Exploring Autonomy in the Design of an Intelligent Health Assistant for Older Adults

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ABSTRACT
In the last few years, interest in consumer intelligent voice assistants (IVAs) to aid older adults in living healthier and longer at home has seen a drastic increase. As these devices become more and more integrated into the lives of older adults to assist with health and wellness tasks at home, it is rapidly becoming important to understand how to design these systems that also match older adults' goals for how they want to govern their personal health tasks. As a first step in understanding older adults' needs for autonomy in intelligent health assistant (IHA) design, we conduct a Wizard of OZ study that included a semi-structured interview with 10 older adults to understand their needs and concerns about IHAs for consumer health. We present our findings as opportunities to design IHA that help inform users in order to meet their needs for autonomy.

Author Keywords
Aging; Older Adults; Intelligent Voice Assistant Intelligent Health Assistant.

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INTRODUCTION
The benefits and tradeoffs of introducing interface agents for assisting users with tasks is well known [1, 2]. Therefore, in understanding users' perceptions and needs for automations is key to designing systems that meet user needs and expectations [1]. In the past few years, there has been emerging interest in using intelligent voice assistants (Alexa, Google Home) to assist older adults with health and wellness tasks at home [3]. However, there is limited understanding of how older adults desire to interact with these devices and their perceptions of the potential tradeoffs on including these types of systems in their day-to-day health regimen. In this paper, we explore older adults perceived needs for autonomy in intelligent health assistants and discuss opportunities for IUIs to address these needs.

METHODS
We conducted a Wizard of Oz (WOZ) study where we introduced the idea of an intelligent health assistant that could provide tailored information and recommendations about medications and symptoms. Participants included ten older adults aged 60 to 76 (AVG=67, SD=5.41). Most participants browsed the internet regularly (3 or more days a week) and most (N=7) used the Internet or other technology to find health information outside of their doctor's office. Eight participants involved another party (e.g. family, friend, doctor) in their health decisions, while two made decisions independently.

During the study, we asked participants questions about how they currently find information about medications and symptoms and the people that are involved in managing their care. We then asked participants to use scenarios to interact with a paper prototype of an intelligent voice (health) assistant that through a speaker mimicked a system that could provide tailored responses based on knowledge of a user's health history. After completing the scenarios, participants were asked questions about their views of an intelligent voice assistant for health, preferences for providing and managing health data, and concerns about adopting a similar system to assist with health tasks. All interview data was transcribed and analyzed using thematic analysis to uncover recurring themes.

FINDINGS
From our interview findings, were found that the participants had two types of concerns when it came to autonomy in the design of intelligent health assistants. We discuss both below.

Autonomy in Data Management
We refer to data management as participants discussions of who they preferred to manage the personal health data used by the system to provide tailored recommendations. In our study, participants described three scenarios for data management. Six participants discussed the need to have full control of who manages their data. These participants felt that they would be comfortable if either they or a family

member (e.g. spouse or child) manage the data required to make tailored recommendations. Of the six participants, four felt they would have no issues or concerns entering their medical data into the system themselves. They stated in the interviews, that they felt confident with entering their information because of past experience with technology. For example, Participant 2 stated when asked about who they would want to manage their data, "*I do it alone because I was an office manager in the doctor's office and I did medical billing codes sell"*. Other participants stated that they would feel comfortable having close relatives assist them with entering and managing data. Participant 3 stated, "*I would want to enter it manually myself or designate only one person to enter it. But I would enter it myself as long as I was capable of doing that"*. Alternatively, three users were apathetic and had no desire to manage their personal health data. Users with apathetic feelings suggested that they would feel comfortable with a third-party managing the data, such as a doctor or a pharmacist, but has no strong feelings about how data was managed or who managed it. For example, Participant 1 stated, "*It wouldn't matter to me who does it [manages the data]. But I wouldn't want to have to sit there and read it to this thing. Send it through an email or something"*.

Autonomy in Personal Health Decisions

The second concern interviewees mentioned regarding autonomy involved the level of interaction they desired to have with the device and how it would be integrated in their personal health regimen. Participants fell into three groups regarding how they would want to interact with the device. Some participants wished to only to engage with the device periodically, and only wanted to receive basic health information similar to that they could find by searching the Internet. They desired basic interactions such as searching for information on how to treat a headache or symptoms of certain disease. Participant 9 stated when asked about what information he/she would want from the device stated," I *think it'll be able to help me whether I need to contact a doctor because I maybe having symptoms of something that may be serious or that may be nothing at all. ... Like you know, [I would ask it] some simple questions about aches and pains"*. Participants who wanted personalization wanted information tailored based on their medical history and current diagnosis. They wanted to include information on their current prescriptions and blood pressure measurements and have the system tailor responses based on the information it had about their health. Participant 13 stated when asked what information he/she would want from a IHA, "*I [would] search for what symptoms [or] side effects that the Hydrochloride has. Sometimes I like to break out with a rash or I require information about that. Like if it'll have different side effects"*. Lastly, participants discussed fully-integrated assistance. This type of assistant goes beyond providing personalized medical assistance and helps the users manage their lifestyle. Examples participants mentioned included information on wellness, exercise, and dietary needs. Participant 14 mentioned that the system should automatically stay up-to-date with information, "*It should give all the data of your everyday medication ... if you go to store and buy over the counter medication, it should have it in there. Your everyday data must be there*".

OPPORTUNITIES FOR IUI DESIGN

Our findings indicate that when considering an intelligent health assistant for home use, older adults had varying needs for autonomy. Tables 1 and 2, list participants' preferences for data management and involvement.

	Full Control	**Apathetic**
Self	P3, P7, P11, P2	-
Family	P13, P14	-
Third-Party	-	P1, P4, P6, P9

Table 1. Participants preferred data management strategies.

	Participant
Fully Integrated into Health Regimen	P4, P6, P3, P14
Personalized Health Information Search	P13, P1
Generic Health Information Search	P9, P7, P2, P11

Table 2. Participants preferred interactions with an IHA.

One interesting finding that emerged from our data, is that while at least three participants preferred to maintain control of their personal data, they also preferred the system to provide personalized recommendations. These findings suggest that there are opportunities not only to support users in understanding how IHAs make recommendations but also to explore how explanations can inform and empower users to meet their desired needs for autonomy. In addition, certain participants lacked interest in how their information is stored and managed which may negatively affect their knowledge of how their data is used and can increase their risk of misinformation, security, and privacy. In the future, we will continue to explore how to design IHAs that increase apathy in users and let then easily manage their own data.

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