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Smart Homes for Smart Health: Developing an Interactive System to Reduce In-Home Secondhand Smoke

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Introduction

Second-hand smoke (SHS) is a particularly unsafe for children due to biological characteristics (higher breathing rates, immature lungs and underdeveloped immune systems) that make it difficult to filter toxins. To address this concern, our lab has begun developing a smart home review system consisting of an Awair air particle monitor and custom-built skill for the Amazon Echo show. This interactive system aims to allow household participants to track SHS in various living spaces and to receive an intervention aimed at reducing SHS in order to protect the health of children residents. Our project focused on delving into the details of the Awair and Echo skill to gain an appreciation of their capabilities in order to refine the system.

Methods

Literature Research

-Peer-reviewed studies with similar characteristics to our study were investigated.

Device Development

- Investigated the capabilities of the Awair device by observing responses to known particle sources (e.g. vaping, nail painting) and exploring device features
- Designed the infrastructure components to code into the Amazon Alexa skill program
- Beta-tested the first version of the custom-built Alexa skill to assess the quality of the interaction and identify any bugs
- Built a flow-chart of skill processes to aid in refinement

References

1. Jones, L.L., Atkinson, O., Longman J., Coleman T., McNeil, A., & Lewis, S.A. 2011. The motivators and barriers to a smoke-free home among disadvantaged caregivers: identifying the positive levers for change. *Nicotine and Tobacco Research*. 13(6): 479-486.
2. Rosen, L.J., Lev, E., Guttman, N., Tillinger, E., Rosenblat, S., Zucker D.M., Myers, V. 2018. Parental Perceptions and Misconceptions of Child Tobacco Smoke Exposure. *Nicotine and Tobacco Research*. 20(11): 1369-1377.

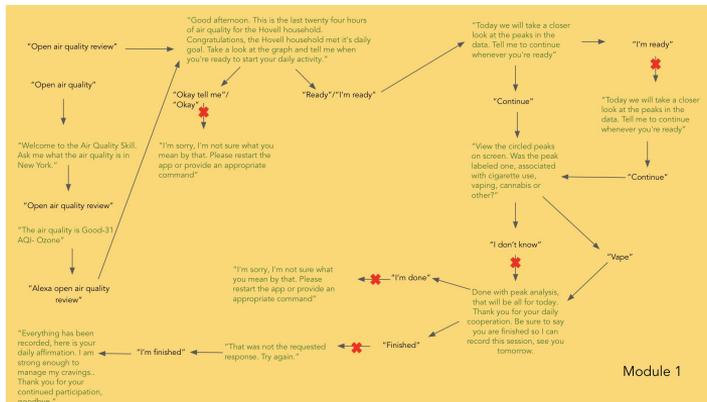


Figure 1: Mapping of Alexa Skill Capabilities, Report Results Module



Figure 2: Snapshots of Air Quality Report from Awair Device

Results

Literature Research

-Behavioral changes in guardians are most effective when they been shown evidence that their smoking habits impact their children's health.¹

-Parents rely on their sensory perceptions of smell, sight, and feel to determine whether smoke exposure has occurred which has been found to lead to misconceptions about exposure to tobacco smoke.²

Amazon Alexa

-Unorganized when navigating participant through different skill programs

-Alexa skill has 4 modules: report results, peak identification, motivational interviewing, and fact presentation. Navigation within these modules is clumsy and requires standardization

Awair Device

-Scores air quality in a specific room based off of: Humidity, Temperature, CO₂, Chemical, & PM2.5 Levels (averages daily score out of 100)

-Cross referencing bad air quality events with PM2.5 level (ug/m³) records allow for the identification of the incidents (non-smoking/smoking) *shown in graphs

-Limited to the degree customizability in alert settings

Next Steps

The next steps in our research is to conduct a virtual feasibility study.

-Participants will be sent the devices through mail and directed through Zoom trainings and meetings

- Develop a method to deconstruct data so that guardians can easily understand the data.

QR Code for Video
Demonstration

