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Understanding older adults' initial perceptions of robot appearance and function: Implications for acceptance

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Abstract

Background: As the aging population grows, it creates more demand on home care support and healthcare resources. Domestic robots have the potential to support older adults to age-in-place. However, not much is known about how older adults initially perceive robots intended for home use and everyday living activity support.
Objective: Our goal was to introduce older adults to a variety of robots that could assist with several tasks within the home to support their activities. The literature shows that function and appearance of a robot can influence older adults' attitudes. We explored whether older adults' first impressions were influenced by the aspects of function and appearance.
Methodology: Data were from a previously conducted interview study. We extracted the participants' qualitative response to the question about their initial impressions of six different robots. These data were coded according to whether the older adult focused on function, appearance, both, and other.
Results: When discussing both function and appearance, the older adults had mostly positive comments. Most older adults in this study focused on the robots' function. The robots with the more industrial appearances had first impression sentiments focused on function. This contrasted with robots that were animal/human-like, where sentiments co-considered appearance and function. We noted two emerging themes. First, older adults found the robots useful for others or their future selves but did not necessarily want or need them currently; second, they found the robots redundant to other technologies they have in the home (e.g., Alexa, the internet).
Conclusions: Older adults' first impressions of robots for domestic support mostly focused on the function and abilities of the robot. Appearance was discussed at a less frequent rate and was often discussed in tandem with the robot's functionality.

Keywords: domestic robots, technology, aging, perceived usefulness

Introduction

Robotic potential for older adults

By 2030, older adults (65 and older) are expected to reach 20 percent of the population (National Institute on Aging, 2018). As Generation X ages, it could create a 50 percent increase in the number of Americans who require nursing home care to about 1.9 million in 2030 (Population Reference Bureau, 2019), which can lead to a limitation of resources to support these individuals. Many older adults prefer to age independently in their homes (Binette & Vasold, 2018; Roy et al., 2018). However, aging can be associated with decreases in physical capacity, mental capacity, and function, which can create barriers to aging in place (WHO, 2018), in the home and community (Rogers et al., 2020). Assistive technology, which can refer to several different devices (i.e., computers, aids, wearables), over time has increasingly improved and has enhanced potential support for older adults who are aging in their homes (Tinker, 2016).

Robots have the capability to bridge the gap between the strain on resources and older adults' needs. It could especially help older adults experiencing limitations and having difficulties with everyday living activities (Mitzner et al., 2014). Robots are currently being developed specifically to aid in functional tasks required to support everyday living. Activities of Daily Living (ADLs) are physically demanding tasks that involve self-care activities like ambulation, transferring, and bathing (Lawton,1990). Samuel et al., (2023) found that studies with older adults and robots that assist with ADL tasks focus on medication intake, lifting objects, ambulation, eating/drinking/cooking, shopping, and bathing. The capability of carrying out ADLs is a major factor in how long an older adult can remain independent (Lawton & Nahemow, 1973). Instrumental Activities of Daily Living (IADLs) are more cog-

Table 1. Sociodemographic characteristics of participants (n=19)

Baseline characteristic	*n*	%
Gender		
Female	12	63.2
Male	7	36.8
Age		
66-69	6	31.6
70-74	4	21.1
75-89	9	47.4
Ethnic grouping		
American Indian / Alaska Native	0	0
Asian	0	0
Native Hawaiian, other Pacific Islander	0	0
Black or African American	4	21.1
White	15	78.9
More than one ethnic origin	0	0
Other	0	0
Hispanic ethnicity		
Yes	0	0
No	19	100
Marital status		
Single	6	31.2
Married	10	52.6
Separated	0	0
Divorced	2	10.5
Widowed	1	5.3
Other	0	0
Highest educational level		
Less than High School	1	5.3
In progress college / Associate's Degree	2	11.0
Bachelor's Degree (BA, BS)	5	26.3
Master's Degree (or other post-graduate training)	8	42.1
Doctoral Degree (PhD, MD, EdD. DDS, JD, etc.)	3	15.8
Income (US$)		
Less than 25,000	1	5.3
25,000-49,999	3	15.8
50,000-74,999	2	10.5
75,000 or more	7	36.8
Do not wish to answer	6	31.6

nitively demanding tasks that involve managing daily tasks such as taking care of household chores, finances, and meal preparation (Lawton & Brody,1969). IADLs are also critical for independent aging and individuals often seek outside assistance if these needs are not met (Ankuda et al., 2019; Mitzner et al., 2014).

Robots are even reaching beyond functional and cognitive support as we see more robots being developed to support enhanced daily living activities. Enhanced Activities of Daily living (EADLs) are activities that involve enrichment or social engagement such as continuing education and managing relationships (Rogers et al., 1998; 2020). Although the capability to do EADLs is not essential to maintain independent aging, it does impact quality of life.

Task, robot appearance, initial impressions

Function may be defined as the robot's ability to fulfill a user's needs, similar to how we define usefulness (Davis, 1989). The Bröhl et al. (2016) study showed that when a product covers a human's needs and expectations, it is perceived to be useful and accepted. Beer et al. (2017) found that humanizing the robot, perceived usefulness, person factors, and robot capability can influence older adults' attitudes toward a robot, with robot capability being most discussed out of these options. This was the case for all tasks in the study, which included ADLs and IADLs. However, these findings were based on one mobile manipulator robot.

Robot appearances can vary (e.g., creature-like, object-like). The appearance of the robot can influence an older adult's attitude (Pino et al., 2015; Prakash & Rogers, 2015; Sundar et al., 2016). Older adults are cognizant of robot appearance, which has been shown to affect robot acceptance (Riek, 2017). Appearance, specifically anthropomorphic (human-likeness) features of virtual elements increase perceived usefulness (Stroessner & Benitez, 2018; Garnier & Poncin, 2013). Prior work shows that appearance can affect a user's perception of a robot's functionality (Haring et al., 2018; Luria et al., 2018). Investigating which aspects of appearance older adults focus on, in the context of the domestic home, can enhance our understanding of which features can increase their perceptions of usefulness.

First impressions have been found to significantly influence how individuals perceive and approach new technology (Hsu & Lu, 2007). It has also been found to influence a user's willingness to continue using a technology and overall satisfaction (Venkatesh et al., 2003). Knowledge of a user's initial perceptions of a robot can help guide how we design these technologies to achieve positive first impressions.

What are older adults' preferences?

Previous research has yielded discrepancies on older adults' preferences for robot design and functionality based on context. The Złotowski et al. (2019) study showed that machine-looking robots are preferred for conventional types of jobs such as cleaner or servant, whereas humanoid robots were preferred for jobs that included human interaction such as clerk or nurse. In another study, the visualizations of household robots had fewer anthropomorphic facial aspects and motions than humanoid robots (Phillips et al., 2017). Some older adults preferred a more performance-orientated robot (e.g., reliable, consistent) rather than social traits (e.g., friendly; Ezer et al., 2009). In the context of a healthcare robot, older adults perceived physical capabilities and monitoring (e.g., detecting falls, lifting) to be more useful compared to social or cognitive tasks such as judgment making (e.g., providing medical advice; Broadbent et al., 2009).

Table 2. Robot stimuli and classification adapted from Deutsch et al. (2019), with Google Home replaced by Jibo

Image							
Name	PR2	Nao	Paro	ElliQ	Cozmo	Google Home	Jibo
Appearance	Creature	Creature	Creature	Object	Object	Object	Object
Function	Assistive	Service	Companion	Service	Companion	Assistive	Assistive
Mobility	Mobile	Mobile	Stationary	Stationary	Mobile	Stationary	Stationary
Proactivity	Reactive	Proactive	Reactive	Proactive	Proactive	Reactive	Reactive

Throughout the literature, there are several studies that use different robots and different tasks showing that both appearance and functionality can have an influence on older adults' attitudes toward a robot (Pino et al., 2015; Prakash & Rogers, 2015; Sundar et al., 2016). If older adults are guided to think about specific tasks and specific aspects of a robot's appearance, we do not gain insights into what they would prioritize organically when forming their initial impressions of the robot on their own. The goal of the present study was to gain a foundational understanding of older adults' first impressions of six different robots that were described to be able to assist with ADLs, IADLs, and EADLs to evaluate if they focused more on the function of the robot or on the appearance.

Overview of the study

To identify the role of functionality and appearance in older adults' first impressions of robots, we used interview data from a previously conducted study (Bayles, 2021). This study provided older adults with images of six robots that had a range of functions and appearances. The images were selected to follow the Deutsch et al (2019) framework to present a range of appearances. The robot images were accompanied by a description of the potential of the robot in ADL, IADL, and EADL scenarios. The order of presentation of the robot images was randomized for each participant. For each image, the researcher introduced the robot, discussed the robot's potential, and asked the participants an open-ended question about their first impression. These data were transcribed and coded.

Method

Participants

Data included are from 19 older adult participants (*Table 1*) who were 65 years or older (M=73.8, SD=6.65) who received the initial familiarization questions used for this analysis (see

Table 3. Overview of coding scheme

Categorization Codes	**Definition**	**Examples**
Appearance	Mentions physical features or aspects of personality (e.g., friendly) unrelated to its function (carrying out a task). Example key words anthropomorphic, zoomorphic and machine-like.	[PT 1020]: *"Nao looks like the terminator. He looks friendly and ominous at the same time; I wouldn't mind having him around."*
Function	Mentions aspects related to executing a task (e.g., ability to move, capability to do a task). Example key words: task-oriented, seems useful.	[PT 1012}: *"Looks like he's capable of handling heavy duty things"*
Both	Mentions both aspects of appearance and function (see definitions above).	[PT 1003]: "*It looks like a toy that would be very attractive for a kid. I don't need any of those functions, I have Alexa who responds to her name, and I imagine it uses some of the same technology as that does. It looks very futuristic... I don't need any of those functions*"
Neither	Does not mention aspects of appearance or function.	[PT 1007]: "*The first thing that pops in my mind that I kinda have something, but I don't stroke it or pet it, and that's the Alexa.*"
Sentiment Codes	**Definition**	**Examples**
Positive	Mention an attribute related to appearance or function that is good, constructive, positive, etc.	[PT 1020]: "*...looks well-designed. I would expect somebody to enjoy having one.*"
Negative	Mentions an attribute related to appearance or function that is undesirable, not optimal, negative, etc.	[PT 1021}: "*...when I look at it, I think of it getting in my way in being able to roll around in my home."*
Neutral	Mention an attribute related appearance or function that has no positive or negative characteristics.	[PT 1012]: "*...It looks like he's ready to go to work."*
Relative advantage	Mentions an attribute related appearance or function that would make a product more desirable or superior.	[PT 1019]: "*I think it's has more use than paro does - being able to go under a wheelchair to show what it may be stuck on.*"

Table 4. Function and appearance categories

Sentiments	Example	n	%
Function			
Positive	*"Some of those things may be more useful 'cause it replaces the apparent need that they have for a full-time or a part time attendant."*	96	48
Negative	"Well limited function- tripping hazard..."	34	33
Neutral	*"...could be either a god-send or I can't believe I gotta dust and vacuum this thing."*	66	17
Relative advantage	*"Even better than Roomba, 'cause Roomba...you can't talk to it and it doesn't go to the front door, so I like it!"*	4	2
Appearance			
Positive	*"...looks well-designed. I would expect somebody to enjoy having one."*	6	50
Negative	*"He looks...ominous at the same time"*	1	8
Neutral	*"Looks like he very active..."*	5	42
Relative advantage	N/A	0	0

Bayles, 2021 for more details about the method). Participants met the following inclusion criteria: older than 65, able to access internet and a video camera, able to read size 14 with corrective lenses, and completed the Telephone Interview for Cognitive Status (TICS; Fong et al., 2009) with a score above 32. Participants were given the TechSAge Background Questionnaire (Remillard et al., 2021) to collect demographic information.

Stimuli and procedure

The robot description cards (*Table 2*) contained an image of the robot, a description of the robot, and examples of potential functions for each task-type (i.e., ADL, EADL, IADL). Robots were presented to participants in a randomized order. After reviewing each robot card, the researcher asked about the participant's initial impression of the robot. Participants were specifically asked *"What are your thoughts about [robot]?"* This open-ended question was analyzed for the present paper. The robot stimuli selection was guided by Deutsch et al. (2019). The Google Home was to be replaced with the robot Jibo to provide participants with robots they did not have previous interactions with as well as keep the consistency of the classification.

Results

Coding scheme development

We had a total of 114 responses to code from 19 participants each having an initial impression of each of the robots. We developed a preliminary coding scheme to code their responses into one of the categories. *Table 3* shows how we defined each category with examples of the type of responses that would fall into each category. We also coded if the response was a positive or negative sentiment.

Table 5. Coded segments by robot

Robots	Function	Appearance	Both	Neither
PR2	15	0	4	0
Cozmo	11	1	6	1
Elli-Q	12	1	6	0
Paro	7	3	8	1
Nao	7	2	9	1
Jibo	8	2	5	5
Total	60	8	38	8

Examples of responses for each category are shown in *Table 3*. Intercoder reliability was tested between two coders over three rounds of coding. After the first round, discrepancies were discussed, and the coding scheme was modified for greater clarity. The last two rounds resulted in agreement at 83%. One coder then applied the coding scheme to the rest of the transcription segments. If there were questionable segments, the team came together to decide a final code. The analysis for qualitative themes was an inductive process. For the participants' responses, we made comments on emerging themes as we coded. These were broad in nature and meant to give a rudimentary idea on the arising themes.

Robot capabilities remain priority

The older adults focused on function the most. This was followed by responses that were coded for both function and robot appearance. Responses that mentioned only appearance or neither function nor appearance were sparse (8 responses each). Out of 114 statements, 60 of the statements were categorized as only discussing function. There were 38 coded responses for statements that focused on both functionality and appearance. A summary of this data is in *Table 4*. Below are examples of responses that were coded as strictly functional:

"Well, I can see how it would be very useful for someone who needs help lifting things and moving things from one room to another. It's much larger, so it would be more noticeable and more intrusive, but I suppose it has to be larger because it has to be able to bear weight"

"That's cool. Yeah, recognize. Yeah, got the door for you. It's good. Move things closer. Yeah, going on there and giving you an image of what's

Table 6. Example of qualitative themes

Theme	Examples
Usefulness for self and/or others	*"Paro would be **good for a person that enjoys a pet**. I'm not a pet person, so I wouldn't enjoy it." "And bringing a phone from another room to the user to call family matters. members or friends, I **think it's important, because some of the seniors that I have worked with they can't reach their phone. So, this is helpful."** "It would be pretty **helpful, especially if a person was blind and, in a wheelchair,** - couldn't move something that was obstructing."*
Comparison to another technology	*"**It's redundant technology**. I don't, to be honest with you, depending on cost and service operation, and maintenance-And this goes with all the robots that may or not may come into play whether or not it's something that will be a barrier." "Dialing phone numbers...**we already have that capability** with other things, you know, like **Google Home over here or my phone**, so I guess it **seems redundant** in that regard." "I currently **see something similar to it**, it's again Amazon product that has a screen and you talk back and forth and **does all these things that Jibo does**."*

under your chair. That's good. I like that."

"I would not like… Paro. I don't think it would be very helpful because for example, I have other timers that I can use. I so far don't need reminders about how long it's been since I've talked to family members or friends, so I don't think Paro would be very helpful."

With so many comments being about function, we further parsed the 'object' robots versus 'creature' robots to identify if the function comments were mostly connected to the object robots (more industry appearance). Our preliminary results showed that robots with more functional appearances (e.g., PR2) seemed to have higher responses coded as function (15 out of 19 participants). Robots that had a more creature like appearance (e.g., Nao, Paro) more often had sentiments of both appearance and function. *Table 5* shows how many responses were coded as function, appearance, both, and neither for each specific robot.

Below are examples of sentiments that were coded only as appearance:

"I like the way he [Nao] looks like he's got that more humanoid sort of look, the kinds of things that we've seen on television he looks more like a friendly robot" [Female, 74].

"I think I might be more likely to talk to him [Paro] than some of the others because of the sweet expression on his face and the fact that he wiggles, I think would be amusing and fun" [Female, 74].

One theme was that the older adults in this study found the robots to be useful, however, it was mostly for others or their future selves. In *Table 6*, we can see participants remark that they see the potential benefit of use for others, but not for themselves.

A participant who expressed similar sentiments with this theme commented that:

"She has Parkinson's and it's hard for her to like hold the phone still...Jibo might be good for somebody like that...For me, I don't know that it would be helpful" [Female, 69].

We noticed that they often compared the robots to another piece of technology that they already have, stating that the robot would not be useful because it would do similar tasks (examples also shown in *Table 6*). An example of this type of sentiment would be:

"I have other ways of accomplishing the same task, usually with the internet. As I say, I have Alexa. Alexa doesn't have a screen, but certainly using the internet on the Tablet or laptop can do the same thing" [Female, 80].

Attitudes

We analyzed each first impression code (function, appearance, both, and neither) with an attitude code. Our initial results from coding showed that most of the sentiments for the robots are positive. When focusing just on the Function category (*Table 4*), we see that preliminary results show that 48% of the sentiments were positive. This is followed by 33% of the sentiments being negative, 17% being neutral, and 2% being coded for the relative advantage category. Relative advantage in this context is a comment about function or appearance that would make the technology more desirable. When focusing on the Appearance category (*Table 4*), we see that preliminary results indicate that 50% of the sentiments are positive. This is followed by 42% of the sentiments being neutral, and 8% being negative (no relative advantage segments were coded for this category).

Discussion and conclusion

When intentionally asked about their first impressions toward six domestic robots, most older adults focused on function, especially for the more 'functional' appearing robots (i.e., PR2). These functional comments were mostly positive, however, older adults did have some negative responses to the robots as well. First impressions that were appearance focused were often attached to robots with a more creature-like appearance. Most of these impressions were also positive, but with a few negative considerations. We noted emerging themes from the impressions, suggesting they find the robots useful for others or their future selves and they would not find a robot helpful because

it would be redundant to other technologies they already own (e.g., Alexa, tablets).

Introducing new technologies to older adults in the proper way can influence an older adult's openness to the technology and increase the likelihood they will use that technology. Understanding that most older adults' first impressions are focused on function could indicate that when introducing a robot to an older adult, the functional capabilities of the robot should be presented to indicated how that robot would be useful to them.

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References

Ankuda, C. K., Levine, D. A., Langa, K. M., Ornstein, K. A., Kelley, A. S. (2020). Caregiving, Recovery, and Death After Incident ADL/IADL Disability Among Older Adults in the United States. Journal of Applied Gerontology, 39(4), 393–397. https://doi.org/10.1177/0733464819826842

Bayles, M. A. (2021). A holistic understanding of older adults' acceptance of domestic robots. [Master's Thesis, University of Illinois Urbana-Champaign]. http://hdl.handle.net/2142/110634

Beer, J., Prakash, A., Smarr, C.-A., Chen, T., Hawkins, K., Nguyen, H., Deyle, T., Kemp, C., Rogers, W. (2017). Older users' acceptance of an assistive robot: Attitudinal changes following brief exposure. Gerontechnology, 16(1), 21–36. https://doi.org/10.4017/gt.2017.16.1.003.00

Binette, J., Vasold, K. (2018). 2018 home and community preferences: A national survey of adults age 18-plus. https://doi.org/10.26419/res.00231.001

Broadbent, E., Stafford, R., MacDonald, B. A. (2009). Acceptance of healthcare robots for the older population: Review and future directions. International Journal of Social Robotics, 1(4), 319-330. https://doi.org/10.1007/s12369-009-0030-6

Bröhl, C., Nelles, J., Brandl, C., Mertens, A., Schlick, C. M. (2016). Tam Reloaded: A technology acceptance model for human-robot cooperation in production systems. HCI International 2016 – Posters' Extended Abstracts, 97–103. https://doi.org/10.1007/978-3-319-40548-3_16

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of Information Technology. MIS Quarterly, 13(3), 319. https://doi.org/10.2307/249008

Deutsch, I., Erel, H., Paz, M., Hoffman, G., & Zuckerman, O. (2019). Home robotic devices for older adults: Opportunities and concerns. Computers in Human Behavior, 98. https://doi.org/10.1016/j.chb.2019.04.002

Ezer, N., Fisk, A. D., Rogers, W. A. (2009). Attitudinal and intentional acceptance of domestic robots by younger and older adults. Universal Access in Human-Computer Interaction. Intelligent and Ubiquitous Interaction Environments, 39-48. https://doi.org/10.1007/978-3-642-02710-9_5

Fong, T. G., Fearing, M. A., Jones, R. N., Shi, P., Marcantonio, E.R., Rudolph, J.L., Yang, F.M., Kiely, D. K., Inouye, S. K. (2009). Telephone Interview for Cognitive Status: Creating a crosswalk with the Mini-Mental State Examination. Alzheimer's & Dementia 5(6), 492-497. https://doi.org/10.1016/j.jalz.2009.02.007

Garnier, M., Poncin, I. (2013). The avatar in marketing: Synthesis, integrative framework and perspectives. Recherche et Applications En Marketing (English Edition), 28(1), 85–115. https://doi.org/10.1177/2051570713478335

Haring, K. S., Watanabe, K., Velonaki, M., Tossell, C. C., Finomore, V. (2018). FFAB—the form function attribution bias in human–robot interaction. IEEE Transactions on Cognitive and Developmental Systems, 10(4), 843–851. https://doi.org/10.1109/tcds.2018.2851569

Hsu, C. L., Lu, H. P. (2007). Consumer behavior in online game communities: A motivational factor perspective. Computers in Human Behavior 23(3), 1642-1659. https://doi.org/10.1016/j.chb.2005.09.001

Lawton, M. P., Brody, E. M. (1969). Assessment of older people: Self-maintaining and instrumental activities of Daily Living. The Gerontologist, 9(3 Part 1), 179–186. https://doi.org/10.1093/geront/9.3_part_1.179

Lawton, M. P., Nahemow, L. (1973). Ecology and the aging process. The Psychology of Adult Development and Aging., 619–674. https://doi.org/10.1037/10044-020

Lawton, M. P. (1990). Aging and performance of Home Tasks. Human Factors: The Journal of the Human Factors and Ergonomics Society, 32(5), 527–536. https://doi.org/10.1177/001872089003200503

Luria, M., Forlizzi, J., Hodgins, J. (2018). The effects of eye design on the perception of Social Robots. 2018 27th IEEE International Symposium on Robot and Human Interactive Communication (RO-MAN). https://doi.org/10.1109/roman.2018.8525767

Mitzner, T. L., Chen, T. L., Kemp, C. C., Rogers, W. A. (2014). Identifying the potential for robotics to assist older adults in different living environments. International Journal of Social Robotics, 6(2), 213–227. https://doi.org/10.1007/s12369-013-0218-7

National Institute on Aging (2018). Strategic Directions for Research, 2020-2025. The National Institute on Aging. https://www.nia.nih.gov/about/aging-strategic-directions-research

Phillips, E., Ullman, D., de Graaf, M. M., Malle, B. F. (2017). What does a robot look like?: A multi-site examination of user expectations about robot appearance. Proceedings of the Human Factors and Ergonomics Society Annual Meeting, 61(1), 1215–1219. https://doi.org/10.1177/1541931213601786

Pino, M., Boulay, M., Jouen, F., Rigaud, A. S. (2015). "Are we ready for robots that care for us?" Attitudes and opinions of older adults toward socially assistive robots. Frontiers in Aging Neuroscience,

7(JUL). https://doi.org/10.3389/fnagi.2015.00141
Population Reference Bureau. (2019). Fact Sheet: Aging in the United States. https://www.prb.org/aging-unitedstates-fact-sheet/
Prakash, A., Rogers, W. A. (2015). Why some humanoid faces are perceived more positively than others: Effects of human-likeness and task. International Journal of Social Robotics, 7, 309-331.
Remillard, E. T., Griffiths, P. C., Sanford, J. A., Mitzner, T. L. Rogers, W. A. (2020). TechSAge background questionnaire: Overview of measures (TechSAge-TR2001). Rehabilitation Engineering Research Center on Technologies to Support Aging-in-Place for People with Long-Term Disabilities.
Riek, L. D. (2017). Healthcare Robotics. Communications of the ACM, 60(11), 68-78. https://doi.org/10.1145/3127874
Rogers, W. A., Meyer, B., Walker, N., Fisk, A. D. (1998). Functional limitations to daily living tasks in the aged: A focus group analysis. Human Factors: The Journal of the Human Factors and Ergonomics Society, 40(1), 111–125. https://doi.org/10.1518/001872098779480613
Rogers, W. A., Ramadhani, W. A., Harris, M. T. (2020). Defining aging in place: The intersectionality of space, person, and time. Innovation in Aging, 4, 1–11. https://doi.org/10.1093/geroni/igaa036
Roy, N., Dubé, R., Després, C., Freitas, A., Légaré, F. (2018). Choosing between staying at home or moving: A systematic review of factors influencing housing decisions among frail older adults. PLOS ONE, 13(1). https://doi.org/10.1371/journal.pone.0189266
Samuel, G., Correa, M., Todd. C., Tinker, A. (2023). What contribution do robots make to the care of older people? A scoping review. Gerontechnology, 22(2). https://doi.org/10.4017/gt.2023.22.2.sam.08
Stroessner, S. J., Benitez, J. (2018). The social perception of humanoid and non-humanoid robots: Effects of gendered and Machinelike features. International Journal of Social Robotics, 11(2), 305–315. https://doi.org/10.1007/s12369-018-0502-7
Sundar, S. S., Waddell, T. F., Jung, E. H. (2016). The Hollywood robot syndrome: Media effects on older adults' attitudes toward robots and adoption intentions. ACM/IEEE International Conference on Human-Robot Interaction, 2016-April. https://doi.org/10.1109/HRI.2016.7451771
Tinker, A. (2016). Some ethical issues in research on the housing of older people. Gerontechnology, 15(4). https://doi.org/10.4017/gt.2016.15.4.002.00
Venkatesh, V., Thong, J. Y., Xu, X. (2012). Consumer acceptance and use of information technology: extending the unified theory of acceptance and use of technology. MIS Quarterly, 157-178. https://doi.org/10.2307/41410412
WHO. (2018). Ageing and health. https://www.who.int/news-room/fact-sheets/detail/ageing-and-health
Złotowski, J., Khalil, A., Abdallah, S. (2019). One robot doesn't fit all: Aligning social robot appearance and job suitability from a Middle Eastern Perspective. AI & SOCIETY, 35(2), 485–500. https://doi.org/10.1007/s00146-019-00895-x