

Building Trust Through Voice: How Vocal Tone Impacts User Perception of Attractiveness of Voice Assistants

SABID BIN HABIB PIAS*, Indiana University Bloomington, USA

ALICIA FREEL, Indiana University Bloomington, USA

RAN HUANG, Indiana University Bloomington, USA

DONALD WILLIAMSON, Ohio State University, USA

MINJEONG KIM, Indiana University Bloomington, USA

APU KAPADIA, Indiana University Bloomington, USA

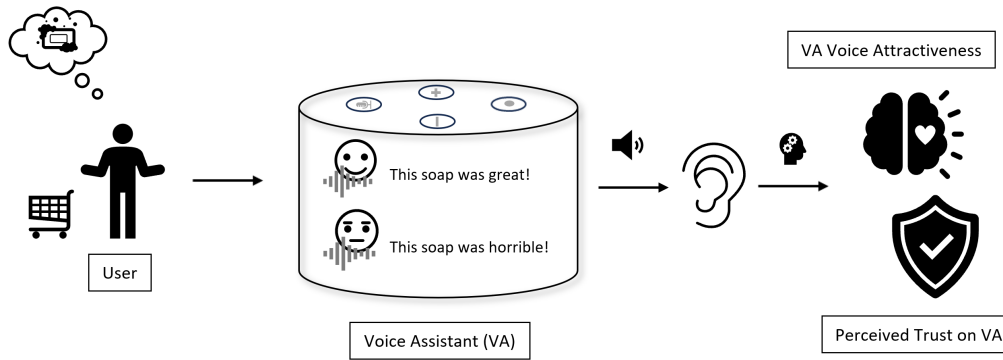


Fig. 1. An illustration of the experiment depicts a user interacting with a voice assistant (VA) featuring diverse vocal tone variations. We hypothesize that the tones of the VA voice influence VA's perceived attractiveness, and the perceived attractiveness subsequently impacts the perceived trustworthiness of the VAs.

Voice Assistants (VAs) are popular for simple tasks, but users are often hesitant to use them for complex activities like online shopping. We explored whether the vocal characteristics like the VA's vocal tone, can make VAs perceived as more attractive and trustworthy to users for complex tasks. Our findings show that the tone of the VA voice significantly impacts its perceived attractiveness and trustworthiness. Participants in our experiment were more likely to be attracted to VAs with positive or neutral tones and ultimately trusted the VAs they found more attractive. We conclude that VA's perceived trustworthiness can be enhanced through thoughtful voice design, incorporating a variety of vocal tones.

Additional Key Words and Phrases: Human-AI Interaction, Trustworthy AI, Voice Assistants

1 INTRODUCTION AND RELATED WORK

Rapid advancements in generative AI and natural language processing (NLP) have significantly expanded the capabilities of voice assistants (VAs) [15, 16], enabling them to perform complex tasks such as engaging in in-depth conversations or providing e-shopping recommendations [1, 14]. Despite these advancements, user adoption for intricate tasks remains limited due to a lack of trust in the VA [20, 35]. This mistrust stems from various concerns, including the skepticism

Authors' Contact Information: Sabid Bin Habib Pias, sabhabib@iu.edu, Indiana University Bloomington, USA; Alicia Freel, Indiana University Bloomington, USA, anfreel@iu.edu; Ran Huang, Indiana University Bloomington, USA, huangran@iu.edu; Donald Williamson, Ohio State University, USA, williamson.413@osu.edu; Minjeong Kim, Indiana University Bloomington, USA, kim2017@indiana.edu; Apu Kapadia, Indiana University Bloomington, USA, kapadia@indiana.edu.

that VAs might make mistakes [10, 19, 32] or interactions with VAs may not be as engaging as those with humans [21]. Therefore, increasing user trust and engagement is crucial for expanding VA adoption in more intricate tasks.

Research suggests that enhancing the perceived physical attractiveness of VAs can serve as a strategy to improve user engagement and trust in VAs [43]. Given the significant implications of the disembodied nature of VAs, such as their interactions with individuals with visual impairments [30], we aim to investigate alternative methods to enhance VA attractiveness. Specifically, we investigate whether acoustic attractiveness can similarly boost user trust and engagement in performing complex tasks with VAs. Introducing human-like qualities in the VAs can increase user attraction to VAs by reducing psychological distance [8, 45]. We investigate the vocal tone of VAs as an anthropomorphic quality, as studies demonstrated the effectiveness of human vocal tones in enhancing attractiveness in interpersonal relationships [54]. Similar effects of vocal attributes have also been observed in human-robot interactions. For example, users generally prefer robots with warm and engaging voices over those with a robotic or monotone quality [33]. Furthermore, urgency in the vocal tone of VAs has been effective in emergency drill scenarios [24]. Therefore, diversifying the tone of voice in VAs has the potential to increase their perceived attractiveness for users and subsequently enhance the perceived trustworthiness of the VAs. However, recent VAs offer limited voice customization. Alexa provides one male and one female voice per accent [2]. Google Assistant has 12 different voices with varied accents [51], and Siri offers a few male and female voices with different accents [12]. Notably, these options lack diversity in vocal tone.

Studies show that users prefer voices that sound engaging and relatable [53]. Therefore, customizing VA voices to match user preferences may make users feel more comfortable and trusting of VAs, especially for important tasks such as online shopping, banking, and bill payments. Increasing comfort can help more people, including the elderly and those with disabilities, use voice assistants for complex tasks if they can trust VAs more with these specific tasks [11, 41, 50]. However, the effects of varying vocal tones on the perceived attractiveness of VAs and their influence on user trust remain largely unexplored. This gap in research underscores the need for further investigation into how specific vocal attributes can enhance the attractiveness and trustworthiness of VAs in consumer contexts. To address this gap, our aim is to investigate how modifying the vocal tone of VAs affects the perceived attractiveness and trustworthiness of VAs. Specifically, we seek to answer the following question:

RQ1: How does the perceived tone of a voice assistant’s voice affect its perceived attractiveness and subsequently affect people’s trust in the voice assistant?

We aimed to explore how positive, negative, and neutral tones of voices by VAs enhance their perceived attractiveness in users, and consequently, whether the participants’ trust is affected by the perceived attractiveness.

It is also important to consider the ethical implications of deploying diverse vocal tones to enhance VA’s attractiveness and trustworthiness, for example, where trust may be misplaced or unwarranted. Our ultimate goal is to assist users in making better decisions while increasing their engagement with VAs. Therefore, it is imperative that the VAs are indeed trustworthy; they should provide factual information, perform to user expectations, and communicate with users to increase user comfort and trust [29], along with improving the attractiveness of the voice of the VAs.

This poster presents additional analysis beyond our previous study [40], which investigated whether users are persuaded by the vocal tones of voice assistants (VAs) and if this persuasiveness influences their purchase intentions. Building on the same study, we examine the interaction between VA and participants from another perspective: whether the tone of VA voice enhances acoustic attractiveness, and whether this increased attractiveness leads to greater trust in the VAs.

2 METHODOLOGY

We generated voice stimuli with varying tones, age groups, and genders and validated the voice stimuli in an initial study, and then measured user behavior toward varying VA voices in a subsequent study. All studies were verified and approved by the ethics review board (IRB) of Indiana University.

We followed the stimuli generation process by Waller et al. [47] to generate voices that varied by tone, age group, and gender. Male and female voices categorized by age groups (younger adults 20–30 years, middle-aged adults 40–50 years, and older adults 60–70 years) were selected, and positive (happy, excited, cheering), neutral (default/flat tone) or negative (sad, frustrated) tones were applied via Microsoft Studio¹. The audio was processed using Audacity² to standardize the intensity [47]. We chose the most popular [22, 25] gender-neutral products and their reviews from Amazon³. Positive product reviews were generated in either a positive or neutral tone, while negative reviews were generated in either a negative or neutral tone. Each review contained 26 to 33 words per Waller et al. [47], resulting in audio clips between 12 and 16 seconds.

We conducted a stimulus validation study to identify the perceived tone and age group of the generated voices (N = 78) [4, 5]. We removed older adult voices from the stimulus set, as pilot study participants could not detect the age of older adult voices properly. In the final stimulus validation survey, each participant was randomly assigned to either a male or female voice to eliminate gender bias. Participants rated the tone of the voice [3] and estimated the age group (younger adult or middle-aged adult). The average ratings were calculated, categorizing the voices by tone and age group.

The main study utilized the validated stimuli to investigate user perceptions of the varying vocal characteristics of a VA using the Prolific⁴. We asked the participants (N = 335) to imagine themselves checking product reviews using a voice assistant. We conducted the study with a factorial design of 2x2x2x2 between subjects, examining the effects of the review valence (positive vs. negative), gender of the voice assistant (female vs. male), age (younger vs. middle-aged) and tone (positive\negative vs. neutral). Each participant was presented with one specific voice type, with the between-factor design used to prevent carry-over effects. Participants listened to these reviews individually, which were 26 to 35 words long and lasted between 12 and 17 seconds. We measured participants' perceived attractiveness of the voice and perceived trustworthiness of the VA (Appendix table 1).

Next, we presented the participants with two qualitative open-ended questions:

- *What do you like/dislike about the voice you heard during the survey? Please elaborate.*
- *If you could create a voice for the voice assistant, what would that voice sound like? Please elaborate.*

Based on a priori G*Power analysis [17] we used the responses of 335 participants for further analyses, where more than 94% participants had experience using a voice assistant. All participants (stimulus included) were paid according to the minimum wage recommendation in the study location [46]. We used Cronbach's alpha [13] to assess internal consistency among the dependent variables. Post-regression, we calculated pairwise comparisons using estimated marginal means to interpret significant interaction effects. We conducted an inductive thematic analysis on open-ended questions about participants' likability for the VA voice. Using Delve⁵, we coded responses and identified themes. We developed and used a code book to code all responses and derive the main themes.

¹<https://speech.microsoft.com/>

²<https://www.audacityteam.org/>

³<https://www.amazon.com/>

⁴<https://app.prolific.co/>

⁵<https://delvetool.com/>

Research has shown that vocal attributes influence listeners' perceived attractiveness of the speaker in interpersonal communication [54]. Moreover, physical attractiveness has been shown to enhance trust in human interactions [52]. We aimed to explore the relationship between vocal characteristics, perceived attractiveness, and trustworthiness of the speaker in the context of voice assistants. We selected vocal tone as a vocal characteristic and investigated how the perceived tone of a VA's voice affects the VA attractiveness and how this, in turn, impacts users' trust in the VA's recommendations. Based on our research questions, we propose the following hypothesis.

H1: The *positive* tone of a voice assistant's voice enhances participants' perceived attractiveness of the VAs more compared to the *neutral* or *negative* tones and subsequently, the enhanced attractiveness increases participants' trustworthiness of the VA.

3 RESULTS

3.1 Effect of Vocal Tones

We employed the causal mediation analysis framework [6, 49] using R package 'lavaan' [44] to estimate the direct effect of the perceived tone of the VA voice on the perceived trustworthiness of the VAs and the indirect effect through the perceived VA voice attractiveness. We included the perceived age and gender of the voice in the mediation model to intercept possible indirect or direct effects of voice age and gender on perceived VA trustworthiness. We used the comparative fit index (CFI) [9] and significant model test statistics to select an optimal mediation model. In addition, the data satisfied the assumptions of homoscedasticity and normality of residuals. Thus, we performed linear regression to evaluate the relationship between the attractiveness of the VA voice and the VA voice tones.

Table 4 shows a significant indirect effect of VA tone on trustworthiness, mediated by the attractiveness of the VA's voice. VA tone directly affected the attractiveness of the voice, which then affected the trust of the participants (Figure 2). A linear regression analysis indicated that positive tones (medium effect) and neutral tones (medium effect) were perceived as more attractive than negative tones (Figure 3). These results partially support hypothesis *H1*. Although positive tones significantly enhanced attractiveness compared to negative tones, there was no significant difference in perceived attractiveness between positive and neutral tones.

In summary, positive and neutral VA tones were perceived as more attractive than negative tones, and the perceived attractiveness of the VA voice significantly influenced perceived trustworthiness in the VAs. Positive and neutral tones similarly affected VA's voice attractiveness and, consequently, VA's trustworthiness. However, for negative reviews, neutral tones were perceived as more attractive than negative tones, leading participants to trust negative reviews more when presented with neutral tones compared to negative VA tones.

Interestingly, we did not find any significant indirect or direct effect of VA voice gender and age on perceived VA trustworthiness.

3.2 Reasons for Voice Preference

We analyzed participants' written responses to understand their preferences for voice tones and how those preferences influenced trust.

Some participants found positive-toned VAs more believable and genuine. For example, P36 stated that the positive-toned VA "*felt and sounded authentic and spoke pretty naturally*". The authenticity may have been contributed by the comfortable atmosphere created by the VA that "*sounded friendly and positive*" (P97).

In addition, some participants preferred neutral voices. They perceived the VA’s calmness as a sign of unbiased recommendations as the VA “*did not give off any type of extreme emotion*” (P87). Moreover, a few participants felt that the neutral-toned VA was more fair as it “*was giving more factual statements, rather than opinions.*” (P15).

Some participants did not like the negative tone of VA voices because they found the strong emotion distracting and overwhelming. P19 stated, “*The voice with negative tone seemed pessimistic towards the majority of things.*” Some participants found it harder to concentrate on the content as “*the voice with a negative tone sounded uninterested or almost sad*” (P146). This group of participants was more interested in the information than in how it was delivered.

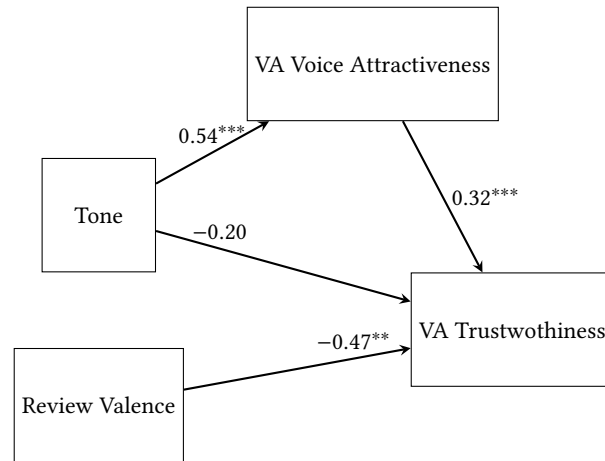


Fig. 2. Path model diagram for the mediation of voice attractiveness in the relationship between VA trustworthiness and the tone, and review valence of the VA voice. (* = p < 0.05, ** = p < 0.01, *** = p < 0.001). Baselines for emotion=neutral

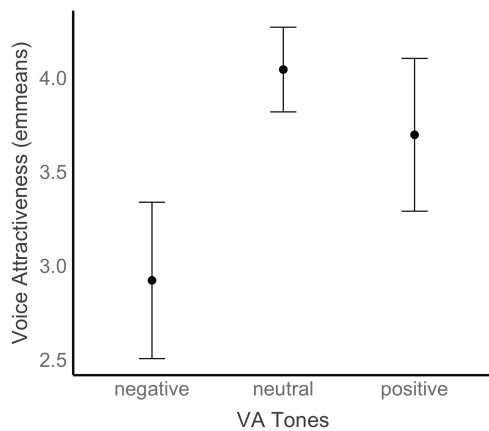


Fig. 3. Differences in the perceived attractiveness of voice in terms of vocal tones (estimated marginal means)

	Estimate	Std. Error
Tone	0.18***	0.04
Gender	0.1	0.06
Age	-0.09	0.06

Fig. 4. Indirect effect of VA tone, age, and gender in the proposed mediation model (* = p < 0.05, ** = p < 0.01, *** = p < 0.001)

4 DISCUSSION AND FUTURE WORK

In our study, we observed that participants found neutral and positive tones more attractive than negative tones, indirectly influencing their trust in VAs. The similar attractiveness of neutral and positive tones is interesting because positive attitudes and attractiveness are often correlated [42], and positive emotions have been shown to be more attractive in various contexts [8]. This result is similar to our previous work that found that a group of users find calm and positive tones to be more persuasive in online shopping scenarios [40]. The written responses of the participants indicated that some people preferred positive tones because a bit of entertainment makes complex tasks more enjoyable. Conversely, a group of participants found the robotic tones to be more appealing, as these tones were factual and allowed them to focus on the recommendations without being distracted. In contrast, some participants expressed that the negative tone of the VAs sounded uninterested and overwhelming, hindering their ability to concentrate on the information. Thus, negative tones were generally not favored by participants. This diverse result reinforces the notion that attractiveness is not always objective [34]; what one person finds attractive, another may not.

In our study, we have also found that when participants were more attracted to VAs, their perceived trustworthiness of the VAs increased significantly. This finding is consistent with prior research that users often associate attractive interfaces with better usability [28], consequently leading to higher user satisfaction [27]. Thus, an appealing interface promotes long-term use and loyalty, which in turn increases user trustworthiness in the interface. Similarly, an attractive VA can create a positive first impression, setting the tone for the entire user experience. Attractive designs can evoke positive emotions, making users feel more comfortable and confident while using the interface. Research has shown that people remember an event more when that event can invoke an emotional response in them [26]. Therefore, when positive or neutral tones enhanced the attractiveness of VAs, they subsequently invoked trustworthiness. A friendly VA voice can also calm people down, making them feel more comfortable using it for even personal tasks.

Making voice assistants more attractive and thus increasing trustworthiness can help reach a broader audience of people who can utilize VAs as a tool, including those who may find traditional interfaces challenging (such as the elderly or visually impaired) [23]. In addition to features such as jokes or friendly responses [31], the diverse vocal tones of VAs can make the experience fun and engaging. Making VAs more attractive through diverse vocal tones also helps reduce the barrier to use VAs, as some people find machines with anthropomorphic attributes easier to interact with [38]. A pleasant and engaging voice assistant can create a stronger emotional connection with users [18], making them more likely to enjoy using the technology and subsequently build user trust over time.

Future VA designs should utilize the effects of diverse VA tones to increase user engagement, considering the positive effect of positive and neutral VA tones on participants' perceived attractiveness and trust in the VAs. However, the personality traits of the users can influence their perception of attractiveness and trust [7]. Moreover, the user acceptance of new information or features can be dictated by their personality [39]. Therefore, VA designs should account for diverse personality-based preferences to ensure that VA voices are appealing and acceptable to a wide range of users.

It is also important to remember that diverse vocal tones are only one element within a broader ethical framework. For VAs to establish genuine trust, they must be trustworthy and demonstrate consistent, accurate performance, and effective communication alongside an appealing vocal style. A VA's overall experience, including voice, performance, and communication methods, builds trust and credibility. Users are more likely to rely on a VA that consistently provides accurate information and helpful assistance in a clear and professional manner.

5 LIMITATION

Our study has some limitations. First, we only used male and female voices, as technology for generating gender-ambiguous voices [48] with specific tones and ages is still developing. Second, the online setting with computer voices might not capture real-world interactions with physical VAs or the user's natural shopping environment.

6 CONCLUSION

We study how the vocal tone of voice assistants (VAs) affects their perceived attractiveness to users and, in turn, their trustworthiness. Our findings indicate that positive and neutral tones increase the perceived voice attractiveness, which consequently increases user trust in the VAs. Based on these results, we suggest that incorporating a greater diversity of vocal tones can be an effective strategy to make VAs more attractive and trustworthy to users. This approach can lower barriers to VA usage, increase user engagement, and improve communication effectiveness through enhanced trust. In addition, we emphasize that VA tones should be carefully designed to avoid misleading users: rather, the tone of VA voice should serve as a medium to foster healthy engagement with trustworthy VAs.

ACKNOWLEDGMENTS

This material is based upon work supported by the National Science Foundation under grants CNS-2207019 and Social Science Research Funding Program (SSRFP) in Indiana University. We would also like to thank Hannah Bolte and Elizabeth Ray for providing statistics consultation from the Indiana Statistical Council Center (ISCC).

REFERENCES

- [1] 2023. *Alexa Voice Shopping*. <https://www.amazon.com/alexa-voice-shopping>
- [2] Amazon Staff. 2022. Amazon Echo and Alexa Devices. <https://www.amazon.com/smart-home-devices/b?ie=UTF8&node=9818047011>. Accessed: 2022-02-10.
- [3] Mary Jean Amon, Rakibul Hasan, Kurt Hugenberg, Bennett I Bertenthal, and Apu Kapadia. 2020. Influencing photo sharing decisions on social media: A case of paradoxical findings. In *2020 IEEE Symposium on Security and Privacy (SP)*. IEEE, 1350–1366.
- [4] Alice Baird, Stina Hasse Jørgensen, Emilia Parada-Cabaleiro, Nicholas Cummins, Simone Hantke, and Björn Schuller. 2018. The perception of vocal traits in synthesized voices: Age, gender, and human likeness. *Journal of the Audio Engineering Society* 66, 4 (2018), 277–285.
- [5] Alice Baird, Stina Hasse Jørgensen, Emilia Parada-Cabaleiro, Simone Hantke, Nicholas Cummins, and Björn Schuller. 2017. Perception of paralinguistic traits in synthesized voices. In *Proceedings of the 12th International Audio Mostly Conference on Augmented and Participatory Sound and Music Experiences*. 1–5.
- [6] Reuben M. Baron and David A. Kenny. 1986. The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology* 51, 6 (1986), 1173–1182. <https://doi.org/10.1037/0022-3514.51.6.1173> Place: US Publisher: American Psychological Association.
- [7] Bernadetta Bartosik, Grzegorz M Wojcik, Aneta Brzezicka, and Andrzej Kawiak. 2021. Are you able to trust me? Analysis of the relationships between personality traits and the assessment of attractiveness and trust. *Frontiers in Human Neuroscience* 15 (2021), 685530.
- [8] Austin Beattie, Autumn P Edwards, and Chad Edwards. 2020. A bot and a smile: Interpersonal impressions of chatbots and humans using emoji in computer-mediated communication. In *Communicating Artificial Intelligence (AI)*. Routledge, 41–59.
- [9] P. M. Bentler. 1990. Comparative fit indexes in structural models. *Psychological Bulletin* 107, 2 (1990), 238–246. <https://doi.org/10.1037/0033-2909.107.2.238> Place: US Publisher: American Psychological Association.
- [10] Margaret C. Campbell and Ronald C. Goodstein. 2001. The Moderating Effect of Perceived Risk on Consumers' Evaluations of Product Incongruity: Preference for the Norm. *Journal of Consumer Research* 28, 3 (Dec. 2001), 439–449. <https://doi.org/10.1086/323731>
- [11] Chen Chen, Janet G Johnson, Kemeberly Charles, Alice Lee, Ella T Lifset, Michael Hogarth, Alison A Moore, Emilia Farcas, and Nadir Weibel. 2021. Understanding Barriers and Design Opportunities to Improve Healthcare and QOL for Older Adults through Voice Assistants. In *Proceedings of the 23rd International ACM SIGACCESS Conference on Computers and Accessibility* (<conf-loc>, <city>Virtual Event</city>, <country>USA</country>, </conf-loc>) (ASSETS '21). Association for Computing Machinery, New York, NY, USA, Article 9, 16 pages. <https://doi.org/10.1145/3441852.3471218>
- [12] Jason Cipriani. 2023. *Siri's 4 new voices: Here's where to find them and how to make the switch*. CNET. <https://www.cnet.com/tech/mobile/siri-4-new-voices-heres-where-to-find-them-and-how-to-make-the-switch/>
- [13] Lee J Cronbach. 1951. Coefficient alpha and the internal structure of tests. *psychometrika* 16, 3 (1951), 297–334.

- [14] Celso M De Melo, Kangsoo Kim, Nahal Norouzi, Gerd Bruder, and Gregory Welch. 2020. Reducing cognitive load and improving warfighter problem solving with intelligent virtual assistants. *Frontiers in psychology* 11 (2020), 554706.
- [15] Pranay Dighe, Yi Su, Shangshang Zheng, Yunshu Liu, Vineet Garg, Xiaochuan Niu, and Ahmed Tewfik. 2024. Leveraging large language models for exploiting asr uncertainty. In *ICASSP 2024-2024 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*. IEEE, 12231–12235.
- [16] Xin Luna Dong, Seungwhan Moon, Yifan Ethan Xu, Kshitiz Malik, and Zhou Yu. 2023. Towards Next-Generation Intelligent Assistants Leveraging LLM Techniques. In *Proceedings of the 29th ACM SIGKDD Conference on Knowledge Discovery and Data Mining* (<conf-loc>, <city>Long Beach</city>, <state>CA</state>, <country>USA</country>, </conf-loc>) (*KDD '23*). Association for Computing Machinery, New York, NY, USA, 5792–5793. <https://doi.org/10.1145/3580305.3599572>
- [17] Franz Faul, Edgar Erdfelder, Albert-Georg Lang, and Axel Buchner. 2007. G* Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior research methods* 39, 2 (2007), 175–191.
- [18] Carlos Flavián, Sergio Ibáñez-Sánchez, and Carlos Orús. 2021. Impacts of technological embodiment through virtual reality on potential guests' emotions and engagement. *Journal of Hospitality Marketing & Management* 30, 1 (2021), 1–20.
- [19] Areum Hong, Changi Nam, and Seongcheol Kim. 2020. What will be the possible barriers to consumers' adoption of smart home services? *Telecommunications Policy* 44, 2 (March 2020), 101867. <https://doi.org/10.1016/j.telpol.2019.101867>
- [20] Tatum Hunter. 2022. *Needy, overconfident voice assistants are wearing on their owners' last nerves*. <https://www.washingtonpost.com/technology/2022/03/07/voice-assistants-wrong-answers/>
- [21] Shilpi Jain, Sriparna Basu, Arghya Ray, and Ronnie Das. 2023. Impact of irritation and negative emotions on the performance of voice assistants: Netting dissatisfied customers' perspectives. *International Journal of Information Management* 72 (2023), 102662.
- [22] Bradley Johnson. 2023. *The 23 Best High Demand Products to Sell In 2023*. <https://www.bluecart.com/blog/high-demand-products>
- [23] Akif Khan and Shah Khuro. 2021. An insight into smartphone-based assistive solutions for visually impaired and blind people: issues, challenges and opportunities. *Universal Access in the Information Society* 20, 2 (2021), 265–298.
- [24] Jieun Kim, Gonzalo Gonzalez-Pumariega, Soyee Park, and Susan R. Fussell. 2023. Urgency Builds Trust: A Voice Agent's Emotional Expression in an Emergency. In *Companion Publication of the 2023 Conference on Computer Supported Cooperative Work and Social Computing (CSCW '23 Companion)*. Association for Computing Machinery, New York, NY, USA, 343–347. <https://doi.org/10.1145/3584931.3606979>
- [25] Alexander Kunst. 2023. *Most popular categories for online purchases in the U.S. 2023*. Retrieved August 25, 2023 from <https://www.statista.com/forecasts/997093/most-popular-categories-for-online-purchases-in-the-us>
- [26] James D Laird, J John Wagener, Mark Halal, and Martha Szegda. 1982. Remembering what you feel: Effects of emotion on memory. *Journal of personality and social psychology* 42, 4 (1982), 646.
- [27] Gitte Lindgaard. 2007. Aesthetics, Visual Appeal, Usability, and User Satisfaction. *Australian journal of emerging technologies and society* (2007).
- [28] Frida Linghammar. 2007. Usability and Aesthetics: is beautiful more usable.
- [29] Xiao Ma and Ariel Liu. 2020. Challenges in supporting exploratory search through voice assistants. In *Proceedings of the 2nd Conference on Conversational User Interfaces*. 1–3.
- [30] Paul Niño Ry Mina, Ice Mae Solon, Fatima Rose Sanchez, Tristan Kent Delante, Jean Kathleen Villegas, Florence John Basay, Jay-r Andales, Francine Pasko, Mary Fair Ruval Estrera, Roberto Samson Jr, et al. 2023. Leveraging Education through Artificial Intelligence Virtual Assistance: A Case Study of Visually Impaired Learners. *International Journal of Educational Innovation and Research* 2, 1 (2023), 10–22.
- [31] Sara Moussawi and Raquel Benbunan-Fich. 2021. The effect of voice and humour on users' perceptions of personal intelligent agents. *Behaviour & Information Technology* 40, 15 (2021), 1603–1626.
- [32] A. P. Kavitha Muthukumar and H. Vani. 2020. Optimizing the usage of voice assistants for shopping. *Indian Journal of Science and Technology* 13, 43 (Dec. 2020), 4407–4416. <https://doi.org/10.17485/IJST/v13i43.1911> Publisher: The Indian Society of Education and Environment.
- [33] Clifford Nass, Ulla Foehr, Scott Brave, and Michael Somoza. 2001. The effects of emotion of voice in synthesized and recorded speech. In *Proceedings of the AAAI symposium emotional and intelligent II: The tangled knot of social cognition*. AAAI North Falmouth, MA.
- [34] Mark S Nestor, Mark A Stillman, and Andrew C Frisina. 2010. Subjective and objective facial attractiveness: ratings and gender differences in objective appraisals of female faces. *The Journal of clinical and aesthetic dermatology* 3, 12 (2010), 31.
- [35] Ekaterina Novozhilova, Kate Mays, and James E. Katz. 2024. Looking towards an automated future: U.S. attitudes towards future artificial intelligence instantiations and their effect. *Humanities and Social Sciences Communications* 11, 1 (Jan. 2024), 1–11. <https://doi.org/10.1057/s41599-024-02625-1> Number: 1 Publisher: Palgrave.
- [36] Roobina Ohanian. 1990. Construction and validation of a scale to measure celebrity endorsers' perceived expertise, trustworthiness, and attractiveness. *Journal of advertising* 19, 3 (1990), 39–52.
- [37] Hyun Jung Park and Li Min Lin. 2020. The effects of match-ups on the consumer attitudes toward internet celebrities and their live streaming contents in the context of product endorsement. *Journal of retailing and consumer services* 52 (2020), 101934.
- [38] Corina Pelau, Dan-Cristian Dabija, and Irina Ene. 2021. What makes an AI device human-like? The role of interaction quality, empathy and perceived psychological anthropomorphic characteristics in the acceptance of artificial intelligence in the service industry. *Computers in Human Behavior* 122 (2021), 106855.
- [39] Sabid Bin Habib Pias, Alicia Freel, Timothy Trammel, Taslima Akter, Donald Williamson, and Apu Kapadia. 2024. The Drawback of Insight: Detailed Explanations Can Reduce Agreement with XAI. *arXiv preprint arXiv:2404.19629* (2024).

- [40] Sabid Bin Habib Pias, Ran Huang, Donald Williamson, Minjeong Kim, and Apu Kapadia. 2024. The Impact of Perceived Tone, Age, and Gender on Voice Assistant Persuasiveness in the Context of Product Recommendations. *arXiv preprint arXiv:2405.04791* (2024).
- [41] Alisha Pradhan, Amanda Lazar, and Leah Findlater. 2020. Use of Intelligent Voice Assistants by Older Adults with Low Technology Use. *ACM Trans. Comput.-Hum. Interact.* 27, 4, Article 31 (sep 2020), 27 pages. <https://doi.org/10.1145/3373759>
- [42] Marc-André Reinhard, Matthias Messner, and Siegfried Ludwig Sporer. 2006. Explicit persuasive intent and its impact on success at persuasion—The determining roles of attractiveness and likeableness. *Journal of Consumer Psychology* 16, 3 (2006), 249–259.
- [43] Minjin Rheu, Ji Youn Shin, Wei Peng, and Jina Huh-Yoo. 2021. Systematic review: Trust-building factors and implications for conversational agent design. *International Journal of Human-Computer Interaction* 37, 1 (2021), 81–96.
- [44] Yves Rosseel. 2012. lavaan: An R Package for Structural Equation Modeling. *Journal of Statistical Software* 48 (May 2012), 1–36. <https://doi.org/10.18637/jss.v048.i02>
- [45] William Seymour and Max Van Kleek. 2021. Exploring Interactions Between Trust, Anthropomorphism, and Relationship Development in Voice Assistants. *Proc. ACM Hum.-Comput. Interact.* 5, CSCW2, Article 371 (oct 2021), 16 pages. <https://doi.org/10.1145/3479515>
- [46] M Six Silberman, Bill Tomlinson, Rochelle LaPlante, Joel Ross, Lilly Irani, and Andrew Zaldivar. 2018. Responsible research with crowds: pay crowdworkers at least minimum wage. *Commun. ACM* 61, 3 (2018), 39–41.
- [47] Sara Skoog Waller, Mårten Eriksson, and Patrik Sörqvist. 2015. Can you hear my age? Influences of speech rate and speech spontaneity on estimation of speaker age. *Frontiers in psychology* 6 (2015), 978.
- [48] Selina Jeanne Sutton. 2020. Gender Ambiguous, not Genderless: Designing Gender in Voice User Interfaces (VUIs) with Sensitivity. In *Proceedings of the 2nd Conference on Conversational User Interfaces (CUI '20)*. Association for Computing Machinery, New York, NY, USA, 1–8. <https://doi.org/10.1145/3405755.3406123>
- [49] Dustin Tingley, Teppei Yamamoto, Kentaro Hirose, Luke Keele, and Kosuke Imai. 2014. **mediation** : R Package for Causal Mediation Analysis. *Journal of Statistical Software* 59, 5 (2014). <https://doi.org/10.18637/jss.v059.i05>
- [50] Alessandro Diogo Vieira, Higor Leite, and Ana Vitória Lachowski Volochchuk. 2022. The impact of voice assistant home devices on people with disabilities: A longitudinal study. *Technological Forecasting and Social Change* 184 (2022), 121961.
- [51] Ara Wagoner. 2019. *Hear the rainbow: Putting personality to the Google Assistant*. Android Central. <https://www.androidcentral.com/google-assistant-voice-personalities>
- [52] Na Zhao, Mingjie Zhou, Yuanyuan Shi, and Jianxin Zhang. 2015. Face attractiveness in building trust: Evidence from measurement of implicit and explicit responses. *Social Behavior and Personality: an international journal* 43, 5 (2015), 855–866.
- [53] Runting Zhong, Mengyao Ma, Yutong Zhou, Qingxia Lin, Leiling Li, and Nengjing Zhang. 2022. User acceptance of smart home voice assistant: a comparison among younger, middle-aged, and older adults. *Universal Access in the Information Society* (2022), 1–18.
- [54] Miron Zuckerman and Robert E Driver. 1989. What sounds beautiful is good: The vocal attractiveness stereotype. *Journal of nonverbal behavior* 13, 2 (1989), 67–82.

A APPENDIX

Factor	Item	Chron. alpha
VA Voice Attractiveness [37]	The voice gave me a good feeling	0.88
	The voice is attractive	
	The voice caught my at- tention	
VA Voice Trustworthiness [36]	The voice assistant is dependable	0.91
	The voice assistant is honest	
	The voice assistant is sincere	
	The voice assistant is trustworthy	
	The voice assistant is re- liable	

Table 1. Question Items about Perceived Voice Attractiveness and Perceived VA Trustworthiness. Chron. alpha= Chronbach's alpha