vividness. To manipulate construal level about one's future life, two different photo conditions (i.e., future self vs. current self-image) were provided. Then, a modified measurement of construal level was used that best fits the context (Lim et al., 2017). Participants were asked to indicate the extent to which they agree with a statement ("To what extent did the image of your future (current)-self illustrate your future as a senior citizen?") using these adjectives on 9-point semantic differential scales (*very abstract – very concrete, very vague – very vivid, very unrealistic – very realistic*). The ratings were to indicate how concretely, vividly, and realistically the image they were given help them picture their future as an older adult ($\alpha = .94$).

Perceived Probability. For manipulation check, perceived probability of the issue was measured with one question on a 9-point Likert scale that was modified from previous study (Wakslak & Trope, 2009). Participants were asked to indicate how likely they will experience Alzheimer's disease when they become old on a 9-point Likert scale (1 = *no chance*, 9 = *definitely will happen*).

Emotional Responses. Participants' emotional responses (i.e., empathic concern and personal distress) were gauged with indices modified from previous research (Batson et al., 1997; López-Pérez et al., 2013). The index for empathic concern included six adjectives (warm, softhearted, tender, moved, compassionate, and sympathetic), and the personal distress index consisted of six adjectives (upset, grieved, sorrowful, distressed, worried, and anxious). Participants were asked to express their degree of feeling related to these adjectives on a 7-point Likert scale (1 = *not at all*, 7 = *extremely*), and the ratings were averaged to form their empathic concern (α = .94) and personal distress (α = .94).

Ageism. Participants' negative perceptions of and stereotypes about older adults were measured using a modified version of the Fraboni Scale of Ageism (FSA; Fraboni et al., 1990). The original scale has 22 measurement items under three dimensions—stereotype, separation, and affective attitude (Rupp et al., 2005). The current study modified and used six questions from the stereotype dimension to measure ageism. Participants were asked to indicate their level of agreement with each statement on a 7-point Likert scale (1 = *strongly disagree*, 7 = *strongly agree*) (e.g., "Many old people are stingy and hoard their money and possessions", α = .89).

Attitude Toward Helping Older Adults. Participants' attitude toward helping older adults was assessed using four 7-point semantic differential scales (Muehling & Laczniak, 1988). For the statement, "I think helping the elderly to address issues related to Alzheimer's Disease is," participants were asked to indicate whether they think helping is *insignificant* – *significant*, *harmful* – *beneficial*, *unimportant* – *important*, and *bad* – *good* (α = .93).

Behavioral Intention to Support a Related Campaign. Participants' behavioral intention to address issues related to Alzheimer's Disease was assessed using six 7-point Likert scales (Grau & Folse, 2007). (e.g., "I am willing to communicate about a campaign to address issues related to Alzheimer's Disease", α = .95) (1 = *strongly disagree*, 7 = *strongly agree*).

Donation Intention. Participants also were asked to indicate how much money they would be willing to donate to address Alzheimer's Disease if they had $100 available to do so. Participants were asked to slide a bar from $0 to $100 to indicate the amount they would like to donate.

Control. Experience with older adults was included as a covariate in the statistical analyses. Participants' experience with older adults, which can influence their attitude and behavioral intention regarding older adult issues (Gerace et al., 2015), was measured using one question that asked them to indicate how much they have interacted with older adults (e.g., their previous experience of living with, caring for, and/or working with older adults) (1 = *not at all*, 7 = *very much*).

Results

Prior to hypothesis testing, descriptive statistics and a correlation matrix of main variables were checked (Table 1).

Table 1. *Descriptive Statistics and Correlation Matrix of Main Variables*.

	Construal level	Empathic Concern	Personal Distress	Ageism	Attitude	Behavioral Intention	Donation Intention	Past Experience
Construal level	1.00							
Empathic Concern	.12	1.00						
Personal Distress	.24**	-.35**	1.00					
Ageism	.21*	.06	.04	1.00				
Attitude	.02	.07	-.01	-.30**	1.00			
Behavioral Intention	.04	.00	.02	-.13	.20*	1.00		
Donation Intention	.05	.26**	-.09	-.16	.26**	.41**	1.00	
Past Experience	.04	.03	-.10	-.09	.10	.21*	.21**	1.00
Mean	5.01	3.84	3.63	3.35	6.19	4.73	38.26	4.47
SD	2.29	1.48	1.53	1.35	1.05	1.36	29.55	1.95

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

One-way ANOVAs were conducted and verified that perceived probability of getting Alzheimer's disease was manipulated successfully[3].

Manipulation Result: Main Effect of Age-Morphed Image on Construal Level

Even though testing whether age-morphed images induced more concrete construal of one's future as an older adult than images of current appearance can be considered as a manipulation check for construal level, this relationship was tested as a hypothesis. One-way ANOVAs were performed. The results showed that participants who experienced their potential future appearance through age-morphing technology indicated more concrete construal ($M_{\text{future self}}$ = 5.98, SD = 2.16, n = 51) than those who saw an image of their current appearance ($M_{\text{current self}}$ = 4.41, SD = 2.17, n = 82, $F(1,131) = 16.55$, $p < .001$, $\eta_p^2 = .11$), supporting H1 (see Table 2 for descriptive statistics of different conditions on potential mediating variables and dependent variables).

Main Effect of Construal Level on Dependent Variables

The results of one-way ANCOVAs revealed that there was no significant mean difference between concrete and abstract construal level groups on dependent variables, controlling for individuals' experience of interacting with older adults (Ageism: $F(1, 131) = 1.89$, $p = .172$, Attitude toward helping older adults: $F(1, 131) < 0.01$, $p = .966$, Behavioral intention: $F(1, 131) = 0.29$, $p = .588$, and Donation intention: $F(1, 131) = 2.30$, $p = .132$). There was no difference between participants who were exposed to their age-progressed images and participants who saw their current appearance in terms of outcome variables, indicating that H2 was not supported[4].

Main Effect of Perceived Probability on Dependent Variables

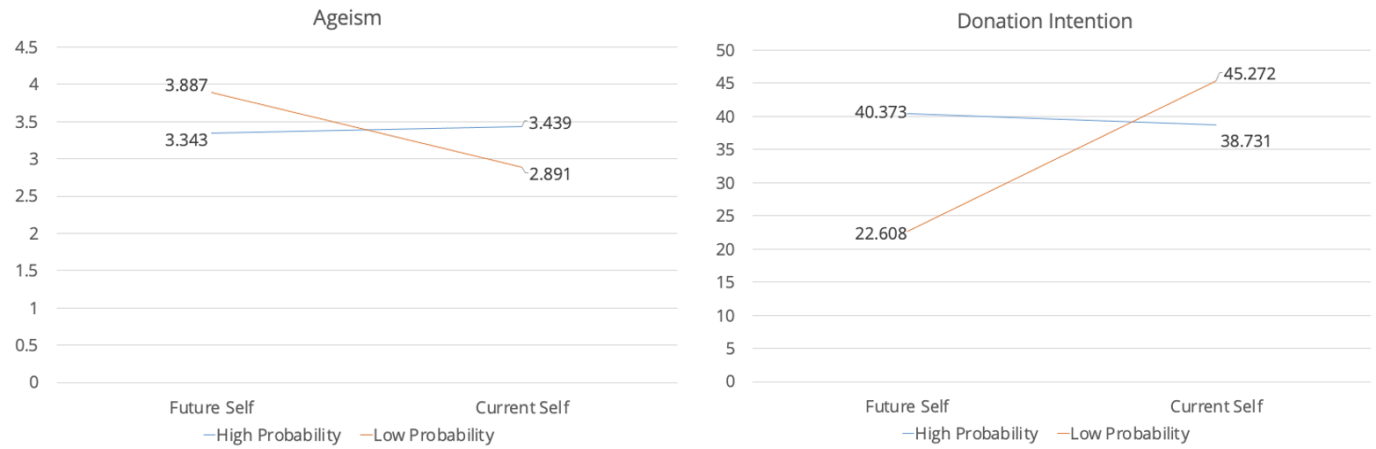
The results of one-way ANCOVAs revealed that there was no significant mean difference between high probability and low probability groups on dependent variables (Ageism: $F(1, 131) = 0.30$, $p = .586$, Attitude toward helping older adults: $F(1, 131) = 0.03$, $p = .867$, Behavioral intention: $F(1, 131) = 3.65$, $p = .058$, and Donation intention: $F(1, 131) = 0.28$, $p = .599$). Participants who read a message that emphasizes Alzheimer's disease is highly likely to happen to most people, including them, showed no significant mean difference compared to participants who read a message that says Alzheimer's disease happens rarely in relation to outcome variables, indicating that H3 was not supported.

Interaction Effect of Construal Level and Perceived Probability on Dependent Variables

A series of two-way analysis of covariance (ANCOVAs) was conducted, controlling for individuals' experience of interacting with older adults. The findings indicated that there were significant two-way interaction effects between construal level and perceived probability on most dependent variables (i.e., ageism, behavioral intention to support a related campaign, and donation intention). First, a significant interaction was found for ageism ($F(1, 128) = 5.03$, $p = .027$, $\eta_p^2 = .04$). Planned pairwise comparison was used to determine where the group differences exist. The results showed that when participants read a message that indicated a low perceived probability of getting Alzheimer's disease, participants who experienced a vivid age-morphed image of their future displayed more ageism (M = 3.89, SE = 0.30) than those who saw a current image of themselves (M = 2.89, SE = 0.24, M_{differ} = 0.995, $F(1,128) = 6.87$, $p = .01$, $\eta_p^2 = .05$; Figure 2).

Also, there was a significant interaction between construal level and perceived probability on behavioral intention to support a related campaign ($F(1, 128) = 5.12$, $p = .025$, $\eta_p^2 = .04$). The results of planned pairwise comparison revealed that under a low perceived probability of getting Alzheimer's disease condition, people who saw an age-morphed image showed less behavioral intention to support a campaign to address the issue (M = 3.96, SE = 0.29) than those who saw their current image (M = 4.76, SE = 0.22, M_{differ} = .79, $F(1, 128) = 4.47$, $p = .036$, $\eta^2_p = .03$). In addition, when participants experience a vivid age-morphed image of their future, a high perceived probability of getting Alzheimer's disease led to more behavioral intention (M = 5.08, SE = 0.24) than low perceived probability (M = 3.96, SE = 0.29, M_{differ} = 1.12, $F(1, 128) = 8.87$, $p = .003$, $\eta_p^2 = .07$).

Figure 2. *Interaction Effects of Future/Current-Self Image and High/Low Perceived Probability on Ageism and Donation Intention.*



With regard to donation intention, there was a significant two-way interaction effect (F(1, 128) = 5.44, p = .021), η_p^2 = .04). The findings of planned pairwise comparison indicated that when participants read a low probability post, people who saw an age-morphed image showed less donation intention (M = 22.61, SE = 6.40) than those who saw their current image (M = 45.27, SE = 5.03, M_{differ} = 22.66, F(1, 128) = 7.75, p = .006, η_p^2 = .06). In the age-morphed image condition, participants who believe they will likely experience Alzheimer's disease showed more donation intention (M = 40.37, SE = 5.11) than participants who thought getting Alzheimer's disease is less likely (M = 22.61, SE = 6.40, M_{differ} = 17.77, F(1, 128) = 4.70, p = .032, η_p^2 = .04; Figure 2). Regarding attitude toward helping older adults, there was no significant two-way interaction effect (F(1, 128) = 2.29, p = .133). Therefore, H4a, H4c, and H4d were supported.

Table 2. *Descriptive Statistics of Experimental Conditions*.

Variable	Current Self (n = 82)	Future Self (n = 51)
Construal Level	4.41 (2.17)	5.98 (2.16)
Ageism	3.23 (1.30)	3.55 (1.42)
Attitude	6.18 (0.99)	6.22 (1.16)
Behavioral Intention	4.76 (1.31)	4.67 (1.46)
Donation Intention	40.98 (29.36)	33.90 (29.62)

	Current Self		Future Self	
	Low Probability (n = 50)	High Probability (n = 32)	Low Probability (n = 31)	High Probability (n = 20)
Personal Distress	3.09 (1.54)	3.18 (1.48)	4.29 (1.18)	4.47 (1.32)
Empathic Concern	4.17 (1.38)	4.01 (1.44)	3.25 (1.48)	3.62 (1.54)
Ageism	2.90 (1.02)	3.45 (1.42)	3.85 (1.50)	3.45 (1.35)
Attitude	6.20 (0.83)	6.16 (1.08)	5.91 (1.36)	6.42 (0.99)
Behavioral Intention	4.74 (1.10)	4.77 (1.31)	4.04 (1.78)	5.07 (1.05)
Donation Intention	45.06 (30.70)	38.36 (28.47)	24.30 (27.27)	40.10 (29.84)

Note. Mean (SD).

These results partially support H4 and reject H5, indicating that participants, who read a message that described Alzheimer's disease as a less probable issue for their future lives and were exposed to vivid images of their potential future appearance, had more ageism and less behavioral intention to help and donate to the cause. That is, when people perceive Alzheimer's disease as an irrelevant and less likely event for themselves, eliciting concrete thoughts of their future as an older adult by seeing an age-morphed image might work negatively, leading to less favorable communication outcomes, compared to seeing a current self image. However, a partial result also indicates potential positive effects of age-morphing technology in campaign settings. According to the results, if Alzheimer's disease is perceived as a highly probably issue, seeing an age-morphed image can help people have more behavioral intention to support the issue-related campaign, compared to when the issue was perceived to be a low probability. These results indicate that promoting concrete construal of future and reducing hypothetical distance at the same time might lead to favorable outcomes, leaving CLT as a better mechanism over PT to explain the observed effects.

Test of H6-1 and H6-2: PT Theory – Moderated Mediation Effect of Emotional Responses

Hayes's PROCESS macro (version 3.5.3, Model 8), using 95% bias-corrected confidence intervals with 5,000 bootstrapped samples, examined the moderated mediation effects of emotional responses on ageism, attitude toward helping older adults, and supportive intention (Hayes, 2013).[5] The results revealed that moderated mediation effects through emotional responses on dependent variables were not significant, rejecting H6-1 and H6-2 (Table 3). Neither interaction effects of construal level and perceived probability on emotional responses nor paths from emotional responses to dependent variables were significant. Specifically, the conditional indirect effect of construal level on any dependent variable (i.e., ageism, attitude toward helping older adults, behavioral intention, and donation intention) was not significant, neither through personal distress nor empathic concern, depending on the level of perceived probability of getting Alzheimer's disease. These findings showed that PT and emotional responses did not serve as an underlying mechanism to explain the observed phenomena. However, even though this research rejected PT theory as an underlying mechanism of observed phenomena, post hoc tests were conducted to further examine the effects of construal level on emotional responses.[6]

Table 3. *Results of the Moderated Mediation Analyses (Model 8, Hayes PROCESS)*.

Variables	Mediating Variables							
	Personal Distress				Empathic Concern			
	Coeff.	SE	LLCI	ULCI	Coeff.	SE	LLCI	ULCI
Ageism								
CL × PP (*a*)	0.01	0.13	-0.24	0.27	0.14	0.13	-0.13	0.40
ER to DV (*b*)	0.01	0.09	-0.16	0.18	0.10	0.08	-0.07	0.27
Attitude								
CL × PP (*a*)	0.01	0.13	-0.24	0.27	0.14	0.13	-0.13	0.40
ER to DV (*b*)	0.00	0.07	-0.13	0.14	0.04	0.07	-0.09	0.17
Behavioral Intention								
CL × PP (*a*)	0.01	0.13	-0.24	0.27	0.14	0.13	-0.13	0.40
ER to DV (*b*)	0.05	0.09	-0.12	0.22	-0.02	0.08	-0.18	0.15
Donation Intention								
CL × PP (*a*)	0.01	0.13	-0.24	0.27	0.14	0.13	-0.13	0.40
ER to DV (*b*)	1.16	1.83	-2.46	4.79	4.82	1.77	1.33	8.32

Note. (CL = Construal Level, PP = Perceived Probability, ER = Emotional Responses, DV = Dependent Variable, *a* = interaction effects of construal level and perceived probability on emotional responses, *b* = path from emotional responses to dependent variables).

Discussion

The results of Study I showed that different levels of both construal and perceived probability did not solely generate significant influence on participants' level of ageism, attitude toward helping older adults, behavioral intention, or donation intention to support older adults through the Alzheimer's disease issue campaign. However, those two factors had significant interaction effects on ageism and behavioral and donation intentions to support the campaign, except for attitude toward helping older adults. More specifically, when people saw their age-morphed images, a message that emphasized hypothetical proximity to the disease generated more favorable outcomes than a message that implied little proximity. That is, high perceived probability of the issue and concrete view of one's future life can help reduce ageism as well as increase supportive intentions to address older adult issues. Also, the interaction results showed that when participants read a message that emphasized a low chance of getting the disease, an age-morphed image led to less favorable outcomes than an image of current look. This implies that when people do not think there is a high likelihood of experiencing the issue, enabling concrete views about older adults will not promote positive outcomes and is even less effective than abstract views about older adults.

The results also showed that neither personal distress nor empathic concern served as a moderated mediator. Considering that 1) the first phase of the model based on PT was not significant (i.e., the interaction of perceived

probability and age-morphing technology did not lead to emotional responses) and 2) the combined effects of high probability and concrete construal resulted in positive outcomes, the model based on PT seems unfit to explain the potential persuasive effects of the technology in the issue on campaign context. The findings of interaction effects indicate that the model based on CLT can better explain the observed results. The failure to find mediating effects of emotional responses might be explained by the delicate nature of how negative appeals can generate different outcomes. Negative appeals such as fear appeal have been used as a communication strategy that can capture the audience's attention, encourage the audience to discontinue dangerous actions, or take certain actions to prevent unfavorable consequences (Ruiter et al., 2014). However, those effects can be limited in creating genuine public engagement (O'Neill & Nicholson-Cole, 2009; Ruiter et al., 2014). If participants perceive certain cognitive, attitudinal, or behavioral changes irrelevant to and/or unhelpful in eliminating personal distress because the participants reasoned the negative outcome would happen anyway, it might not lead to those desirable changes. The effect of the negative appeal might not have extended to people's perceptions about older adults, because the effect is not directly related to addressing their own perceived negative consequences of being older.

Unlike ageism and behavioral and donation intentions, there was no significant interaction effect found on attitude toward helping older adults. One potential explanation might be that an overall attitude toward older adults is formed by cognitive and affective experiences with older adults over time (Eagly et al., 1994; Edwards, 1990). That is, cumulative cognitive evaluations of older adults (e.g., positive or negative beliefs and stereotypes about older adults) and emotional experience (e.g., feelings toward and concerns about older adults) affect individuals' attitude toward helping older adults. A general attitude toward older adults is a superordinate concept that a one-time visual experience of future self is likely to change compared with reactional behavioral support to address the issue.

Study II: Effects of Self- vs. Other-Benefiting Appeals

Extending the findings of Study I, Study II was designed to test message appeals (i.e., benefit orientation) as a factor that might improve the effects of age-morphing technology on persuasion outcomes. Considering that increasing perceived probability of experiencing an issue cannot be a universal strategy for all older adult issues, it is important to explore different message strategies that can reduce psychological distance from older adult issues that still affect many people. One potential message strategy is benefit-orientation appeals (i.e., self-benefiting vs. other-benefiting appeals), which can influence individual's psychological distance from the issue and thoughts and actions related to the issue. Because it may not be immediately obvious for young people to see how helping older adults would benefit them at this point in their lives, messages with self-benefiting appeals can help young people gain concrete construal of future benefits by providing concrete ideas of how their actions can benefit themselves. Also, their increased perceived relevance of the issue may help them feel closer to the issue. Thus, the messages compensate for an issue's psychological distance caused by the low perceived probability of the issue directly affecting them. Therefore, Study II tested two benefit orientations (i.e., self-benefiting vs. other-benefiting) that might influence the effects of age-morphing technology, particularly in a low perceived probability condition. Three-way interactions among perceived probability, construal level, and message appeals were hypothesized as below. To test H7, a 2 (perceived probability: high vs. low) by 2 (construal level: concrete vs. abstract) by 2 (message orientation: self vs. other-benefiting) between-subject factorial experimental design was employed.

H7. Under the low perceived probability condition, a message that uses an age-morphed image and self-benefiting appeal will generate (a) less ageism, (b) more favorable attitude toward helping older adults, (c) more behavioral intention to support a related campaign, and (d) more donation intention than a message that uses an age-morphed image and other-benefiting appeal.

Method

Recruitment and Participants

Study II used the same recruiting procedure as Study 1, and the participants had similar demographic characteristics. From the initial sample, 22 people who said they have or might have participated in similar studies (i.e., pretests and Study 1) were excluded. In total, 264 participants were recruited, which surpassed that

recommended sample size, 128, using G*Power. The sample demographic showed that 56.4 % (n = 149) was female. The majority was White/Caucasian (77.7%, n = 205), and the average age was 26.86 (SD = 4.82). Approximately, 30 participants were assigned to each experimental condition.

Procedure

To test the proposed interactions, participants were randomly assigned to one of eight conditions. Consistent with Study I, participants were exposed to one of four posts: 1) high probability and self-benefiting appeal, 2) low probability and self-benefiting appeal, 3) high probability and other-benefiting appeal, and 4) low probability and other-benefiting appeal. Self-benefiting messages emphasized how supporting the issue can provide long-term benefits for themselves, whereas other-benefiting messages highlighted how supporting the issue would benefit older adults who suffered from Alzheimer's Disease. Then, participants were asked to either check their potential future appearance via age-morphing technology or their current appearance, consistent with the procedure of Study I. Participants received the same questionnaire that measured outcome variables and demographic information. The study took about 15 minutes.

Stimuli Development

The messages from Study I were developed to create self-benefiting and other-benefiting appeal conditions. To emphasize the different benefit-orientation, two lists of self- or other-oriented benefits were created. Self-benefiting messages include a list of self-oriented benefits of supporting the campaign, whereas other-benefiting messages contain a list of other-oriented benefits (e.g., improving the health care system for you and your family who might be diagnosed with Alzheimer's disease in the future vs. helping older adults suffering from the disease). In addition to these lists, the messages contain capitalized subject of benefits (e.g., YOU vs. THE ELDERLY) and hashtags (e.g., #HelpFutureSelf vs. #HelpTheElderly). Several pretests were conducted to ensure whether the different message appeals were manipulated successfully.

Measurement

For Study II, the same measurements from Study I were employed. For pretests and the manipulation check, an additional measurement for message appeal was added.

Message Appeal. Type of message appeal was measured by modifying a previously developed scale (Green & Peloza, 2014; White & Peloza, 2009). Six questions were used to measure whether participants perceive the message as other-oriented or self-focused on seven-point Likert scales (e.g., to what degree the message was an altruistic or egoistic appeal, to what degree the message focused on helping others or oneself, to what degree the message was associated with looking out for the interests of others or oneself). Two original items were added to measure participants' perception about whom they think their support would benefit (i.e., to what degree they think their support would benefit others or oneself) (1 = *not at all*, 7 = *very much*). Four questions for each message appeal were used to calculate the overall score for message appeal (α = .89).

Results

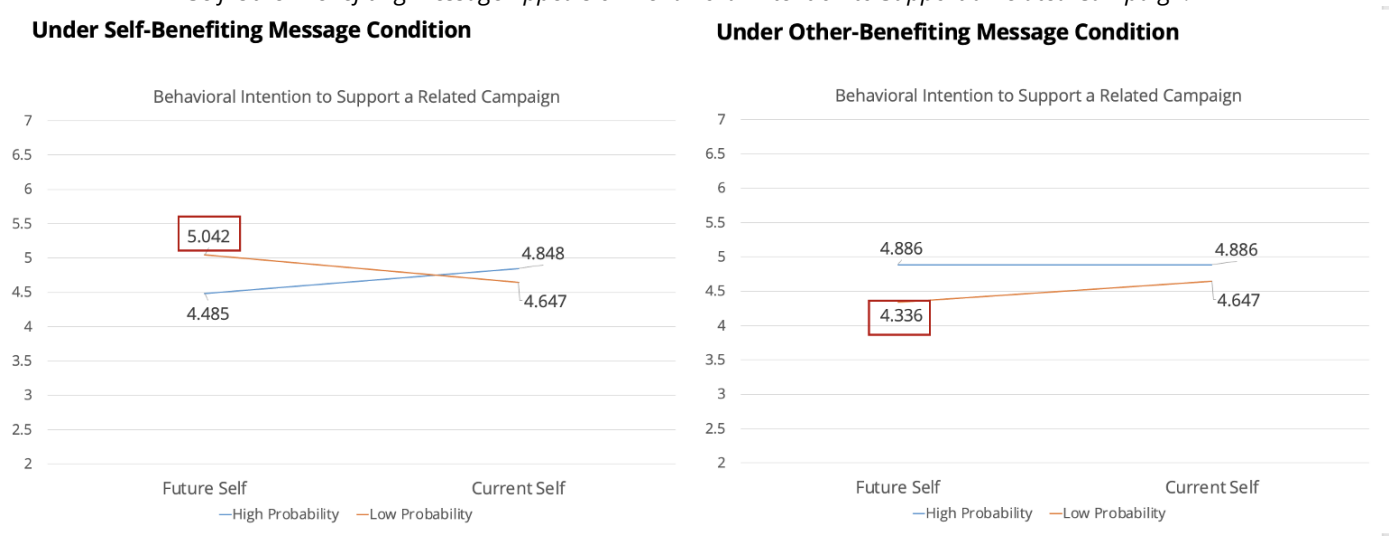
A series of one-way ANOVA revealed that all independent variables were successfully manipulated.[7]

Three-way Interaction Effects of Perceived Probability, Construal Level, and Message Appeal

To test H7, ANCOVA was used to control for past experience with older adults. The results showed a marginally significant three-way interaction among perceived probability, construal level, and message appeal (F(4, 716) = 3.32, p = .07, η^2_p = .01) on behavioral intention to support a related campaign (Figure 3). The results of planned pairwise comparison indicated that for participants who read a Facebook post with emphasis on a low probability of getting Alzheimer's disease and saw their age-morphed image as an older adult, a message that highlights self-benefits (M = 5.04, SE = .25) led to marginally higher behavioral intention to support a related campaign than a message that emphasizes how others can benefit by their support (M = 4.37, SE = 0.22, M_{differ} = 0.68, SE = 0.34, p = .05, η_p^2 = .02). That is, in case of a low perceived probability of getting Alzheimer's

disease, self-benefiting appeals combined with an age-progressed image seemed to elicit more behavioral intention to help older adults through an issue campaign than other-benefiting appeals. There was no further significant three-way interaction, rejecting H7a, H7b, and H7d.

Figure 3. *Marginally Significant Three-Way Interactions of Future/Current-Self Image, High/Low Perceived Probability, and Self/Other-Benefiting Message Appeals on Behavioral Intention to Support a Related Campaign.*



Note. The red boxes indicated groups with marginally significant mean difference.

General Discussion

The current research has several theoretical contributions and practical implications by examining how the interplay of age-morphing technology with other message factors can generate negative or positive outcomes based on two potential mechanisms.

First, this research advances the literature of technology-mediated communication by testing two prominent theoretical frameworks as potential underlying mechanisms to explain the effects of future-related technology: CLT and the PT framework. Previous studies have investigated the effects of age-morphing technology, using different frameworks (e.g., psychological distance from the old self: Lee, 2017, stereotype activation and negative affect: Rittenour & Cohen, 2016, and PT: Lee et al., 2020; Oh et al., 2016). These studies have demonstrated the technology's mixed effects, either positive or negative, on people's perception, attitude, and behavioral intention regarding older adults. The current research focused on two prominent theoretical frameworks, CLT and PT. Two sets of hypotheses were developed based on these two theoretical frameworks to explain in what conditions age-morphing technology works favorably or unfavorably in older adult issue campaigns. The findings lend support for CLT as an underlying framework that better explains the effects of the technology combined with a message that frames a high probability of experiencing an older adult issue. This research took a further step by testing another message factor (i.e., benefit orientation), which can influence an individual's psychological distance from the issue. The overall findings imply that CLT better serves as a theoretical explanation of the communicative effects of age-morphing technology in the issue campaign setting.

Second, this research contributes to improving our understanding of future-related technology in communicating about social issues. The current research employed age-morphing technology to investigate how and when the technology can influence people's perception, attitude, and behavioral intention regarding issues affecting older adults. The research shows that age-morphing technology should be used cautiously as a strategic tool to promote people's supportive thoughts and actions. According to the results, positive effects of the technology can be generated when people perceive that certain issues are likely to happen during their lives. However, if the technology is used to elicit concrete views about the future when those issues are considered as distant and unlikely, then this technology can generate unfavorable results. Considering that vivid visual experience does not always lead to favorable outcomes, the findings showed what conditions using the technology resulted in positive outcomes and why. The findings of this research contribute to advancing knowledge by exploring several important conditions based on two theoretical frameworks—PT and CLT.

Third, the results showcase a potential for message framing and appeals in influencing persuasive effects of age-progressed images. Message appeal/framing has been one of the most-studied strategies to generate persuasive

effects and elicit certain behaviors (e.g., framing different levels of temporal distance, hypothetical distance, and orientation of benefits; Chang & Lee, 2010; Das et al., 2008). Expanding the literature, the current research examined the critical role of different message framing strategies (i.e., framing the perceived probability of being affected by an issue and a self- vs. other-benefiting orientation) that positively or negatively influence the effects of age-morphing technology. While Study I showed for an issue with a low perceived probability, age-morphed images led to less favorable outcomes, Study II hinted at the potential role of a self-benefiting message appeal in addressing the limitation that certain issues are less likely affect everyone than other adult health issues. Considering that self-benefiting appeals describe how supporting the campaign would benefit people in their own futures, such as potentially reducing the personal financial burden and mental agony caused by Alzheimer's disease, this message also provides more detailed information and allows concrete construal of how people can benefit in the long run by supporting the cause now. It makes sense that this effect could compensate for the negative effects of a low perceived probability of being affected by an older adult issue by bringing them closer to the issue by relating the rewards of their support to them. These results advance our understanding of how different message framing can maximize the technology's effects to generate favorable outcomes of strategies for communicating about this disease and other older adult issue campaigns.

The current study also provides important practical implications for those who are interested in using morphing technology for addressing older adult issues. For example, nonprofit organizations that advocate for older adults' well-being and social inclusion are likely to find financial and technical constraints on future-related technologies challenging. Age-morphed technology can be considered as a relatively inexpensive and easy tool to employ (e.g., FaceApp through Snapchat) for them in developing an effective communication strategy. The findings of the research provide an important insight for cautious uses of these technologies as a communication strategy in older adult issue campaigns. The exposure to vivid age-morphed images or a more immersed visual experience of one's own future can encourage young people to hold more concrete thoughts of their own futures. The concrete construal of one's own future and high perceived probability gained through certain message framing and appeals can facilitate more positive thoughts and behaviors toward older adults among younger generations. However, for the issues with low perceived probability, concrete construal level generated via age-morphed images would lead to negative results. Considering that the same issues can be perceived more or less probable for people with varying knowledge, experience, and conditions (e.g., age, gender, and region), the findings can inform communication practitioners to be cautious about what to highlight and what to avoid during the message creating process. The findings indicate that this technology has a potential to be used for educational and organizational management purposes among for-profit or governmental organizations under certain circumstances to reduce negative age stereotypes that influence intergenerational communications and interactions (Hummert et al., 1998). The novelty and unique effects of age-morphing technology can cautiously be explored and used to persuade young people who need to understand how to live harmoniously with older adults in an aging society.

Limitations and Suggestions for Future Research

The current study has several limitations. First, the results are based solely on a single study that required participants to spend approximately 15 to 20 minutes in the experiment to experience age-morphing technology. A short, one-time exposure to the technology did not allow for examining the full and long-term impact of age-morphing technology on young people. This limitation might have affected the findings and could explain why some hypotheses were not supported. To advance our understanding of how to leverage digital and virtual technology for older adult issues, future research should determine if this study's significant results can be replicated. Although this research rejected PT theory as an underlying mechanism to explain the observed phenomena, a post hoc test of Study I showed that seeing an age-progressed image led to more personal distress and less empathic concern than an image of participants' current appearance. In line with previous research that has shown that emotional responses can play a role in explaining the effects of the technology, this result might indicate that emotional responses can serve as a mechanism to explain different phenomena related to the technology. Therefore, further efforts are needed to examine the PT framework and emotional responses as underlying mechanisms related to the technology's effects with different contexts and factors.

Additionally, the effects of age-morphing technology can vary depending on the quality of age-morphing technology software and applications. A wide range of age-morphing software provides diverse visual information ranging from cartoonish caricatures to realistic 3-D images of the future self (e.g., AprilAge). ChangeMyFace

generates a relatively vivid and realistic age-progressed image. And, in the survey instructions, participants were asked to follow photo guidelines carefully to secure quality and realistic future images. However, some participants who did not follow the photo guidelines had cursory/clumsy and less realistic stimuli. Although poor-quality photos were excluded during the data-cleaning process, there was still a range of quality, which might have affected participants' reactions to their age-progressed images.

In addition, the results may be unique to motivated participants because the data included only participants who completed the relatively complicated task of the experiment. The procedure includes taking a picture using a device camera, logging into age-morphing software using the given ID and password, and uploading the photo to the software and a screenshot of the age-morphed image into Qualtrics. These complicated tasks might have caused fatigue that may have influenced the results. Also, some conditions that require participants to use age-morphing technology turned out to have relatively small sample size. Considering that the larger sample size would contribute to improving the statistical power of the results, future research exploring the effects of age-morphing technology in persuasive communication contexts should aim to obtain a larger sample size to achieve more valid and robust statistical analysis results. In addition, samples recruited from M-Turk do not fully represent the general population, which limits the external validity of the findings. Even though the current research showed statistically significant results with acceptable explanatory power and sample size, future researchers should use larger samples to improve statistical power and the external validity of the results.

Footnotes

[1] Alzheimer's disease, which is a progressive degenerative brain disease that cause memory loss and cognitive and behavioral disability mostly among older adults (Alzheimer's Association, n.d.), was selected among several older adult issues based on several pretests (see stimuli development of Study I).

[2] We referred to the Cohen's f statistic index to understand the valid standard of effect size of main statistical analyses. According to the Cohen's index, the values of 0.10, 0.25, and 0.40 represent small, medium, and large effect sizes, respectively. We set up the effect size as .25 (medium effect size) in an a priori power analysis, considering that previous studies have shown mostly small-to-medium effect sizes, (Lee, 2020; Oh et al., 2016; Rittenour & Cohen, 2016; Van Gelder et al., 2015).

[3] The one-way ANOVA revealed that the manipulation of perceived probability was successful (F(1, 131) = 71.83, p < .001). Participants who read the high-probability post indicated stronger beliefs about the probability of getting Alzheimer's disease ($M_{\text{high probability}}$ = 6.17, SD = 1.77, n = 81) compared to the low-probability post ($M_{\text{low probability}}$ = 3.48, SD = 1.81, n = 52).

[4] As pointed out in Recruitment and Participants' section, there was a size imbalance across experimental groups. For statistical analyses to compare multiple groups, an equal sample size makes results more robust in case of the violation of statistical assumptions. The unequal sample size could undermine the results of the one-way ANOVA. Therefore, the Brown-Forsythe test, which tests for the equality of group variances, was conducted to make sure that these groups are statistically equal to compare on dependent variables. First, regarding future- and current-self conditions, the results illustrated that homogeneity of variances was not violated, indicating that two groups were homogeneous enough to be compared (Ageism: Brown-Forsythe (1, 99) = 1.64, p = .203, Attitude: Brown-Forsythe (1, 93) = 0.05, p = .824, Behavioral intention: Brown-Forsythe (1, 98) = 0.15, p = .703, Donation intention: Brown-Forsythe (1, 105) = 1.81, p = .182). In addition, the sample size of high-probability and low-probability conditions is unequal. The results of Brown-Forsythe tests revealed that the variances of two groups who were assigned to these conditions did not vary, indicating that it is safe to compare the two groups (Ageism: Brown-Forsythe (1, 114) = 0.38, p = .538, Attitude: Brown-Forsythe (1, 108) = 0.80, p = .374, Behavioral intention: Brown-Forsythe (1, 102) = 2.83, p = .096, Donation intention: Brown-Forsythe (1, 103) = 0.13, p = .716).

[5] Construal level of one's future based on the exposure to an image of one's future or current appearance was coded (-1 = *current self* and 1 = *future self*). The moderating variable, level of perceived probability of getting Alzheimer's disease, was coded (-1 = *low perceived probability* and 1 = *high perceived probability*).

[6] Post Hoc Test: Main effect of construal level on emotional responses: The results of one-way ANOVA showed the main effects of age-morphing technology on both personal distress (F(1, 131) = 24.96, p < .001, η_p^2 = .16) and empathic concern (F(1, 131) = 5.30, p = .023, η_p^2 = .039). Participants who saw their potential future appearance through age-progressed images showed more personal distress (M = 4.40, SD = 1.26, n = 51) and less empathic

concern (M = 3.47, SD = 1.51) than those who saw an image of their current appearance ($M_{\text{personal distress}}$ = 3.15, SD = 1.49, n = 82, $M_{\text{empathic concern}}$ = 4.07, SD = 1.41).

[7] For construal level, the results indicated that participants who checked their potential future look via age-morphing technology thought the image showed their future more concrete, vivid, and realistic ($M_{\text{future self}}$ = 6.12, SD = 1.84, n = 118), compared to those who saw an image of their current look ($M_{\text{current self}}$ = 4.30, SD = 2.10, n = 146; F (1, 262) = 54.88, p < .001). With regard to the perceived probability of Alzheimer's disease, participants who were assigned to read the high-probability message thought they would likely experience the issue in the future as a senior citizen ($M_{\text{high probability}}$ = 5.69, SD = 1.89, n = 128) compared to participants who were assigned to read the low-probability message ($M_{\text{low probability}}$ = 3.46, SD = 1.67, n = 136; F (1, 262) = 103.51, p < .001). Lastly, message appeal was also successfully manipulated. First, participants who read a Facebook post with a self-benefiting appeal indicated the message is an egoistic appeal focusing on helping oneself rather than supporting others ($M_{\text{self-benefiting appeal}}$ = 3.52, SD = 1.42, n = 131), compared to those who read an other-benefiting appeal ($M_{\text{other-benefiting appeal}}$ = 2.34, SD = 1.07, n = 133; F(1, 262) = 58.19, p < .001).

Data Availability Statement

The research stimuli, questionnaire, and data of this research are available through the Open Science Framework (osf.io/k7489).

Conflict of Interest

The Authors declare that there is no conflict of interest.

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Appendix

Figure A2. *Stimuli for Study I - Low Probability Message (Left) and High Probability Message (Right).*

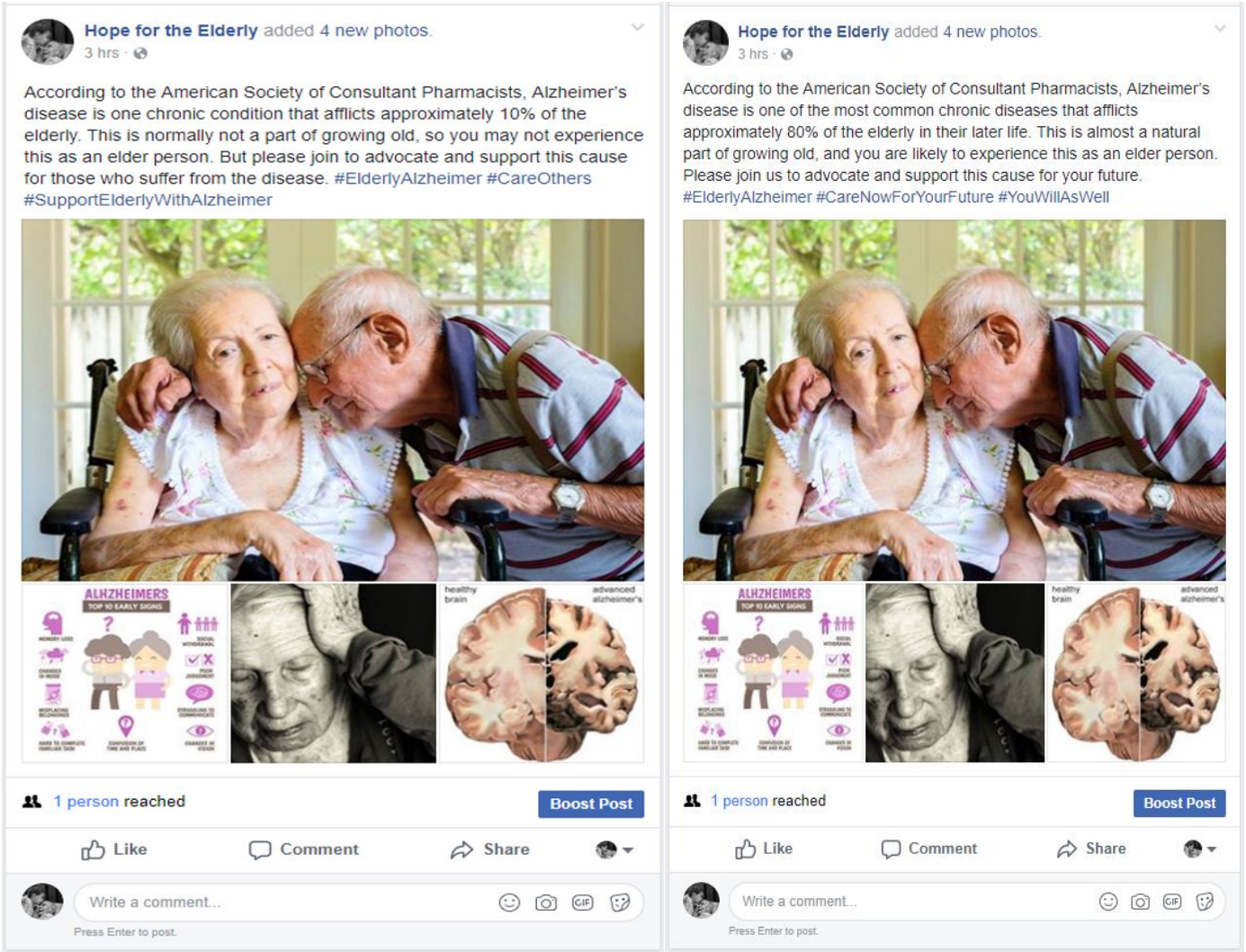

Figure A2. *Photo Guideline for Experiencing Age-Morphing Technology and Examples of Change My Face Software.*

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